Pharmacy Council of India

New Delhi

Rules & Syllabus for the Bachelor of Pharmacy (B. Pharm) Course

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[Framed under Regulation 6, 7 & 8 of the Bachelor of Pharmacy (B. Pharm) course regulations 2014]

CHAPTER- I: REGULATIONS

1. Short Title and Commencement

These regulations shall be called as "The Revised Regulations for the B. Pharm. Degree Program (CBCS)of the Pharmacy Council of India, New Delhi". They shall come into effect from the Academic Year 2016-17. The regulations framed are subject to modifications from time to time by Pharmacy Council of India.

2. Minimum qualification for admission

2.1 First year B. Pharm:

Candidate shall have passed 10+2 examination conducted by the respective state/central government authorities recognized as equivalent to 10+2 examination by the Association of Indian Universities (AIU) with English as one of the subjects and Physics, Chemistry, Mathematics (P.C.M) and or Biology (P.C.B / P.C.M.B.) as optional subjects individually. Any other qualification approved by the Pharmacy Council of India as equivalent to any of the above examinations.

2.2. B. Pharm lateral entry (to third semester):

A pass in D. Pharm. course from an institution approved by the Pharmacy Council of India under section 12 of the Pharmacy Act.

3. Duration of the program

The course of study for B.Pharm shall extend over a period of eight semesters (four academic years) and six semesters (three academic years) for lateral entry students. The curricula and syllabi for the program shall be prescribed from time to time by Pharmacy Council of India, New Delhi.

4. Medium of instruction and examinations

Medium of instruction and examination shall be in English.

5. Working days in each semester

Each semestershall consist of not less than 100 working days. The odd semesters shall be conducted from the month of June/July to November/December and the even semesters shall be conducted from December/January to May/June in every calendar year.

6. Attendance and progress

A candidate is required to put in at least 80% attendance in individual courses considering theory and practical separately. The candidate shall complete the prescribed course satisfactorily to be eligible to appear for the respective examinations.

7. Program/Course credit structure

As per the philosophy of Credit Based Semester System, certain quantum of academic work viz. theory classes, tutorial hours, practical classes, etc. are measured in terms of credits. On satisfactory completion of the courses, a candidate earns credits. The amount of credit associated with a course is dependent upon the number of hours of instruction per week in that course. Similarly, the credit associated with any of the other academic, co/extra-curricular activities is dependent upon the quantum of work expected to be put in for each of these activities per week.

7.1. Credit assignment

7.1.1. Theory and Laboratory courses

Courses are broadly classified as Theory and Practical. Theory courses consist of lecture (L) and /or tutorial (T) hours, and Practical (P) courses consist of hours spent in the laboratory. Credits (C) for a course is dependent on the number of hours of instruction per week in that course, and is obtained by using a multiplier of one (1) for lecture and tutorial hours, and a multiplier of half (1/2) for practical (laboratory) hours. Thus, for example, a theory course having three lectures and one tutorial per week throughout the semester carries a credit of 4. Similarly, a practical having four laboratory hours per week throughout semester carries a credit of 2.

7.2. Minimum credit requirements

The minimum credit points required for award of a B. Pharm. degree is 208. These credits are divided into Theory courses, Tutorials, Practical, Practice School and Projectover the duration of eight semesters. The credits are distributed semester-wise as shown in Table IX. Courses generally progress in sequences, building competencies and their positioning indicates certain academic maturity on the part of the learners. Learners are expected to follow the semester-wise schedule of courses given in the syllabus.

The lateral entry students shall get 52 credit points transferred from their D. Pharm program. Such students shall take up additional remedial courses of ‘Communication Skills’ (Theory and Practical) and ‘Computer Applications in Pharmacy’ (Theory and Practical) equivalent to 3 and 4 credit points respectively, a total of 7 credit points to attain 59 credit points, the maximum of I and II semesters.

8. Academic work

A regular record of attendance both in Theory and Practical shall be maintained by the teaching staff of respective courses.

9. Course of study

The course of study for B. Pharm shall include Semester Wise Theory & Practical as given in Table – I to VIII. The number of hours to be devoted to each theory, tutorial and practical course in any semester shall not be less than that shown in Table – I to VIII.

Table-I: Course of study for semester I

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP101T	Human Anatomy and Physiology I– Theory	3	1	4
BP102T	Pharmaceutical Analysis I – Theory	3	1	4
BP103T	Pharmaceutics I – Theory	3	1	4
BP104T	Pharmaceutical Inorganic Chemistry – Theory	3	1	4
BP105T	Communication skills – Theory *	2	-	2
BP106RBT BP106RMT	Remedial Biology/ Remedial Mathematics – Theory*	2	-	2
BP107P	Human Anatomy and Physiology – Practical	4	-	2
BP108P	Pharmaceutical Analysis I – Practical	4	-	2
BP109P	Pharmaceutics I – Practical	4	-	2
BP110P	Pharmaceutical Inorganic Chemistry – Practical	4	-	2
BP111P	Communication skills – Practical*	2	-	1
BP112RBP	Remedial Biology – Practical*	2	-	1
	Total	**32/34$/36#**	**4**	**27/29$/30#**

#Applicable ONLY for the students who have studied Mathematics / Physics / Chemistry at HSC and appearing for Remedial Biology (RB)course**.**

$Applicable ONLY for the students who have studied Physics / Chemistry / Botany / Zoology at HSC and appearing for Remedial Mathematics (RM)course**.**

* Non University Examination (NUE)

Table-II: Course of study for semester II

Course Code	Name of the course	No. of hours	Tutorial	Credit points
BP201T	Human Anatomy and Physiology II – Theory	3	1	4
BP202T	Pharmaceutical Organic Chemistry I – Theory	3	1	4
BP203T	Biochemistry – Theory	3	1	4
BP204T	Pathophysiology – Theory	3	1	4
BP205T	Computer Applications in Pharmacy – Theory *	3	-	3
BP206T	Environmental sciences – Theory *	3	-	3
BP207P	Human Anatomy and Physiology II –Practical	4	-	2
BP208P	Pharmaceutical Organic Chemistry I– Practical	4	-	2
BP209P	Biochemistry – Practical	4	-	2
BP210P	Computer Applications in Pharmacy – Practical*	2	-	1
	Total	**32**	**4**	**29**

*****Non University Examination (NUE)

Table-III: Course of study for semester III

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP301T	Pharmaceutical Organic Chemistry II – Theory	3	1	4
BP302T	Physical Pharmaceutics I – Theory	3	1	4
BP303T	Pharmaceutical Microbiology – Theory	3	1	4
BP304T	Pharmaceutical Engineering – Theory	3	1	4
BP305P	Pharmaceutical Organic Chemistry II – Practical	4	-	2
BP306P	Physical Pharmaceutics I – Practical	4	-	2
BP307P	Pharmaceutical Microbiology – Practical	4	-	2
BP 308P	Pharmaceutical Engineering –Practical	4	-	2
	Total	**28**	**4**	**24**

Table-IV: Course of study for semester IV

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP401T	Pharmaceutical Organic Chemistry III– Theory	3	1	4
BP402T	Medicinal Chemistry I – Theory	3	1	4
BP403T	Physical Pharmaceutics II – Theory	3	1	4
BP404T	Pharmacology I – Theory	3	1	4
BP405T	Pharmacognosy and Phytochemistry I– Theory	3	1	4
BP406P	Medicinal Chemistry I – Practical	4	-	2
BP407P	Physical Pharmaceutics II – Practical	4		2
BP408P	Pharmacology I – Practical	4	-	2
BP409P	Pharmacognosy and Phytochemistry I – Practical	4	-	2
	Total	**31**	**5**	**28**

Table-V: Course of study for semester V

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP501T	Medicinal Chemistry II – Theory	3	1	4
BP502T	Industrial PharmacyI– Theory	3	1	4
BP503T	Pharmacology II – Theory	3	1	4
BP504T	Pharmacognosy and Phytochemistry II– Theory	3	1	4
BP505T	Pharmaceutical Jurisprudence – Theory	3	1	4
BP506P	Industrial PharmacyI – Practical	4	-	2
BP507P	Pharmacology II – Practical	4	-	2
BP508P	Pharmacognosy and Phytochemistry II – Practical	4	-	2
	Total	**27**	**5**	**26**

Table-VI: Course of study for semester VI

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP601T	Medicinal Chemistry III – Theory	3	1	4
BP602T	Pharmacology III – Theory	3	1	4
BP603T	Herbal Drug Technology – Theory	3	1	4
BP604T	Biopharmaceutics and Pharmacokinetics – Theory	3	1	4
BP605T	Pharmaceutical Biotechnology – Theory	3	1	4
BP606T	Quality Assurance –Theory	3	1	4
BP607P	Medicinal chemistry III – Practical	4	-	2
BP608P	Pharmacology III – Practical	4	-	2
BP609P	Herbal Drug Technology – Practical	4	-	2
	Total	**30**	**6**	**30**

Table-VII: Course of study for semester VII

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP701T	Instrumental Methods of Analysis – Theory	3	1	4
BP702T	Industrial PharmacyII – Theory	3	1	4
BP703T	Pharmacy Practice – Theory	3	1	4
BP704T	Novel Drug Delivery System – Theory	3	1	4
BP705P	Instrumental Methods of Analysis – Practical	4	-	2
BP706PS	Practice School*	12	-	6
	Total	**28**	**5**	**24**

***** Non University Examination (NUE)

Table-VIII: Course of study for semester VIII

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP801T	Biostatistics and Research Methodology	3	1	4
BP802T	Social and Preventive Pharmacy	3	1	4
BP803ET	Pharma Marketing Management	3 + 3 = 6	1 + 1 = 2	4 + 4 = 8
BP804ET	Pharmaceutical Regulatory Science			
BP805ET	Pharmacovigilance			
BP806ET	Quality Control and Standardization of Herbals			
BP807ET	Computer Aided Drug Design			
BP808ET	Cell and Molecular Biology			
BP809ET	Cosmetic Science			
BP810ET	Experimental Pharmacology			
BP811ET	Advanced Instrumentation Techniques			
BP812ET	Dietary Supplements and Nutraceuticals			
BP813PW	Project Work	12	-	6
	Total	**24**	**4**	**22**

Table-IX: Semester wise credits distribution

Semester	Credit Points
I	**27/29$/30#**
II	29
III	26
IV	28
V	26
VI	26
VII	24
VIII	22
Extracurricular/ Co curricular activities	01*
Total credit points for the program	**209/211$/212#**

* The credit points assigned for extracurricular and or co-curricular activities shall be given by the Principals of the colleges and the same shall be submitted to the University. The criteria to acquire this credit point shall be defined by the colleges from time to time.

$Applicable ONLY for the students studied Physics / Chemistry / Botany / Zoology at HSC and appearing for Remedial Mathematics course**.**

#Applicable ONLY for the students studied Mathematics / Physics / Chemistry at HSC and appearing for Remedial Biology course**.**

10. Program Committee

1. The B. Pharm. program shall have a Program Committee constituted by the Head of the institution in consultation with all the Heads of the departments.

2. The composition of the Program Committee shall be as follows:

   A senior teacher shall be the Chairperson; One Teacher from each department handling B.Pharm courses; and four student representatives of the program (one from each academic year), nominated by the Head of the institution.

3. Duties of the Program Committee:

   i. Periodically reviewing the progress of the classes.
   ii. Discussing the problems concerning curriculum, syllabus and the conduct of classes.
   iii. Discussing with the course teachers on the nature and scope of assessment for the course and the same shall be announced to the students at the beginning of respective semesters.
   iv. Communicating its recommendation to the Head of the institution on academic matters.
   v. The Program Committee shall meet at least thrice in a semester preferably at the end of each Sessionalexam (Internal Assessment) and before the end semester exam.

11. Examinations/Assessments

The scheme for internal assessment and end semester examinations is given in Table – X.

11.1. End semester examinations

The End Semester Examinations for each theory and practical coursethrough semesters I to VIII shall beconducted by the university except for the subjects with asterix symbol (*) in table I and II for which examinations shall be conducted by the subject experts at college level and the marks/grades shall be submitted to the university.

Tables-X: Schemes for internal assessments and end semester examinations semester wise

Semester I

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP101T	Human Anatomy and Physiology I– Theory	10	15	1 Hr	25	75	3 Hrs	100
BP102T	Pharmaceutical Analysis I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP103T	Pharmaceutics I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP104T	Pharmaceutical Inorganic Chemistry – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP105T	Communication skills – Theory *	5	10	1 Hr	15	35	1.5 Hrs	50
BP106RBT BP106RMT	Remedial Biology/ Mathematics – Theory*	5	10	1 Hr	15	35	1.5 Hrs	50
BP107P	Human Anatomy and Physiology – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP108P	Pharmaceutical Analysis I – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP109P	Pharmaceutics I – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP110P	Pharmaceutical Inorganic Chemistry – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP111P	Communication skills – Practical*	5	5	2 Hrs	10	15	2 Hrs	25
BP112RBP	Remedial Biology – Practical*	5	5	2 Hrs	10	15	2 Hrs	25
	Total	**70/75$^{\$}$/80$^{\#}$**	**115/125$^{\$}$/130$^{\#}$**	**23/24$^{\$}$/26$^{\#}$ Hrs**	**185/200$^{\$}$/210$^{\#}$**	**490/525$^{\$}$/ 540$^{\#}$**	**31.5/33$^{\$}$/ 35$^{\#}$ Hrs**	**675/725$^{\$}$/ 750$^{\#}$**

$^{\#}$Applicable ONLY for the students studied Mathematics / Physics / Chemistry at HSC and appearing for Remedial Biology (RB)course**.**

$^{\$}$Applicable ONLY for the students studied Physics / Chemistry / Botany / Zoology at HSC and appearing for Remedial Mathematics (RM)course**.**

***** Non University Examination (NUE)

Semester II

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP201T	Human Anatomy and Physiology II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP202T	Pharmaceutical Organic Chemistry I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP203T	Biochemistry – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP204T	Pathophysiology – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP205T	Computer Applications in Pharmacy – Theory*	10	15	1 Hr	25	50	2 Hrs	75
BP206T	Environmental sciences – Theory*	10	15	1 Hr	25	50	2 Hrs	75
BP207P	Human Anatomy and Physiology II –Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP208P	Pharmaceutical Organic Chemistry I– Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP209P	Biochemistry – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP210P	Computer Applications in Pharmacy – Practical*	5	5	2 Hrs	10	15	2 Hrs	25
Total		**80**	**125**	**20 Hrs**	**205**	**520**	**30 Hrs**	**725**

***** The subject experts at college level shall conduct examinations

Semester III

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP301T	Pharmaceutical Organic Chemistry II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP302T	PhysicalPharmaceuticsI –Theory	10	15	1 Hr	25	75	3 Hrs	100
BP303T	Pharmaceutical Microbiology – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP304T	Pharmaceutical Engineering – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP305P	Pharmaceutical Organic Chemistry II – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP306P	Physical Pharmaceutics I – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP307P	Pharmaceutical Microbiology – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP308P	Pharmaceutical Engineering – Practical	5	10	4 Hr	15	35	4 Hrs	50
Total		**60**	**100**	**20**	**160**	**440**	**28Hrs**	**600**

Semester IV

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP401T	Pharmaceutical Organic Chemistry III– Theory	10	15	1 Hr	25	75	3 Hrs	100
BP402T	Medicinal Chemistry I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP403T	Physical Pharmaceutics II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP404T	Pharmacology I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP405T	Pharmacognosy I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP406P	Medicinal Chemistry I – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP407P	Physical Pharmaceutics II – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP408P	Pharmacology I – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP409P	Pharmacognosy I – Practical	5	10	4 Hrs	15	35	4 Hrs	50
Total		**70**	**115**	**21 Hrs**	**185**	**515**	**31 Hrs**	**700**

Semester V

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP501T	Medicinal Chemistry II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP502T	Industrial PharmacyI– Theory	10	15	1 Hr	25	75	3 Hrs	100
BP503T	Pharmacology II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP504T	Pharmacognosy II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP505T	Pharmaceutical Jurisprudence – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP506P	Industrial PharmacyI– Practical	5	10	4 Hr	15	35	4 Hrs	50
BP507P	Pharmacology II – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP508P	Pharmacognosy II – Practical	5	10	4 Hr	15	35	4 Hrs	50
Total		**65**	**105**	**17 Hr**	**170**	**480**	**27 Hrs**	**650**

Semester VI

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP601T	Medicinal Chemistry III – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP602T	Pharmacology III – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP603T	Herbal Drug Technology – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP604T	Biopharmaceutics and Pharmacokinetics – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP605T	Pharmaceutical Biotechnology– Theory	10	15	1 Hr	25	75	3 Hrs	100
BP606T	Quality Assurance– Theory	10	15	1 Hr	25	75	3 Hrs	100
BP607P	Medicinal chemistry III – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP608P	Pharmacology III – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP609P	Herbal Drug Technology – Practical	5	10	4 Hrs	15	35	4 Hrs	50
Total		**75**	**120**	**18 Hrs**	**195**	**555**	**30 Hrs**	**750**

Semester VII

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP701T	Instrumental Methods of Analysis – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP702T	Industrial Pharmacy – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP703T	Pharmacy Practice – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP704T	Novel Drug Delivery System – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP705 P	Instrumental Methods of Analysis – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP706 PS	Practice School*	25	-	-	25	125	5 Hrs	150
Total		**70**	**70**	**8Hrs**	**140**	**460**	**21 Hrs**	**600**

***** The subject experts at college level shall conduct examinations

Semester VIII

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP801T	Biostatistics and Research Methodology – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP802T	Social and Preventive Pharmacy – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP803ET	Pharmaceutical Marketing – Theory	10 + 10 = 20	15 + 15 = 30	1 + 1 = 2 Hrs	25 + 25 = 50	75 + 75 = 150	3 + 3 = 6 Hrs	100 + 100 = 200
BP804ET	Pharmaceutical Regulatory Science – Theory							
BP805ET	Pharmacovigilance – Theory							
BP806ET	Quality Control and Standardization of Herbals – Theory							
BP807ET	Computer Aided Drug Design – Theory							
BP808ET	Cell and Molecular Biology – Theory							
BP809ET	Cosmetic Science – Theory							
BP810ET	Experimental Pharmacology – Theory							
BP811ET	Advanced Instrumentation Techniques – Theory							
BP812PW	Project Work	-	-	-	-	150	4 Hrs	150

Total	**40**	**60**	**4 Hrs**	**100**	**450**	**16 Hrs**	**550**

11.2. Internal assessment: Continuous mode

The marks allocated for Continuous mode of Internal Assessment shall be awarded as per the scheme given below.

Table-XI:Scheme for awarding internal assessment: Continuous mode

Theory		
Criteria	**Maximum Marks**	
Attendance (Refer Table – XII)	4	2
Academic activities (Average of any 3 activities e.g. quiz, assignment, open book test, field work, group discussion and seminar)	3	1.5
Student – Teacher interaction	3	1.5
Total	**10**	**5**
Practical		
Attendance (Refer Table – XII)	2	
Based on Practical Records, Regular viva voce, etc.	3	
Total	**5**	

Table- XII: Guidelines for the allotment of marks for attendance

Percentage of Attendance	**Theory**	**Practical**
95 – 100	4	2
90 – 94	3	1.5
85 – 89	2	1
80 – 84	1	0.5
Less than 80	0	0

11.2.1. Sessional Exams

Two Sessional exams shall be conducted for each theory / practical course as per the schedule fixed by the college(s). The scheme of question paper for theory and practical Sessional examinations is given below. The average marks of two Sessional exams shall be computed for internal assessment as per the requirements given in tables – X.

Sessional exam shall be conducted for 30 marks for theory and shall be computed for 15 marks. Similarly Sessional exam for practical shall be conducted for 40 marks and shall be computed for 10 marks.

Question paper pattern for theory Sessional examinations

For subjects having University examination

I. Multiple Choice Questions (MCQs)
(Answer all the questions) = 10 x 1 = 10
I. Long Answers (Answer 1 out of 2) = 1 x 10 = 10
II. Short Answers (Answer 2 out of 3) = 2 x 5 = 10

Total = 30 marks

For subjects having Non University Examination

I. Long Answers (Answer 1 out of 2)	=	1 x 10 = 10
II. Short Answers (Answer 4 out of 6)	=	4 x 5 = 20

Total	=	30 marks

Question paper pattern for practical sessional examinations

I. Synopsis	=	10
II. Experiments	=	25
III. Viva voce	=	05

Total	=	40 marks
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12. Promotion and award of grades

A student shall be declared PASSand eligible for getting gradein a course of B.Pharm.program if he/she secures at least 50% marks in that particular course including internal assessment.For example, to be declared as PASS and to get grade, the student has to secure a minimum of 50 marks for the total of 100 including continuous mode of assessment and end semester theory examination and has to secure a minimum of 25 marks for the total 50 including internal assessment and end semester practical examination.

13. Carry forward of marks

In case a studentfails to secure the minimum 50% in any Theory or Practical course as specified in 12,then he/she shall reappear for the end semester examinationof that course. However his/her marks of the Internal Assessmentshallbe carried overand he/she shall be entitled for grade obtained by him/her on passing.

14. Improvement of internal assessment

A studentshall have the opportunity to improvehis/her performance only oncein the Sessional exam component of the internal assessment. The re-conduct of the Sessional exam shall be completed before the commencement of next end semester theory examinations.

15. Re-examination of end semester examinations

Reexamination ofend semester examinationshall be conducted as per the schedule given in table XIII. The exact dates of examinations shall be notified from time to time.

Table-XIII: Tentative schedule of end semester examinations

Semester	For Regular Candidates	For Failed Candidates
I, III, V and VII	November / December	May / June
II, IV, VI and VIII	May / June	November / December

Question paper pattern for end semester theory examinations

For 75 marks paper

I. Multiple Choice Questions(MCQs)
(Answer all the questions) = 20 x 1 = 20
I. Long Answers (Answer 2 out of 3) = 2 x 10 = 20
II. Short Answers (Answer 7 out of 9) = 7 x 5 = 35

Total = 75 marks

For 50 marks paper

I. Long Answers (Answer 2 out of 3) = 2 x 10 = 20
II. Short Answers (Answer 6 out of 8) = 6 x 5 = 30

Total = 50 marks

For 35 marks paper

I. Long Answers (Answer 1 out of 2) = 1 x 10 =10
II. Short Answers (Answer 5 out of 7) = 5 x 5 = 25

Total = 35 marks

Question paper pattern for end semester practical examinations

I. Synopsis = 5
II. Experiments = 25
III. Viva voce = 5

Total = 35 marks
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16. Academic Progression:

No student shall be admitted to any examination unless he/she fulfills the norms given in 6. Academic progression rules are applicable as follows:

A student shall be eligible to carry forward all the courses of I, II and III semesters till the IV semester examinations. However, he/she shall not be eligible to attend the courses of V semester until all the courses of I and II semesters are successfully completed.

A student shall be eligible to carry forward all the courses of III, IV and V semesters till the VI semester examinations. However, he/she shall not be eligible to attend the courses of VII semester until all the courses of I, II, III and IV semesters are successfully completed.

A student shall be eligible to carry forward all the courses of V, VI and VII semesters till the VIII semester examinations. However, he/she shall not be eligible to get the course completion certificate until all the courses of I, II, III, IV, V and VI semesters are successfully completed.

A student shall be eligible to get his/her CGPA upon successful completion of the courses of I to VIII semesters within the stipulated time period as per the norms specified in 26.

A lateral entry student shall be eligible to carry forward all the courses of III, IV and V semesters till the VI semester examinations. However, he/she shall not be eligible to attend the courses of VII semester until all the courses of III and IV semesters are successfully completed.

A lateral entry student shall be eligible to carry forward all the courses of V, VI and VII semesters till the VIII semester examinations. However, he/she shall not be eligible to get the course completion certificate until all the courses of III, IV, V and VI semesters are successfully completed.

A lateral entry student shall be eligible to get his/her CGPA upon successful completion of the courses of III to VIII semesters within the stipulated time period as per the norms specified in 26.

Any student who hasgiven more than 4 chances for successful completion of I / III semester courses and more than 3 chances for successful completion of II / IV semester courses shall be permitted to attend V / VII semester classes ONLY during the subsequent academic year as the case may be. In simpler terms there shall NOT be any ODD BATCH for any semester.

Note: Grade ABshould be considered as failed and treated as one head for deciding academic progression. Such rules are also applicable for those students who fail to register for examination(s) of any course in any semester.

17. Grading of performances

17.1. Letter grades and grade points allocations:

Based on the performances, each student shall be awarded a final letter grade at the end of the semester for each course.The letter grades and their corresponding grade points are given in Table – XII.

Table – XII: Letter grades and grade points equivalent to Percentage of marks and performances

Percentage of Marks Obtained	Letter Grade	Grade Point	Performance
90.00 – 100	O	10	Outstanding
80.00 – 89.99	A	9	Excellent
70.00 – 79.99	B	8	Good
60.00 – 69.99	C	7	Fair
50.00 – 59.99	D	6	Average
Less than 50	F	0	Fail
Absent	AB	0	Fail

A learner who remains absent for any end semester examination shall be assigned a letter grade of ABand a corresponding grade point of zero. He/she should reappear for the said evaluation/examination in due course.

18. The Semester grade point average (SGPA)

The performance of a student in a semester is indicated by a number called 'Semester Grade Point Average' (SGPA). The SGPA is the weighted average of the grade points obtainedin all the courses by the student during the semester. For example, if a student takes five courses(Theory/Practical) in a semester with credits C1, C2, C3, C4 and C5 and the student's grade pointsin these courses are G1, G2, G3, G4 and G5, respectively, and then students' SGPA is equal to:

$$\text{SGPA} = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4G_4 + C_5G_5}{C_1 + C_2 + C_3 + C_4 + C_5}$$

The SGPA is calculated to two decimal points.It should be noted that, the SGPA for any semester shall take into consideration the F and ABSgrade awarded in that semester. For example if a learner has a F or ABS grade in course 4, theSGPA shall then be computed as:

$$SGPA = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4 * ZERO + C_5G_5}{C_1 + C_2 + C_3 + C_4 + C_5}$$

19. Cumulative Grade Point Average (CGPA)

The CGPA is calculated with the SGPA of all the VIII semesters to two decimal points and is indicated in final grade report card/final transcript showing the grades of all VIII semesters and their courses. The CGPA shall reflect the failed statusin case of F grade(s),till the course(s) is/are passed. When the course(s)is/are passedby obtaining a pass grade on subsequent examination(s) theCGPA shall only reflect the new grade and not the fail grades earned earlier.The CGPA is calculated as:

$$CGPA = \frac{C_1S_1 + C_2S_2 + C_3S_3 + C_4S_4 + C_5S_5 + C_6S_6 + C_7S_7 + C_8S_8}{C_1 + C_2 + C_3 + C_4 + C_5 + C_6 + C_7 + C_8}$$

where $C_1, C_2, C_3, \ldots$ is the total number of credits for semester I,II,III,…. and $S_1, S_2, S_3, \ldots$ is the SGPA of semester I,II,III,…. .

20. Declaration of class

The class shall be awarded on the basis of CGPA as follows:

First Class with Distinction	= CGPA of. 7.50 and above
First Class	= CGPA of 6.00 to 7.49
Second Class	= CGPA of 5.00 to 5.99

21. Project work

All the students shall undertake a projectunder the supervision of a teacher and submit a report. The area of the project shall directly relate any one of the elective subject opted by the student in semester VIII. The project shall be carried out in group not exceeding 5 in number. The project report shall be submitted in triplicate (typed & bound copy not less than 25 pages).

The internal and external examiner appointed by the University shall evaluate the project at the time of the Practical examinations of other semester(s). Students shall be evaluated in groups for four hours (i.e., about half an hour for a group of five students). The projects shall be evaluated as per the criteria given below.

Evaluation of Dissertation Book:

Objective(s) of the work done		15 Marks
Methodology adopted		20 Marks
Results and Discussions		20 Marks
Conclusions and Outcomes		20 Marks
	Total	**75 Marks**

Evaluation of Presentation:

Presentation of work		25 Marks
Communication skills		20 Marks
Question and answer skills		30 Marks
	Total	**75 Marks**

Explanation: The 75 marks assigned to the dissertation book shall be same for all the students in a group. However, the 75 marks assigned for presentation shall be awarded based on the performance of individual students in the given criteria.

22. Industrial training (Desirable)

Every candidate shall be required to work for at least 150 hours spread over four weeks in a Pharmaceutical Industry/Hospital. It includes Production unit, Quality Control department, Quality Assurance department, Analytical laboratory, Chemical manufacturing unit, Pharmaceutical R&D, Hospital (Clinical Pharmacy), Clinical Research Organization, Community Pharmacy, etc. After the Semester – VI and before the commencement of Semester – VII, and shall submit satisfactory report of such work and certificate duly signed by the authority of training organization to the head of the institute.

23. Practice School

In the VII semester, every candidate shall undergo practice school for a period of 150 hours evenly distributed throughout the semester. The student shall opt any one of the domains for practice school declared by the program committee from time to time.

At the end of the practice school, every student shall submit a printed report (in triplicate) on the practice school he/she attended (not more than 25 pages). Along with the exams of semester VII, the report submitted by the student, knowledge and skills acquired by the student through practice school shall be evaluated by the subject experts at college leveland grade point shall be awarded.

24. Award of Ranks

Ranks and Medals shall be awarded on the basis of final CGPA. However, candidates who fail in one or more courses during the B.Pharm program shall not be eligible for award of ranks.Moreover, the candidates should have completed the B. Pharm program in minimum prescribed number of years, (four years) for the award of Ranks.

25. Award of degree

Candidates who fulfill the requirements mentioned above shall be eligible for award of degree during the ensuing convocation.

26. Duration for completion of the program of study

The duration for the completion of the program shall be fixed as double the actual duration of the program and the students have to pass within the said period, otherwise they have to get fresh Registration.

27. Re-admission after break of study

Candidate who seeks re-admission to the program after break of study has to get the approval from the university by paying a condonation fee.

No condonation is allowed for the candidate who has more than 2 years of break up period and he/she has to rejoin the program by paying the required fees.

B. PHARM. SEMESTER – I (BPH)
SUBJECT: HUMAN ANATOMY AND PHYSIOLOGY I -THEORY (BP101T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: It is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. It provides the basic knowledge required to understand the various disciplines of pharmacy.

Objectives: Upon completion of the course the student shall be able to

- Explain the gross morphology, structure and functions of various organs of the human body.
- Describe the various homeostatic mechanisms and their imbalances.
- Identify the various tissues and organs of different systems of human body.
- Perform the various experiments related to special senses and nervous system.
- Appreciate coordinated working pattern of different organs of each system

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Introduction to human body** Definition and scope of anatomy and physiology, levels of structural organization and body systems, basic life processes, homeostasis, basic anatomical terminology. **Cellular level of organization** Structure and functions of cell, transport across cell membrane, cell division, cell junctions. General principles of cell communication, intracellular signaling pathway activation by extracellular signal molecule, Forms of intracellular signaling: a) Contact-dependent b) Paracrine c) Synaptic d) Endocrine **Tissue level of organization** Classification of tissues, structure, location and functions of epithelial, muscular and nervous and connective tissues.	**10**	CO1
[2]	**Integumentary system** Structure and functions of skin **Skeletal system** Divisions of skeletal system, types of bone, salient features and functions of bones of axial and appendicular skeletal system Organization of skeletal muscle, physiology of muscle contraction, neuromuscular junction **Joints** Structural and functional classification, types of joints movements and its articulation	**10**	CO1 CO2 CO3

[3]	**Body fluids and blood** Body fluids, composition and functions of blood, hemopoeisis, formation of hemoglobin, anemia, mechanisms of coagulation, blood grouping, Rh factors, transfusion, its significance and disorders of blood, Reticulo endothelial system. **Lymphatic system** Lymphatic organs and tissues, lymphatic vessels, lymph circulation and functions of lymphatic system	10	CO2 CO3 CO4 CO5
[4]	**Peripheral nervous system:** Classification of peripheral nervous system: Structure and functions of sympathetic and parasympathetic nervous system. Origin and functions of spinal and cranial nerves. **Special senses** Structure and functions of eye, ear, nose and tongue and their disorders.	08	C01 CO2 CO3 C04 C05
[5]	**Cardiovascular system** Heart – anatomy of heart, blood circulation, blood vessels, structure and functions of artery, vein and capillaries, elements of conduction system of heart and heart beat, its regulation by autonomic nervous system, cardiac output, cardiac cycle. Regulation of blood pressure, pulse, electrocardiogram and disorders of heart	08	C01 CO2 CO3 CO4 CO5

C. TEXT BOOKS

1. Charles Herbert Best; Brobeck, J. R.; Norman Burke Taylor. Best & Tailor's Physiológical Basic of Medical Practice; Williams & Wilkins: Baltimore, 1980.
2. Hall, J. E.; Hall, M. E. Guyton and Hall Textbook of Medical Physiology; Elsevier - Health Science: S.L., 2020.

D. REFERENCE BOOKS

1. Scanlon, V. C.; Sander, T. Student Workbook for Essentials of Anatomy and Physiology; F.A. Davis: Philadelphia, 1991.
2. Hall, J. E.; Hall, M. E. Guyton and Hall Textbook of Medical Physiology; Elsevier - Health Science: S.L., 2020.
3. Tortora, G. J.; Derrickson, B. Principles of Anatomy and Physiology, 15th ed.; Wiley: Hoboken, 2017.
4. Charles Herbert Best; Brobeck, J. R.; Norman Burke Taylor. Best & Tailor's Physiológical Basic of Medical Practice; Williams & Wilkins: Baltimore, 1980.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and remember	To get knowledge about the basic anatomy and function of the body and remember the position of the various parts of our body
CO2	Remember, Understand and Apply	To know about the working mechanism of the body part and measure the activity of certain body parts by various techniques.
CO3	Understand Apply and Evaluate	To understand about the mechanism behind the action produced by various body part
CO4	Understand	To know about how disease occurs, and for that which organ system is required to defence those disease condition
CO5	Remember, Understand, Apply and evaluate	To get knowledge about functioning and dysfunctioning of various parts of the body/system and disease occur due to these imbalances.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	1	3	1	3	3	1	3	3	3	3	1	1
CO2	3	2	2	3	2	2	2	2	3	1	3	3	3	3	2	2
CO3	3	3	3	3	2	2	2	2	3	2	2	3	3	3	2	2
CO4	3	3	3	3	2	3	3	2	3	2	2	3	3	3	3	2
CO5	3	3	2	2	2	2	3	2	2	2	2	2	3	3	2	2
Avg	3	2.6	3	2.4	1.8	2.4	2.2	2.2	2.8	1.6	2.4	2.8	3	3	2.2	1.8

B. PHARM. SEMESTER – I (BPH)
SUBJECT: PHARMACEUTICAL ANALYSIS I -THEORY (BP102T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect.	Tut	Prac.	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	04	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This course deals with the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs

Objectives: Upon completion of the course student shall be able to

- understand the principles of volumetric and electro chemical analysis
- carryout various volumetric and electrochemical titrations
- Develop analytical skills

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**(a) Pharmaceutical analysis** Definition and scope i) Different techniques of analysis ii) Methods of expressing concentration iii) Primary and secondary standards. iv) Preparation and standardization of various molar and normal solutions- Oxalic acid, sodium hydroxide, hydrochloric acid, sodium thiosulphate, sulphuric acid, potassium permanganate and ceric ammonium sulphate **(b)Errors:** Sources of errors, types of errors, methods of minimizing errors, accuracy, precision and significant figures	**10**	CO1 CO5
[2]	**Acid base titration**: Theories of acid base indicators, classification of acid base titrations and theory involved in titrations of strong, weak, and very weak acids and bases, neutralization curves **Non aqueous titration**: Solvents, acidimetry and alkalimetry titration and estimation of Sodium benzoate and Ephedrine HCl	**10**	CO2 CO3 CO4 CO5
[3]	**Precipitation titrations**: Mohr's method, Volhard's, Modified Volhard's, Fajans method, estimation of sodium chloride. **Complexometric titration**: Classification, metal ion indicators, masking and demasking reagents, estimation of Magnesium sulphate, and calcium gluconate. **Gravimetry**: Principle and steps involved in gravimetric analysis. Purity of the precipitate: co-precipitation and post precipitation, Estimation of barium sulphate.	**10**	CO2 CO3 CO4 CO5
[4]	**Redox titrations** (a) Concepts of oxidation and reduction (b) Types of redox titrations (Principles and applications)	**08**	CO2 CO3 CO4 CO5

	Cerimetry, Iodimetry, Iodometry, Bromatometry, Dichrometry, Titration with potassium iodate		
[5]	Electrochemical methods of analysis **Conductometry**- Introduction, Conductivity cell, Conductometric titrations, applications. **Potentiometry -** Electrochemical cell, construction and working of reference (Standard hydrogen, silver chloride electrode and calomel electrode) and indicator electrodes (metal electrodes and glass electrode), methods to determine end point of potentiometric titration and applications. **Polarography** - Principle, Ilkovic equation, construction and working of dropping mercury electrode and rotating platinum electrode, applications	**07**	CO2 CO3 CO4 CO5

C. TEXT BOOKS

1. G. H. Jeffery J. Bassett J. Mendham R C. Denney, *Vogel's textbook of quantitative chemical analysis*, 5th ed.; Bath press, Avon : Great Britain, 1989.
2. Sharma B. K., *Analytical Chemistry*, 2nd ed.; Krishna Prakashan media (p) Ltd: Delhi, India, 2006.

D. REFERENCE BOOKS

1. P. Gundu Rao, *Inorganic Pharmaceutical Chemistry (Pharma Chemistry-I)*, 2010
2. Arthur Owen Bentley; John Edmund Driver; Lewis Malcolm Atherden. *Bentley and Driver's Textbook of Pharmaceutical Chemistry.*; Oxford University Press: Oxford, 1977.
3. Kennedy, J. H. *Analytical Chemistry : Principles*; Saunders College Pub: New York, 1990.
4. Health, O. Indian Pharmacopoeia 2010. Vol. 1; Ghaziabad Indian Pharmacopoeia Commission, 2010.
5. Skoog, Douglas A, F J. Holler, and Timothy A. Nieman, *Principles of Instrumental Analysis*, 7th ed.; Saunders College Pub: United stated of America, 2016.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand	Understand the importance, scope and fundamentals of analytical chemistry.
CO2	Remember, Understand and learn	Understand and learn different analytical and electroanalytical methods
CO3	Understand, remember Apply	Remember and apply various analytical and electroanalytical methods in pharmaceutical drug analysis
CO4	Understand, analyse and evaluate	Analyse and evaluate various volumetric and electrochemical titrations results
CO5	Development and evaluation	Evaluation of sources of errors, promoting ethical practises and development of analytical skills

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	1	1	1	3	1	1	1	-	3	3	3	2	2	-
CO2	3	1	3	2	1	3	1	1	1	-	3	3	3	2	2	1
CO3	3	1	3	2	1	3	1	1	1	-	3	3	3	2	2	1
CO4	3	1	3	2	1	3	1	1	1	-	3	3	3	2	2	1
CO5	3	1	3	1	1	3	1	1	1	-	3	3	3	2	2	-
Avg.	3	1	3	2	1	3	1	1	1	-	3	3	3	2	2	0.6

B. PHARM. SEMESTER – I (BPH)
SUBJECT: PHARMACEUTICS I -THEORY (BP103T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: Course enables the student to impart a fundamental knowledge on the preparatory pharmacy with arts and science of preparing the different conventional dosage forms.

Objectives: Upon completion of the course the student shall be able to

- Know the history of profession of pharmacy
- Understand the basics of different dosage forms, pharmaceutical incompatibilities and pharmaceutical calculations
- Understand the professional way of handling the prescription
- Prepare various conventional dosage forms

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Historical background and development of profession of pharmacy:** History of profession of Pharmacy in India in relation to pharmacy education, industry and organization, Pharmacy as a career, Pharmacopoeias: Introduction to IP, BP, USP and Extra Pharmacopoeia. · **Dosage forms:** Introduction to dosage forms, classification and definitions · **Prescription:** Definition, Parts of prescription, handling of Prescription and Errors in prescription. · **Posology:** Definition, Factors affecting posology. Pediatric dose calculations based on age, body weight and body surface area.	**10**	CO1 CO3 CO4
[2]	**Pharmaceutical calculations**: Weights and measures – Imperial & Metric system, Calculations involving percentage solutions, alligation, proof spirit and isotonic solutions based on freezing point and molecular weight. · **Powders:** Definition, classification, advantages and disadvantages,Simple & compound powders – official preparations, dusting powders, effervescent, efflorescent and hygroscopic powders, eutectic mixtures. Geometric dilutions. · **Liquid dosage forms:** Advantages and disadvantages of liquid dosage forms.Excipients used in formulation of liquid dosage forms. Solubility enhancement techniques	**10**	CO2 CO5
[3]	**Monophasic liquids:** Definitions and preparations of Gargles, Mouthwashes, Throat Paint, Eardrops, Nasal drops, Enemas, Syrups, Elixirs, Liniments and Lotions. · **Biphasic liquids:** · **Suspensions:** Definition, advantages and disadvantages, classifications, Preparation of suspensions; Flocculated and Deflocculated suspension & stability problems and methods to overcome. · **Emulsions:** Definition, classification, emulsifying agent, test for the identification of type of Emulsion, Methods of preparation & stability problems and methods to overcome.	**10**	CO2 CO5

[4]	**Suppositories**: Definition, types, advantages and disadvantages, types of bases, methods of preparations. Displacement value & its calculations, evaluation of suppositories. · **Pharmaceutical incompatibilities**: Definition, classification, physical, chemical and therapeutic incompatibilities with examples.	**8**	CO1 CO2 CO5
[5]	**Semisolid dosage forms:** Definitions, classification, mechanisms and factors influencing dermal penetration of drugs. Preparation of ointments, pastes, creams and gels. Excipients used in semi solid dosage forms. Evaluation of semi solid dosages forms	**7**	CO2 CO5

C. TEXT BOOKS

1. Gunn, C.; Cooper, J. W.; Sidney James Carter. Cooper and Gunn's Dispensing for Pharmaceutical Students; Cbs: New Delhi, 2008.

D. REFERENCE BOOKS

2. Ansel, H. C.; Allen, L. V.; Popovich, N. G. Pharmaceutical Dosage Forms and Drug Delivery Systems; Philadelphia, Pa Lippincott-Williams & Wilkins, 1999.
3. Arthur Owen Bentley; Ernest Alexander Rawlins. Bentley's Textbook of Pharmaceutics.; All India Traveller Book Seller: New Delhi, 2002.
4. Aulton, M. E. Pharmaceutics : The Science of Dosage Form Design; Churchill Livingstone: Edinburgh Etc., 2003.
5. Gunn, C.; Cooper, J. W.; Sidney James Carter. Cooper and Gunn's Dispensing for Pharmaceutical Students; Cbs: New Delhi, 2008.
6. Françoise Nielloud; Marti-Mestres, G. Pharmaceutical Emulsions and Suspensions; Informa Healthcare, Cop: New York, 2010.
7. Ghebre-Sellassie, I. Pharmaceutical Pelletization Technology; Dekker: New York U.A., 1989.
8. Parikh, D. M. Handbook of Pharmaceutical Granulation Technology; Informa Healthcare: New York, N.Y., 2007.
9. Remington, J. P.; Gennaro, A. R. Remington : Volume 1 : The Science and Practice of Pharmacy; Mack Pub. Co: Easton, Pa., 1995.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and Remember	To understand and remember the professional way of handling the prescription
CO2	Understand and Remember	To understand the basics of different dosage forms and pharmaceutical incompatibilities
CO3	Understand	To understand the history of profession of pharmacy
CO4	Perform	To perform the pharmaceutical calculations
CO5	Prepare and evaluate	To prepare and evaluate various conventional dosage forms

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	1	3	3	3	3	2	3	3	3	3	3	3
CO2	3	2	3	3	1	2	1	2	2	1	2	3	3	3	2	2
CO3	3	2	2	1	1	3	-	2	2	-	3	2	2	3	3	3
CO4	3	1	3	3	-	1	1	1	1	1	2	3	2	3	2	1
CO5	3	1	3	3	-	1	1	1	1	1	2	3	3	3	1	1
Avg	3	1.8	2.8	2.6	0.6	2	1.2	1.8	1.8	1	2.6	2.8	2.6	3	2.2	2

B. PHARM. SEMESTER – I (BPH)

SUBJECT: PHARMACEUTICAL INORGANIC CHEMISTRY -THEORY (BP104T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This subject deals with the monographs of inorganic drugs and pharmaceuticals.
Objectives: Upon completion of the course the student shall be able to

- Know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals
- Understand the medicinal and pharmaceutical importance of inorganic compounds

B. COURSE CONTENT

General methods of preparation, assay for the compounds superscripted with **asterisk (*),** properties and medicinal uses of inorganic compounds belonging to the following classes

NO	TOPIC	L (Hrs)	COs
[1]	**Impurities in pharmaceutical substances:** History of Pharmacopoeia, Sources and types of impurities, principle involved in the limit test for Chloride, Sulphate, Iron, Arsenic, Lead and Heavy metals, modified limit test for Chloride and Sulphate	**10**	CO1 CO2
[2]	**Acids, Bases and Buffers:** Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity. **Major extra and intracellular electrolytes**: Functions of major physiological ions, Electrolytes used in the replacement therapy: Sodium chloride*, Potassium chloride, Calcium gluconate* and Oral Rehydration Salt (ORS), Physiological acid base balance. **Dental products**: Dentifrices, role of fluoride in the treatment of dental caries, Desensitizing agents, Calcium carbonate, Sodium fluoride, and Zinc eugenol cement.	**10**	CO2 CO3 CO4 CO5
[3]	**Gastrointestinal agents** **Acidifiers:** Ammonium chloride* and Dil. HCl **Antacid:** Ideal properties of antacids, combinations of antacids, Sodium Bicarbonate*, Aluminum hydroxide gel, Magnesium hydroxide mixture **Cathartics:** Magnesium sulphate, Sodium orthophosphate, Kaolin and Bentonite **Antimicrobials**: Mechanism, classification, Potassium permanganate, Boric acid, Hydrogen peroxide*, Chlorinated lime*, Iodine and its preparations	**10**	CO2 CO3 CO4 CO5
[4]	**Miscellaneous compounds** **Expectorants:** Potassium iodide, Ammonium chloride*. **Emetics**: Copper sulphate*, Sodium potassium tartarate **Haematinics:** Ferrous sulphate*, Ferrous gluconate **Poison and Antidote:** Sodium thiosulphate*, Activated charcoal, Sodium nitrite333 **Astringents**: Zinc Sulphate, Potash Alum	**8**	CO2 CO3 CO4 CO5

[5]	**Radiopharmaceuticals**: Radio activity, Measurement of radioactivity, Properties of α, β, γ radiations, Half life, radio isotopes and study of radio isotopes - Sodium iodide I_{131}, Storage conditions, precautions & pharmaceutical application of radioactive substances.	7	CO2 CO3 CO4 CO5

C. TEXT BOOKS (LATEST EDITION)

1. Anand & G.R. Chatwal, Inorganic Pharmaceutical Chemistry, India, 2010
2. Suhagia B. N., Inorganic Pharmaceutical Chemistry, Nirav Prakashan, India, 2013

D. REFERENCE BOOKS (LATEST EDITION)

1. Schroff, M. L. Pharmaceutical Chemistry; National Book Centre: Calcutta, 1968.
2. Arthur Owen Bentley; John Edmund Driver; Lewis Malcolm Atherden. Bentley and Driver's Textbook of Pharmaceutical Chemistry.; Oxford University Press: Oxford, 1977.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and Remember	To know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals
CO2	Understand and Remember	To understand the medicinal and pharmaceutical importance of inorganic compounds
CO3	Understand	To understand and learn about various types of inorganic compounds
CO4	Understand and Remember	To study preparation and assay of selected inorganic compounds
CO5	Understand and Remember	To understand and remember synonyms and chemical formula of various inorganic compounds

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	-	1	-	-	1	-	2	1	3	2	3	1	1	1
CO2	3	-	-	1	-	1	-	-	2	1	3	2	3	1	1	1
CO3	3	-	-	1	-	-	-	-	1	1	3	2	2	1	1	1
CO4	3	-	-	1	-	-	-	-	1	-	3	2	2	1	-	-
CO5	3	-	-	1	-	-	-	-	-	-	3	2	-	-	-	-
Avg	3	-	-	1	-	0.2	0.2	-	1.2	0.6	3	2	2	0.8	0.6	0.6

B. PHARM. SEMESTER – I (BPH)
SUBJECT: COMMUNICATION SKILLS -THEORY (BP105T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect.	Tut	Prac.	Total		Ext	Sess.	CM	Prac.	Total
2	-	-	2	2	35	10	5	-	50

A. COURSE OVERVIEW

Scope: This course will prepare the young pharmacy student to interact effectively with doctors, nurses, dentists, physiotherapists and other health workers. At the end of this course the student will get the soft skills set to work cohesively with the team as a team player and will add value to the pharmaceutical business

Objectives: Upon completion of the course the student shall be able to

- Understand the behavioural needs for a Pharmacist to function effectively in the areas of pharmaceutical operation
- Communicate effectively (Verbal and Non-Verbal)
- Effectively manage the team as a team player
- Develop interview skills
- Develop Leadership qualities and essentials

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Communication Skills:** Introduction, Definition, The Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context **Barriers to communication:** Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers **Perspectives in Communication:** Introduction, Visual Perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment	**07**	CO1 CO2
[2]	**Elements of Communication:** Introduction, Face to Face Communication - Tone of Voice, Body Language (Non-verbal communication), Verbal Communication, Physical Communication **Communication Styles:** Introduction, The Communication Styles Matrix with example for each -Direct Communication Style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style	**07**	CO1 CO2
[3]	**Basic Listening Skills:** Introduction, Self-Awareness, Active Listening, Becoming an Active Listener, Listening in Difficult Situations **Effective Written Communication:** Introduction, When and When Not to Use Written Communication - Complexity of the Topic, Amount of Discussion' Required, Shades of Meaning, Formal Communication **Writing Effectively:** Subject Lines, Put the Main Point First, Know Your Audience, Organization of the Message	**07**	CO1 CO2 CO3
[4]	**Interview Skills:** Purpose of an interview, Do's and Dont's of an interview	**05**	CO4

	Giving Presentations: Dealing with Fears, planning your Presentation, Structuring Your Presentation, Delivering Your Presentation, Techniques of Delivery		CO5
[5]	**Group Discussion:** Introduction, Communication skills in group discussion, Do's and Dont's of group discussion	**04**	CO3 CO5

C. TEXT BOOKS

1. Mosam Sinha. *Effective Communication Skills*; Aavishkar Publishers, Distributors: Jaipur, 2017.
2. Lisel Erasmus-Kritzinger. *Introductory Communication : The Ultimate Guide to Effective Communication Skills, Study Skills, Life Skills*; Nasou Via Afrika: Cape Town, 2007.

D. REFERENCE BOOKS

1. Rutherfoord, A. J. *Basic Communication Skills for Technology*; Englewood Cliffs, Nj Prentice Hall, 1991.
2. Worth, R. *Communication Skills.*; Ferguson: New York, 2019.
3. Nira Konar. *Communication Skills for Professionals*; Phi Learning Private Limited: New Delhi, 2011.
4. Mitra, B. K. *Personality Development and Soft Skills*; Oxford University Press: New Delhi, 2011.
5. Wentz, F. H. *Soft Skills Training : A Workbook to Develop Skills for Employment*; Createspace: Charleston, Sc, 2012.
6. Peter, F. S. J. *Soft Skills and Professional Communication*; Tata Mcgraw-Hill: New Delhi, 2012.
7. Araya, M. MTD Training Effective Communication Skills. *www.academia.edu*.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand	Understand the behavioural needs for a Pharmacist to function effectively in the areas of pharmaceutical operation
CO2	Learn	Learn to communicate effectively (Verbal and Non Verbal) and apply appropriate communication style in professional context
CO3	Understand	Understand the effective team management as a team player
CO4	Understand and Remember	Understand and remember the requisites for development of an effective interview skills
CO5	Understand and learn	Develop Leadership qualities and essentials

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	-	-	-	-	1	3	-	3	-	-	3	1	1	-	3	-
CO2	-	-	-	-	3	3	-	3	-	-	3	1	1	-	3	-
CO3	-	-	-	-	3	1	-	1	-	-	3	1	1	-	3	-
CO4	-	-	-	-	-	1	-	1	-	-	3	1	1	-	3	-
CO5	-	-	-	-	3	3	-	3	-	-	3	1	1	-	3	-
Avg.	-	-	-	-	2	2.2	-	2.2	-	-	3	1	1	-0	3	-

B. PHARM. SEMESTER – I (BPH)
SUBJECT: REMEDIAL BIOLOGY -THEORY (BP106RBT)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
2	--	---	2	2	35	10	5	-	50

A. COURSE OVERVIEW

Scope: To learn and understand the components of living world, structure and functional system of plant and animal kingdom.

Objectives: Upon completion of the course the student shall be able to

- know the classification and salient features of five kingdoms of life
- Understand the basic components of anatomy & physiology of plant
- Know understand the basic components of anatomy & physiology animal with special reference to human

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Living world:** Definition and characters of living organisms • Diversity in the living world • Binomial nomenclature • Five kingdoms of life and basis of classification. Salient features of Monera, Potista, Fungi, Animalia and Plantae, Virus, **Morphology of Flowering plants** • Morphology of different parts of flowering plants – Root, stem, inflorescence, flower, leaf, fruit, seed. • General Anatomy of Root, stem, leaf of monocotyledons & Dicotylidones	7	CO1 CO4 CO5
[2]	**Body fluids and circulation** • Composition of blood, blood groups, coagulation of blood • Composition and functions of lymph • Human circulatory system • Structure of human heart and blood vessels • Cardiac cycle, cardiac output and ECG **Digestion and Absorption** • Human alimentary canal and digestive glands • Role of digestive enzymes • Digestion, absorption and assimilation of digested food **Breathing and respiration** • Human respiratory system • Mechanism of breathing and its regulation • Exchange of gases, transport of gases and regulation of respiration • □ Respiratory	7	CO2 CO3

[3]	**Excretory products and their elimination** • Modes of excretion • Human excretory system- structure and function • Urine formation • Rennin angiotensin system **Neural control and coordination** • Definition and classification of nervous system • Structure of a neuron • Generation and conduction of nerve impulse • Structure of brain and spinal cord • Functions of cerebrum, cerebellum, hypothalamus and medulla oblongata **Chemical coordination and regulation** • Endocrine glands and their secretions • Functions of hormones secreted by endocrine glands **Human reproduction** • Parts of female reproductive system • Parts of male reproductive system • Spermatogenesis and Oogenesis • □ Menstrual cycle	**07**	CO2 CO3
[4]	**Plants and mineral nutrition:** • Essential mineral, macro and micronutrients • Nitrogen metabolism, Nitrogen cycle, biological nitrogen fixation **Photosynthesis** • Autotrophic nutrition, photosynthesis, Photosynthetic pigments, Factors affecting photosynthesis.	**05**	CO2 CO3
[5]	**Plant respiration:** Respiration, glycolysis, fermentation (anaerobic). **Plant growth and development** • Phases and rate of plant growth, Condition of growth, Introduction to plant growth regulators **Cell - The unit of life** • Structure and functions of cell and cell organelles. Cell division **Tissues** • Definition, types of tissues, location and functions	**04**	CO1 CO4 CO5

C. TEXT BOOKS

1. A Gokhale, S. B.; Kokate, C. K.; Gokhale, A. S.; Kalaskar, M. G. Pharmacognosy of Traditional Drugs - I; Nirali Prakashan, August: Pune, 2014.
2. Scanlon, V. C.; Sander, T. Student Workbook for Essentials of Anatomy and Physiology; F.A. Davis: Philadelphia, 1991.

D. REFERENCE BOOKS

1. Gokhale, S. B.; Kokate, C. K.; Gokhale, A. S.; Kalaskar, M. G. Pharmacognosy of Traditional Drugs - I; Nirali Prakashan, August: Pune, 2014.
2. Dutta, A. C. Botany for Degree Students.; Oxford University Press: Kolkata, 1996.
3. Gokhale, S. B.; Kokate, C. K.; Pharmaceutical Biology; Nirali Prakashan, August: Pune, 2015.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand	To get knowledge about the basic part of the living world i.e plants, the parts of plant, its morphology and physiology, classification of kingdom. diversity in the world.
CO2	Remember and understand	To know about the anatomy and function of the various parts of the body
CO3	Understand Remember and Evaluate	To understand about the mechanism behind the action produced by various body part, evaluation of functions of the body part. To know about how disease occurs, and for that which organ system is required to defence those disease condition
CO4	Understand and evaluate	To know about plant photosynthesis, minerals, and factor affecting photosynthesis
CO5	Remember, Understand, Apply and evaluate	To get knowledge about plant respiration, plant growth and detail about the cell and tissue structure and function.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	2	2	3	3	3	2	3	3	3	2	2	3	2	1
CO2	3	1	2	3	2	2	2	2	3	2	3	3	3	3	2	2
CO3	3	2	3	3	2	2	2	2	3	2	2	3	3	3	2	3
CO4	3	2	3	3	2	3	3	2	3	2	2	3	3	3	3	3
CO5	3	2	2	2	2	2	3	2	2	2	2	2	3	3	2	2
Avg	3	1.6	2.4	2.6	2.5	2.4	2.6	2	2.8	2.2	2.4	2.6	2.8	3	2.2	2.2

B.PHARM. SEMESTER – I (BPH)
SUBJECT: REMEDIALMATHEMATICS-THEORY (BP106RMT)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
2	-	-	2	2	35	10	05	-	50

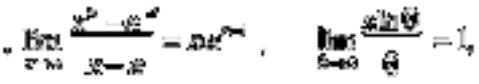
A. COURSE OVERVIEW

Scope: This is an introductory course in mathematics. This subject deals with the introduction to Partial fraction, Logarithm, matrices and Determinant, Analytical geometry, Calculus, differential equation and La Place transform.

Objectives: Upon completion of this course the student should be able to

- Know the theory and their application in Pharmacy.
- Solve the different types of problems by applying theory.
- Appreciate the important application of mathematics in Pharmacy.
- Apply mathematics in solving statistical problems in pharmacy.
- Know the basics of mathematical problem-solving skills in Pharmacy.

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Partial fraction** Introduction, Polynomial, Rational fractions, Proper and Improper fractions, Partial fraction, Resolving into Partial fraction, Application of Partial Fraction in Chemical Kinetics and Pharmacokinetics **Logarithms** Introduction, Definition, Theorems/Properties of logarithms, Common logarithms, Characteristic and Mantissa, worked examples, application of logarithm to solve pharmaceutical problems. **Function:** Real Valued function, Classification of real valued functions. **Limits and continuity:** Introduction, Limit of a function, Definition of limit of a function. (ϵ-δ definition) 	**06**	CO1, CO2, CO4.
[2]	**Matrices and Determinant:** Introduction matrices, Types of matrices, Operation on matrices, Transpose of a matrix, Matrix Multiplication, Determinants, Properties of determinants, Product of determinants, Minors and co-Factors, Adjoin or adjutant of a square matrix, Singular and non-singular matrices, Inverse of a matrix, Solution of system of linear of equations using matrix method,Cramer'srule, Characteristics equation and roots of a square matrix, Cayley–Hamilton theorem, Application of Matrices in solving Pharmacokinetic equations.	**06**	CO1, CO2, CO4.
[3]	**Calculus** Differentiation: Introductions, Derivative of a function ,Derivative of a constant, Derivative of a product of a constant and a function, Derivative of the sum or difference of two functions, Derivative of the product of two functions (product formula),Derivative of the quotient of two functions (Quotient formula)–Without Proof, Derivative of x^nw.r.tx,where n is any rational number, Derivative of Derivative of log	**06**	CO1, CO3, CO5.

	e^x, Derivative of a^x ,Derivative of trigonometric functions from first principles(without Proof),Successive Differentiation, Conditions for a function to be a maximum or a minimum at a point. Application		
[4]	**Analytical Geometry** Introduction: Signs of the Coordinates, Distance formula, Straight Line: Slope or gradient of a straight line, Conditions for parallel is m and perpendicularity of two lines, Slope of a line joining two points, Slope– intercept form of a straight line Integration: Introduction, Definition, Standard formulae, Rules of integration, Method of substitution,MethodofPartialfractions,Integrationbyparts,definite integrals, application	**06**	CO1, CO3, CO4.
[5]	**Differential Equations**: Some basic definitions, Order and degree, Equations in separable form, Homogeneous equations, Linear Differential equations, Exact equations, Application in solving Pharmacokinetic equations Laplace **Transform:** Introduction, Definition, Properties of La place transform, Laplace Transforms of elementary functions, Inverse Laplace transforms, Laplace transform of derivatives, Application to solve Linear differential equations, Application in solving Chemical kinetics and Pharmacokinetics equations	**06**	CO3, CO4, CO5.

C. TEXT BOOKS

1. Hari Kishan. *Differential Calculus*; Atlantic Publishers & Distributors: New Delhi, 2007.
2. Ranganath, G. K. *Remedial Mathematics.* 2017.

D. REFERENCE BOOKS

1. Hari Kishan. *Differential Calculus*; Atlantic Publishers & Distributors: New Delhi, 2007.
2. Ranganath, G. K. *Remedial Mathematics.* 2017.
3. Hyma, P. *Pharmaceutical Mathematics with Application to Pharmacy*; Anmol Publications Pvt. Ltd: New Delhi, India, 2017.
4. H S Govinda Rao. *Higher Engineering Mathematics*; Viva Books: New Delhi, 2007.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and apply	Know the theory and their application in Pharmacy.
CO2	Understand and apply	Solve the different types of problems by applying theory.
CO3	Evaluate	Appreciate the important application of mathematics in Pharmacy.
CO4	Apply and Remember	Apply mathematics in solving statistical problems in pharmacy.
CO5	Analyse and Evaluate	Know the basics of mathematical problem solving skills in Pharmacy.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	1	3	3	0	3	1	1	3	3	3	3	1
CO2	3	1	3	3	1	3	3	0	1	1	0	3	3	3	3	1
CO3	3	1	3	3	1	3	3	0	2	1	1	3	3	3	3	1
CO4	3	1	3	3	2	3	3	1	1	1	0	2	3	3	3	1
CO5	3	1	3	3	1	3	3	1	1	1	1	2	3	3	3	1
Avg	3	1.4	3	3	1.2	3	3	0.4	1.6	1	0.6	2.6	3	3	3	1

B. PHARM. SEMESTER – I (BPH)

SUBJECT: HUMAN ANATOMY AND PHYSIOLOGY I -PRACTICAL (BP107 P)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
---	--	4	4	2	35	10	5	-	50

A. COURSE OVERVIEW

Scope: It is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. It provides the basic knowledge required to understand the various disciplines of pharmacy.

Objectives:

- Practical allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings. This is helpful for developing an insight on the subject

B. COURSE CONTENT

NO	TOPIC	P (Hrs)	COs
[1]	1. Study of compound microscope. 2. Microscopic study of epithelial and connective tissue 3. Microscopic study of muscular and nervous tissue 4. Identification of axial bones 5. Identification of appendicular bones 6. Introduction to hemocytometry. 7. Enumeration of white blood cell (WBC) count 8. Enumeration of total red blood corpuscles (RBC) 9. Determination of bleeding time 10. Determination of clotting time 11. Estimation of haemoglobin count 12. Determination of blood group 13. Determination of erythrocyte sedimentation rate (ESR) 14. Determination of heart rate and pulse rate 15. Recording of blood pressure.	**60**	CO1 CO2 CO3 CO4 CO5

C. TEXT BOOKS

1. A Textbook of Practical Physiology; Jaypee Brothers Medical Publishers (P) Ltd: New Delhi, 2013.
2. Sri Nageswari K; Sharma, R. Practical Workbook of Human Physiology; Jaypee Brothers Medical Publishers (P) Ltd, 2006.

D. REFERENCE BOOKS

1. Scanlon, V. C.; Sander, T. Student Workbook for Essentials of Anatomy and Physiology; F.A. Davis: Philadelphia, 1991.
2. Hall, J. E.; Hall, M. E. Guyton and Hall Textbook of Medical Physiology; Elsevier - Health Science: S.L., 2020.

3. Tortora, G. J.; Derrickson, B. Principles of Anatomy and Physiology, 15th ed.; Wiley: Hoboken, 2017.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and remember	To get knowledge about the basic instruments used in this subject and how to operate it
CO2	Remember, Understand and evaluate	To know about the working mechanism of the instruments, understanding of models and result evaluation.
CO3	Understand Apply Evaluate and remember	To understand about procedure for measurement of various biochemical parameter, evaluation of result and after interpretation of result
CO4	Understand Apply and Evaluate	To know the value, obtain from the test and apply it in healthy or disease condition and give interpretation
CO5	Remember, Apply and evaluate	To get knowledge about parts of the instrument used in lab, its working principle, measurement and interpretation of result

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	1	3	3	2	3	3	3	2	3	3	3	1
CO2	3	2	2	3	1	3	2	2	3	1	3	3	3	3	2	1
CO3	3	3	3	3	2	2	2	3	3	1	2	3	3	3	2	2
CO4	3	2	3	3	2	3	3	2	3	2	2	3	3	3	3	2
CO5	3	3	3	3	2	2	3	2	2	2	2	2	3	3	2	2
Avg	3	2.4	2.8	3	1.6	2.6	2.6	2.2	2.8	1.8	2.4	2.6	3	3	2.4	1.6

B. PHARM. SEMESTER – I (BPH)
SUBJECT: PHARMACEUTICAL ANALYSIS I -PRACTICAL (BP108P)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
-	-	4	4	2	35	10	05	-	50

A. COURSE OVERVIEW

Scope: This course deals with the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs.

Objectives: Upon completion of the course student shall be able to

- understand the principles of volumetric and electro chemical analysis
- carryout various volumetric and electrochemical titrations
- Develop analytical skills

B. COURSE CONTENT

NO	TOPIC	P (Hrs)	COs
[1]	**Preparation and standardization of** (1) Sodium hydroxide (2) Sulphuric acid (3) Sodium thiosulfate (4) Potassium permanganate (5) Ceric ammonium sulphate **Assay of the following compounds along with Standardization of Titrant** (1) Ammonium chloride by acid base titration (2) Ferrous sulphate by Cerimetry (3) Copper sulphate by Iodometry (4) Calcium gluconate by complexometry (5) Hydrogen peroxide by Permanganometry (6) Sodium benzoate by non-aqueous titration (7) Sodium Chloride by precipitation titration **Determination of Normality by electro-analytical methods** (1) Conductometric titration of strong acid against strong base (2) Conductometric titration of strong acid and weak acid against strong base (3) Potentiometric titration of strong acid against strong base	**60**	CO1 CO2 CO3 CO4 CO5

C. TEXT BOOKS

1. Ministry, India.; Indian Pharmacopoeia Commission. *Indian Pharmacopoeia, 2010*; Indian Pharmacopoeia Commission: Ghaziabad, 2010.
2. Jain, D. S. M.; Patel, D. V. B. *Pharmaceutical Analysis*; Nirali Prakashan, 2018.

D. REFERENCE BOOKS

1. Beckett, A. H.; Stenlake, J. B. *Practical Pharmaceutical Chemistry*; Athlone Press: London, 1988
2. Muhammad Sajid Hamid Akash; Kanwal Rehman. *Essentials of Pharmaceutical Analysis*; Singapore Springer, 2020.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand, learn and remember	Understand, learn and remember various calculations for quantification of drugs by analytical and electroanalytical methods.
CO2	Learn and remember	Learn and remember the concept of calibration of apparatus and instruments
CO3	Understand and apply	Understand and apply the analytical and electroanalytical methods for assay and quantification of drugs in an unknown samples.
CO4	Understand	Understand the importance of data integrity and ethical practices in every steps of drugs quantification
CO5	Develop	Develop skills in performing the volumetric titration and handling electroanalytical instruments

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	1	1	1	1	2	-	3	3	3	2	2	-
CO2	3	3	2	1	1	2	1	1	2	-	3	3	3	2	2	-
CO3	3	3	3	3	2	2	1	1	2	1	3	3	3	2	2	1
CO4	3	1	3	1	2	2	1	1	2	-	3	3	3	2	2	1
CO5	3	3	1	1	1	2	1	1	2	1	3	3	3	2	2	-
Avg	3	2.6	2.2	1.8	1.4	1.8	1	1	2	0.4	3	3	3	2	2	0.4

B. PHARM. SEMESTER – I (BPH)
SUBJECT: PHARMACEUTICS I -PRACTICAL (BP109P)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	-	Total
-	-	4	4	2	35	10	5	-	50

A. COURSE OVERVIEW

Scope: Course enables the student to impart a fundamental knowledge on the preparatory pharmacy with arts and science of preparing the different conventional dosage forms.

Objectives: Upon completion of the course the student shall be able to

- Know the history of profession of pharmacy
- Understand the basics of different dosage forms, pharmaceutical incompatibilities and pharmaceutical calculations
- Understand the professional way of handling the prescription
- Prepare various conventional dosage forms

B. COURSE CONTENT

NO	TOPIC	P (Hrs)	COs
[1]	**1 . Syrups** a) Syrup IP'66 b) Compound syrup of Ferrous Phosphate BPC'68 **2. Elixirs** a) Piperazine citrate elixir b) Paracetamol pediatric elixir **3.Linctus** a) Terpin Hydrate Linctus IP'66 **4. Solutions** b) Iodine Throat Paint (Mandles Paint) a) Strong solution of ammonium acetate b) Cresol with soap solution c) Lugol's solution **5. Suspensions** a) Calamine lotion b) Magnesium Hydroxide mixture c) Aluminimum Hydroxide gel **6. Emulsions** a) Turpentine Liniment b) Liquid paraffin emulsion **7. Powders and Granules** a) ORS powder (WHO) b) Effervescent granules c)Dusting powder d)Divded powders **8. Suppositories** a) Glycero gelatin suppository b) Coca butter suppository c) Zinc Oxide suppository **8. Semisolids** a) Sulphur ointment b) Non staining-iodine ointment with methyl salicylate c) Carbopal gel	**60**	CO1 CO2 CO3 CO4 CO5

	9. Gargles and Mouthwashes a) Iodine gargle b) Chlorhexidine mouthwash		

C. TEXT BOOKS

1. Sanmathi. Dispensing Pharmacy : A Practical Manual.; Pharma Book Syndicate, 2010.
2. Gunn, C.; Cooper, J. W.; Sidney James Carter. Cooper and Gunn's Dispensing for Pharmaceutical Students; Cbs: New Delhi, 2008.

D. REFERENCE BOOKS

1. Ansel, H. C.; Allen, L. V.; Popovich, N. G. Pharmaceutical Dosage Forms and Drug Delivery Systems; Philadelphia, Pa Lippincott-Williams & Wilkins, 1999.
2. Arthur Owen Bentley; Ernest Alexander Rawlins. Bentley's Textbook of Pharmaceutics.; All India Traveller Book Seller: New Delhi, 2002.
3. Aulton, M. E. Pharmaceutics : The Science of Dosage Form Design; Churchill Livingstone: Edinburgh Etc., 2003.
4. Gunn, C.; Cooper, J. W.; Sidney James Carter. Cooper and Gunn's Dispensing for Pharmaceutical Students; Cbs: New Delhi, 2008.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and remember	To convert the values of different parameters in different unit system for the calculation of ingredients in the formulation.
CO2	Apply	To perform the calculation for preparation of different dosage forms.
CO3	Create and prepare	To prepare the conventional dosage forms.
CO4	Evaluate	To evaluate the conventional dosage forms.
CO5	Apply and evaluate	To learn the packaging conditions, labeling and storage conditions for different dosage forms.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	2	3	3	2	2	-	2	2	-	3	3	3	3	3	1
CO2	3	1	3	3	1	2	1	3	2	2	3	3	3	3	3	2
CO3	3	1	3	3	1	1	-	1	1	1	3	3	3	3	3	1
CO4	3	1	3	3	1	1	-	1	1	1	3	3	3	3	3	1
CO5	3	3	3	3	3	3	2	2	3	3	3	3	3	3	3	3
Avg	3	1.6	3	3	1.6	1.8	0.6	1.8	1.8	1.4	3	3	3	3	3	1.6

B. PHARM. SEMESTER – I (BPH)

SUBJECT: PHARMACEUTICAL INORGANIC CHEMISTRY -PRACTICAL (BP110P)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
-	-	4	4	2	35	10	05	-	50

A. COURSE OVERVIEW

Scope: This subject deals with the monographs of inorganic drugs and pharmaceuticals.
Objectives: Upon completion of the course the student shall be able to

- know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals
- understand the medicinal and pharmaceutical importance of inorganic compounds

B. COURSE CONTENT

NO	TOPIC	P(Hrs)	COs
[1]	**Limit tests for following ions** Limit test for Chlorides and Sulphates Modified limit test for Chlorides and Sulphates Limit test for Iron Limit test for Heavy metals Limit test for Lead Limit test for Arsenic **Identification test** Magnesium hydroxide Ferrous sulphate Sodium bicarbonate Calcium gluconate Copper sulphate **Test for purity** Swelling power of Bentonite Neutralizing capacity of aluminum hydroxide gel Determination of potassium iodate and iodine in potassium Iodide **Preparation of inorganic pharmaceuticals** Boric acid Potash alum Ferrous sulphate	**60**	CO1 CO2 CO3 CO4 CO5

C. TEXT BOOKS (LATEST EDITION)

1. Dhake A S, Inorganic pharmaceutical chemistry, First edition, Career publications, India, 2004

D. REFERENCE BOOKS (LATEST EDITION)

1. Ministry, India.; Indian Pharmacopoeia Commission. Indian Pharmacopoeia, 2010. Addendum 2012; Indian Pharmacopoeia Commission: Ghaziabad, 2012.
2. Anand & G.R. Chatwal, Inorganic Pharmaceutical Chemistry, India, 2010

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and Apply	To study limit tests of various inorganic compounds
CO2	Understand and Remember	To perform identification tests of various inorganic compounds
CO3	Understand and Remember	To understand and remember the preparations of various inorganic pharmaceuticals
CO4	Understand and Remember	To understand and remember the reactions involved in preparation of various inorganic pharmaceuticals
CO5	Understand and Evaluate	To understand and evaluate tests for purity of various inorganic pharmaceuticals

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	1	-	1	-	1	1	-	2	3	3	3	2	1	1
CO2	3	1	1	-	1	-	-	1	-	-	3	3	2	2	-	-
CO3	2	1	1	-	1	-	-	1	-	-	3	3	2	-	-	1
CO4	2	-	-	-	-	-	-	-	-	-	3	1	-	-	-	-
CO5	3	1	1	-	1	-	1	1	1	-	3	3	3	2	1	1
Avg	2.6	0.8	0.8	-	0.8	-	0.4	0.8	0.2	0.4	3	2.6	2	1.2	0.4	0.6

B. PHARM. SEMESTER – I (BPH)
SUBJECT: COMMUNICATION SKILLS -PRACTICAL (BP111P)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect.	Tut	Prac.	Total		Ext	Sess.	CM	Prac.	Total
-	-	2	2	1	15	5	5	-	25

A. COURSE OVERVIEW

Scope: This course will prepare the young pharmacy student to interact effectively with doctors, nurses, dentists, physiotherapists and other health workers. At the end of this course the student will get the soft skills set to work cohesively with the team as a team player and will add value to the pharmaceutical business

Objectives: Upon completion of the course the student shall be able to

- Communicate effectively (Verbal and Non-Verbal)
- Effectively manage the team as a team player
- Develop interview skills, writing skills, Leadership qualities and essentials

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Basic communication covering the following topics** Meeting People Asking Questions Making Friends What did you do? **Pronunciations covering the following topics** Pronunciation (Consonant Sounds) Pronunciation and Nouns Pronunciation (Vowel Sounds) **Advanced Learning** Listening Comprehension / Direct and Indirect Speech Figures of Speech Effective Communication Writing Skills Effective Writing Interview Handling Skills E-Mail etiquette Presentation Skills	**30**	CO1 CO2 CO3 CO4 CO5

C. TEXT BOOKS

1. Fujishin, R. *The Art of Communication : Improving Your Fundamental Communication Skills*; Rowman & Littielfied: Lanham, 2016.
2. Pandey, M.; Phil, M.; Lit, E.; Lib, M. *FIRST YEAR B. PHARM. Semester I*

D. REFERENCE BOOKS

1. Burton, L.; Dalley, D.; University Of Learning Ltd. *Developing Your Influencing Skills : A Guide to Developing the 7 Traits of Influential People*; Universe Of Learning: Great Britain, 2010.
2. Shikha Kapoor. *Personality Development and Soft Skills : Preparing for Tomorrow*; I.K. International Publishing House Pvt. Ltd: New Delhi, 2018.
3. Thomson, A. J.; Martinet, A. V. A *Practical English Grammar*; Oxford Univ. Press, 2012.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and learn	Understand and learn the basics of communication and apply it appropriately in professional and social context
CO2	Learn, remember and apply	Learn, remember and apply the key concepts of pronunciations in speaking
CO3	Display/ Demonstrate	Display competence in oral, written, and visual communication
CO4	Learn	Learn to prepare an audience – centric presentation
CO5	Understand, learn and apply	Understand, Learn and apply the requisites for an effective writing skills and listening skills

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	-	-	-	-	-	3	-	3	1	-	3	1	-	-	3	-
CO2	-	-	-	-	-	3	-	3	3	-	3	1	-	-	3	-
CO3	-	-	-	-	-	3	-	3	3	-	3	1	-	-	3	-
CO4	-	-	-	-	-	3	-	3	3	-	3	1	-	-	3	-
CO5	-	-	-	-	-	3	-	3	3	-	3	1	-	-	3	-
Avg.	-	-	-	-	-	3	-	3	2.6	-	3	1	-	-	3	-

B. PHARM. SEMESTER – I (BPH)
SUBJECT: REMEDIAL BIOLOGY – PRACTICAL (BP112RBP)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
--	--	1	2	1	15	10	5	-	25

A. COURSE OVERVIEW

1. Scope: To learn and understand the components of living world, structure and functional system of plant and animal kingdom.

Objectives: Upon completion of the course the student shall be able to

- know the classification and salient features of five kingdoms of life
- Understand the basic components of anatomy & physiology of plant
- Know understand the basic components of anatomy & physiology animal with special reference to human

B. COURSE CONTENT

NO	TOPIC	P (Hrs)	COs
[1]	1. Introduction to Experiments in Biology A) Study of Microscope B) Section Cutting Techniques C) Mounting and Staining D) Permanent Slide Preparation 2. Study of Cell and Its Inclusions 3. Study of Stem, Root, Leaf, Seed, Fruit, Flower and Their Modifications 4. Detailed Study of Frog by Using Computer Models 5. Microscopic Study and Identification of Tissues Pertinent To Stem, Root 6. Leaf, Seed, Fruit and Flower 7. Identification of Bones 8. Determination of Blood Group 9. Determination of Blood Pressure 10. Determination of Tidal Volume	**60**	CO1 CO2 CO3 CO4 CO5

C. TEXT BOOKS

1. Gokhale, S. B.; Kokate, C. K.; Pharmaceutical Biology; Nirali Prakashan, August: Pune, 2015.
2. Kale, S. R.; Kale, R. R. Practical Human Anatomy and Physiology for First Year Diploma Course in Pharmacy; Nirali Prakashan: Pune, India, 2007.

D. REFERENCE BOOKS

1. Kale, S. R.; Kale, R. R. Practical Human Anatomy and Physiology for First Year Diploma Course in Pharmacy; Nirali Prakashan: Pune, India, 2007.
2. Gokhale, S. B.; Kokate, C. K.; Pharmaceutical Biology; Nirali Prakashan, August: Pune, 2015.
3. Shafi, M.J.H. Biology practical manual according to National core curriculum .Biology forum of Karnataka.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and remember	To get knowledge about the basic instruments used in this subject and how to operate and what is the procedure behind it.
CO2	Remember, Understand and evaluate	To know about the working mechanism of the instruments, understanding of models and result evaluation.
CO3	Understand Apply Evaluate and remember	To understand about parts of the plant and animals, evaluation of study in both animals and plants
CO4	Understand Apply and Evaluate	To know the about the parts and function of the parts of body
CO5	Remember, Apply and evaluate	To get knowledge about parts of the instrument used in lab, its working principle, measurement and interpretation of result

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	2	3	3	2	3	3	3	2	3	3	3	3
CO2	3	2	2	3	2	2	2	2	3	2	3	3	3	3	2	2
CO3	3	3	3	3	2	2	2	2	3	2	2	3	3	3	2	2
CO4	3	3	3	3	2	3	3	2	3	2	2	3	3	3	3	2
CO5	3	3	2	2	2	2	3	2	2	2	2	2	3	3	2	2
Avg	3	2.8	2.6	2.8	2	2.4	2.6	2	2.8	2.2	2.4	2.6	3	3	2.4	2.2

B. PHARM. SEMESTER – II (BPH)
SUBJECT: HUMAN ANATOMY AND PHYSIOLOGY II -THEORY (BP201T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.
Objectives: Upon completion of the course the student shall be able to

- Explain the gross morphology, structure and functions of various organs of the human body.
- Describe the various homeostatic mechanisms and their imbalances.
- Identify the various tissues and organs of different systems of human body.
- Perform the haematological tests like blood cell counts, haemoglobin estimation, bleeding/clotting time, etc. and also record blood pressure, heart rate, pulse and respiratory volume.
- Appreciate coordinated working pattern of different organs of each system.
- Appreciate the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of human body.

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Nervous system** Organization of nervous system, neuron, neuroglia, classification and properties of nerve fibre, electrophysiology, action potential, nerve impulse, receptors, synapse, neurotransmitters. **Central nervous system:** Meninges, ventricles of brain and cerebrospinal fluid. Structure and functions of brain (cerebrum, brain stem, cerebellum), spinal cord (gross structure, functions of afferent and efferent nerve tracts, reflex activity)	**10**	CO1
[2]	**Digestive system** Anatomy of GI Tract with special reference to anatomy and functions of stomach, (Acid production in the stomach, regulation of acid production through parasympathetic nervous system, pepsin role in protein digestion) small intestine and large intestine, anatomy and functions of salivary glands, pancreas and liver, movements of GIT, digestion and absorption of nutrients and disorders of GIT. **Energetics** Formation and role of ATP, Creatinine Phosphate and BMR.	**06**	CO2 CO4

[3]	**Respiratory system** Anatomy of respiratory system with special reference to anatomy of lungs, mechanism of respiration, regulation of respiration. Lung Volumes and capacities transport of respiratory gases, artificial respiration, and resuscitation methods. **Urinary system** Anatomy of urinary tract with special reference to anatomy of kidney and Nephrons, functions of kidney and urinary tract, physiology of urine formation, micturition reflex and role of kidneys in acid base balance, role of RAS in kidney and disorders of kidney.	**10**	CO3 CO4
[4]	**Endocrine system** Classification of hormones, mechanism of hormone action, structure and functions of pituitary gland, thyroid gland, parathyroid gland, Adrenal gland, pancreas, pineal gland, thymus and their disorders.	**10**	C04
[5]	**Reproductive system** Anatomy of male and female reproductive system, Functions of male and female reproductive system, sex hormones, physiology of menstruation, fertilization, spermatogenesis, oogenesis, pregnancy and parturition **Introduction to genetics** Chromosomes, genes and DNA, protein synthesis, genetic pattern of inheritance	**09**	CO4 CO5

C. TEXT BOOKS

1. Scanlon, V. C.; Sander, T. Student Workbook for Essentials of Anatomy and Physiology; F.A. Davis: Philadelphia, 1991.

D. REFERENCE BOOKS

1. Sembulingam, K. Essentials of Medical Physiology: With Free Review of Medical Physiology. Jaypee Brothers: S.L., 2019.
2. Waugh, A.; Ross, J. S.; Grant, A.; Wilson, K. J. W. Ross and Wilson Anatomy and Physiology in Health and Illness : Anne Waugh, Allison Grant ; Illustrations by Graeme Chambers.; Churchill Livingstone: Edinburgh, 2001.
3. Charles Herbert Best; Brobeck, J. R.; Norman Burke Taylor. Best & Tailor's Physiológical Basic of Medical Practice; Williams & Wilkins: Baltimore, 1980.
4. Hall, J. E.; Hall, M. E. Guyton and Hall Textbook of Medical Physiology; Elsevier - Health Science: S.L., 2020.
5. Tortora, G. J.; Derrickson, B. Principles of Anatomy and Physiology, 15th ed.; Wiley: Hoboken, 2017.
6. Singh, I. Textbook of Human Histology: (with Colour Atlas & Practical Guide); Jaypee Brothers Medical Publishers: New Delhi, 2011.
7. Ghai, C. L. A Textbook of Practical Physiology; Jaypee Brothers Medical Publishers (P) Ltd: New Delhi, 2013.
8. Srinageswari, K.; Sharma, R. Practical workbook of Human Physiology; Jaypee brother's medical publishers, New Delhi
9. Charles Herbert Best; Brobeck, J. R.; Norman Burke Taylor. Best & Tailor's Physiológical Basic of Medical Practice; Williams & Wilkins: Baltimore, 1980.
10. Chatterjee, C. C. Human Physiology: For Preclinical Medical and Degree Courses in Physiology; CBS Publishers & Distributors: New Delhi, 2016.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Remember, Understand and Apply	To know the basic fundamental structural features of neurons, mechanism of neurotransmitters along with processes of neuroconduction and neurotransmission.
CO2	Remember, Understand and Apply	To understand the basic biochemical processes occurs in the body related to digestion and energy production
CO3	Understand and remember	To understand the structure and basic functioning of the respiratory tract and urinary tract.
CO4	Understand and remember	To know about various hormones in the body and its related disorders
CO5	Understand and remember	To get knowledge about human reproductive system and its importance and know the basic genetics processes

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	2	3	2	3	2	3	3	2	2	3	3	3	3	2
CO2	3	1	2	3	2	3	2	3	3	2	2	3	3	3	3	2
CO3	3	1	2	3	2	3	2	3	3	2	2	3	3	3	3	2
CO4	3	1	2	3	2	3	2	3	3	2	2	3	3	3	3	2
CO5	3	1	2	3	2	3	2	3	3	2	2	3	3	3	3	2
Avg	3	1	2	3	2	3	2	3	3	2	2	3	3	3	3	2

B. PHARM. SEMESTER – II (BPH)
SUBJECT: PHARMACEUTICAL ORGANIC CHEMISTRY I -THEORY (BP202T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This subject deals with classification and nomenclature of simple organic compounds, structural isomerism, intermediates forming in reactions, important physical properties, reactions and methods of preparation of these compounds. The syllabus also emphasizes on mechanisms and orientation of reactions.

Objectives: Upon completion of the course the student shall be able to

- write the structure, name and the type of isomerism of the organic compound
- write the reaction, name the reaction and orientation of reactions
- account for reactivity/stability of compounds,
- identify/confirm the identification of organic compound

B. COURSE CONTENT

General methods of preparation and reactions of compounds superscripted with asterisk (*) to be explained

To emphasize on definition, types, classification, principles/mechanisms, applications, examples and differences

NO	TOPIC	L (Hrs)	COs
[1]	**Classification, nomenclature and isomerism** Classification of Organic Compounds Common and IUPAC systems of nomenclature of organic compounds (up to 10 Carbons open chain and carbocyclic compounds) Structural isomerisms in organic compounds	**07**	CO1 CO2
[2]	**Alkanes*, Alkenes* and Conjugated dienes** SP3hybridization in alkanes, Halogenation of alkanes, uses of paraffins. Stabilities of alkenes, SP2 hybridization in alkenes E1 and E2 reactions – kinetics, order of reactivity of alkyl halides, rearrangement of carbocations, Saytzeffs orientation and evidences. E 1 verses E 2 reactions, Factors affecting E1 and E2 reactions. Ozonolysis, electrophilic addition reactions of alkenes, Markownikoff's orientation, free radical addition reactions of alkenes, Anti Markownikoff's orientation. Stability of conjugated dienes, Diel-Alder, electrophilic addition, free radical addition reactions of conjugated dienes, allylic rearrangement	**10**	CO1 CO3 CO4 CO5
[3]	**Alkyl halides** SN1 and SN2 reactions - kinetics, order of reactivity of alkyl halides, stereochemistry and rearrangement of carbocations. SN1 versus SN2 reactions, Factors affecting SN1 and SN2 reactions Structure and uses of ethylchloride, Chloroform, trichloroethylene, tetrachloroethylene, dichloromethane, tetrachloromethane and iodoform. Alcohols*- Qualitative tests, Structure and uses of Ethyl alcohol, Methyl alcohol, chlorobutanol, Cetosteryl alcohol, Benzyl alcohol, Glycerol, Propylene glycol	**10**	CO1 CO3 CO4 CO5
[4]	**Carbonyl compounds**	**10**	CO1

	Nucleophilic addition, Electromeric effect, aldol condensation, Crossed Aldol condensation, Cannizzaro reaction, Crossed Cannizzaro reaction, Benzoin condensation, Perkin condensation, qualitative tests, Structure and uses of Formaldehyde, Paraldehyde, Acetone, Chloral hydrate, Hexamine, Benzaldehyde, Vanilin, Cinnamaldehyde.		CO3 CO4 CO5
[5]	**Carboxylic acids** Acidity of carboxylic acids, effect of substituents on acidity, inductive effect and qualitative tests for carboxylic acids ,amide and ester Structure and Uses of Acetic acid, Lactic acid, Tartaric acid, Citric acid, Succinic acid. Oxalic acid, Salicylic acid, Benzoic acid, Benzyl benzoate, Dimethyl phthalate, Methyl salicylate and Acetyl salicylic acid **Aliphatic amines** - Basicity, effect of substituent on Basicity. Qualitative test, Structure and uses of Ethanolamine, Ethylenediamine, Amphetamine	**8**	CO1 CO3 CO4 CO5

C. TEXT BOOKS (LATEST EDITION)

1. Mehta, B.; Mehta, M. Organic Chemistry; Prentice Hall Of India: New Delhi, 2005.

D. REFERENCE BOOKS (LATEST EDITION)

1. Robert Thornton Morrison; Robert Neilson Boyd. Organic Chemistry. 2 : Study Guide; Allyn And Bacon: Boston, Mass., 1987.
2. Finar, I. L. Organic Chemistry : Volume 1: The Fundamental Principles; Pearson Eduation: India, 2003.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and Remember	To learn about name, structure, isomerism and uses of organic compound
CO2	Understand and Remember	To understand about various factors which affect the reactions of organic compounds
CO3	Understand and Apply	To know the reaction, name of the reaction and orientation of reactions
CO4	Understand	To understand the reactivity/stability of organic compounds
CO5	Understand and Remember	To understand and remember the preparation of organic compounds

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	-	2	-	-	-	1	1	-	3	3	2	2	1	-
CO2	3	-	-	2	-	-	-	1	1	-	3	3	2	2	1	-
CO3	3	1	1	2	-	-	-	1	1	-	3	3	2	2	1	-
CO4	3	-	-	2	-	-	-	1	1	-	3	3	2	2	1	-
CO5	3	-	-	2	-	-	-	1	1	3	3	3	2	3	1	-
Avg	3	0.2	0.2	2	-	-	-	1	1	0.6	3	3	2	2.2	1	-

B. PHARM. SEMESTER – II (BPH)
SUBJECT: BIOCHEMISTRY (BP203T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac.	Total		Ext	Sess.	CM	Prac	Total
3	1	-	04	04	75	15	10	-	100

A. COURSE OVERVIEW

Scope:.Biochemistry deals with complete understanding of the molecular levels of the chemical process associated with living cells. The scope of the subject is providing biochemical facts and the principles to understand metabolism of nutrient molecules in physiological and pathological conditions. It is also emphasizing on genetic organization of mammalian genome and hetero & autocatalytic functions of DNA.

Objectives: Upon completion of course student shell able to

- Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.
- Understand the metabolism of nutrient molecules in physiological and pathological conditions.
- Understand the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins.

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Carbohydrate metabolism** Glycolysis – Pathway, energetics and significance Citric acid cycle- Pathway, energetics and significance HMP shunt and its significance; Glucose-6-Phosphate dehydrogenase (G6PD) deficiency Glycogen metabolism Pathways and glycogen storage diseases (GSD) Gluconeogenesis- Pathway and its significance Hormonal regulation of blood glucose level and Diabetes mellitus **Biological oxidation** Electron transport chain (ETC) and its mechanism. Oxidative phosphorylation & its mechanism and substrate level phosphorylation Inhibitors ETC and oxidative phosphorylation/Uncouplers	**10**	CO2 CO4
[2]	**Lipid metabolism** β-Oxidation of saturated fatty acid (Palmitic acid) Formation and utilization of ketone bodies; ketoacidosis De novo synthesis of fatty acids (Palmitic acid) Biological significance of cholesterol and conversion of cholesterol into bile acids, steroid hormone and vitamin D Disorders of lipid metabolism: Hypercholesterolemia, atherosclerosis, fatty liver and obesity. **Amino acid metabolism** General reactions of amino acid metabolism: Transamination, deamination & decarboxylation, urea cycle and its disorders	**10**	CO2 CO4

	Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenyketonuria, Albinism, alkeptonuria, tyrosinemia) Synthesis and significance of biological substances; 5-HT, melatonin, dopamine, noradrenaline, adrenaline Catabolism of heme; hyperbilirubinemia and jaundice		
[3]	**Nucleic acid metabolism and genetic information transfer** Biosynthesis of purine and pyrimidine nucleotides Catabolism of purine nucleotides and Hyperuricemia and Gout disease Organization of mammalian genome Structure of DNA and RNA and their functions DNA replication (semi conservative model) Transcription or RNA synthesis Genetic code, Translation or Protein synthesis and inhibitors	**10**	CO3 CO4
[4]	**Biomolecules** Introduction, classification, chemical nature and biological role of carbohydrate, lipids, nucleic acids, amino acids and proteins. **Bioenergetics** Concept of free energy, endergonic and exergonic reaction, Relationship between free energy, enthalpy and entropy; Redox potential. Energy rich compounds; classification; biological significances of ATP and cyclic AMP	**08**	CO2 CO4 CO5
[5]	**Enzymes** Introduction, properties, nomenclature and IUB classification of enzymes Enzyme kinetics (Michaelis plot, Line Weaver Burke plot) Enzyme inhibitors with examples Regulation of enzymes: enzyme induction and repression, allosteric enzymes regulation Therapeutic and diagnostic applications of enzymes and isoenzymes Coenzymes –Structure and biochemical functions	**07**	CO1

C. TEXT BOOKS

1. Murray, R.; Bender, D.; Botham, K.; Kennelly, P.; Rodwell, V.; Weil, P.; York, N.; San, C.; Lisbon, F.; Madrid, L.; City, M.; Delhi, M.; Juan, S. *Twenty-Eighth Edition*..
2. U Satyanarayana. *Biochemistry*; Elsevier India: New Delhi, 2021.

D. REFERENCE BOOKS

1. Cox, D. L. *Lehninger principles of biochemistry: International Edition.*; W H Freeman & Co Ltd: S.L., 2021..
2. Berg, J. M.; Tymoczko, J. L.; J, G.; Lubert Stryer. *Biochemistry*; W.H. Freeman/Mcmillan Learning: New York, 2019..

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and learn	Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.
CO2	Understand and learn	Understand the metabolism of nutrient molecules in physiological and pathological conditions.
CO3	Understand and learn	Understand the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins.
CO4	Learn and remember	Learn and remember the basic chemical structure of nutrient molecules and biological importance of biological macromolecules
CO5	Understand	Explain biological mechanisms, such as the processes and control of bioenergetics and metabolism, as chemical reactions

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	3	1	-	2	1	1	3	-	3	3	3	3	1	1
CO2	3	-	3	1	-	2	1	1	3	-	3	3	3	3	1	1
CO3	3	-	3	1	-	2	1	1	2	-	3	3	3	3	1	1
CO4	3	-	3	1	-	2	1	1	2	-	3	3	3	3	1	1
CO5	3	-	3	1	-	2	1	1	3	-	3	3	3	3	1	1
Avg.	3	-	3	1	-	2	1	1	2.6	-	3	3	3	3	1	1

B. PHARM. SEMESTER – II (BPH)
SUBJECT: PATHOPHYSIOLOGY-THEORY (BP 204T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	---	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: Pathophysiology is the study of causes of diseases and reactions of the body to such disease producing causes. This course is designed to impart a thorough knowledge of the relevant aspects of pathology of various conditions with reference to its pharmacological applications, and understanding of basic pathophysiological mechanisms. Hence it will not only help to study the syllabus of pathology, but also to get baseline knowledge required to practice medicine safely, confidently, rationally and effectively.

Objectives: Upon completion of the course the student shall be able to

- Describe the etiology and pathogenesis of the selected disease states;
- Name the signs and symptoms of the diseases; and
- Mention the complications of the diseases.

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Basic principles of Cell injury and Adaptation:** Introduction, definitions, Homeostasis, Components and Types of Feedback systems, Causes of cellular injury, Pathogenesis (Cell membrane damage, Mitochondrial damage, Ribosome damage, nuclear damage), Morphology of cell injury – Adaptive changes (Atrophy, Hypertrophy, hyperplasia, Metaplasia, Dysplasia), Cell swelling, Intra cellular accumulation, Calcification, Enzyme leakage and Cell Death Acidosis & Alkalosis, Electrolyte imbalance **Basic mechanism involved in the process of inflammation and repair:** Introduction, Clinical signs of inflammation, Different types of Inflammation, Mechanism of Inflammation – Alteration in vascular permeability and blood flow, migration of WBC's, Mediators of inflammation, Basic principles of wound healing in the skin, Pathophysiology of Atherosclerosis	**10**	CO1
[2]	**Cardiovascular System:** Hypertension, congestive heart failure, ischemic heart disease (angina, myocardial infarction, atherosclerosis and arteriosclerosis) ● **Respiratory system**: Asthma, Chronic obstructive airways diseases. ● **Renal system** : Acute and chronic renal failure .	**10**	CO2 CO3 CO4 CO5

[3]	**Haematological Diseases:** Iron deficiency, megaloblastic anemia (Vit B12 and folic acid), sickle cell anemia, thalasemia, hereditary acquired anemia, hemophilia ● **Endocrine system**: Diabetes, thyroid diseases, disorders of sex hormones ● **Nervous system**: Epilepsy, Parkinson's disease, stroke, psychiatric disorders: depression, schizophrenia and Alzheimer's disease. ● **Gastrointestinal system**: Peptic Ulcer	**10**	CO2 CO3 CO4 CO5
[4]	Inflammatory bowel diseases, jaundice, hepatitis (A,B,C,D,E,F) alcoholic liver disease. ● **Disease of bones and joints**: Rheumatoid arthritis, osteoporosis and gout ● **Principles of cancer**: classification, etiology and pathogenesis of cancer	**08**	CO2 CO3 CO4 CO5
[5]	**Infectious diseases**: Meningitis, Typhoid, Leprosy, Tuberculosis Urinary tract infections ● **Sexually transmitted diseases**: AIDS, Syphilis, Gonorrhea	**07**	CO2 CO3 CO4 CO5

C. TEXT BOOKS

1. Harsh Mohan; Damjanov, I. Textbook of Pathology; Jaypee Brothers Medical Publishers:New Delhi, 2019.
2. Walker, R.; Cate Whittlesea. Clinical Pharmacy and Therapeutics; Churchill Livingstone: Edinburgh ; New York, 2007.

D. REFERENCE BOOKS

1. Hall, J. E.; Hall, M. E. Guyton and Hall Textbook of Medical Physiology; Elsevier - Health Science: S.L., 2020
2. Walker, R.; Cate Whittlesea. Clinical Pharmacy and Therapeutics; Churchill Livingstone: Edinburgh ; New York, 2007.
3. Blumenthal, D. K.; Rollins, D. E. Workbook and Casebook for "Goodman and Gilman's the Pharmacological Basis of Therapeutics"; Mcgraw Hill: New York ; Madrid Etc, 2016.
4. Davidson's Principles and Practice of Medicine.; Elsevier Health Sciences: S.L., 2022.

RECOMMENDED JOURNALS

1. Toner, P. G. The Journal of Pathology 1999, 187 (1), 187. https://doi.org/3.0.co;2-n">10.1002/(sici)1096-9896(199901)187:1<187::aid-path269>3.0.co;2-n.
2. Robbins, J. KCNQ Potassium Channels: Physiology, Pathophysiology, and Pharmacology. Pharmacology & Therapeutics 2001, 90 (1), 1–19. https://doi.org/10.1016/s0163-7258(01)00116-4.
3. Quiz Page. Indian Journal of Pathology and Microbiology 2015, 58 (4), 568. https://doi.org/10.4103/0377-4929.168897.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and remember	To get knowledge about the mechanism behind cell death, inflammatory process and repair mechanism in human body
CO2	Remember, Understand and Apply	To know about the system and function of the body and disease associated with dysfunctioning of the system
CO3	Understand Apply and Evaluate	To understand about the mechanism behind generation of the disease and/or cause of diseases
CO4	Understand	To know about cause, and treatment of the communicable and non-communicable diseases.
CO5	Remember, Understand, Apply and evaluate	To get knowledge about medication used to treat the disease according to the pathway of disease production.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	2	1	1	3	3	2	2	3	3	3	2	1
CO2	3	2	2	3	1	1	1	3	3	2	2	3	3	3	2	1
CO3	3	2	3	3	2	3	2	3	3	1	2	3	3	3	2	1
CO4	3	1	3	3	1	3	3	3	3	2	2	3	3	3	3	2
CO5	3	3	2	3	2	2	3	3	2	3	2	2	3	3	2	2
Avg	3	2	2.4	2.8	1.6	2	2	3	2.8	2	2	2.8	3	3	2.2	1.4

B. PHARM. SEMESTER – II (BPH)
SUBJECT: COMPUTER APPLICATIONS IN PHARMACY-THEORY (BP205T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	-	-	3	3	50	15	10	-	75

A. COURSE OVERVIEW

Scope: This subject deals with the introduction Database, Database Management system, computer application in clinical studies and use of databases

Objectives: Upon completion of the course the student shall be able to

- Know the various types of application of computers in pharmacy
- Know the various types of databases
- Know the various applications of databases in pharmacy

B. COURSE CONTENT

NO	TOPIC	L(Hrs)	COs
[1]	**Number system:** Binary number system, Decimal number system, Octal number system, Hexadecimal number systems, conversion decimal to binary, binary to decimal, octal to binary etc, binary addition, binary subtraction – One's complement ,Two's complement method, binary multiplication, binary division **Concept of Information Systems and Software :**Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project	**06**	CO2
[2]	**Web technologies**: Introduction to HTML, XML, CSS and Programming languages, introduction to web servers and Server Products Introduction to databases, MYSQL, MS ACCESS, Pharmacy Drug database	**06**	CO3 CO4
[3]	**Application of computers in Pharmacy** – Drug information storage and retrieval, Pharmacokinetics, Mathematical model in Drug design, Hospital and Clinical Pharmacy, Electronic Prescribing and discharge (EP) systems, barcode medicine identification and automated dispensing of drugs, mobile technology and adherence monitoring Diagnostic System, Lab-diagnostic System, Patient Monitoring System, Pharma Information System	**06**	CO1
[4]	**Bioinformatics:** Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery	**06**	CO5
[5]	**Computers as data analysis in Preclinical development**: Chromatographic dada analysis (CDS), Laboratory Information management System (LIMS) and Text Information Management System (TIMS)	**06**	CO1

C. TEXT BOOKS

1. V. Bhagat, S. Narkhede, D. Kardile, S. Shankar.*Computer Application in Pharmacy.*NiraliPrakashan, Pune. 1st Edition 2018.

D. REFERENCE BOOKS

1. William E Fassett; Dale B Christensen. *Computer Application in Pharmacy*. Lea and Febiger, USA, 1986.
2. Sean Ekins. *Computer Application in Pharmaceutical Research and Development*. Wiley-Interscience, USA, 2006.
3. S.C. Rastogi. *Bioinformatics: Concept, Skills and Applications*. CBS Publishers and Distributors, New Delhi, 2nd Edition 2019.
4. Cary N. Prague. *Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath.* Wiley Dreamtech India (P) Ltd., New Delhi,

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand	Understand various applications of computers in pharmacy
CO2	Understand and apply	Understand and apply concept of Information Systems and Software
CO3	Remember and Evaluate	Remember and evaluate various types of databases
CO4	Understand and Remember	Understand and remember about Web technologies
CO5	Understand and analyse	Understand and anlyse concept of Bioinformatics

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	2	2	3	-	2	-	-	1	-	3	2	2	1	-	-
CO2	2	1	1	2	-	1	-	-	1	-	2	1	2	1	-	-
CO3	1	-	2	2	-	-	-	-	-	-	1	1	1	-	-	-
CO4	-	-	1	1	-	-	-	1	-	-	2	2	1	-	-	-
CO5	2	1	-	3	-	-	1	-	1	-	-	2	3	1	-	-
Avg	1.4	0.8	1.2	2.2	-	0.6	0.2	0.2	0.6	-	1.6	1.6	1.8	0.6	-	-

B. PHARM. SEMESTER – II (BPH)

SUBJECT: ENVIRONMENTAL SCIENCES- THEORY (BP206T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
2	-	-	2	3	50	15	10	-	75

A. COURSE OVERVIEW

Scope: Environmental Sciences is the scientific study of the environmental system and the status of its inherent or induced changes on organisms. It includes not only the study of physical and biological characters of the environment but also the social and cultural factors and the impact of man on environment.

Objectives: Upon completion of the course the student shall be able to**:**

- Create the awareness about environmental problems among learners.
- Impart basic knowledge about the environment and its allied problems.
- Develop an attitude of concern for the environment.
- Motivate learner to participate in environment protection and environment improvement.
- Acquire skills to help the concerned individuals in identifying and solving environmental problems.
- Strive to attain harmony with Nature.

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	The Multidisciplinary nature of environmental studies Natural Resources Renewable and non-renewable resources: Natural resources and associated problems a) Forest resources; b) Water resources; c) Mineral resources; d) Food resources; e) Energy resources; f) Land resources: Role of an individual in conservation of natural resources.	**10**	CO1 CO3 CO4
[2]	Ecosystems ▪ Concept of an ecosystem. ▪ Structure and function of an ecosystem. ▪ Introduction, types, characteristic features, structure and function of the ecosystems: Forest ecosystem; Grassland ecosystem; Desert ecosystem; Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)	**10**	CO1 CO2 CO3
[3]	Environmental Pollution: Air pollution; Water pollution; Soil pollution	**10**	CO1 CO3 CO5

C. TEXT BOOKS

1. S.S. Randhava, Environmental Sciences, Vikas and Company Medical Publishers, Pee vee publication, Jalandhar, 2019.
2. Prof. M. K. Gupta, Prof. Manish Jaimini, Environmental sciences,Vikas Pandey, published by Nirali Prakashan, Pune, 2018

D. REFERENCE BOOKS

1. Y.K. Sing, Environmental Science, New Age International Pvt, Publishers, Bangalore
2. Agarwal, K.C. Environmental Biology, Nidi Publ. Ltd. Bikaner, 2001
3. Bharucha Erach, The Biodiversity of India, Mapin Pu blishing Pvt. Ltd., Ahmedabad – 380 013, India,
4. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
5. Clark R.S., Marine Pollution, Clanderson Press Oxford
6. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T., Environmental Encyclopedia, Jaico Publ. House, Mumbai, 2001, 1196p
7. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
8. Down of Earth, Centre for Science and Environment

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and create	Discuss environmental problems among learners and create the awareness and strive to attain harmony with Nature.
CO2	Understand and remember	Describe concept of Ecosystems and remember structure and function of it.
CO3	Create	To create an attitude of concern for the environment protection and environment improvement.
CO4	Understand and remember	Explain Natural Resources of Environment
CO5	Understand and analyse	Describe and analyse the environmental pollution.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	1	3	2	1	2	2	3	3	3	2	2	2	2
CO2	2	3	3	1	2	2	1	2	2	3	3	3	2	2	2	2
CO3	2	3	3	2	2	2	1	2	2	3	3	3	3	2	2	2
CO4	2	3	2	2	2	2	2	2	2	3	3	3	3	2	2	2
CO5	2	3	3	2	3	2	2	2	2	3	3	3	3	2	2	2
Avg	2.2	3	2.8	1.6	2.4	2	1.4	2	2	3	3	3	2.6	2	2	2

B. PHARM. SEMESTER – II (BPH)

SUBJECT: HUMAN ANATOMY AND PHYSIOLOGY II - PRACTICAL (BP207P)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
-	-	4	4	2	35	10	5	-	50

A. COURSE OVERVIEW

Scope: Practical physiology is complimentary to the theoretical discussions in physiology.
Objectives: Practical allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings. This is helpful for developing an insight on the subject.

B. COURSE CONTENT

NO	TOPIC	P(Hrs)	COs
[1]	1. To study the integumentary and special senses using specimen, models, etc., 2. To study the nervous system using specimen, models, etc., 3. To study the endocrine system using specimen, models, etc 4. To demonstrate the general neurological examination 5. To demonstrate the function of olfactory nerve 6. To examine the different types of taste. 7. To demonstrate the visual acuity 8. To demonstrate the reflex activity 9. Recording of body temperature 10. To demonstrate positive and negative feedback mechanism. 11. Determination of tidal volume and vital capacity. 12. Study of digestive, respiratory, cardiovascular systems, urinary and reproductive systems with the help of models, charts and specimens. 13. Recording of basal mass index 14. Study of family planning devices and pregnancy diagnosis test. 15. Demonstration of total blood count by cell analyser 16. Permanent slides of vital organs and gonads.	**60**	CO1 CO2 CO3 CO4 CO5

C. TEXT BOOKS

1. Ghai, C. L. A Textbook of Practical Physiology; Jaypee Brothers Medical Publishers (P) Ltd: New Delhi, 2013.
2. Scanlon, V. C.; Sander, T. Student Workbook for Essentials of Anatomy and Physiology; F.A. Davis: Philadelphia, 1991

D. REFERENCE BOOKS

1. Waugh, A.; Ross, J. S.; Grant, A.; Wilson, K. J. W. Ross and Wilson Anatomy and Physiology in Health and Illness : Anne Waugh, Allison Grant ; Illustrations by Graeme Chambers.; Churchill Livingstone: Edinburgh, 2001.
2. Tortora, G. J.; Derrickson, B. Principles of Anatomy and Physiology, 15th ed.; Wiley: Hoboken, 2017.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and remember	To get knowledge about basic anatomy and physiology of the human organ systems
CO2	Remember, Understand and evaluate	To know about performance of experiments like neurological reflex, body temperature measurement, body mass index, olfaction, gestation reflex and eye sight, etc.
CO3	Understand Apply Evaluate and remember	To understand about procedure for measurement of various haematological parameter, evaluation and interpretation of result
CO4	Understand Apply and Evaluate	To know about family planning
CO5	Remember, Apply and evaluate	To know the histological structures of the body organs

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	1	3	3	3	1	3	3	1	2	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	1	1	3	3	3	1	3	3	3	3	3	3	3	3	3
Avg	3	2.2	2.2	3	3	3	2.2	3	3	2.6	2.8	3	3	3	3	3

B. PHARM. SEMESTER – II (BPH)

SUBJECT: PHARMACEUTICAL ORGANIC CHEMISTRY I -PRACTICAL (BP208P)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
-	-	4	4	2	35	10	05	-	50

A. COURSE OVERVIEW

Scope: This subject deals with classification and nomenclature of simple organic compounds, structural isomerism, intermediates forming in reactions, important physical properties, reactions and methods of preparation of these compounds. The syllabus also emphasizes on mechanisms and orientation of reactions.

Objectives: Upon completion of the course the student shall be able to

- write the structure, name and the type of isomerism of the organic compound
- write the reaction, name the reaction and orientation of reactions
- account for reactivity/stability of compounds,
- identify/confirm the identification of organic compound

B. COURSE CONTENT

NO	TOPIC	P (Hrs)	COs
[1]	1. Systematic qualitative analysis of unknown organic compounds like Preliminary test: Color, odour, aliphatic/aromatic compounds, saturation and unsaturation, etc. 2. Detection of elements like Nitrogen, Sulphur and Halogen by Lassaigne's test 3. Solubility test 4. Functional group test like Phenols, Amides/ Urea, Carbohydrates, Amines, Carboxylic acids, Aldehydes and Ketones, Alcohols, Esters, Aromatic and Halogenated Hydrocarbons, Nitro compounds and Anilides. 5. Melting point/Boiling point of organic compounds 6. Identification of the unknown compound from the literature using melting point/ boiling point. 7. Preparation of the derivatives and confirmation of the unknown compound by melting point/ boiling point. 8. Minimum 5 unknown organic compounds to be analysed systematically. 2. Preparation of suitable solid derivatives from organic compounds 3. Construction of molecular models	**60**	CO1 CO2 CO3 CO4 CO5

C. TEXT BOOKS (LATEST EDITION)

1. Raval H G, Practical organic Chemistry, First edition, Nirav & Roopal Prakashan, India, 2008

D. REFERENCE BOOKS (LATEST EDITION)

1. Mann, F. G.; Saunders, B. C. Practical Organic Chemistry; Pearson: New Delhi, 2009..
2. Arthur Israel Vogel; Furniss, B. S. Vogel's Textbook of Practical Organic Chemistry Including Qualitative Organic Analysis; London Longman Scientific & Technical [U.A, 1987.

3. Vishnoi, N. K. Advanced Practical Organic Chemistry.; Vikas Publishing House: Noida, 2009.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and Remember	To understand the various preliminary test for organic compounds
CO2	Understand and apply	To perform nature identification test for various organic compounds
CO3	Understand and evaluate	Detection of elements like Nitrogen, Sulphur and Halogen by Lassaigne's test
CO4	Understand and evaluate	To study about various functional groups identification for organic compounds
CO5	Understand & Apply	Identification of unknown organic compound from the literature using melting point/boiling point

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	2	-	1	-	-	1	1	1	2	3	2	3	1	1
CO2	3	1	2	-	1	-	-	1	1	1	2	3	2	3	1	1
CO3	3	1	2	-	1	-	-	1	1	1	2	3	2	3	1	1
CO4	3	1	2	-	1	-	-	1	1	1	2	3	2	3	1	1
CO5	3	1	2	-	1	-	-	1	1	1	2	3	2	3	1	1
Avg	3	1	2	-	1	-	-	1	1	1	2	3	2	3	1	1

B. PHARM. SEMESTER – II (BPH)
SUBJECT: BIOCHEMISTRY PRACTICAL (BP209P)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect.	Tut	Prac.	Total		Ext	Sess.	CM	Prac	Total
-	-	4	4		35	10	5	-	50

A. COURSE OVERVIEW

Scope: The scope of the subject deals with complete understanding of different qualitative test to be performed for identification of carbohydrates, lipids and proteins. It is also emphasizing on quantitative estimation of sugars and proteins, preparation of buffers and studying the activity of enzyme.

Objectives: Upon completion of course, student shell able to

- Perform various qualitative tests for identification of carbohydrates, proteins and abnormal constituents.
- Understand the Principles for quantitative estimation of glucose and cholesterol.
- Understand and evaluate activity of salivary amylase enzyme

B. COURSE CONTENT

NO	TOPIC	P(Hrs)	COs
[1]	Qualitative analysis of carbohydrates (Glucose, Fructose, Lactose, Maltose, Sucrose and starch) Identification tests for Proteins (albumin and Casein) Qualitative analysis of urine for abnormal constituents Quantitative analysis of reducing sugars (DNSA method) and Proteins (Biuret method) Determination of blood creatinine Determination of blood sugar Determination of serum total cholesterol Preparation of buffer solution and measurement of pH Study of enzymatic hydrolysis of starch. Determination of Salivary amylase activity Study the effect of Temperature on Salivary amylase activity. Study the effect of substrate concentration on salivary amylase activity.	**60**	CO1 CO2 CO3 CO4 CO5

C. TEXT BOOKS

1. G. Raval, H. Practicals in biochemistry
2. Gupta, R. C. *Practical Biochemistry*; Cbs Publishers And Distributors: New Delhi, 2006.

D. REFERENCE BOOKS

1. Plummer David T. *An Introduction to Practical Biochemistry*; Tata Mcgraw Hill: New Delhi, 1990.
2. G Rajagopal; Es Rāmakiruṣṇan. *Practical Biochemistry for Medical Students*; Orient Longman ; New York, Ny: Hyderabad, 1983.
3. Varley, H. *Practical Clinical Biochemistry*; Cbs Publishers & Distributors: Delhi, 1988.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand, remember and learn	Understand, remember, learn principles and perform various test ethically for qualitative analysis of carbohydrates, proteins and abnormal constituent in urine.
CO2	Understand, learn and apply and evaluate	Understand, learn and perform the quantitative test for analysis of reducing sugars and protein.
CO3	Understand Apply and Evaluate	Analyse and evaluate the factors affecting enzyme activity
CO4	Understand Apply and Evaluate	Understand and learn the concept of buffers
CO5	Understand Apply and Evaluate	Evaluation and interpretation of data emanating from a pathological lab for various carbohydrates, lipids and protein.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	1	2	2	1	1	3	-	3	3	2	-	2	1
CO2	3	3	3	1	2	2	1	1	3	-	3	3	2	-	2	1
CO3	3	3	3	1	2	2	1	1	3	-	3	3	2	-	2	1
CO4	3	3	3	1	2	2	1	1	3	-	3	3	2	-	2	1
CO5	3	3	3	1	2	2	1	1	3	-	3	3	2	-	2	1
Avg.	3	3	3	1	2	2	1	1	3	-	3	3		-	2	1

B. PHARM. SEMESTER – II (BPH)

SUBJECT: COMPUTER APPLICATIONS IN PHARMACY-PRACTICAL(BP210P)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
-	-	2	2	1	15	5	5	-	25

A. COURSE OVERVIEW

Scope: This subject deals with the introduction Database, Database Management system, computer application in clinical studies and use of databases

Objectives: Upon completion of the course the student shall be able to

- Know the various types of office tools and their applications
- Create he various databases
- Know the various applications of databases in pharmacy

B. COURSE CONTENT

NO	TOPIC	P (Hrs)	CO
[1]	1. Design a questionnaire using a word processing package to gather information about a particular disease. 2. Create a HTML web page to show personal information 3. Retrieve the information of a drug and its adverse effects using online tools 4. Creating mailing labels Using Label Wizard , generating label in MS WORD 5. Create a database in MS Access to store the patient information with the required fields Using access 6. Design a form in MS Access to view, add, delete and modify the patient record in the database 7. Generating report and printing the report from patient database 8. Creating invoice table using – MS Access 9. Drug information storage and retrieval using MS Access 10. Creating and working with queries in MS Access 11. Exporting Tables, Queries, Forms and Reports to web pages 12. Exporting Tables, Queries, Forms and Reports to XML pages	**60**	CO1 CO2 CO3 CO4 CO5

C. TEXT BOOKS

1. V. Bhagat, S. Narkhede, D. Kardile, S. Shankar.*Computer Application in Pharmacy.*NiraliPrakashan, Pune. 1st Edition 2018.

D. REFERENCE BOOKS

1. William E Fassett; Dale B Christensen. *Computer Application in Pharmacy*. Lea and Febiger, USA, 1986.

2. Sean Ekins. *Computer Application in Pharmaceutical Research and Development*. Wiley-Interscience, USA, 2006.
3. S.C. Rastogi. *Bioinformatics: Concept, Skills and Applications*. CBS Publishers and Distributors, New Delhi, 2nd Edition 2019.
4. Cary N. Prague. *Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath.* Wiley Dreamtech India (P) Ltd., New Delhi,

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and Apply	Understand basic tools of MS Word, MS Excel and MS Power point and apply them to create documents.
CO2	Remember, Understand and Create	Remember and Understand HTML tags and create HTML web page.
CO3	Create	Create mailing labels Using Label Wizard, generating label in MS WORD
CO4	Design	Design questionnaire/reports using a word processing package to gather information about a particular disease.
CO5	Understand and Apply	Understand tools of MS Access and apply in creating database, queries, relationship and reports from patient database

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	-	1	2	-	-	-	2	-	-	1	1	2	-	-	-
CO2	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	1	-	-	-	1	-	-	1	1	-	-	1	-
CO4	1	-	1	2	-	-	-	1	1	-	-	1	1	-	-	-
CO5	1	-	1	2	-	-	-	-	-	-	-	1	-	-	-	-
Avg	0.6	-	0.6	1.6	-	-	-	0.8	0.2	-	0.4	0.8	0.6	-	0.2	-

B. PHARM. SEMESTER – III (BPH)

SUBJECT: PHARMACEUTICAL ORGANIC CHEMISTRY II -THEORY (BP301T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This subject deals with general methods of preparation and reactions of some organic compounds. Reactivity of organic compounds are also studied here. The syllabus emphasizes on mechanisms and orientation of reactions. Chemistry of fats and oils are also included in the syllabus.
Objectives: Upon completion of the course the student shall be able to

- write the structure, name and the type of isomerism of the organic compound
- write the reaction, name the reaction and orientation of reactions
- account for reactivity/stability of compounds,
- prepare organic compounds

B. COURSE CONTENT

General methods of preparation and reactions of compounds superscripted with asterisk (*) to be explained
To emphasize on definition, types, classification, principles/mechanisms, applications, examples and differences

NO	TOPIC	L (Hrs)	COs
[1]	**Benzene and its derivatives** **A.** Analytical, synthetic and other evidences in the derivation of structure of benzene, Orbital picture, resonance in benzene, aromatic characters, Huckel's rule **B.** Reactions of benzene - nitration, sulphonation, halogenation- reactivity, Friedel crafts alkylation- reactivity, limitations, Friedelcrafts acylation. **C.** Substituents, effect of substituents on reactivity and orientation of mono substituted benzene compounds towards electrophilic substitution reaction **D.** Structure and uses of DDT, Saccharin, BHC and Chloramine	**10**	CO1 CO3 CO4 CO5
[2]	**Phenols* -** Acidity of phenols, effect of substituents on acidity, qualitative tests, Structure and uses of phenol, cresols, resorcinol, naphthols **Aromatic Amines* -** Basicity of amines, effect of substituents on basicity, and synthetic uses of aryl diazonium salts **Aromatic Acids* –** Acidity, effect of substituents on acidity and important reactions of benzoic acid.	**10**	CO1 CO3 CO4 CO5
[3]	**Fats and Oils** a. Fatty acids – reactions. b. Hydrolysis, Hydrogenation, Saponification and Rancidity of oils, Drying oils. c. Analytical constants – Acid value, Saponification value, Ester value, Iodine value, Acetyl value, Reichert Meissl (RM) value – significance and principle involved in their determination.	**10**	CO1 CO3 CO5
[4]	**Polynuclear hydrocarbons:** a. Synthesis, reactions b. Structure and medicinal uses of Naphthalene, Phenanthrene, Anthracene, Diphenylmethane, Triphenylmethane and their derivatives	**8**	CO1 CO3 CO5

[5]	**Cyclo alkanes*** Stabilities – Baeyer's strain theory, limitation of Baeyer's strain theory, Coulson and Moffitt's modification, Sachse Mohr's theory (Theory of strainless rings), reactions of cyclopropane and cyclobutane only	**7**	CO1 CO3 CO4 CO5

C. TEXT BOOKS (LATEST EDITION)

1. Mehta, B.; Mehta, M. Organic Chemistry; Prentice Hall Of India: New Delhi, 2005.

D. REFERENCE BOOKS (LATEST EDITION)

1. Robert Thornton Morrison; Robert Neilson Boyd. Organic Chemistry. 2 : Study Guide; Allyn And Bacon: Boston, Mass., 1987.
2. Finar, I. L. Organic Chemistry : Volume 1: The Fundamental Principles; Pearson Eduation: India, 2003.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and Apply	To write the structure, name of organic compound
CO2	Understand and Remember	To understand the type of isomerism of the compound
CO3	Understand and Remember	To know the reaction, name of the reaction and orientation of reactions
CO4	Understand and Remember	To understand the reactivity/stability of organic compounds
CO5	Understand and Remember	To understand and remember the preparation of organic compounds

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	1	1	2	1	1	-	1	2	3	3	3	3	1	1	1
CO2	3	1	1	1	1	1	-	1	3	2	3	3	3	1	1	1
CO3	3	1	1	1	1	1	-	1	3	2	3	3	3	3	1	1
CO4	3	1	1	1	1	1	-	1	3	1	3	3	3	3	1	1
CO5	3	1	1	1	1	1	-	1	2	2	3	3	3	2	1	1
Avg	2.8	1	1	1.2	1	1	-	1	2.6	2	3	3	3	2	1	1

B. PHARM. SEMESTER – III (BPH)
SUBJECT: PHYSICAL PHARMACEUTICS I-THEORY (BP302T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: The course deals with the various physical and physicochemical properties, and principles involved in dosage forms/formulations. Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development, and stability studies of pharmaceutical dosage forms.

Objectives: Upon completion of the course the student shall be able to

- Understand various physicochemical properties of drug molecules in the designing the dosage forms
- Know the principles of solubility, pH & buffers to use them for designing of formulations

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Solubility of drugs:** Solubility expressions, mechanisms of solute solvent interactions, ideal solubility parameters, solvation & association, quantitative approach to the factors influencing solubility of drugs, diffusion principles in biological systems. Solubility of gas in liquids, solubility of liquids in liquids, (Binary solutions, ideal solutions) Raoult's law, real solutions. Partiallymiscible liquids, Critical solution temperature and applications. Distribution law, its limitations and applications	**10**	CO1
[2]	**States of Matter and properties of matter:** State of matter, changes in the state of matter, latent heats, vapour pressure, sublimation critical point, eutectic mixtures, gases, aerosols – inhalers, relative humidity, liquid complexes, liquid crystals, glassy states, solid crystalline, amorphous & polymorphism. **Physicochemical properties of drug molecules:** Refractive index, optical rotation, dielectric constant, dipole moment, dissociation constant, determinations and applications	**10**	CO2 CO3
[3]	**Surface and interfacial phenomenon:** Liquid interface, surface & interfacial tensions, surface free energy, measurement of surface & interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB Scale, solubilisation, detergency, adsorption at solid interface.	**10**	CO4
[4]	**Complexation and protein binding:** Introduction, Classification of Complexation, Applications, methods of analysis, protein binding, Complexation and drug action, crystalline structures of complexes and thermodynamic treatment of stability constants	**08**	CO3
[5]	**pH, buffers and Isotonic solutions:** Sorensen's pH scale, pH determination (electrometric and calorimetric), applications of buffers, buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions.	**07**	CO5

C. TEXT BOOKS

1. Subrahmanyam, C. V. S. Textbook of Physical Pharmaceutics. India: Vallabh Prakashan. 2000.

D. REFERENCE BOOKS

1. Sinko, Patrick J., and Alfred N. Martin. Martin's Physical Pharmacy and Pharmaceutical Sciences: Physical Chemical and Biopharmaceutical Principles in the Pharmaceutical Sciences. 5th ed. Philadelphia: Lippincott Williams & Wilkins, 2006.
2. Parrott, E. L., Saski, W. Experimental Pharmaceutics. United States: Burgess Publishing Company. 1977
3. Carter, S. J. Cooper and Gunn's Tutorial Pharmacy. India: CBS Publishers & Distributors. 2021.
4. Ansel, H. C., Stoklosa, M. J. Pharmaceutical Calculations. United Kingdom: Lea &Febiger. 1986.
5. Gilbert S. Banker, Herbert Lieberman, Martin Rieger. Pharmaceutical Dosage Forms: Disperse Systems. United States: CRC Press. 2020.
6. Manavalan, R., Ramasamy, C. Physical Pharmaceutics. India: Pharma Med Press. 2017.
7. Jain, G., KrishenKhar, R., Ahmad, F. J. Theory and Practice of Physical Pharmacy - E-Book. India: Elsevier Health Sciences. 2011.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and Analyse	Understand and analyse the principles of solubility and partition coefficient
CO2	Remember, Evaluate and apply	Remember and evaluate various physicochemical properties of drug molecules and apply in the designing the dosage form
CO3	Understand and Apply	Understand and apply physical principles of states of matter and complexation
CO4	Remember and evalaute	Remember and evaluate the role of surfactants, interfacial phenomenon and adsorption
CO5	Understand	Understand the importance of pH and buffers in pharmaceutical dosage forms and maintaining stability

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	-	1	-	-	-	-	1	-	-	3	1	3	-	1
CO2	3	-	-	1	-	-	-	-	1	-	-	3	1	2	-	-
CO3	3	-	-	-	-	-	-	-	1	-	-	3	1	2	-	1
CO4	3	-	-	-	-	-	-	-	1	-	-	3	1	1	-	-
CO5	3	-	-	-	-	-	-	-	1	-	-	3	1	1	-	-
Avg	3	-	-	0.4	-	-	-	-	1	-	-	3	1	1.8	-	0.4

B. PHARM. SEMESTER – III (BPH)
SUBJECT: PHARMACEUTICAL MICROBIOLOGY-THEORY (BP303T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: Course enables the student to learn all categories of microorganisms especially for the production of alcohol, antibiotics, vaccines, vitamins, enzymes etc.
Objectives: Upon completion of the course the student shall be able to understand the concepts related to various microorganisms, sterility testing and its application in pharmaceutical industries.

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	Introduction, history of microbiology, its branches, scope and its importance. Introduction to Prokaryotes and Eukaryotes Study of ultrastructure and morphological classification of bacteria, nutritional requirements, raw materials used for culture media and physical parameters for growth, growth curve, isolation and preservation methods for pure cultures, cultivation of anaerobes, quantitative measurement of bacterial growth (total & viable count). Study of different types of phase contrast microscopy, dark field microscopy and electron microscopy.	**10**	CO1
[2]	Identification of bacteria using staining techniques (simple, Gram's &Acid fast staining) and biochemical tests (IMViC). Study of principle, procedure, merits, demerits and applications of physical, chemical gaseous, radiation and mechanical method of sterilization. Evaluation of the efficiency of sterilization methods. Equipment employed in large scale sterilization. Sterility indicators.	**10**	CO2 CO3
[3]	Study of morphology, classification, reproduction/replication and cultivation of Fungi and Viruses. Classification and mode of action of disinfectants Factors influencing disinfection, antiseptics and their evaluation. For bacteriostatic and bactericidal actions Evaluation of bactericidal & Bacteriostatic. Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP.	**10**	CO5
[4]	Designing of aseptic area, laminar flow equipment; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification. Principles and methods of different microbiological assay. Methods for standardization of antibiotics, vitamins and amino acids. Assessment of a new antibiotic.	**08**	CO2 CO5
[5]	Types of spoilage, factors affecting the microbial spoilage of pharmaceutical products, sources and types of microbial contaminants, assessment of microbial contamination and spoilage.	**07**	CO4

	Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations. Growth of animal cells in culture, general procedure for cell culture, Primary, established and transformed cell cultures. Application of cell cultures in pharmaceutical industry and research.		

C. TEXT BOOKS

1. Pelczar, M. J.; Chan, E. C. S.; Krieg, N. R. *Microbiology*; Tata Mcgraw-Hill: New Delhi, 2010.

D. REFERENCE BOOKS

1. Denyer, S. P.; Hodges, N. A.; Gorman, S. P.; Hugo, W. B.; Russell, A. D. *Pharmaceutical Microbiology*; Blackwell Science: Malden, 2004.
2. Prescott; Dunn. *Industrial Microbiology*, 4th edition.; CBS Publishers & Distributors, Delhi.
3. Denyer, S. P.; Hugo, W. B. *Hugo and Russell's Pharmaceutical Microbiology*; Wiley-Blackwell: Chichester, West Sussex, Uk ; Hoboken, Nj, 2011.
4. Rose, A. H. *Industrial Microbiology*; Butterworths: London, 1961.
5. Probisher; Hinsdill. *Fundamentals of Microbiology*, 9th ed.; Japan.
6. Cooper, J. W.; Gunn, C.; Sidney James Carter. *Cooper and Gunn's Tutorial Pharmacy*; Cbs Publishers: Editorial: New Delhi, 2005.
7. Peppler, H. J.; Perlman, D. *Microbial Technology.*; New York, Etc., Academic P, 1979.
8. I.P., B.P., U.S.P.- latest editions.
9. Edward Alcamo. *Fundamentals of Microbiology*; Jones And Bartlett: Sudbury, Mass., 2001.
10. Jain, N. K. *Pharmaceutical Microbiology.*; Vallabh Prakashan: Delhi, 2001.
11. Brenner, D. J.; Krieg, N. R.; Staley, J. T.; Garrity, G. M. *Bergey's Manual of Systematic Bacteriology. Volume Two, the Proteobacteria. Part A, Introductory Essays. Part B, the Gammaproteobacteria. Part C, the Alpha-, Beta-, Delta-, and Epsilonproteobacteria*; Springer: New York, 2005.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand Apply and Evaluate	To Understand methods of identification, cultivation and preservation of various microorganisms
CO2	Remember, Understand and Evaluate	To understand the importance and implementation of sterilization in pharmaceutical processing and industry
CO3	Understand Apply and Evaluate	To Understand the cell culture technology and its applications in pharmaceutical industries
CO4	Understand and Remember	To understand structure and growth of bacteria, virus and fungi
CO5	Understand Apply and Evaluate	To perform and evaluate microbial assay of various antibiotics and vitamin

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	3	0	2	0	3	2	3	3	3	1	3	2	3
CO2	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3	3
CO3	3	-	2	3	2	2	0	2	1	2	2	3	3	3	2	3
CO4	3	2	2	2	2	2	2	2	1	3	3	3	1	3	2	3
CO5	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3	3
Avg	3	2	2.6	2.8	1.6	2.4	1.6	2.6	2	2.8	2.8	3	2.2	3	2.4	3

B. PHARM. SEMESTER – III (BPH)
SUBJECT: PHARMACEUTICAL ENGINEERING - THEORY (BP304T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This course is designed to impart a fundamental knowledge on the art and science of various unit operations used in pharmaceutical industry.

Objectives: Upon completion of the course student shall be able:

- To know various unit operations used in Pharmaceutical industries.
- To understand the material handling techniques.
- To perform various processes involved in pharmaceutical manufacturing process.
- To carry out various test to prevent environmental pollution.
- To appreciate and comprehend significance of plant lay out design for optimum use of resources.
- To appreciate the various preventive methods used for corrosion control in Pharmaceutical industries.

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Flow of fluids:** Types of manometers, Reynolds number and its significance, Bernoulli's theorem and its applications, Energy losses, Orifice meter, Venturimeter, Pitot tube and Rotometer. **Size Reduction:** Objectives, Mechanisms & Laws governing size reduction, factors affecting size reduction, principles, construction, working, uses, merits and demerits of Hammer mill, ball mill, fluid energy mill, Edge runner mill & end runner mill. **Size Separation:** Objectives, applications & mechanism of size separation, official standards of powders, sieves, size separation Principles, construction, working, uses, merits and demerits of Sieve shaker, cyclone separator, Air separator, Bag filter & elutriation tank.	**10**	CO2 CO3 CO1
[2]	**Heat Transfer:** Objectives, applications & Heat transfer mechanisms. Fourier's law, Heat transfer by conduction, convection & radiation. Heat interchangers & heat exchangers. **Evaporation:** Objectives, applications and factors influencing evaporation, differences between evaporation and other heat process. principles, construction, working, uses, merits and demerits of Steam jacketed kettle, horizontal tube evaporator, climbing film evaporator, forced circulation evaporator, multiple effect evaporator& Economy of multiple effect evaporator. **Distillation:** Basic Principles and methodology of simple distillation,flash distillation, fractional distillation, distillation under reduced pressure, steam distillation & molecular distillation	**10**	CO2 CO3
[3]	**Drying:** Objectives, applications & mechanism of drying process, measurements & applications of Equilibrium Moisture content, rate of drying curve. principles, construction, working, uses, merits and demerits	**10**	CO2 CO3

	of Tray dryer, drum dryer spray dryer, fluidized bed dryer, vacuum dryer, freeze dryer. **Mixing:** Objectives, applications & factors affecting mixing, Difference between solid and liquid mixing, mechanism of solid mixing, liquids mixing and semisolids mixing. Principles, Construction, Working, uses, Merits and Demerits of Double cone blender, twin shell blender, ribbon blender, Sigma blade mixer, planetary mixers, Propellers, Turbines, Paddles & Silverson Emulsifier		
[4]	**Filtration:** Objectives, applications, Theories & Factors influencing filtration, filter aids, filter medias. Principle, Construction, Working, Uses, Merits anddemerits of plate & frame filter, filter leaf, rotary drum filter, Meta filter & Cartridge filter, membrane filters and Seidtz filter. **Centrifugation:** Objectives, principle & applications of Centrifugation, principles, construction, working, uses, merits and demerits of Perforated basket centrifuge, Non-perforated basket centrifuge, semi continuous centrifuge & super centrifuge.	**8**	CO2 CO3
[5]	**Materials of pharmaceutical plant construction, Corrosion and its prevention:** Factors affecting during materials selected for Pharmaceutical plant construction, Theories of corrosion, types of corrosion and there prevention. Ferrous and nonferrous metals, inorganic and organic non metals, basic of material handling systems.	**7**	CO2 CO3 CO4 CO5

C. TEXT BOOKS

1. C V S Subrahmanyam; J Thimma Setty; Suresh, S.; V Kusum Devi. Pharmaceutical Engineering : Principles and Practices.; Vallabh Prakashan: Delhi, 2002.
2. C V S Shubramanyam. Pharmaceutical Engineering : Unit Operations - II; Vallabh Prakashan: Delhi, 2014.

D. REFERENCE BOOKS

1. Badger, W. L. Introduction to Chemical Engineering; Mc Graw Hill: Auckland, 1987.
2. Cooper, J. W.; Gunn, C.; Sidney James Carter. Cooper and Gunn's Tutorial Pharmacy; Cbs Publishers: Editorial: New Delhi, 2005.
3. Joseph Price Remington; Eric Wentworth Martin. Remington's Practice of Pharmacy Easton, Pa. Mack, 1961.
4. Khar, R. K.; Vyas, S. P.; Ahmad, F. J.; Jain, G. K. Lachman/Lieberman's the Theory and Practice of Industrial Pharmacy; Cbs Publishers & Distributor, Repr: New Delhi, 2015.
5. Mccabe, W. L.; Smith, J. C.; Harriott, P. Unit Operations of Chemical Engineering; Chennai Mcgraw-Hill Education (India) Private Limited, 2014.
6. Simpson, N. J. K. Solid-Phase Extraction Principles, Techniques, and Applications; New York, N.Y. Dekker, 2000.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Remember and Understand	To understand and remember the various unit operations used in Pharmaceutical industries.
CO2	Understand	To understand the material handling techniques.
CO3	Apply and Evaluate	To perform various processes involved in pharmaceutical manufacturing process.
CO4	Understand and apply	To appreciate and comprehend significance of plant lay out design for optimum use of resources and to carry out various test to prevent environmental pollution.
CO5	Apply and evaluate	To appreciate the various preventive methods used for corrosion control in Pharmaceutical industries.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	3	2	2	-	2	2	2	3	3	3	3	3	3
CO2	3	1	3	3	2	2	-	2	2	2	2	3	3	3	2	2
CO3	3	2	2	3	2	1	2	2	1	2	3	3	3	2	3	2
CO4	3	1	2	3	-	1	1	-	-	3	3	3	2	2	2	3
CO5	3	1	2	3	-	1	1	2	2	3	2	3	3	3	1	3
Avg	3	1.4	2.4	3	1.2	1.4	0.8	1.6	1.4	2.4	2.6	3	2.8	2.6	2.2	2.6

B. PHARM. SEMESTER – III (BPH)

SUBJECT: PHARMACEUTICAL ORGANIC CHEMISTRY II -PRACTICAL (BP305P)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
-	-	4	4	2	35	10	05	-	50

A. COURSE OVERVIEW

Scope: This subject deals with general methods of preparation and reactions of some organic compounds. Reactivity of organic compounds are also studied here. The syllabus emphasizes on mechanisms and orientation of reactions. Chemistry of fats and oils are also included in the syllabus.
Objectives: Upon completion of the course the student shall be able to

- write the structure, name and the type of isomerism of the organic compound
- write the reaction, name the reaction and orientation of reactions
- account for reactivity/stability of compounds,
- prepare organic compounds

B. COURSE CONTENT

NO	TOPIC	P (Hrs)	COs
[1]	**Experiments involving laboratory techniques** • Recrystallization • Steam distillation **Determination of following oil values (including standardization of reagents)** • Acid value • Saponification value • Iodine value **Preparation of compounds** • Benzanilide/Phenyl benzoate/Acetanilide from Aniline/ Phenol /Aniline by acylation reaction. • 2,4,6-Tribromo aniline/Para bromo acetanilide from Aniline/ Acetanilide by halogenation (Bromination) reaction. 1-Phenyl azo-2-napthol from Aniline by diazotization and coupling reactions. 5-Nitro salicylic acid/Meta di nitro benzene from Salicylic acid / Nitro benzene by nitration reaction. • Benzoic acid from Benzyl chloride by oxidation reaction. • Benzoic acid/ Salicylic acid from alkyl benzoate/ alkyl salicylate by hydrolysis reaction. Benzil from Benzoin by oxidation reaction. • Dibenzal acetone from Benzaldehyde by Claison Schmidt reaction • Cinnammic acid from Benzaldehyde by Perkin reaction, *P*-Iodo benzoic acid from *P*-amino benzoic acid	**60**	CO1 CO2 CO3 CO4 CO5

C. TEXT BOOKS (LATEST EDITION)

1. Raval H G, Practical organic Chemistry, First edition, Nirav & Roopal Prakashan, India, 2008

D. REFERENCE BOOKS (LATEST EDITION)

1. Mann, F. G.; Saunders, B. C. Practical Organic Chemistry; Pearson: New Delhi, 2009..
2. Arthur Israel Vogel; Furniss, B. S. Vogel's Textbook of Practical Organic Chemistry Including Qualitative Organic Analysis; London Longman Scientific & Technical [U.A, 1987.
3. Vishnoi, N. K. Advanced Practical Organic Chemistry.; Vikas Publishing House: Noida, 2009.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and Apply	To understand the experimental laboratory techniques
CO2	Understand and Remember	Determination of oils values for fats and oils
CO3	Understand and Apply	To study the name of the reaction involved in the organic compound
CO4	Understand and Remember	To understand the preparation of organic compound
CO5	Understand & Evaluate	To perform the purification of compound

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	2	1	1	-	1	1	2	1	1	2	3	3	1	1
CO2	3	1	2	1	1	-	1	1	3	1	2	2	3	3	1	1
CO3	3	1	2	1	1	-	-	1	3	2	1	2	3	2	1	1
CO4	3	1	2	1	1	-	1	1	3	1	2	2	3	2	1	1
CO5	3	1	2	1	1	-	1	1	3	2	1	2	3	3	1	1
Avg	3	1	2	1	1	-	0.8	1	2.8	1.4	1.4	2	3	2.6	1	1

B. PHARM. SEMESTER – III (BPH)
SUBJECT: PHYSICAL PHARMACEUTICS I-PRACTICAL (BP306P)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
-	-	4	4	2	35	10	5	-	50

A. COURSE OVERVIEW

Scope: The course deals with the various physical and physicochemical properties, and principals involved in dosage forms/formulations. Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development, and stability studies of pharmaceutical dosage forms.

Objectives: Upon completion of the course the student shall be able to

- Know and determine physical properties such as solubility, surface tension, partition coefficient and pKa and apply in the design of dosage forms.
- Know the principles of solubility, pH & buffers to use them for designing of formulations

B. COURSE CONTENT

NO	TOPIC	P (Hrs)	COs
[1]	1. Determination the solubility of drug at room temperature 2. Determination of pKa value by Half Neutralization/ Henderson Hasselbalch equation 3. Determination of Partition co- efficient of benzoic acid in benzene and water 4. Determination of Partition co- efficient of Iodine in CCl_4 and water 5. Determination of % composition of NaCl in a solution using phenol-water system by CST method 6. Determination of surface tension of given liquids by drop count and drop weight method 7. Determination of HLB number of a surfactant by saponification method 8. Determination of Freundlich and Langmuir constants using activated char coal 9. Determination of critical micellar concentration of surfactants 10. Determination of stability constant and donor acceptor ratio of PABA-Caffeine complex by solubility method 11. Determination of stability constant and donor acceptor ratio of Cupric-Glycine complex by pH titration method	**60**	CO1 CO2 CO3 CO4 CO5

C. TEXT BOOKS

1. Sen, K. K., Dutta, S. K. A Laboratory Manual of Physical Pharmaceutics. India: PharmaMed Press. 2019.

D. REFERENCE BOOKS

1. Sinko, Patrick J., and Alfred N. Martin. Martin's Physical Pharmacy and Pharmaceutical Sciences: Physical Chemical and Biopharmaceutical Principles in the Pharmaceutical Sciences. 5th ed. Philadelphia: Lippincott Williams & Wilkins, 2006.
2. Parrott, E. L., Saski, W. Experimental Pharmaceutics. United States: Burgess Publishing Company. 1977
3. Carter, S. J. Cooper and Gunn's Tutorial Pharmacy. India: CBS Publishers & Distributors. 2021.
4. Ansel, H. C., Stoklosa, M. J. Pharmaceutical Calculations. United Kingdom: Lea &Febiger. 1986.
5. Gilbert S. Banker, Herbert Lieberman, Martin Rieger. Pharmaceutical Dosage Forms: Disperse Systems. United States: CRC Press. 2020.
6. Manavalan, R., Ramasamy, C. Physical Pharmaceutics. India: Pharma Med Press. 2017.
7. Subrahmanyam, C. V. S. Textbook of Physical Pharmaceutics. India: Vallabh Prakashan. 2000.
8. Jain, G., KrishenKhar, R., Ahmad, F. J. Theory and Practice of Physical Pharmacy - E-Book. India: Elsevier Health Sciences. 2011.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand, Evaluate and Apply	Understand and evaluate physical properties such as solubility, surface tension, partition coefficient and pKa and apply in the design of dosage forms.
CO2	Understand and apply	Understand and apply Henderson – Hasselbalch equation for determination of pKa value of drugs.
CO3	Understand and Evaluate	Understand and evaluate the HLB value and critical micellar concentration of a surfactant.
CO4	Understand and Evaluate	Understand adsorption isotherms and determine Freundlich-Langmuir adsorption isotherm.
CO5	Evaluate	Evaluate the stability constants of complexes by various methods.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	1	-	-	-	-	-	1	-	-	3	-	3	-	-
CO2	3	-	1	-	-	-	-	-	1	-	-	3	-	3	-	-
CO3	3	-	1	-	-	-	-	-	1	-	-	3	-	3	-	-
CO4	3	-	1	-	-	-	-	-	1	-	-	3	-	3	-	-
CO5	3	-	1	-	-	-	-	-	1	-	-	3	-	3	-	-
Avg	3	-	1	-	-	-	-	-	1	-	-	3	-	3	-	-

B. PHARM. SEMESTER – III (BPH)
SUBJECT: PHARMACEUTICAL MICROBIOLOGY-PRACTICAL (BP307P)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
-	-	4	4	2	35	10	5	-	50

A. COURSE OVERVIEW

Scope: Course enables the student to learn all categories of microorganisms especially for the production of alcohol, antibiotics, vaccines, vitamins enzymes etc..

Objectives: Upon completion of the course the student shall be able to

- Understand methods of identification, cultivation and preservation of various microorganisms.
- To understand the importance and implementation of sterilization in pharmaceutical processing and industry
- Learn sterility testing of pharmaceutical products.
- Carried out microbiological standardization of Pharmaceuticals.
- Understand the cell culture technology and its applications in pharmaceutical industries.

B. COURSE CONTENT

NO	TOPIC	P (Hrs)	COs
[1]	1. Introduction and study of different equipments and processing, e.g., B.O.D. incubator, laminar flow, aseptic hood, autoclave, hot air sterilizer, deep freezer, refrigerator, microscopes used in experimental microbiology. 2. Sterilization of glassware, preparation and sterilization of media. 3. Sub culturing of bacteria and fungus. Nutrient stabs and slants preparations. 4. Staining methods- Simple, Grams staining and acid fast staining (Demonstration with practical). 5. 4.Isolation of pure culture of micro-organisms by multiple streak plate technique and other techniques 6. Microbiological assay of antibiotics by cup plate method and other methods 7. Motility determination by Hanging drop method. 8. Sterility testing of pharmaceuticals. 9. Bacteriological analysis of water 10. Biochemical test.	**60**	CO1 CO2 CO3 CO4 CO5

C. TEXT BOOKS

(1) Arora, B.; Arora, D. R. *Practical Microbiology*; Cbs Publishers & Distributors, Pvt Ptd: New Delhi, 2020.

D. REFERENCE BOOKS

(1) G Sirockin; Cullimore, S. *Practical Microbiology*; London Mcgraw-Hill C, 1969.
(2) Pelczar, M. J.; Chan, E. C. S.; Krieg, N. R. *Microbiology*; Tata Mcgraw-Hill: New Delhi, 2010.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand Apply and Evaluate	To perform and Evaluate sterility testing of pharmaceutical products.
CO2	Understand Apply and Evaluate	To perform microbiological standardization of Pharmaceuticals.
CO3	Understand Apply and Evaluate	To perform staining techniques for different microbes
CO4	Understand Apply and Evaluate	To evaluate motility of microorganism
CO5	Understand Apply and Evaluate	To perform microbial assay of antibiotics

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	1	1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	1	1	3	3	3	3	2	3	3	3	2	2
CO3	3	3	3	2	1	1	1	2	1	2	1	2	2	3	2	1
CO4	3	3	3	2	1	1	1	1	1	1	1	1	1	3	1	1
CO5	3	3	3	2	1	1	2	3	3	3	2	3	2	3	2	3
Avg	3	3	3	2.4	1	1	2	2.4	2.2	2.4	1.8	2.4	2.2	3	2	2

B. PHARM. SEMESTER – III (BPH)
SUBJECT: PHARMACEUTICAL ENGINEERING-PRACTICAL (BP308P)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	-	Total
-	-	4	4	2	35	10	5	-	50

A. COURSE OVERVIEW

Scope: This course is designed to impart a fundamental knowledge on the art and science of various unit operations used in pharmaceutical industry.

Objectives: Upon completion of the course student shall be able:

- To know various unit operations used in Pharmaceutical industries.
- To understand the material handling techniques.
- To perform various processes involved in pharmaceutical manufacturing process.
- To carry out various test to prevent environmental pollution.
- To appreciate and comprehend significance of plant lay out design for optimum use of resources.
- To appreciate the various preventive methods used for corrosion control in Pharmaceutical industries.

B. COURSE CONTENT

NO	TOPIC	P (Hrs)	COs
[1]	1. Determination of radiation constant of brass, iron, unpainted and painted glass. 2. Steam distillation – To calculate the efficiency of steam distillation. 3. To determine the overall heat transfer coefficient by heat exchanger. 4. Construction of drying curves (for calcium carbonate and starch). 5. Determination of moisture content and loss on drying. 6. Determination of humidity of air – i) From wet and dry bulb temperatures –use of Dew point method. 7. Description of Construction working and application of Pharmaceutical 8. Machinery such as rotary tablet machine, fluidized bed coater, fluid energy mill,de humidifier. 9. Size analysis by sieving – To evaluate size distribution of tablet granulations – Construction of various size frequency curves including arithmetic and logarithmic probability plots. 10. Size reduction: To verify the laws of size reduction using ball mill and determining Kicks, Rittinger's, Bond's coefficients, power requirement and critical speed of Ball Mill. 11. Demonstration of colloid mill, planetary mixer, fluidized bed dryer, freeze dryer and such othermajor equipment. 12. Factors affecting Rate of Filtration and Evaporation (Surface area, Concentration and Thickness/ viscosity 13. To study the effect of time on the Rate of Crystallization. 14. To calculate the uniformity Index for given sample by using Double Cone Blender.	**60**	CO1 CO2 CO3 CO4 CO5

C. TEXT BOOKS

1. Momin M, Mehta T, Practical Manual of Pharmaceutical Engineering, B.S. Shah Prakashan, Ahmedabad, Gujarat, 2002.

D. REFERENCE BOOKS

1. C V S Shubramanyam. Pharmaceutical Engineering : Unit Operations - II; Vallabh Prakashan: Delhi, 2014.
2. C V S Subrahmanyam; J Thimma Setty; Suresh, S.; V Kusum Devi. Pharmaceutical Engineering : Principles and Practices.; Vallabh Prakashan: Delhi, 2002.
3. Badger, W. L. Introduction to Chemical Engineering; Mc Graw Hill: Auckland, 1987.
4. Cooper, J. W.; Gunn, C.; Sidney James Carter. Cooper and Gunn's Tutorial Pharmacy; Cbs Publishers: Editorial: New Delhi, 2005.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and remember	To understand and convert the values of factors in different units to perform various unit operations in Pharmaceutical industries.
CO2	Apply	To perform basic unit operations such as filtration, centrifugation, drying etc.
CO3	Evaluate	To check the effect of various processing parameters on different unit operations.
CO4	Apply	To create plant lay out design for optimum use of resources and to carry out various tests to prevent environmental pollution.
CO5	Apply and evaluate	To appreciate the various preventive methods used for corrosion control in Pharmaceutical industries.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	3	2	-	1	1	2	1	3	3	3	2	2	2
CO2	3	2	3	3	2	2	-	2	2	2	3	3	3	3	1	2
CO3	3	2	3	3	-	2	-	2	2	2	3	3	3	3	2	2
CO4	3	2	3	3	2	-	-	2	1	1	3	3	3	2	3	2
CO5	3	3	3	3	2	3	2	3	3	3	3	3	3	2	3	3
Avg	3	2.2	3	3	1.6	1.4	0.6	2	2	1.8	3	3	3	2.4	2.2	2.2

B. PHARM. SEMESTER – VII (BPH)
SUBJECT: INTRODUCTION TO YOGA (BP309P)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
-	-	2	2	-	-	-	-	-	-

* Non-University Examination with grading satisfactory/ unsatisfactory

A. COURSE OVERVIEW

Scope: This subject is designed to impart basic knowledge and practical skill of Yoga

Objectives: Upon completion of the course student shall be able

- To introduce the student to the fundamentals of a Yoga practice in a safe, supportive and academic environment.
- To learn proper body alignment & the basics of breathing techniques (pranayama)
- To understand various forms of yoga mediation & yogic asanas.

B. COURSE CONTENT

NO	TOPIC	L (Hrs)
[1]	TRAINING IN YOGIC ASANAS, PRANAYAMS AND MUDRAS – Kapalbhati, Anulom-vilom, Pranayam, Omkar Pranayam, Bharmari, Pranayam, Body Roration, Shavasan, Suryanamaskar, – Asans for Meditaion: Padmasan, Swastikasan, Siddhasan, Bhadrasan, Vajrasan, Makarasan, Savasan. – Asans to be performed in Standing Position: Trikonasan, Pervatasan, Utkatukasan, Hastpadsan – Asans to be performed while lying in Supine position: Servangasan, Halasan, Savasan, Kosthavishramasan, Matshendrasan, Suptavajrasan – Asans to be performed while lying in Prone position: Uttanpadasan, Uttanadhasan, Serpasan, Bhujasan, Salabhasan, Dhanurasan, Makarasan – Asans to be performed in sitting position: Pavanmuktasan, Hastapadasan, Vajrasan, Ardhamatshyendrasan, Shishuasan, Saptamudrasan, Gomukhasan. – Yoga Mudras (Seven Types)	**30**

B. PHARM. SEMESTER – IV (BPH)

SUBJECT: PHARMACEUTICAL ORGANIC CHEMISTRY III -THEORY (BP401T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This subject imparts knowledge on stereo-chemical aspects of organic compounds and organic reactions, important named reactions, chemistry of important hetero cyclic compounds. It also emphasizes on medicinal and other uses of organic compounds.

Objectives: At the end of the course, the student shall be able to

- understand the methods of preparation and properties of organic compounds
- explain the stereo chemical aspects of organic compounds and stereo chemical reactions
- know the medicinal uses and other applications of organic compounds

B. COURSE CONTENT

To emphasize on definition, types, mechanisms, examples, uses/applications

NO	TOPIC	L (Hrs)	COs
[1]	**Stereo isomerism** Optical isomerism – Optical activity, enantiomerism, diastereoisomerism, meso compounds Elements of symmetry, chiral and achiral molecules DL system of nomenclature of optical isomers, sequence rules, RS system of nomenclature of optical isomers Reactions of chiral molecules Racemic modification and resolution of racemic mixture. Asymmetric synthesis: partial and absolute	**10**	CO3
[2]	Geometrical isomerism Nomenclature of geometrical isomers (Cis Trans, EZ, Syn Anti systems) Methods of determination of configuration of geometrical isomers. Conformational isomerism in Ethane, n-Butane and Cyclohexane. Stereo isomerism in biphenyl compounds (Atropisomerism) and conditions for optical activity. Stereospecific and stereoselective reactions	**10**	CO3
[3]	**Heterocyclic compounds:** Nomenclature and classification Synthesis, reactions and medicinal uses of following compounds/derivatives Pyrrole, Furan, and Thiophene Relative aromaticity and reactivity of Pyrrole, Furan and Thiophene	**10**	CO1 CO2 CO4
[4]	Synthesis, reactions and medicinal uses of following compounds/derivatives Pyrazole, Imidazole, Oxazole and Thiazole. Pyridine, Quinoline, Isoquinoline, Acridine and Indole. Basicity of pyridine Synthesis & medicinal uses of Pyrimidine, Purine, azepines and their dvts	**8**	CO2 CO3 CO4
[5]	**Reactions of synthetic importance**	**7**	CO5

	Metal hydride reduction (NaBH 4 and LiAlH 4), Clemmensen reduction, Birch reduction, Wolff Kishner reduction. Oppenauer-oxidation and Dakin reaction. Beckmanns rearrangement and Schmidt rearrangement. Claisen-Schmidt condensation		

C. TEXT BOOKS (LATEST EDITION)

1. Mehta, B.; Mehta, M. Organic Chemistry; Prentice Hall Of India: New Delhi, 2005.

D. REFERENCE BOOKS (LATEST EDITION)

1. Bansal R, Heterocyclic Chemistry; New Age International (P) Limited, Publishers: New Delhi, 2014.
2. Finar, I. L. Organic Chemistry : Volume 1: The Fundamental Principles; Pearson Eduation: India, 2003.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and Remember	To understand the methods of preparation for various organic compounds
CO2	Understand and Remember	To understand chemical properties for various organic compounds
CO3	Understand and Apply	To know the stereo chemical aspects of organic compounds and stereochemical reactions
CO4	Understand and Apply	To know medicinal uses and Other application of organic compounds
CO5	Understand and Remember	To understand and remember the reaction of synthetic importance

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	-	3	-	-	-	-	1	1	3	3	2	3	1	1
CO2	3	-	-	3	-	-	-	-	1	-	3	3	2	3	1	1
CO3	3	-	-	3	-	-	-	-	1	-	3	3	2	3	1	1
CO4	3	-	-	2	-	-	-	-	1	-	3	3	3	3	1	1
CO5	3	-	-	2	-	-	-	-	1	-	3	3	3	3	2	1
Avg	3	-	-	2.6	-	-	-	-	1	0.2	3	3	2.4	3	1.2	1

B. PHARM. SEMESTER – IV (BPH)
SUBJECT: MEDICINAL CHEMISTRY I -THEORY (BP402T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs. The syllabus also emphasizes on chemical synthesis of important drugs under each class.

Objectives: Upon completion of the course the student shall be able to

- understand the methods of preparation and properties of organic compounds
- explain the stereo chemical aspects of organic compounds and stereo chemical reactions
- know the medicinal uses and other applications of organic compounds

B. COURSE CONTENT

Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (*)

NO	TOPIC	L (Hrs)	COs
[1]	**Introduction to Medicinal Chemistry** **History and development of medicinal chemistry** **Physicochemical properties in relation to biological action** Ionization, Solubility, Partition Coefficient, Hydrogen bonding, Protein binding, Chelation, Bioisosterism, Optical and Geometrical isomerism. **Drug metabolism** Drug metabolism principles- Phase I and Phase II. Factors affecting drug metabolism including stereo chemical aspects.	**10**	CO1 CO2
[2]	**Drugs acting on Autonomic Nervous System** **Adrenergic Neurotransmitters:** Biosynthesis and catabolism of catecholamine. Adrenergic receptors (Alpha & Beta) and their distribution. **Sympathomimetic agents: SAR of Sympathomimetic agents** Direct acting: Nor-epinephrine, Epinephrine, Phenylephrine*, Dopamine, Methyldopa, Clonidine, Dobutamine, Isoproterenol, Terbutaline, Salbutamol*, Bitolterol, Naphazoline, Oxymetazoline and Xylometazoline. • Indirect acting agents: Hydroxyamphetamine, Pseudoephedrine, Propylhexedrine. • Agents with mixed mechanism: Ephedrine, Metaraminol. **Adrenergic Antagonists:** **Alpha adrenergic blockers:** Tolazoline*, Phentolamine, Phenoxybenzamine, Prazosin, Dihydroergotamine, Methysergide. **Beta adrenergic blockers:** SAR of beta blockers, Propranolol*, Metibranolol, Atenolol, Betazolol, Bisoprolol, Esmolol, Metoprolol, Labetolol, Carvedilol.	**10**	CO2 CO3 CO4 CO5
[3]	**Cholinergic neurotransmitters:**	**10**	CO2

	Biosynthesis and catabolism of acetylcholine. Cholinergic receptors (Muscarinic & Nicotinic) and their distribution. **Parasympathomimetic agents: SAR of Parasympathomimetic agents** **Direct acting agents:** Acetylcholine, Carbachol*, Bethanechol, Methacholine, Pilocarpine. **Indirect acting/ Cholinesterase inhibitors (Reversible & Irreversible):** Physostigmine, Neostigmine*, Pyridostigmine, Edrophonium chloride, Tacrine hydrochloride, Ambenonium chloride, Isofluorphate, Echothiophate iodide, Parathione, Malathion. **Cholinesterase reactivator:** Pralidoxime chloride. **Cholinergic Blocking agents: SAR of cholinolytic agents** **Solanaceous alkaloids and analogues:** Atropine sulphate, Hyoscyamine sulphate, Scopolamine hydrobromide, Homatropine hydrobromide, Ipratropium bromide*. **Synthetic cholinergic blocking agents:** Tropicamide, Cyclopentolate hydrochloride, Clidinium bromide, Dicyclomine hydrochloride*, Glycopyrrolate, Methantheline bromide, Propantheline bromide, Benztropine mesylate, Orphenadrine citrate, Biperidine hydrochloride, Procyclidine hydrochloride*, Tridihexethyl chloride, Isopropamide iodide, Ethopropazine hydrochloride.		CO3 CO4 CO5
[4]	**Drugs acting on Central Nervous System** **A. Sedatives and Hypnotics:** **Benzodiazepines:** SAR of Benzodiazepines, Chlordiazepoxide, Diazepam*, Oxazepam, Chlorazepate, Lorazepam, Alprazolam, Zolpidem **Barbiturtes:** SAR of barbiturates, Barbital*, Phenobarbital, Mephobarbital, Amobarbital, Butabarbital, Pentobarbital, Secobarbital **Miscelleneous:** Amides & imides: Glutethmide. Alcohol & their carbamate derivatives: Meprobomate, Ethchlorvynol. Aldehyde & their derivatives: Triclofos sodium, Paraldehyde. **B. Antipsychotics** **Phenothiazeines:** SAR of Phenothiazeines - Promazine hydrochloride, Chlorpromazine hydrochloride*, Triflupromazine, Thioridazine hydrochloride, Piperacetazine hydrochloride, Prochlorperazine maleate, Trifluoperazine hydrochloride. **Ring Analogues of Phenothiazeines:** Chlorprothixene, Thiothixene, Loxapine succinate, Clozapine. **Fluro buterophenones:** Haloperidol, Droperidol, Risperidone. **Beta amino ketones:** Molindone hydrochloride. **Benzamides:** Sulpieride. **C. Anticonvulsants:** SAR of Anticonvulsants**,** mechanism of anticonvulsant action **Barbiturates**: Phenobarbitone, Methabarbital. **Hydantoins:** Phenytoin*, Mephenytoin, Ethotoin **Oxazolidine diones:** Trimethadione, Paramethadione **Succinimides:** Phensuximide, Methsuximide, Ethosuximide* **Urea and monoacylureas**: Phenacemide, Carbamazepine* **Benzodiazepines**: Clonazepam **Miscellaneous:** Primidone, Valproic acid , Gabapentin, Felbamate	**8**	CO2 CO3 CO4 CO5
[5]	**Drugs acting on Central Nervous System** **General anesthetics:** **Inhalation anesthetics:** Halothane*, Methoxyflurane, Enflurane, Sevoflurane, Isoflurane, Desflurane.	**7**	CO2 CO3 CO4 CO5

	Ultra short acting barbitutrates: Methohexital sodium*, Thiamylal sodium, Thiopental sodium. **Dissociative anesthetics:** Ketamine hydrochloride.* **Narcotic and non-narcotic analgesics** **Morphine and related drugs:** SAR of Morphine analogues, Morphine sulphate, Codeine, Meperidine hydrochloride, Anilerdine hydrochloride, Diphenoxylate hydrochloride, Loperamide hydrochloride, Fentanyl citrate*, Methadone hydrochloride*, Propoxyphene hydrochloride, Pentazocine, Levorphanol tartarate. **Narcotic antagonists:** Nalorphine hydrochloride, Levallorphan tartarate, Naloxone hydrochloride. **Anti-inflammatory agents:** Sodium salicylate, Aspirin, Mefenamic acid*, Meclofenamate, Indomethacin, Sulindac, Tolmetin, Zomepriac, Diclofenac, Ketorolac, Ibuprofen*, Naproxen, Piroxicam, Phenacetin, Acetaminophen, Antipyrine, Phenylbutazone.		

C. TEXT BOOKS (LATEST EDITION)

1. Kadam S S, Bothara, K G Principles of Medicinal Chemistry, Volume I & II, 17th edition, Nirali Prakashan, India, 2008
2. Alagarswamy, V Textbookm of Medicinal Chemistry, Volume I & II, Elesevier, India 2012

D. REFERENCE BOOKS (LATEST EDITION)

1. Delgado, J. N.; Remers, W. A. Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry; Lippincott-Raven: Philadelphia, 1998.
2. Foye, W. O.; Lemke, T. L.; Williams, D. A. Principles of Medicinal Chemistry; Williams & Wilkins, Cop: Baltimore Etc., 1995.
3. Remington, J. P.; Gennaro, A. R. Remington's Pharmaceutical Sciences; Mack Pub. Co: Easton, Pa., 1990.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and Remember	To understand the chemistry of drugs with respect to their pharmacological activity
CO2	Understand and Remember	To understand the classification of drugs with their structures
CO3	Understand	To understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
CO4	Understand and Remember	To know the Structural Activity Relationship (SAR) of different class of drugs
CO5	Understand and Apply	To learn about the chemical synthesis of some drugs

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	-	1	1	1	-	-	2	-	3	3	3	2	1	1
CO2	3	-	-	1	1	1	-	-	2	-	3	3	1	2	1	1
CO3	3	-	-	1	1	1	-	-	2	-	3	3	3	2	1	1
CO4	3	-	-	1	1	1	-	-	1	-	3	3	2	2	1	1
CO5	3	-	-	1	1	1	-	-	2	-	3	3	1	2	1	1
Avg	3	-	-	1	1	1	-	-	1.8	-	3	3	2	2	1	1

B. PHARM. SEMESTER – IV (BPH)
SUBJECT: PHYSICAL PHARMACEUTICS-II-THEORY (BP403T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: The course deals with the various physical and physicochemical properties, and principles involved in dosage forms/formulations. Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development, and stability studies of pharmaceutical dosage forms.

Objectives: Upon completion of the course the student shall be able to

- Know the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations
- Know basics of the dispersed systems and colloidal dispersions.

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Colloidal dispersions:** Classification of dispersed systems & their general characteristics, size & shapes of colloidal particles, classification of colloids & comparative account of their general properties. Optical, kinetic & electrical properties. Effect of electrolytes, coacervation, peptization & protective action.	**07**	CO1
[2]	**Rheology:** Newtonian systems, law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudoplastic, dilatant, plastic, thixotropy, thixotropy in formulation, determination of viscosity, capillary, falling Sphere, rotational viscometers **Deformation of solids:** Plastic and elastic deformation, Heckel equation, Stress, Strain, Elastic Modulus	**08**	CO2
[3]	**Coarse dispersion:** Suspension, interfacial properties of suspended particles, settling in suspensions, formulation of flocculated and deflocculated suspensions. Emulsions and theories of emulsification, microemulsion and multiple emulsions; Stability of emulsions, preservation of emulsions, rheological properties of emulsions and emulsion formulation by HLB method.	**10**	CO1 CO3
[4]	**Micromeretics:** Particle size and distribution, mean particle size, number and weight distribution, particle number, methods for determining particle size by different methods, counting and separation method, particle shape, specific surface, methods for determining surface area, permeability, adsorption, derived properties of powders, porosity, packing arrangement, densities, bulkiness & flow properties.	**10**	CO4
[5]	**Drug stability:** Reaction kinetics: zero, pseudo-zero, first & second order, units of basic rate constants, determination of reaction order. Physical and chemical factors influencing the chemical degradation of pharmaceutical product: temperature, solvent, ionic strength, dielectric constant, specific & general acid base catalysis, Simple numerical problems. Stabilization of medicinal agents against common reactions like hydrolysis & oxidation. Accelerated stability testing in expiration dating of pharmaceutical dosage forms. Photolytic degradation and its prevention	**10**	CO3 CO4

C. TEXT BOOKS

1. Subrahmanyam, C. V. S. Textbook of Physical Pharmaceutics. India: Vallabh Prakashan. 2000.

D. REFERENCE BOOKS

1. Sinko, Patrick J., and Alfred N. Martin. Martin's Physical Pharmacy and Pharmaceutical Sciences: Physical Chemical and Biopharmaceutical Principles in the Pharmaceutical Sciences. 5th ed. Philadelphia: Lippincott Williams & Wilkins, 2006.
2. Parrott, E. L., Saski, W. Experimental Pharmaceutics. United States: Burgess Publishing Company. 1977
3. Carter, S. J. Cooper and Gunn's Tutorial Pharmacy. India: CBS Publishers & Distributors. 2021.
4. Ansel, H. C., Stoklosa, M. J. Pharmaceutical Calculations. United Kingdom: Lea &Febiger. 1986.
5. Gilbert S. Banker, Herbert Lieberman, Martin Rieger. Pharmaceutical Dosage Forms: Disperse Systems. United States: CRC Press. 2020.
6. Manavalan, R., Ramasamy, C. Physical Pharmaceutics. India: Pharma Med Press. 2017.
7. Jain, G., KrishenKhar, R., Ahmad, F. J. Theory and Practice of Physical Pharmacy - E-Book. India: Elsevier Health Sciences. 2011.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and apply	Understand basics of the dispersed systems and apply principles of colloidal dispersions.
CO2	Interpret and Evaluate	Interpret the rheological behaviour of fluids and evaluate the physics of tablet compression.
CO3	Evaluate and apply	Formulate and evaluate coarse dispersions making use of rheological and electrical properties.
CO4	Understand, Evaluate and apply	Understand and evaluate the properties of powders and apply them in formulation development.
CO5	Understand and Analyse	Understand principles of kinetics in the stabilization of dosage forms. Analyze the chemical stability of various drug products

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	1	-	-	-	-	-	2	-	-	3	2	3	-	-
CO2	3	-	1	-	-	-	-	-	2	-	-	3	2	3	-	-
CO3	3	-	1	-	-	-	-	-	2	-	-	3	2	3	-	-
CO4	3	-	1	-	-	-	-	-	2	-	-	3	2	3	-	-
CO5	3	-	2	-	-	-	-	-	3	-	-	3	2	3	-	-
Avg	3	-	1.2	-	-	-	-	-	2.2	-	-	3	2	3	-	-

B. PHARM. SEMESTER – IV (BPH)
SUBJECT: PHARMACOLOGY I -THEORY (BP401T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	---	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: The main purpose of the subject is to understand what drugs do to the living organisms and how their effects can be applied to therapeutics. The subject covers the information about the drugs like, mechanism of action, physiological and biochemical effects (pharmacodynamics) as well as absorption, distribution, metabolism and excretion (pharmacokinetics) along with the adverse effects, clinical uses, interactions, doses, contraindications and routes of administration of different classes of drugs.

Objectives: Upon completion of the course the student shall be able to

- Understand the pharmacological actions of different categories of drugs
- Explain the mechanism of drug action at organ system/sub cellular/macromolecular levels.
- Apply the basic pharmacological knowledge in the prevention and treatment of various diseases.
- Observe the effect of drugs on animals by simulated experiments
- Appreciate correlation of pharmacology with other bio medical sciences

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**1. General Pharmacology** a. Introduction to Pharmacology- Definition, historical landmarks and scope of pharmacology, nature and source of drugs, essential drugs concept and routes of drug administration, Agonists, antagonists (competitive and non competitive), spare receptors, addiction, tolerance, dependence, tachyphylaxis, idiosyncrasy, allergy. **b. Pharmacokinetics-** Membrane transport, absorption, distribution, metabolism and excretion of drugs .Enzyme induction, enzyme inhibition, kinetics of elimination	**08**	CO1 CO4 CO5
[2]	**General Pharmacology** **a. Pharmacodynamics-** Principles and mechanisms of drug action. Receptor theories and classification of receptors, regulation of receptors. drug receptors interactions signal transduction mechanisms, G-protein–coupled receptors, ion channel receptor, transmembrane enzyme linked receptors, transmembrane JAK-STAT binding receptor and receptors that regulate transcription factors, dose response relationship, therapeutic index, combined effects of drugs and factors modifying drug action. **b. Adverse drug reactions**. **c. Drug interactions** (pharmacokinetic and pharmacodynamic) **d. Drug discovery and clinical evaluation of new drugs** -Drug discovery phase, preclinical evaluation phase, clinical trial phase, phases of clinical trials and pharmacovigilance	**12**	CO1 CO2 CO3 CO4 CO5

[3]	**Pharmacology of drugs acting on peripheral nervous system** a. Organization and function of ANS. b. Neurohumoral transmission-transmission and classification of neurotransmitters. c. Parasympathomimetic, Parasympatholytic, Sympathomimetics, sympatholytic. d. Neuromuscular blocking agents and skeletal muscle relaxants (peripheral). e. Local anaesthetic agents. f. Drugs used in myasthenia gravis and glaucoma	10	CO1 CO2 CO3 CO4 CO5
[4]	**Pharmacology of drugs acting on central nervous system** a. Neurohumoral transmission in the C.N.S. special emphasis on importance of various neurotransmitters like with GABA, Glutamate, Glycine, serotonin, dopamine. b. General anaesthetics and pre-anaesthetics. c. Sedatives, hypnotics and centrally acting muscle relaxants. d. Anti-epileptics e. Alcohols and disulfiram.	08	C01 CO2 CO3 CO4 CO5
[5]	**Pharmacology of drugs acting on central nervous system** a. Psychopharmacological agents: Antipsychotics, antidepressants, anti-anxiety agents, anti-manic and hallucinogens. b. Drugs used in Parkinson's disease and Alzheimer's disease. c. CNS stimulants and nootropics. d. Opioid analgesics and antagonists e. Drug addiction, drug abuse, tolerance and dependence.	07	CO1 CO2 CO3 CO4 CO5

C. TEXT BOOKS

1. Ritter, J.; Flower, R. J.; Henderson, G.; Yoon Kong Loke; Rang, H. P. Rang and Dale's Pharmacology, 9th ed.; Elsevier: Endinburgh, 2020.
2. Tripathi, K. D. Essentials of Medical Pharmacology; Jaypee Bros: New Delhi, 1988.
3. Brunton, L. L.; Hilal-Dandan, R.; Knollmann, B. C. Goodman & Gilman's the Pharmacological Basis of Therapeutics, 13th ed.; McGraw-Hill Education: New York, 2018.

D. REFERENCE BOOKS

1. Ritter, J.; Flower, R. J.; Henderson, G.; Yoon Kong Loke; Rang, H. P. Rang and Dale's Pharmacology, 9th ed.; Elsevier: Endinburgh, 2020.
2. Tripathi, K. D. Essentials of Medical Pharmacology; Jaypee Bros: New Delhi, 1988.3.
3. Brunton, L. L.; Hilal-Dandan, R.; Knollmann, B. C. Goodman & Gilman's the Pharmacological Basis of Therapeutics, 13th ed.; McGraw-Hill Education: New York, 2018.
4. Bickley, L. S.; Bates, B. Bates' Guide to Physical Examination and History Taking.; Lippincott Williams & Wilkins: Philadelphia, 2020.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand	To know about general idea of pharmacology subject, the contents of the subject, the basic about the drug and its action inside the body
CO2	Remember, Understand and Apply	To get knowledge about how to body react towards the drug and basic action and adverse effects produced by the drugs
CO3	Understand Apply and Evaluate	To understand about the system, disease and drug used in treatment of that type of disease
CO4	Understand and remember	To know about how disease occurs and drugs used in those diseases and drug interaction with others.
CO5	Remember, Understand, Apply and evaluate	To get knowledge about various agonist and antagonist and drugs dependence abuse and tolerance about certain drugs

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	3	3	3	3	3	3	1	2	3	3	3	3	1
CO2	3	2	3	3	3	3	2	3	3	2	3	3	3	3	3	1
CO3	3	2	3	3	3	3	2	3	3	2	2	3	3	3	3	1
CO4	3	2	3	3	3	3	2	3	3	2	2	3	3	3	3	1
CO5	3	2	3	3	3	3	3	3	3	2	2	2	3	3	3	1
Avg	3	2	3	3	3	3	2.4	3	3	1.8	2.2	2.8	3	3	3	1

B. PHARM. SEMESTER – IV (BPH)
SUBJECT: PHARMACOGNOSY AND PHYTOCHEMISTRY -THEORY (BP405T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: The subject involves the fundamentals of Pharmacognosy like scope, classification of crude drugs, their identification and evaluation, phytochemicals present in them and their medicinal properties.

Objectives: Upon completion of the course, the student shall be able

- To know the techniques in the cultivation and production of crude drugs.
- To know the crude drugs, their uses and chemical nature.
- Know the evaluation techniques for the herbal drugs.
- To carry out the microscopic and morphological evaluation of crude drugs.

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Introduction to Pharmacognosy:** (a) Definition, history, scope and development of Pharmacognosy (b) Sources of Drugs – Plants, Animals, Marine & Tissue culture (c) Organized drugs, unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo- gum -resins). **Classification of drugs:** Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and sero-taxonomical classification of drugs **Quality control of Drugs of Natural Origin:** Adulteration of drugs of natural origin. Evaluation by organoleptic, microscopic, physical, chemical and biological methods and properties. Quantitative microscopy of crude drugs including lycopodium spore method, leafconstants, camera lucida and diagrams of microscopic objects to scale with camera lucida.	**10**	CO2 CO5
[2]	**Cultivation, Collection, Processing and storage of drugs of natural origin:** Cultivation and Collection of drugs of natural origin Factors influencing cultivation of medicinal plants. Plant hormones and their applications. Polyploidy, mutation and hybridization with reference to medicinal plants **Conservation of medicinal plants**	**10**	CO1
[3]	**Plant tissue culture:** Historical development of plant tissue culture, types of cultures, Nutritional requirements, growth and their maintenance. Applications of plant tissue culture in pharmacognosy. Edible vaccines	**07**	CO4
[4]	**Pharmacognosy in various systems of medicine:** Role of Pharmacognosy in allopathy and traditional systems of medicine namely, Ayurveda, Unani, Siddha, Homeopathy and Chinese systems of medicine. **Introduction to secondary metabolites:**	**10**	CO2 CO3 CO5

	Definition, classification, properties and test for identification of Alkaloids, Glycosides, Flavonoids, Tannins, Volatile oil and Resins		
[5]	Study of biological source, chemical nature and uses of drugs of natural origin containing following drugs **Plant Products:** Fibers - Cotton, Jute, Hemp Hallucinogens, Teratogens, Natural allergens **Primary metabolites:** General introduction, detailed study with respect to chemistry, sources, preparation, evaluation, preservation, storage, therapeutic uses and commercial utility as Pharmaceutical Aids and/or Medicines for the following Primary metabolites: **Carbohydrates:** Acacia, Agar, Tragacanth, Honey **Proteins and Enzymes :**Gelatin, casein, proteolytic enzymes (Papain, bromelain, serratiopeptidase, urokinase, streptokinase, pepsin). **Lipids(Waxes, fats, fixed oils)** : Castor oil, Chaulmoogra oil, Wool Fat, Bees Wax . **Marine Drugs:** Novel medicinal agents from marine sources.	**08**	CO2 CO5

C. TEXT BOOKS

1. Dr. Shukla P., Dr. Shashi, A. &Dr. Shukla P., A textbook of "Pharmacognosy& Phytochemistry-I" 1st Edition, Nirali Prakashan, 2019.
2. Kabra, A., Dr. Ashok PK. & Setia, S., A textbook of "Pharmacognosy & Phytochemistry-I", Pee Vee Book , S. Vikas & Company (Medical Publishers) ,2019.

D. REFERENCE BOOKS

1. Deore SL., **"**Pharmacognosy & Phytochemistry-I-A Comprehensive Approach" 2nd edition, Pharma Med. Press, 2019.
2. Ali, M., "Pharmacognosy- Pharmacognosy & Phytochemistry-I", Volume-I CBS Publishers & Distributors PVT. Ltd., 2018
3. Shah, B., & Seth, AK., "Textbook of Pharmacognosy & Phytochemistry" , 2nd Edition, CBS Publishers & Distributors PVT. Ltd., 2017.
4. Quadry, JS., "Textbook of Pharmacognosy (Theory & Practical)" 17th Edition, CBS Publishers &Distributors PVT. Ltd., 2020.
5. Rangari VD., "Pharmacognosy & Phytochemistry" Volume-I 3rd Edition, Career Publications,2017.
6. Rangari VD., "Pharmacognosy & Phytochemistry" Volume-II 3rd Edition, Career Publications, 2017.
7. Jarald EE. &Jarald SE., "Textbook of Pharmacognosy & Phytochemistry" 1st edition, CBS Publishers & Distributors PVT. Ltd., 2007.
8. Neha Tyagi &Dr. Verma Santosh Kumar "A textbook of Pharmacognosy & Phytochemistry-I", 1st Edition, BFC Publication, 2020.
9. Gokhale, SB., Dr.Kokate CK., Dr.Tatiya AV., Dr. Kalaskar MG., "Pharmacognosy & Phytochemistry-I" 1st Edition, Nirali Prakashan, 2019.
10. Ashutosh Kar, "Pharmacognosy& Phytochemistry-I ", 1st Edition, New Age International Private LTD. Publishers. 2020.
11. Dr. Das K., "Pharmacognosy & Phytochemistry-I" 1st Edition, Nirali Prakashan, 2019.
12. Kalia AN., Textbook of "Pharmacognosy & Phytochemistry-I" CBS Publishers & Distributors PVT. Ltd., 2021.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and Analyse	Identify and analyse the techniques in the cultivation and production of crude drugs.
CO2	Remember and Understand Evaluate	Describe Pharmacognostic parameters & Pharmacognostic study of crude drug with their evaluation.
CO3	Understand and Apply	Explain & apply the basic principle of Indian systems of medicines.
CO4	Understand and apply	Discuss and apply the basic principle and techniques of Plant tissue culture.
CO5	Understand and apply	Discuss primary and secondary metabolites systematically from the source of their pharmaceutical and industrial application.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	-	2	-	2	2	3	2	3	2	2	2	1
CO2	3	2	2	2	-	2	2	1	2	1	2	3	2	3	2	1
CO3	3	2	2	1	-	2	3	2	2	1	2	3	2	3	3	1
CO4	3	2	2	2	-	2	2	1	2	1	2	3	2	2	3	1
CO5	3	2	2	2	-	2	-	2	2	1	2	3	2	2	2	1
Avg	3	2	2	1.8	-	2	1.4	1.6	2	1.4	2	3	2	2.4	2.4	1

B. PHARM. SEMESTER – IV (BPH)
SUBJECT: MEDICINAL CHEMISTRY I -PRACTICAL (BP406P)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
-	-	4	4	2	35	10	05	-	50

A. COURSE OVERVIEW

Scope: This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs. The syllabus also emphasizes on chemical synthesis of important drugs under each class.

Objectives: Upon completion of the course the student shall be able to

- understand the methods of preparation and properties of organic compounds
- explain the stereo chemical aspects of organic compounds and stereo chemical reactions
- know the medicinal uses and other applications of organic compounds

B. COURSE CONTENT

NO	TOPIC	P (Hrs)	COs
[1]	**Preparation of drugs/ intermediates** 1,3-pyrazole 1,3-oxazole Benzimidazole Benztriazole 2,3- diphenyl quinoxaline Benzocaine Phenytoin Phenothiazine Barbiturate **Assay of drugs** Chlorpromazine Phenobarbitone Atropine Ibuprofen Aspirin Furosemide **Determination of Partition coefficient for any two drugs**	**60**	CO1 CO2 CO4 CO5

C. TEXT BOOKS (LATEST EDITION)

1. Raval H G, Practical organic Chemistry, First edition, Nirav & Roopal Prakashan, India, 2008

D. REFERENCE BOOKS (LATEST EDITION)

1. Mann, F. G.; Saunders, B. C. Practical Organic Chemistry; Pearson: New Delhi, 2009..
2. Arthur Israel Vogel; Furniss, B. S. Vogel's Textbook of Practical Organic Chemistry Including Qualitative Organic Analysis; London Longman Scientific & Technical [U.A, 1987.
3. Vishnoi, N. K. Advanced Practical Organic Chemistry.; Vikas Publishing House: Noida, 2009.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and Apply	To determine the partition coefficient of some drugs
CO2	Understand and Apply	To carry out the synthesis of drugs
CO3	Understand and Evaluate	To perform the assay of drugs using various analytical methods
CO4	Understand and Apply	To synthesize intermediates using different chemical reaction
CO5	Understand and Apply	To purify synthesized compounds and determine their physical constants

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	1	1	1	1	-	1	1	-	3	3	1	2	1	0
CO2	3	1	1	1	1	1	1	1	1	1	3	3	2	3	1	1
CO3	3	1	1	1	1	1	-	1	1	-	3	3	1	1	1	1
CO4	3	1	1	1	1	1	-	1	1	1	3	3	2	2	1	1
CO5	3	1	1	1	1	1	1	1	1	1	3	3	1	2	1	2
Avg	3	1	1	1	1	1	0.4	1	1	0.6	3	3	1.4	2	1	1

B. PHARM. SEMESTER – IV (BPH)
SUBJECT: PHYSICAL PHARMACEUTICS-II-PRACTICAL(BP407P)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
-	-	4	4	2	35	10	5	-	50

A. COURSE OVERVIEW

Scope: The course deals with the various physical and physicochemical properties, and principles involved in dosage forms/formulations. Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development, and stability studies of pharmaceutical dosage forms.

Objectives: Upon completion of the course the student shall be able to

- Know the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations
- Know basics of the micromeritics, dispersed systems and colloidal dispersions

B. COURSE CONTENT

NO	TOPIC	P (Hrs)	COs
[1]	1. Determination of particle size, particle size distribution using sieving method 2. Determination of particle size, particle size distribution using Microscopic method 3. Determination of bulk density, true density and porosity 4. Determine the angle of repose and influence of lubricant on angle of repose 5. Determination of viscosity of liquid using Ostwald's viscometer 6. Determination sedimentation volume with effect of different suspending agent 7. Determination sedimentation volume with effect of different concentration of 8. single suspending agent 9. Determination of viscosity of semisolid by using Brookfield viscometer 10. Determination of reaction rate constant first order. 11. Determination of reaction rate constant second order 12. Accelerated stability studies	**60**	CO1 CO2 CO3 CO4 CO5

C. TEXT BOOKS

1. Sen, K. K., Dutta, S. K. A Laboratory Manual of Physical Pharmaceutics. India: PharmaMed Press. 2019.

D. REFERENCE BOOKS

1. Sinko, Patrick J., and Alfred N. Martin. Martin's Physical Pharmacy and Pharmaceutical Sciences: Physical Chemical and Biopharmaceutical Principles in the Pharmaceutical Sciences. 5th ed. Philadelphia: Lippincott Williams & Wilkins, 2006.
2. Parrott, E. L., Saski, W. Experimental Pharmaceutics. United States: Burgess Publishing Company. 1977
3. Carter, S. J. Cooper and Gunn's Tutorial Pharmacy. India: CBS Publishers & Distributors. 2021.
4. Ansel, H. C., Stoklosa, M. J. Pharmaceutical Calculations. United Kingdom: Lea &Febiger. 1986.
5. Gilbert S. Banker, Herbert Lieberman, Martin Rieger. Pharmaceutical Dosage Forms: Disperse Systems. United States: CRC Press. 2020.
6. Manavalan, R., Ramasamy, C. Physical Pharmaceutics. India: Pharma Med Press. 2017.
7. Subrahmanyam, C. V. S. Textbook of Physical Pharmaceutics. India: Vallabh Prakashan. 2000.
8. Jain, G., KrishenKhar, R., Ahmad, F. J. Theory and Practice of Physical Pharmacy - E-Book. India: Elsevier Health Sciences. 2011.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and Evaluate	Understand and evaluate basic, derived and flow properties of powders and apply to prepare a stable formulation.
CO2	Understand and Evaluate	Understand and evaluate viscosity of fluids and formulations.
CO3	Remember and Analyse	Remember various type of suspending agent and anlyse them to formulate a stable suspension.
CO4	Apply and Analyse	Apply principles of chemical kinetics in determination of rate constants as per the chemical reaction.
CO5	Understand and Analyse	Understand and analyse the shelf life of a formulation by accelerated stability studies.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	1	-	-	-	-	-	2	-	-	3	2	3	-	-
CO2	3	-	1	-	-	-	-	-	1	-	-	3	1	3	-	-
CO3	3	-	1	-	-	-	-	-	1	-	-	3	1	3	-	-
CO4	3	-	2	-	-	-	-	-	1	-	-	3	2	3	-	-
CO5	3	-	2	-	-	-	-	-	1	-	-	3	2	3	-	-
Avg	3	-	1.4	-	-	-	-	-	1.2	-	-	3	1.6	3	-	-

B. PHARM. SEMESTER – IV (BPH)
SUBJECT: PHARMACOLOGY I -PRACTICAL (B408 P)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
--	--	4	4	2	35	10	5	-	50

A. COURSE OVERVIEW

Scope: It is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. It provides the basic knowledge required to understand the various disciplines of pharmacy.

Objectives: Upon completion of the course the student shall be able to

- Explain the gross morphology, structure and functions of various organs of the human body.
- Describe the various homeostatic mechanisms and their imbalances.
- Identify the various tissues and organs of different systems of human body.
- Perform the various experiments related to special senses and nervous system.
- Appreciate coordinated working pattern of different organs of each system

B. COURSE CONTENT

NO	TOPIC	P (Hrs)	COs
[1]	1. Introduction to experimental pharmacology. 2. Commonly used instruments in experimental pharmacology. 3. Study of common laboratory animals. 4. Maintenance of laboratory animals as per CPCSEA guidelines. 5. Common laboratory techniques. Blood withdrawal, serum and plasma separation, anaesthetics and euthanasia used for animal studies. 6. Study of different routes of drugs administration in mice/rats. 7. Study of effect of hepatic microsomal enzyme inducers on the phenobarbitone sleeping time in mice. 8. Effect of drugs on ciliary motility of frog oesophagus 9. Effect of drugs on rabbit eye. 10. Effects of skeletal muscle relaxants using rota-rod apparatus. 11. Effect of drugs on locomotor activity using actophotometer. 12. Anticonvulsant effect of drugs by MES and PTZ method. 13. Study of stereotype and anti-catatonic activity of drugs on rats/mice. 14. Study of anxiolytic activity of drugs using rats/mice. 15. Study of local anaesthetics by different methods Microscopic study of epithelial and connective tissue	**60**	CO1 CO2 CO3 CO4 CO5

C. TEXT BOOKS

1. Ritter, J.; Flower, R. J.; Henderson, G.; Yoon Kong Loke; Rang, H. P. Rang and Dale's Pharmacology, 9th ed.; Elsevier: Endinburgh, 2020.
2. Tripathi, K. D. Essentials of Medical Pharmacology; Jaypee Bros: New Delhi, 1988.
3. Brunton, L. L.; Hilal-Dandan, R.; Knollmann, B. C. Goodman & Gilman's the Pharmacological Basis of Therapeutics, 13th ed.; McGraw-Hill Education: New York, 2018.

D. REFERENCE BOOKS

1. Kulkarni, R. S. Index Theorems of Atiyah, Bott, Patodi and Curvature Invariants; Presses De L'université De Montreal: Montreal, 1975.
2. F Hoffmeister; G Stille. Handbook of Experimental Pharmacology. Vol. 55/2, Psychotropic Agents, Part 2, Anxiolytics, Gerontopsychopharmacological Agents, and Psychomotor Stimulants; Springer: Berlin, 1981.
3. Kapadia, S. R.; Chew, D.; Cura, F.; L'allier, P. L.; Roffi, M.; E Murat Tuzcu. Textbook of Interventional Cardiology: A Global Perspective; Jaypee: The Health Sciences Publisher: New Delhi, 2017.
4. Fundamentals of Experimental Pharmacology; Hilton & Company: Kolkata, 2015.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand	To know about general idea of pharmacology subject, the contents of the subject, the basic instrument used in pharmacology
CO2	Remember, Understand and Apply	To get knowledge about animals used in experimental pharmacology its detail, housing, feeding, dissection etc
CO3	Understand Apply and Evaluate	To understand about the drugs acting on the animals body part and instruments used to check the activity of the animal
CO4	Understand and remember	To know about how diseases are produced in the animals and drug used for those diseases.
CO5	Remember, Understand, Apply and evaluate	To get knowledge about which animals, which instrument and which kind of drug we can used to induce the disease and for treatment of those disease,

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	2	3	3	3	3	3	2	3	3	3	3	3
CO2	3	3	3	3	2	3	2	3	3	3	3	3	3	3	3	3
CO3	3	2	3	3	2	3	2	3	3	1	2	3	3	3	3	3
CO4	3	2	3	3	2	3	2	3	3	1	2	3	3	3	3	3
CO5	3	3	3	3	2	3	3	3	3	2	2	2	3	3	3	2
Avg	3	2.6	3	3	2	3	2.4	3	3	2	2.2	2.8	3	3	3	2.8

B. PHARM. SEMESTER – IV (BPH)

SUBJECT: PHARMACOGNOSY AND PHYTOCHEMISTRY I -PRACTICAL (BP409P)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
-	-	4	4	2	35	10	05	-	50

A. COURSE OVERVIEW

Scope: The subject involves the fundamentals of Pharmacognosy like scope, classification of crude drugs, their identification and evaluation, phytochemicals present in them and their medicinal properties.

Objectives: Upon completion of the course, the student shall be able

- To know the techniques in the cultivation and production of crude drugs.
- To know the crude drugs, their uses and chemical nature.
- Know the evaluation techniques for the herbal drugs.
- To carry out the microscopic and morphological evaluation of crude drugs.

B. COURSE CONTENT

NO	TOPIC	P (Hrs)	COs
[1]	1. Analysis of crude drugs by chemical tests: (i)Tragacanth (ii) Acacia (iii)Agar 1. (iv) Gelatin (v) starch (vi) Honey (vii) Castor oil. 2. Determination of stomatal number and stomatal index. 3. Determination of vein islet number, vein islet termination and palisade ratio. 4. Determination of size of starch grains, calcium oxalate crystals by eye piece micrometer. 5. Determination of Fiber length and width 6. Determination of number of starch grains by Lycopodium spore method 7. Determination of Ash value. 8. Determination of Extractive values of crude drugs. 9. Determination of moisture content of crude drugs. 10. Determination of swelling index and foaming index.	**60**	CO1 CO2 CO3 CO4 CO5

C. TEXT BOOKS

1. Rana, M. &Kabra A., "Practical Mannual - Pharmacognosy & Phytochemistry-I" Pee Vee Book , S. Vikas & Company (Medical Publishers) ,2019.
2. Dr. Khandelwal, KR., "Practical Pharmacognosy" 19th edition, Nirali Prakashan, 2008.

D. REFERENCE BOOKS

1. Kabra, A., Dr. Ashok PK. & Setia, S., A textbook of "Pharmacognosy & Phytochemistry-I", Pee Vee Book , S. Vikas & Company (Medical Publishers) ,2019.
2. Deore, SL., **"**Pharmacognosy & Phytochemistry-I-A Comprehensive Approach" 2nd edition, Pharma Med. Press, 2019.
3. Ali, M., "Pharmacognosy- Pharmacognosy & Phytochemistry-I", Volume-I CBS Publishers & Distributors PVT. Ltd., 2018.

4. Shah, B., & Seth, AK., "Textbook of Pharmacognosy & Phytochemistry" , 2nd Edition, CBS Publishers & Distributors PVT. Ltd., 2017.
5. Quadry, JS., "Textbook of Pharmacognosy (Theory & Practical)" 17th Edition, CBS Publishers & Distributors PVT. Ltd., 2020.
6. Rangari VD., "Pharmacognosy & Phytochemistry" Volume-I 3rd Edition, Career Publications, 2017.
7. Rangari VD., "Pharmacognosy & Phytochemistry" Volume-II 3rd Edition, Career Publications, 2017.
8. Jarald EE. &Jarald SE., "Textbook of Pharmacognosy & Phytochemistry" 1st edition, CBS Publishers & Distributors PVT. Ltd., 2007.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Identify and Analyse	Identify and Analyse unorganised and organized crude drugs by chemical tests.
CO2	Remember, Understand and Evaluate	Evaluation of Crude drug by qualitative and quantitative microscopic method.
CO3	Understand, Evaluate and Analyse	Discuss the evaluation and analyse Physicochemical parameters for crude drugs.
CO4	Understand, Remember and Apply	Describe the principle of different microscopic measurement techniques.
CO5	Apply and Analyse	Explain evaluation of crude drugs.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	-	2	-	1	2	1	3	2	2	3	2	1
CO2	3	3	2	3	-	2	-	1	2	1	3	2	2	3	2	1
CO3	3	3	2	3	-	2	-	1	2	1	3	2	2	3	2	1
CO4	3	3	2	3	-	1	-	1	1	1	3	2	2	3	2	1
CO5	3	3	2	3	-	2	-	1	2	1	3	2	2	3	2	1
Avg	3	3	2	3	-	1.8	-	1	1.8	1	3	2	2	3	2	1

B.PHARM. SEMESTER – V (BPH)
SUBJECT: MEDICINAL CHEMISTRY II -THEORY (BP501T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs. The syllabus also emphasizes on chemical synthesis of important drugs under each class.

Objectives: Upon completion of the course the student shall be able to

- Understand the chemistry of drugs with respect to their pharmacological activity
- Understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
- Know the Structural Activity Relationship of different class of drugs
- Study the chemical synthesis of selected drugs

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Classification, mechanism of action, uses, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted(*) of following class of drugs in all units.** **Antihistaminic agents**: Histamine, receptors and their distribution in the human body **H1–antagonists:** Diphenhydramine hydrochloride*, Dimenhydrinate, Doxylamines cuccinate, Clemastine fumarate, Diphenylphyraline hydrochloride, Tripelenamine hydrochloride, Chlorcyclizine hydrochloride, Meclizine hydrochloride, Buclizine hydrochloride, Chlorpheniramine maleate, Triprolidine hydrochloride*, Phenidamine tartarate, Promethazine hydrochloride*, Trimeprazine tartrate, Cyproheptadine hydrochloride, Azatidine maleate, Astemizole, Loratadine, Cetirizine, Levocetrazine Cromolyn sodium **H2-antagonists:** Cimetidine*, Famotidine, Ranitidin **Gastric Proton pump inhibitors:** Omeprazole, Lansoprazole, Rabeprazole, Pantoprazole **Anti-neoplastic agents:** **Alkylating agents: Meclorethamine*,** Cyclophosphamide, Melphalan Chlorambucil, Busulfan, Thiotepa Antimetabolites: Mercaptopurine*, Thioguanine, Fluorouracil, Floxuridine, Cytarabine, Methotrexate*, Azathioprine Antibiotics: Dactinomycin, Daunorubicin, Doxorubicin, Bleomycin Plant products: Etoposide, Vinblastin sulphate, Vincristin sulphate Miscellaneous: Cisplatin, Mitotane.	**10**	CO1 CO2 CO3 CO4 CO5
[2]	**Anti-anginal:** **Vasodilators:** Amyl nitrite, Nitroglycerin*, Pentaerythritol tetranitrate, Isosorbide dinitrite*, Dipyridamole **Calcium channel blockers:** Verapamil, Bepridil hydrochloride, Diltiazem	**10**	CO1 CO2 CO3 CO4

	hydrochloride, Nifedipine, Amlodipine, Felodipine, Nicardipine, Nimodipine **Diuretics:** **Carbonic anhydrase inhibitors:** Acetazolamide*, Methazolamide, Dichlorphenamide **Thiazides:** Chlorthiazide*, Hydrochlorothiazide, Hydroflumethiazide, Cyclothiazide **Loop diuretics:** Furosemide*, Bumetanide, Ethacrynic acid **Potassium sparing Diuretics:** Spironolactone, Triamterene, Amiloride. **Osmotic Diuretics:** Mannitol **Anti-hypertensive Agents:** Timolol, Captopril, Lisinopril, Enalapril, Benazepril hydrochloride, Quinapril hydrochloride, Methyldopate hydrochloride,* Clonidine hydrochloride, Guanethidine monosulphate, Guanabenz acetate, Sodium nitroprusside, Diazoxide, Minoxidil, Reserpine, Hydralazine hydrochloride.		CO5
[3]	**Anti-arrhythmic Drugs:** Quinidine sulphate, Procainamide hydrochloride, Disopyramide phosphate*, Phenytoin sodium, Lidocaine hydrochloride, Tocainide hydrochloride, Mexiletine hydrochloride, Lorcainide hydrochloride, Amiodarone, Sotalol **Anti-hyperlipidemic agents:** Clofibrate, Lovastatin, Cholesteramine and Cholestipol **Coagulant & Anticoagulants:** Menadione, Acetomenadione, Warfarin*, Anisindione, clopidogrel **Drugs used in Congestive Heart Failure:** Digoxin, Digitoxin, Nesiritide, Bosentan, Tezosentan	**10**	CO1 CO2 CO3 CO4 CO5
[4]	**Drugs acting on Endocrine system** Nomenclature, Stereochemistry and metabolism of steroids **Sex hormones:** Testosterone, Nandralone, Progestrones, Oestriol, Oestradiol, Oestrione, Diethyl stilbestrol **Drugs for erectile dysfunction:** Sildenafil, Tadalafil **Oral contraceptives:** Mifepristone, Norgestril, Levonorgestrol **Corticosteroids:** Cortisone, Hydrocortisone, Prednisolone, Betamethasone, Dexamethasone **Thyroid and antithyroid drugs:** L-Thyroxine, L-Thyronine, Propylthiouracil, Methimazole	**08**	CO1 CO2 CO3 CO4 CO5
[5]	**Antidiabetic agents:** Insulin and its preparations **Sulfonylureas:** Tolbutamide*, Chlorpropamide, Glipizide, Glimepiride. Biguanides: Metformin. **Thiazolidinediones:** Pioglitazone, Rosiglitazone. Meglitinides: Repaglinide, Nateglinide. Glucosidase inhibitors: Acrabose, Voglibose. Local Anesthetics: SAR of Local anesthetics **Benzoic Acid derivatives;** Cocaine, Hexylcaine, Meprylcaine, Cyclomethycaine, Piperocaine **Amino Benzoic acid derivatives:** Benzocaine*, Butamben, Procaine*, Butacaine, Propoxycaine, Tetracaine, Benoxinate **Lidocaine/Anilide derivatives:** Lignocaine, Mepivacaine, Prilocaine, Etidocaine. **Miscellaneous:** Phenacaine, Diperodon, Dibucaine.*	**07**	CO1 CO2 CO3 CO4 CO5

C. TEXT BOOKS

1. Alagarsamy, V. Textbook of Medicinal Chemistry, Volume I and Volume II, 3rd ed.; CBS Publishers, India, 2016
2. Kadam, S.S., Mahadik, K.R., Bothara, K.G. Principles of Medicinal Chemistry, Volume I and II, 20th ed.; Nirali Prakashan, India, 2010

D. REFERENCE BOOKS

1. Hansch, C., Semmes, P.G., Taylor, J.B. Comprehensive Medicinal Chemistry, Volume I to VI, 1st ed.; Elsevier, India, 2005
2. Abraham, D.J. Burger's Medicinal Chemistry and Drug Discovery, Volume I to VI, 6th ed.; Wiley-Interscience, New Jersey, 2003
3. Lemke, T.L., Williams, D.A. FOYE'S Principles of Medicinal Chemistry, 7th ed.; Lippincott Williams & Wilkins, Baltimore, 2013
4. Baele, J.M., Block J. H. Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry, 12th ed.; Lippincott Williams & Wilkins; Baltimore, 2011
5. Lendnicer, D., Mitscher, L.A. The Organic Chemistry of Drug Synthesis, Volume I to VI, Wiley-Interscience, New Jersey, 2008
6. Johnson, D.S., Li, J.J. Art of Drug Synthesis, 1st ed,; Wiley-Interscience, New Jersey, 2007
7. Smith, J.H., Williams, H. Smith and Williamson's Introduction to the Principles of Drug Design and Action, 3rd ed; CRC Press, The Netherlands, 2005
8. Vardanyan, R., Hruby, V. Synthesis of Essential Drugs, Volume I & II, 1st ed.; Elsevier, The Netherlands, 2006

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and remember	To describe classification and chemistry of drugs
CO2	Understand and remember	To discuss mechanism of action of various drugs
CO3	Understand and remember	To explain drug metabolic pathways and adverse effects of drugs
CO4	Analysis	To explain Structural Activity Relationship of different class of drugs
CO5	Apply	To describe synthesis of selected drugs.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	1	1	-	-	-	-	-	-	3	2	3	1	1	-
CO2	3	-	2	2	-	-	-	-	-	-	3	2	3	1	2	-
CO3	3	-	1	1	-	-	-	-	-	-	3	2	3	1	2	-
CO4	3	-	2	1	-	-	-	-	-	-	3	2	3	1	1	-
CO5	3	3	3	2	3	-	-	-	-	3	3	2	3	3	2	3
Avg	3	0.6	1.8	1.4	0.6	-	-	-	-	0.6	3	2	3	1.4	1.6	0.6

B. PHARM. SEMESTER – V (BPH)
SUBJECT: INDUSTRIAL PHARMACY I -THEORY (BP502T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: Course enables the student to understand and appreciate the influence of pharmaceutical additives and various pharmaceutical dosage forms on the performance of the drug product.
Objectives: Upon completion of the course the student shall be able to

- Know the various pharmaceutical dosage forms and their manufacturing techniques.
- Know various considerations in development of pharmaceutical dosage forms
- Formulate solid, liquid and semisolid dosage forms and evaluate them for their quality

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Pre-formulation Studies:** Introduction to pre-formulation, goals and objectives, study of physicochemical characteristics of drug substances. a. Physical properties: Physical form (crystal & amorphous), particle size, shape, flow properties, solubility profile (pKa, pH, partition coefficient), polymorphism b. Chemical Properties: Hydrolysis, oxidation, reduction, racemisation, polymerization BCS classification of drugs & its significant Application of pre-formulation considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms.	**07**	CO1
[2]	**Tablets:** a. Introduction, ideal characteristics of tablets, classification of tablets. Excipients, Formulation of tablets, granulation methods, compression and processing problems, equipments and tablet tooling. b. Tablet coating: Types of coating, coating materials, formulation of coating composition, methods of coating, equipment employed and defects in coating. c. Quality control tests: In process and finished product tests **Liquid orals:** Formulation and manufacturing consideration of syrups and elixirs suspensions and emulsions; Filling and packaging; evaluation of liquid orals official in pharmacopoeia	**10**	CO2 CO3
[3]	**Capsules:** a. Hard gelatin capsules: Introduction, Production of hard gelatin capsule shells. size of capsules, Filling, finishing and special techniques of formulation of hard gelatin capsules, manufacturing defects. In process and final product quality control tests for capsules. b. soft gelatin capsules: Nature of shell and capsule content, size of capsules, importance of base adsorption and minim/gram factors, production, in process and final product quality control tests. Packing, storage and stability testing of soft gelatin capsules and their applications. **Pellets:** Introduction, formulation requirements, pelletization process, equipments for manufacture of pellets	**08**	CO2 CO3

[4]	**Parenteral Products:** a. Definition, types, advantages and limitations. Pre-formulation factors and essential requirements, vehicles, additives, importance of isotonicity b. Production procedure, production facilities and controls, aseptic processing c. Formulation of injections, sterile powders, large volume parenterals and lyophilized products. d. Containers and closures selection, filling and sealing of ampoules, vials and infusion fluids. Quality control tests of parenteral products. Ophthalmic Preparations: Introduction, formulation considerations; formulation of eye drops, eye ointments and eye lotions; methods of preparation; labelling, containers; evaluation of ophthalmic preparations	**10**	CO2 CO3
[5]	**Cosmetics:** Formulation and preparation of the following cosmetic preparations: lipsticks, shampoos, cold cream and vanishing cream, tooth pastes, hair dyes and sunscreens. **Pharmaceutical Aerosols:** Definition, propellants, containers, valves, types of aerosol systems; formulation and manufacture of aerosols; Evaluation of aerosols; Quality control and stability studies. **Packaging Materials Science:** Materials used for packaging of pharmaceutical products, factors influencing choice of containers, legal and official requirements for containers, stability aspects of packaging materials, quality control tests.	**10**	CO2 CO3 CO4 CO5

C. TEXT BOOKS

1. Lachman, L.; Liebermann, H. A. The Theory and Practice of Industrial Pharmacy; Cbs Publishers & Distributors Pvt. Ltd: New Delhi, 2013.

D. REFERENCE BOOKS

1. Lieberman, H. A. Pharmaceutical Dosage Forms. Tablets, Vol. 1; New York, Ny Dekker, 1989.
2. Lieberman, H. A.; Lachmann, L.; Kenneth Edwards Avis. Pharmaceutical Dosage Forms : Parenteral Medications;Vol-1-3; M. Dekker: New York, 1984.
3. Lieberman, H. A.; Rieger, M. M.; Banker, G. S. Pharmaceutical Dosage Forms-- Disperse Systems. Volume 1- 3; Dekker: New York, 1998.
4. Banker, G. S.; Rhodes, C. T. Modern Pharmaceutics; Marcel Dekker: New York, 2002.
5. Beringer, P. Remington : The Science and Practice of Pharmacy.; Lippincott Williams & Wilkins: Philadelphia ; London, 2011.
6. Aulton, M. E. Pharmaceutics : The Science of Dosage Form Design; Churchill Livingstone: Edinburgh Etc., 2003.
7. Ansel, H. C. Introduction to Pharmaceutical Dosage Forms; Lea & Febiger: Philadelphia, 1985.
8. Rhodes, C. T.; Jens Thurø Carstensen. Drug Stability : Principles and Practices; Marcel Dekker: New York, 2000.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and Analyse	To understand pre-formulation considerations in development of pharmaceutical dosage forms.
CO2	Remember, Understand and Evaluate	To get knowledge of various pharmaceutical dosage forms and their manufacturing techniques.
CO3	Understand Apply and Evaluate	To understand various quality control test for pharmaceutical dosage forms and apply it to maintain quality drug product.
CO4	Understand and Remember	To know packaging requirements and evaluate various packaging materials for pharmaceutical dosage forms.
CO5	Understand	To understand formulation and preparation of cosmetic products.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	1	-	1	1	-	2	3	3	3	2	1	1
CO2	3	3	3	3	1	2	1	1	3	1	3	3	3	1	1	1
CO3	3	1	3	3	1	3	1	1	1	-	3	3	3	2	2	2
CO4	3	1	3	3	1	3	1	1	3	-	3	3	3	1	2	2
CO5	3	3	2	3	1	2	1	1	3	2	3	3	3	1	1	1
Avg	3	2.2	3	3	1	2	1	1	2	1	3	3	3	1.4	1.4	1.4

B. PHARM. SEMESTER – V (BPH)
SUBJECT: PHARMACOLOGY-II–THEORY (BP503T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This subject is intended to impart the fundamental knowledge on various aspects (classification, mechanism of action, therapeutic effects, clinical uses, side effects and contraindications) of drugs acting on different systems of body and in addition, emphasis on the basic concepts of bioassay.

Objectives: Upon completion of this course the student should be able to

- Understand the mechanism of drug action and its relevance in the treatment of different diseases
- Demonstrate isolation of different organs/tissues from the laboratory animals by simulated experiments
- Demonstrate the various receptor actions using isolated tissue preparation
- Appreciate correlation of pharmacology with related medical sciences

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Pharmacology of drugs acting on cardio vascular system** a. Introduction to hemodynamic and electrophysiology of heart. b. Drugs used in congestive heart failure c. Anti-hypertensive drugs. d. Anti-anginal drugs. e. Anti-arrhythmic drugs. f. Anti-hyperlipidaemia drugs.	**10**	CO1, CO2, CO4.
[2]	**Pharmacology of drugs acting on cardio vascular system** a. Drug used in the therapy of shock. b. Haematinics, coagulants and anticoagulants. c.Fibrinolytics and anti-platelet drugs d. Plasma volume expanders **Pharmacology of drugs acting on urinary system** a. Diuretics b. Anti-diuretics.	**10**	CO1, CO2, CO4.
[3]	**Autacoids and related drugs** a.Introduction to autacoids and classification b. Histamine, 5-HTandtheirantagonists. c. Prostaglandins, Thromboxane's and Leukotrienes. d. Angiotensin, Bradykinin and Substance P. e. Non-steroidal anti-inflammatory agents f.Anti-goutdrugs g. Anti-rheumatic drugs	**10**	CO1, CO3, CO5.
[4]	**Pharmacology of drugs acting on endocrine system** a. Basic concepts in endocrine pharmacology. b. Anterior Pituitary hormones-analogues and their inhibitors. c. Thyroid hormones-analogues and their inhibitors.	**08**	CO1, CO3, CO4.

	d. Hormones regulating plasma calcium level-Parathormone, Calcitonin and Vitamin-D. e. Insulin, Oral Hypoglycaemic agents and glucagon. f. ACTH and corticosteroids.		
[5]	**Pharmacology of drugs acting on endocrine system** a. Androgens and Anabolic steroids. b. Estrogens, progesterone and oral contraceptives. c. Drugs acting on the uterus. **Bioassay** a. Principles and applications of bioassay. b. Types of bioassay c. Bioassay of insulin, oxytocin, vasopressin, ACTH, d-tubocurarine, digitalis, histamine and 5-HT.	**07**	CO3, CO4, CO5.

C. TEXT BOOKS

1. Tripathi, K. D. *Essentials of Medical Pharmacology*; Jaypee Brothers Medical Publishers: New Delhi, 2019.

D. REFERENCE BOOKS

1. Ritter, J.; Flower, R. J.; Henderson, G.; Yoon Kong Loke; Rang, H. P. *Rang and Dale's Pharmacology*, 9th ed.; Elsevier: Endinburgh, 2020.
2. Katzung, B. G. *Basic & Clinical Pharmacology*, 14th ed.; Mcgraw-Hill Education, Copyright: New York I 11 Pozostałych, 2018.
3. Louis Sanford Goodman; Gilman, A.; Brunton, L. L.; Chabner, B. A.; KnollmannB. C. *Goodman & Gilman's the Pharmacological Basis of Therapeutics*; Mcgraw-Hill Medical: New York, 2011.
4. Al, E. *Applied Therapeutics: The Clinical Use of Drugs*; Wolters Kluwer Health - Lippincott Williams & Wilkins, Cop: Philadelphia, 2013.
5. *Lippincott's Illustrated Reviews Bundle Lippincott's Illustrated Reviews: Biochemistry, 4th Ed + Lippincott's Illustrated Reviews, Pharmacology, North American Edition, 4th Ed + Lippincott's.*; Lippincott Williams & Wilkins, 2009.
6. Hl Sharma; Kk Sharma. *Principles of Pharmacology*; Paras: New Delhi, 2011.
7. Craig, C. R.; Stitzel, R. E. *Modern Pharmacology with Clinical Applications*; Lippincott Williams & Wilkins: Philadelphia, 2004.
8. *Fundamentals of Experimental Pharmacology*; Hilton & Company: Kolkata, 2015.
9. Kulkarni, S. *Handbook of Experimental Pharmacology*, 3rd Edition. Vallabh Prakashan: Delhi, 2005.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and apply	Understand the mechanism of drug action and its relevance in the treatment of different diseases.
CO2	Understand and apply	Correlate the pathophysiology and mechanism of drug action of drugs and is application in treatment of the disease.
CO3	Create, Remember and Evaluate	Create the choice of medicine based on various receptor actions using isolated tissue preparation.
CO4	Understand and Remember	Appreciate correlation of pharmacology with related medical sciences.
CO5	Understand, analyse and Evaluate	Apply clinical skills in ethical practice in pharmacy practice.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	3	3	-	3	3	2	3	-	3	3	3	3	2	3
CO2	3	-	3	3	-	3	3	1	3	-	3	3	3	3	2	3
CO3	3	-	3	3	-	3	3	2	3	-	3	3	3	3	2	3
CO4	3	-	3	3	-	3	3	1	3	-	3	3	3	3	2	3
CO5	3	-	3	3	-	3	3	-	3	-	3	2	3	3	2	3
Avg	3	-	3	3	-	3	3	1.2	3	-	3	2.8	3	3	2	3

B. PHARM. SEMESTER – V (BPH)
SUBJECT: PHARMACOGNOSY & PHYTOCHEMISTRY-II -THEORY (BP504T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: The main purpose of subject is to impart the students the knowledge of how the secondary metabolites are produced in the crude drugs, how to isolate and identify and produce them industrially. Also this subject involves the study of producing the plants and Phytochemicals through plant tissue culture, drug interactions and basic principles of traditional system of medicine

Objectives: Upon completion of the course, the student shall be able

- To know the modern extraction techniques, characterization and identification of the herbal drugs and Phytoconstituents.
- To understand the preparation and development of herbal formulation.
- To understand the herbal drug interactions.
- To carryout isolation and identification of phytoconstituents.

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Metabolic pathways in higher plants and their determination** a) Brief study of basic metabolic pathways and formation of different secondary metabolites through these pathways- Shikimic acid pathway, Acetate pathways and Amino acid pathway. b) Study of utilization of radioactive isotopes in the investigation of Biogenetic studies.	**07**	CO1
[2]	General introduction, composition, chemistry & chemical classes, biological source, therapeutic uses and commercial applications of following secondary metabolites: **Alkaloids:** Vinca, Rauwolfia, Belladonna, Opium, **Phenylpropanoids and Flavonoids:** Lignans, Tea, Ruta **Steroids, Cardiac Glycosides & Triterpenoids**: Liquorice, Dioscorea, Digitalis **Volatile oils**: Mentha, Clove, Cinnamon, Fennel, Coriander, **Tannins:** Catechu, Pterocarpus **Resins:** Benzoin, Guggul, Ginger, Asafoetida, Myrrh, Colophony **Glycosides:** Senna, Aloes, Bitter Almond **Iridoids, Other terpenoids & Naphthaquinones:** Gentian, Artemisia, taxus, carotenoids.	**14**	CO5
[3]	**Isolation, Identification and Analysis of Phytoconstituents** a) Terpenoids: Menthol, Citral, Artemisin b) Glycosides: Glycyrhetinic acid & Rutin c) Alkaloids: Atropine,Quinine,Reserpine,Caffeine d) Resins: Podophyllotoxin, Curcumin.	**06**	CO2 CO3
[4]	**Industrial production, estimation and utilization of the following phytoconstituents:** Forskolin, Sennoside, Artemisinin, Diosgenin, Digoxin, Atropine, Podophyllotoxin, Caffeine, Taxol, Vincristine and Vinblastine.	**10**	CO4

[5]	**Basics of Phytochemistry** Modern methods of extraction, application of latest techniques like Spectroscopy, chromatography and electrophoresis in the isolation, purification and identification of crude drugs.	**08**	CO2

C. TEXT BOOKS

1. Dr. Shukla P., Dr. Shashi, A. & Dr. Shukla P., "Pharmacognosy & Phytochemistry-II" NiraliPrakashan, 1st Edition, 2019.
2. Kabra, A., Dr. Ashok PK. & Setia, S., A textbook of "Pharmacognosy & Phytochemistry-II", Pee Vee, S. Vikas & Company Medical Publishers, 2019.

D. REFERENCE BOOKS

1. Shah, B., & Seth, AK., "Textbook of Pharmacognosy & Phytochemistry", 2nd Edition, CBS Publishers & Distributors PVT. Ltd., 2017.
2. Quadry, JS., "Textbook of Pharmacognosy (Theory & Practical)" 17th Edition, CBS Publishers & Distributors PVT. Ltd., 2020.
3. Rangari VD., "Pharmacognosy & Phytochemistry" Volume-I 3rd Edition, Career Publications, 2017.
4. Rangari VD., "Pharmacognosy & Phytochemistry" Volume-II 3rd Edition, Career Publications, 2017.
5. Jarald EE. &Jarald SE., "Textbook of Pharmacognosy & Phytochemistry" 1st edition, CBS Publishers & Distributors PVT. Ltd., 2007.
6. Dr. Sudha T., Mrs. Rajeshwari, R.,Dr. Ravikumar VR. & Dr. Nimbakar TP., Current trend in "Pharmacognosy & Phytochemistry-II" Part-2, PV Publication, 2019.
7. Dr. Das K., "Pharmacognosy & Phytochemistry-II" 1st Edition, NiraliPrakashan, 2019.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and remember	To describe various metabolic pathways and formation of different metabolites
CO2	Understand and apply	To explain conventional and modern extraction techniques for phytoconstituents and apply analytical techniques.
CO3	Apply and evaluate	To evaluate phytoconstituents by Isolation, identification and estimation.
CO4	Analyse	To analyse industrial production and estimate of important phytoconstituents.
CO5	Remember and understand	To discuss the chemistry and commercial applications of natural crude drugs.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	3	-	1	-	1	2	1	3	3	2	3	1	1
CO2	3	2	2	3	-	2	1	2	2	2	2	3	2	3	2	1
CO3	3	2	3	3	-	2	1	2	2	2	2	3	2	3	2	1
CO4	3	2	2	3	-	2	2	2	3	3	3	3	3	3	2	1
CO5	3	2	2	3	-	3	2	2	3	3	3	3	3	3	3	1
Avg	3	2	2	3	0	2	1.2	1.8	2.4	2.2	2.6	3	2.4	3	2	1

B.PHARM. SEMESTER – V (BPH)
SUBJECT: PHARMACEUTICAL JURISPRUDENCE–THEORY (BP505T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This course is designed to impart basic knowledge on important legislations related to the profession of pharmacy in India.

Objectives: Upon completion of the course, the student shall be able to understand:

- The Pharmaceutical legislations and their implications in the development and marketing of Pharmaceuticals.
- Various Indian pharmaceutical Acts and Laws.
- The regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals.
- The code of ethics during the pharmaceutical practice.

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Drugs and Cosmetics Act, 1940 and its rules 1945:** Objectives, Definitions, Legal definitions of schedules to the Act and Rules **Import of drugs –** Classes of drugs and cosmetics prohibited from import, Import under license or permit. Offences and penalties**.** **Manufacture of drugs –** Prohibition of manufacture and sale of certain drugs, Conditions for grant of license and conditions of license for manufacture of drugs, Manufacture of drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license.	**10**	CO3 CO4
[2]	**Drugs and Cosmetics Act, 1940 and its rules 1945.** Detailed study of Schedule G, H, M, N, P,T,U, V, X, Y, Part XII B, Sch F & DMR (OA) **Sale of Drugs –** Wholesale, Retail sale and Restricted license. Offences and penalties **Labeling &Packing of drugs-** General labeling requirements and specimen labels for drugs and cosmetics, List of permitted colors. Offences and penalties. **Administration of the Act and Rules –** Drugs Technical Advisory Board, Central drugs Laboratory, Drugs Consultative Committee, Government drug analysts, Licensing authorities, controlling authorities, Drugs Inspectors.	**10**	CO3 CO4
[3]	**Pharmacy Act –1948**: Objectives, Definitions, Pharmacy Council of India; its constitution and functions, Education Regulations, State and Joint state pharmacy councils; constitution and functions, Registration of Pharmacists, Offences andPenalties **Medicinal and Toilet Preparation Act –1955**: Objectives, Definitions, Licensing, Manufacture In bond and Outside bond, Export of alcoholic preparations, Manufacture of Ayurvedic, Homeopathic, Patent & Proprietary Preparations. Offences and Penalties.	**10**	CO3 CO4 CO5

	Narcotic Drugs and Psychotropic substances Act-1985 and Rules: Objectives, Definitions, Authorities and Officers, Constitution and Functions of narcotic & Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse, Prohibition, Control and Regulation, opium poppy cultivation and production of poppy straw, manufacture, sale and export of opium, Offences and Penalties.		
[4]	**Study of Salient Features of Drugs and Magic Remedies Act and its rules:** Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalties. **Prevention of Cruelty to animals Act-1960:** Objectives, Definitions, Institutional Animal Ethics Committee, CPCSEA guidelines for Breeding and Stocking of Animals, Performance of Experiments, Transfer and acquisition of animals for experiment, Records, Power to suspend or revoke registration, Offences and Penalties. **National Pharmaceutical Pricing Authority:** Drugs Price Control Order (DPCO)- 2013. Objectives, Definitions, Sale prices of bulk drugs, Retail price of formulations, Retail price and ceiling price of scheduled formulations, National List of Essential Medicines (NLEM).	**08**	CO3 CO4
[5]	**Pharmaceutical Legislations –** A brief review, Introduction, Study of drugs enquiry committee, Health survey and development committee, Hathi committee and Mudaliar committee. **Code of Pharmaceutical ethics:** Definition, Pharmacist in relation to his job, trade, medical profession and his profession, Pharmacist's oath **Medical Termination of Pregnancy Act :** **Right to Information Act:** **Introduction to Intellectual Property Rights (IPR):**	**07**	CO1 CO2 CO3

C. TEXT BOOKS

1. Dua, J. and Sharma, S., "Pharmaceutical Jurisprudence", S Vikas and Company, Pee vee publishers, India, 2019.
2. Jani, GK., "Pharmaceutical Jurisprudence, Forensic Pharmacy", Atul Prakashan, India, 2019

D. REFERENCE BOOKS

1. Jain, NK., "A text book of Forensic Pharmacy" Second edition-Reprint, Vallabh Prakashan, 2007.
2. Mithal, BM., "Text book of Forensic Pharmacy" first edition, Vallabh Prakashan, 1988.
3. Suresh, B.,A text book of "Forensic Pharmacy" 20th edition, Birla publication PVT. LTD., 2019.
4. Governmentf India, Ministry of Health and Family Welfare, "Drugs and Cosmetics Act and Rules" 2016.
5. Dr. Agrawal, SP. And Dr. Khanna, R., " Pharmaceutical Jurisprudence And Ethics" 5th edition, Birla publication PVT. LTD.,2008.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and apply	Describe and apply the Pharmaceutical legislations in the development and marketing of pharmaceuticals.
CO2	Understand, Remember and Apply	Discuss the code of ethics during the pharmaceutical practice.
CO3	Understand and remember	Explain basic principle of Indian pharmaceutical Acts and Laws.
CO4	Understand and remember	Describe the concept of the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals.
CO5	Understand, Remember and Apply	Explain and apply Pharmacy act.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	2	-	2	2	3	2	2	-	3	3	2	1	3	1
CO2	3	1	2	-	2	2	3	2	2	-	3	3	2	1	3	1
CO3	3	2	2	-	2	2	3	2	2	-	3	3	2	2	3	1
CO4	3	2	2	-	2	2	3	2	2	-	3	3	2	2	3	1
CO5	3	2	2	-	2	2	3	2	2	-	3	3	2	2	3	1
Avg	3	1.6	2	-	2	2	3	2	2	-	3	3	2	1.6	3	1

B. PHARM. SEMESTER – V (BPH)
SUBJECT: INDUSTRIAL PHARMACY I -PRACTICAL (BP506P)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
-	-	4	4	2	35	10	05	-	50

A. COURSE OVERVIEW

Scope: Course enables the student to understand and apply various manufacturing techniques to formulate different pharmaceutical dosage forms.

Objectives: Upon completion of the course the student shall be able to

- To design pre-formulation protocol and evaluation of various preformulation parameters for drugs.
- To prepare and evaluate different dosage forms like tablets, capsules, liquids, semisolids, sterile etc.
- To formulate cosmetic products.

B. COURSE CONTENT

NO	TOPIC	P (Hrs)	COs
[1]	1. Preformulation studies on paracetamol/aspirin/or any other drug 2. Preparation and evaluation of Paracetamol tablets 3. Preparation and evaluation of Aspirin tablets 4. Coating of tablets- film coating of tables/granules 5. Preparation and evaluation of Tetracycline capsules 6. Preparation of Calcium Gluconate injection 7. Preparation of Ascorbic Acid injection 8. Quality control test of (as per IP) marketed tablets and capsules 9. Preparation of Eye drops/ and Eye ointments 10. Preparation of Creams (cold / vanishing cream) 11. Evaluation of Glass containers (as per IP)	**60**	CO1 CO2 CO3 CO4 CO5

C. TEXT BOOKS

1. Goudanavar, Prakash. Practical Manual for Industrial Pharmacy I: As per Syllabus Prescribed by PCI for B. Pharm v Sem; Orange Books Publication, 2020.
2. Patil, Ketan., Patil, Paresh., Patil, Narendra., Kshirsagar, Sandip. The Theory and Practical Book of Industrial Pharmacy-I; Ip Innovative Publication Pvt. Ltd: New Delhi, 2020.

D. REFERENCE BOOKS

1. Kohli, D. P. S.; Shah, D. H. Drug Formulations Manual; Business Horizons: New Delhi, 2012.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Apply and Create	To apply knowledge of preformulation in designing preformulation protocol and designing dosage forms.
CO2	Create and Evaluate	To prepare and evaluate tablet, capsules, of different APIs
CO3	Create and Evaluate	To prepare and evaluate sterile dosage form like injections and ophthalmic products.
CO4	Create	To prepare cosmetic products.
CO5	Evaluate	Evaluation of packaging materials for dosage forms as per pharmacopoeial standards.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	2	3	1	3	2	3	3	3	3	3	3	1
CO2	3	3	3	3	1	2	3	3	3	3	3	3	3	3	3	2
CO3	3	3	3	3	1	2	3	3	3	3	3	3	3	3	3	2
CO4	3	3	3	3	1	3	1	3	3	3	3	3	3	3	3	2
CO5	3	3	3	3	1	2	3	3	3	3	3	3	3	3	3	3
Avg	3	3	3	3	1.2	2.6	2.2	3	3	3	3	3	3	3	3	3

B.PHARM. SEMESTER – V (BPH)
SUBJECT: PHARMACOLOGY-II–PRACTICAL (BP507P)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
-	-	4	4	2	35	10	05	-	50

A. COURSE OVERVIEW

Scope: This subject is intended to impart the fundamental knowledge on various aspects (classification, mechanism of action, therapeutic effects, clinical uses, side effects and contraindications) of drugs acting on different systems of body and in addition, emphasis on the basic concepts of bioassay.

Objectives: Upon completion of this course the student should be able to

- Perform different types of bioassay.
- Isolate different organs/tissues from the laboratory animals by simulated experiments.
- Analyse various receptor actions using isolated tissue preparation.
- Evaluate and analyse different types of analgesic and anti-inflammatory drugs
- To evaluate the drugs on different organs/tissues from the laboratory animals by in vivo/in vitro analysis.

B. COURSE CONTENT

NO	TOPIC	P (Hrs)	COs
[1]	1) Introduction to in-vitro pharmacology and physiological salt solutions. 2) Effect of drugs on isolated frog heart. 3) Effect of drugs on blood pressure and heart rate of dog. 4) Study of diuretic activity of drugs using rats/mice. 5) DRC of acetylcholine using frog rectus abdominis muscle. 6) Effect of physostigmine and atropine on DRC of acetylcholine using frog rectus abdominis-muscle and rat ileum respectively. 7) Bioassay of histamine using guinea pig ileum by matching method 8) Bioassay of oxytocin using rat uterine horn by interpolation method. 9) Bioassay of serotonin using rat fundus strip by three point bioassay. 10) Bioassay of acetylcholine using rat ileum/colon by four point bioassay. 11) Determination of PA2value of prazosin using rat anococcygeus muscle (by Schilds plot method). 12) Determination of PD2 value using guinea pig ileum. 13) Effect of spasmogens and spasmolytic using rabbit jejunum. 14) Anti-inflammatory activity of drugs using carrageenan induced paw-oedema model. 15) Analgesic activity of drug using central and peripheral methods.	**60**	CO1, CO2, CO3, CO4, CO5.

C. TEXT BOOKS

1. Tripathi, K. D. *Essentials of Medical Pharmacology*; Jaypee Brothers Medical Publishers: New Delhi, 2019.

D. REFERENCE BOOKS

1. Ritter, J.; Flower, R. J.; Henderson, G.; Yoon Kong Loke; Rang, H. P. *Rang and Dale's Pharmacology*, 9th ed.; Elsevier: Endinburgh, 2020.
2. Katzung, B. G. *Basic & Clinical Pharmacology*, 14th ed.; Mcgraw-Hill Education, Copyright: New York I 11 Pozostałych, 2018.
3. Louis Sanford Goodman; Gilman, A.; Brunton, L. L.; Chabner, B. A.; KnollmannB. C. *Goodman & Gilman's the Pharmacological Basis of Therapeutics*; Mcgraw-Hill Medical: New York, 2011.
4. Al, E. *Applied Therapeutics: The Clinical Use of Drugs*; Wolters Kluwer Health - Lippincott Williams & Wilkins, Cop: Philadelphia, 2013.
5. *Lippincott's Illustrated Reviews Bundle Lippincott's Illustrated Reviews: Biochemistry, 4th Ed + Lippincott's Illustrated Reviews, Pharmacology, North American Edition, 4th Ed + Lippincott's.*; Lippincott Williams & Wilkins, 2009.
6. Hl Sharma; Kk Sharma. *Principles of Pharmacology*; Paras: New Delhi, 2011.
7. Craig, C. R.; Stitzel, R. E. *Modern Pharmacology with Clinical Applications*; Lippincott Williams & Wilkins: Philadelphia, 2004.
8. *Fundamentals of Experimental Pharmacology*; Hilton & Company: Kolkata, 2015.
9. Kulkarni, S. *Handbook of Experimental Pharmacology*, 3rd Edition. Vallabh Prakashan: Delhi, 2005.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Perform, Apply and Quantify.	Perform different types of bioassay.
CO2	Understand and Isolate	Isolate different organs/tissues from the laboratory animals by simulated experiments.
CO3	Analyse	Analyse various receptor actions using isolated tissue preparation.
CO4	Analyse an Evaluate.	Evaluate and analyse different types of analgesic and anti-inflammatory drugs
CO5	Evaluate and analyse	To evaluate the drugs on different organs/tissues from the laboratory animals by in vivo/in vitro analysis.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	3	3	3	3	3	3	3	2	3	3	3	3	3
CO2	3	2	3	3	3	3	2	3	3	3	3	3	2	2	3	3
CO3	3	2	3	3	3	3	2	3	3	2	2	3	3	3	3	3
CO4	3	2	3	3	3	3	2	3	3	2	2	3	1	3	2	3
CO5	3	2	3	3	3	3	3	3	3	2	2	3	2	3	2	3
Avg	3	2	3	3	3	3	2.4	3	3	2.4	2.8	3	2.4	2.8	2.6	3

B.PHARM. SEMESTER – V (BPH)
SUBJECT: PHARMACOGNOSY & PHYTOCHEMISTRY-II -PRACTICAL (BP508P)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
-	-	4	4	2	35	10	05	-	50

1. COURSE OVERVIEW

Scope: The main purpose of subject is to impart the students the knowledge of how the secondary metabolites are produced in the crude drugs, how to isolate and identify and produce them industrially. Also, this subject involves the study of producing the plants and Phytochemicals through plant tissue culture, drug interactions and basic principles of traditional system of medicine

Objectives: Upon completion of the course, the student shall be able

- To know the modern extraction techniques, characterization and identification of the herbal drugs and Phytoconstituents.
- To understand the preparation and development of herbal formulation.
- To understand the herbal drug interactions.
- To carryout isolation and identification of phytoconstituents.

B. COURSE CONTENT

NO	TOPIC	P (Hrs)	COs
[1]	1. Morphology, histology and powder characteristics & extraction & detection of: Cinchona, Cinnamon, Senna, Clove, Ephedra, Fennel and Coriander. 2. Exercise involving isolation & detection of active principles a. Caffeine from tea dust. b. Diosgenin from Dioscorea c. Atropine from Belladonna d. Sennosides from Senna 3. Separation of sugars by Paper chromatography 4. TLC of herbal extract 5. Distillation of volatile oils and detection of phytoconstitutents by TLC. 6. Analysis of crude drugs by chemical tests: (i) Asafoetida (ii) Benzoin (iii) Colophony (iv) Aloes (v) Myrrh	60	CO1 CO2 CO3 CO4 CO5

C. TEXT BOOKS

1. Kabra, A., Dr. Ashok PK. & Setia, S., A textbook of "Pharmacognosy & Phytochemistry-II", Pee Vee Book , S. Vikas & Company (Medical Publishers) ,2019.
2. Dr. Shukla P., Dr. Shashi, A. &Dr. Shukla P., "Pharmacognosy & Phytochemistry-II" NiraliPrakashan, 1st Edition, NiraliPrakashan, 2019.

D. REFERENCE BOOKS

1. Shah, B., & Seth, AK., "Textbook of Pharmacognosy & Phytochemistry", 2nd Edition, CBS Publishers & Distributors PVT. Ltd., 2017.

2. Quadry, JS., "Textbook of Pharmacognosy (Theory & Practical)" 17th Edition, CBS Publishers & Distributors PVT. Ltd., 2020.
3. Rangari VD., "Pharmacognosy & Phytochemistry" Volume-I 3rd Edition, Career Publications, 2017.
4. Rangari VD., "Pharmacognosy & Phytochemistry" Volume-II 3rd Edition, Career Publications, 2017.
5. Jarald EE. &Jarald SE., "Textbook of Pharmacognosy & Phytochemistry" 1st edition, CBS Publishers & Distributors PVT. Ltd., 2007.
6. Dr. Sudha T., Mrs. Rajeshwari, R.,Dr. Ravikumar VR. &Dr.Nimbakar TP., Current trend in "Pharmacognosy & Phytochemistry-II" Part-2, PV Publication, 2019.
7. Rana, M. &Kabra A., "Practical Mannual - Pharmacognosy & Phytochemistry-II" Pee Vee Book, S. Vikas & Company (Medical Publishers), 2019.
8. Dr.Khandelwal, KR., "Practical Pharmacognosy" 19th edition, NiraliPrakashan, 2008.

E. COURSE OUTCOME

CO Number	Skill	Statement
CO1	Understand and remember	To study morphology, histology, powder characteristics, extraction and detection of crude drugs.
CO2	Analyse	To isolate and analyse the phytoconstituents.
CO3	Evaluate	To evaluate phytoconstituents by different chromatographic techniques.
CO4	Analyse	To analyse and standardise crude drugs.
CO5	Apply	To apply the industrial production techniques of important phytoconstituents.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	-	3	-	3	3	3	3	3	3	2	2	2
CO2	3	2	2	3	-	3	2	2	3	2	2	3	3	2	2	2
CO3	3	2	3	3	-	3	2	2	3	2	2	3	2	2	2	2
CO4	3	2	2	3	-	3	2	3	3	3	2	3	3	2	2	2
CO5	3	3	3	3	-	3	2	2	2	3	2	3	3	2	2	2
Avg	3	2.4	2.4	3	-	3	1.6	2.4	2.8	2.6	2.2	3	2.8	2	2	2

B. PHARM. SEMESTER – VI (BPH)
SUBJECT: MEDICINAL CHEMISTRY III -THEORY (BP601T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasis on modern techniques of rational drug design like quantitative structure activity relationship (QSAR), Prodrug concept, combinatorial chemistry and Computer aided drug design (CADD). The subject also emphasizes on the chemistry, mechanism of action, metabolism, adverse effects, Structure Activity Relationships (SAR), therapeutic uses and synthesis of important drugs.

Objectives: Upon completion of the course student shall be able to

- Understand the importance of drug design and different techniques of drug design.
- Understand the chemistry of drugs with respect to their biological activity.
- Know the metabolism, adverse effects and therapeutic value of drugs.
- Know the importance of SAR of drugs.

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Classification, mechanism of action, uses, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (*) of following class of drugs in all units.** **Antibiotics** Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes. **β-Lactam antibiotics:** Penicillin, Cepholosporins, β- Lactamase inhibitors, Monobactams **Aminoglycosides:** Streptomycin, Neomycin, Kanamycin **Tetracyclines:** Tetracycline, Oxytetracycline, Chlortetracycline, Minocycline, Doxycycline	**10**	CO1 CO2 CO3 CO4
[2]	**Antibiotics** **Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes.** **Macrolide:** Erythromycin Clarithromycin, Azithromycin **Miscellaneous:** Chloramphenicol*, Clindamycin **Prodrugs:** Basic concepts and application of prodrugs design **Antimalarials:** Etiology of malaria **Quinolines:** SAR, Quinine sulphate, Chloroquine*, Amodiaquine, Primaquine phosphate, Pamaquine*, Quinacrine hydrochloride, Mefloquine **Biguanides and dihydro triazines:** Cycloguanil pamoate, Proguanil **Miscellaneous:** Pyrimethamine, Artesunete, Artemether, Atovoquone	**10**	CO1 CO2 CO3 CO4 CO5
[3]	**Anti-tubercular Agents**	**10**	CO1

	Synthetic anti tubercular agents: Isoniozid*, Ethionamide, Ethambutol, Pyrazinamide, Para amino salicylic acid.* **Anti tubercular antibiotics:** Rifampicin, Rifabutin, Cycloserine Streptomycine, Capreomycin sulphate **Urinary tract anti-infective agents** **Quinolones:** SAR of quinolones, Nalidixic Acid, Norfloxacin, Enoxacin, Ciprofloxacin*, Ofloxacin, Lomefloxacin, Sparfloxacin, Gatifloxacin, Moxifloxacin **Miscellaneous:** Furazolidine, Nitrofurantoin*, Methanamine **Antiviral agents:** Amantadine hydrochloride, Rimantadine hydrochloride, Idoxuridine trifluoride, Acyclovir*, Gancyclovir, Zidovudine, Didanosine, Zalcitabine, Lamivudine, Loviride, Delavirdine, Ribavirin, Saquinavir, Indinavir, Ritonavir		CO2 CO3 CO4 CO5
[4]	**Antifungal agents:** **Antifungal antibiotics:** Amphotericin-B, Nystatin, Natamycin, Griseofulvin. **Synthetic Antifungal agents:** Clotrimazole, Econazole, Butoconazole, Oxiconazole Tioconozole, Miconazole*, Ketoconazole, Terconazole, Itraconazole, Fluconazole, Naftifine hydrochloride, Tolnaftate*. **Anti-protozoal Agents:** Metronidazole*, Tinidazole, Ornidazole, Diloxanide, Iodoquinol, Pentamidine Isethionate, Atovaquone, Eflornithine. **Anthelmintics:** Diethylcarbamazine citrate*, Thiabendazole, Mebendazole*, Albendazole, Niclosamide, Oxamniquine, Praziquantal, Ivermectin. **Sulphonamides and Sulfones** Historical development, chemistry, classification and SAR of Sulfonamides: Sulphamethizole, Sulfisoxazole, Sulphamethizine, Sulfacetamide*, Sulphapyridine, Sulfamethoxaole*, Sulphadiazine, Mefenide acetate, Sulfasalazine **Folate reductase inhibitors:** Trimethoprim*, Cotrimoxazole **Sulfones:** Dapsone*	**08**	CO1 CO2 CO3 CO4 CO5
[5]	**Introduction to Drug Design** Various approaches used in drug design. Physicochemical parameters used in quantitative structure activity relationship (QSAR) such as partition coefficient, Hammet's electronic parameter, Tafts steric parameter and Hansch analysis. **Pharmacophore modeling and docking techniques**. **Combinatorial Chemistry:** Concept and applications chemistry: solid phase and solution phase synthesis.	**07**	CO1

C. TEXT BOOKS

1. Alagarsamy, V. Textbook of Medicinal Chemistry, Volume I and Volume II, 3rd ed.; CBS Publishers, India, 2016
2. Kadam, S.S., Mahadik, K.R., Bothara, K.G. Principles of Medicinal Chemistry, Volume I and II, 20th ed.; Nirali Prakashan, India, 2010

D. REFERENCE BOOKS

1. Hansch, C., Semmes, P.G., Taylor, J.B. Comprehensive Medicinal Chemistry, Volume I to VI, 1st ed.; Elsevier, India, 2005
2. Abraham, D.J. Burger's Medicinal Chemistry and Drug Discovery, Volume I to VI, 6th ed.; Wiley-Interscience, New Jersey, 2003
3. Lendnicer, D., Mitscher, L.A. The Organic Chemistry of Drug Synthesis, Volume I to VI, Wiley-Interscience, New Jersey, 2008
4. Johnson, D.S., Li, J.J. Art of Drug Synthesis, 1st ed,; Wiley-Interscience, New Jersey, 2007
5. Patrick, G.L. An Introduction to Medicinal Chemistry, 3rd ed.; Oxford University Press, Oxford, 2006
6. Silverman, R.B. The Organic Chemistry of Drug Design and Drug Action, 2nd ed,; Academic Press, Burlington, 2004
7. Lemke, T.L., Williams, D.A. FOYE'S Principles of Medicinal Chemistry, 7th ed.; Lippincott Williams & Wilkins, Baltimore, 2013
8. Baele, J.M., Block J. H. Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry, 12th ed.; Lippincott Williams & Wilkins; Baltimore, 2011
9. Smith, J.H., Williams, H. Smith and Williamson's Introduction to the Principles of Drug Design and Action, 3rd ed; CRC Press, The Netherlands, 2005
10. Vardanyan, R., Hruby, V. Synthesis of Essential Drugs, Volume I & II, 1st ed.; Elsevier, The Netherlands, 2006

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and remember	To explain the fundamentals of drug design, different techniques of drug design and combinatorial chemistry
CO2	Understand and remember	To describe classification and chemistry of drugs
CO3	Understand and remember	To discuss action of drugs, their metabolism, adverse effects and therapeutic value of drugs
CO4	Analysis	To explain structural activity relationship of different class of drugs
CO5	Apply	To describe synthesis of selected drugs

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	1	2	-	-	-	-	-	-	3	2	2	3	2	1
CO2	3	-	2	1	-	-	-	-	-	-	3	2	3	2	1	1
CO3	3	-	2	2	-	-	-	-	-	-	3	2	2	3	1	1
CO4	3	-	2	1	-	-	-	-	-	-	3	2	1	3	2	1
CO5	3	3	3	3	3	-	-	-	-	3	3	2	2	3	2	3
Avg	3	0.6	2	1.8	0.6	-	-	-	-	0.6	3	2	2	2.8	1.6	1.4

B. PHARM. SEMESTER – VI (BPH)
SUBJECT: PHARMACOLOGY-III–THEORY (BP602T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This subject is intended to impart the fundamental knowledge on various aspects (classification, mechanism of action, therapeutic effects, clinical uses, side effects and contraindications) of drugs acting on respiratory and gastrointestinal system, infectious diseases, immuno-pharmacology and in addition, emphasis on the principles of toxicology and Chrono pharmacology.

Objectives: Upon completion of this course the student should be able to:

- understand the mechanism of drug action and its relevance in the treatment of different infectious diseases
- comprehend the principles of toxicology and treatment of various poisonings and
- appreciate correlation of pharmacology with related medical sciences

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Pharmacology of drugs acting on Respiratory system** a.Anti-asthmatic drugs b.Drugs used in the management of COPD c.Expectorants and antitussives d.Nasal decongestants e.Respiratory stimulants **Pharmacology of drugs acting on the Gastrointestinal Tract** a. Antiulcer agents. b. Drugs for constipation and diarrhoea. c. Appetite stimulants and suppressants. d. Digestants and carminatives. e. Emetics and anti-emetics.	**10**	CO1, CO2, CO3.
[2]	**Chemotherapy** a. General principles of chemotherapy. b. Sulphonamides and cotrimoxazole. c. Antibiotics- Penicillin's, cephalosporin's, chloramphenicol, macrolides, quinolones and fluoroquinolones, tetracycline and aminoglycosides	**10**	CO1, CO2, CO3.
[3]	**Chemotherapy** a. Anti-tubercular agents b. Anti-leprotic agents c. Anti-fungal agents d. Antiviral drugs e. Anthelmintics f. Antimalarial drugs g. Anti-amoebic agents	**10**	CO1, CO2, CO3.
[4]	**Chemotherapy** Urinary tract infections and sexually transmitted diseases. Chemotherapy of malignancy.	**08**	CO4, CO5.

	Immunopharmacology a.Immunostimulants b. Immunosuppressant Protein drugs, monoclonal antibodies, target drugs to antigen, biosimilar.		
[5]	**Principles of toxicology** a. Definition and basic knowledge of acute, subacute and chronic toxicity. b.Definition and basic knowledge of genotoxicity, carcinogenicity, teratogenicity and mutagenicity c. General principles of treatment of poisoning. d.Clinical symptoms and management of barbiturates, morphine, organophosphosphorus compound and lead, mercury and arsenic poisoning. **Chronopharmacology** a.Definition of rhythm and cycles. b.Biological clock and their significance leading to chronotherapy.	**07**	CO4, CO5.

C. TEXT BOOKS

1. Tripathi, K. D. *Essentials of Medical Pharmacology*; Jaypee Brothers Medical Publishers: New Delhi, 2019.

D. REFERENCE BOOKS

1. Ritter, J.; Flower, R. J.; Henderson, G.; Yoon Kong Loke; Rang, H. P. *Rang and Dale's Pharmacology*, 9th ed.; Elsevier: Endinburgh, 2020.
2. Katzung, B. G. *Basic & Clinical Pharmacology*, 14th ed.; Mcgraw-Hill Education, Copyright: New York I 11 Pozostałych, 2018.
3. Louis Sanford Goodman; Gilman, A.; Brunton, L. L.; Chabner, B. A.; KnollmannB. C. *Goodman & Gilman's the Pharmacological Basis of Therapeutics*; Mcgraw-Hill Medical: New York, 2011.
4. Al, E. *Applied Therapeutics: The Clinical Use of Drugs*; Wolters Kluwer Health - Lippincott Williams & Wilkins, Cop: Philadelphia, 2013.
5. *Lippincott's Illustrated Reviews Bundle Lippincott's Illustrated Reviews: Biochemistry, 4th Ed + Lippincott's Illustrated Reviews, Pharmacology, North American Edition, 4th Ed + Lippincott's.*; Lippincott Williams & Wilkins, 2009.
6. Hl Sharma; Kk Sharma. *Principles of Pharmacology*; Paras: New Delhi, 2011.
7. Craig, C. R.; Stitzel, R. E. *Modern Pharmacology with Clinical Applications*; Lippincott Williams & Wilkins: Philadelphia, 2004.
8. *Fundamentals of Experimental Pharmacology*; Hilton & Company: Kolkata, 2015.
9. Kulkarni, S. *Handbook of Experimental Pharmacology*, 3rd Edition. Vallabh Prakashan: Delhi, 2005.
10. N Udupa; Gupta, P. D. *Concepts in Chronopharmacology*; Shyam Prakashan: Jaipur, 2009.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and Apply	Understand the mechanism of drug action and its relevance in the treatment of different infectious diseases.
CO2	Understand and Apply	Understand the resistance mechanism of drug action in the treatment of different infectious diseases.
CO3	Remember, Evaluate and Apply	Select the drug, its necessity, frequency, duration, prophylaxis and test for cure of the treatment of infectious diseases.
CO4	Understand, Remember and Apply	Appreciate correlation of pharmacology with related medical sciences and Chrono-pharmacology.
CO5	Understand, Evaluate and analyse	Comprehend the principles of toxicology and treatment of various poisonings.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	3	3	3	2	3	1	3	1	3	3	-	3	3	3
CO2	3	-	3	3	3	1	3	1	3	3	2	3	-	3	3	3
CO3	3	1	3	3	2	2	3	2	3	2	2	3	-	3	3	3
CO4	3	1	3	3	3	1	3	3	3	3	3	3	-	3	3	3
CO5	3	1	3	3	3	2	3	1	3	1	3	3	-	3	3	3
Avg	3	0.6	3	3	2.8	1.6	3	1.6	3	2.2	2.6	3	-	3	3	3

B. PHARM. SEMESTER – VI (BPH)
SUBJECT: HERBAL DRUG TECHNOLOGY–THEORY (BP603T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This subject gives the student the knowledge of basic understanding of herbal drug industry, the quality of raw material, guidelines for quality of herbal drugs, herbal cosmetics, natural sweeteners, nutraceutical etc. The subject also emphasizes on Good Manufacturing
Practices (GMP), patenting and regulatory issues of herbal drugs
Objectives: Upon completion of this course the student should be able to:

- Understand raw material as source of herbal drugs from cultivation to herbal drug product
- Know the WHO and ICH guidelines for evaluation of herbal drugs
- Know the herbal cosmetics, natural sweeteners, nutraceuticals
- Appreciate patenting of herbal drugs, GMP.

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Herbs as raw materials** Definition of herb, herbal medicine, herbal medicinal product, herbal drug preparation. Source of Herbs, Selection, identification and authentication of herbal materials Processing of herbal raw material **Biodynamic Agriculture** Good agricultural practices in cultivation of medicinal plants including Organic farming. Pest and Pest management in medicinal plants: Biopesticides/Bioinsecticides. **Indian Systems of Medicine** a) Basic principles involved in Ayurveda, Siddha, Unani and Homeopathy b) Preparation and standardization of Ayurvedic formulations viz Aristas and Asavas, Ghutika,Churna, Lehya and Bhasma.	**11**	CO1 CO5
[2]	**Nutraceuticals** General aspects, Market, growth, scope and types of products available in the market. Health benefits and role of Nutraceuticals in ailments like Diabetes, CVS diseases, Cancer, Irritable bowel syndrome and various Gastro intestinal diseases. Study of following herbs as health food: Alfalfa, Chicory, Ginger, Fenugreek, Garlic, Honey, Amla, Ginseng, Ashwagandha, Spirulina **Herbal-Drug and Herb-Food Interactions:** General introduction to interaction and classification. Study of following drugs and their possible side effects and interactions: Hypercium, kava-kava, Ginkobiloba, Ginseng, Garlic, Pepper & Ephedra.	**07**	CO3
[3]	**Herbal Cosmetics** Sources and description of raw materials of herbal origin used via, fixed oils, waxes, gums colours, perfumes, protective agents, bleaching agents, antioxidants in products such as skin care, hair care and oral hygiene products. **Herbal excipients:**	**10**	CO3 CO5

	Herbal Excipients – Significance of substances of natural origin as excipients – colorants, sweeteners, binders, diluents, viscosity builders, disintegrants, flavors & perfumes. **Herbal formulations :** Conventional herbal formulations like syrups, mixtures and tablets and Novel dosage forms like phytosomes		
[4]	**Evaluation of Drugs** WHO & ICH guidelines for the assessment of herbal drugs Stability testing of herbal drugs. **Patenting and Regulatory requirements of natural products:** a) Definition of the terms: Patent, IPR, Farmers right, Breeder's right, Bioprospecting and Biopiracy b) Patenting aspects of Traditional Knowledge and Natural Products. Case study of Curcuma & Neem. **Regulatory Issues** - Regulations in India (ASU DTAB, ASU DCC), Regulation of manufacture of ASU drugs - Schedule Z of Drugs & Cosmetics Act for ASU drugs.	**10**	CO2 CO4
[5]	**General Introduction to Herbal Industry** Herbal drugs industry: Present scope and future prospects. A brief account of plant based industries and institutions involved in work on medicinal and aromatic plants in India. **Schedule T–Good Manufacturing Practice of Indian systems of medicine** Components of GMP (Schedule–T) and its objectives, Infrastructural requirements, working space, storage area, machinery and equipments, standard operating procedures, health and hygiene, documentation and records.	**07**	CO3 CO4

C. TEXT BOOKS

1. Dr. Arora, P. &Dr. Arora, V., A text book of "Herbal Drug Technology" Pee Vee Books, S. Vikas & Company (Medical Publishers) ,2019.
2. Dr. Lodhi, S., Dr. Usman, R. Md ., Dr. Deshmukh Ta., Darvekar, VM. &Dr. Kori ML., "Herbal Drug Technology", 1st Edition, Nirali Prakashan, 2019.

D. REFERENCE BOOKS

1. Dr. Mukherjee, PK. &Dr.Verpoorte, R., "GMP for Botanicals" 1st Edition, Business Horizons Pharmaceutical Publishers, 2003.
2. Dr. Mukherjee, PK."Quality Control of Herbal Drugs: An Approach to Evaluation of botanicals" 1st Edition reprint, Elsevier Science Publication, 2017.
3. Agrawal, SS. &Paridhavi M., "Herbal Drug Technology" 2nd edition, Orient Blackswan , 2012.
4. Shah, B., & Seth, AK., "Textbook of Pharmacognosy & Phytochemistry" , 2nd Edition, CBS Publishers & Distributors PVT. Ltd., 2017.
5. Rangari VD., "Pharmacognosy & Phytochemistry" Volume-I 3rd Edition, Career Publications, 2017.
6. Rangari VD., "Pharmacognosy & Phytochemistry" Volume-II 3rd Edition, Career Publications, 2017.
7. Quadry, JS., "Textbook of Pharmacognosy (Theory & Practical)" 17th Edition, CBS Publishers & Distributors PVT. Ltd., 2020.
8. Dr. Shinde, VM. & Mrs. Bodas-yadav, KS., "Herbal Drug Technology", 2nd edition, Nirali Prakashan, 2020.
9. Dr. Tiwari V., "Herbal Drug Technology", 1st edition, Nirali Prakashan, 2020.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and Remember	Describe concept of raw material as source of herbal drugs from cultivation for herbal drug production.
CO2	Understand, Remember and Apply	Application of WHO and ICH guidelines for standardisation of herbal drugs.
CO3	Understand and Remember	Explain the concept of herbal medicines, Herbal cosmetics and neutraceuticals and herbal industry.
CO4	Understand and Apply	Describe Good manufacturing practice, Patenting and Regulatory requirements of natural products.
CO5	Understand and Analyse	Detail description and analysis of various ayurvedic formulations.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	-	2	2	1	2	1	3	3	2	2	-	1
CO2	3	2	2	2	-	2	3	1	2	1	3	3	2	2	3	1
CO3	3	2	2	2	-	2	2	1	3	1	3	3	2	2	-	1
CO4	3	2	2	2	-	2	3	1	3	1	3	3	2	2	3	1
CO5	3	2	2	2	-	2	2	1	2	1	3	3	2	2	3	1
Avg	3	2	2	2	-	2	2.4	1	2.4	1	3	3	2	2	1.8	1

B. PHARM. SEMESTER – VI (BPH)

SUBJECT: BIOPHARMACEUTICS AND PHARMACOKINETICS-THEORY (BP604T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This subject is designed to impart knowledge and skills of Biopharmaceutics and pharmacokinetics and their applications in pharmaceutical development, design of dose and dosage regimen and in solving the problems arised therein.

Objectives: Upon completion of the course student shall be able to:

- Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance.
- Use of plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination.
- To understand the concepts of bioavailability and bioequivalence of drug products and their significance.
- Understand various pharmacokinetic parameters, their significance & applications.

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Introduction to Biopharmaceutics** **Absorption**; Mechanisms of drug absorption through GIT, factors influencing drug absorption though GIT, absorption of drug from Non-per oral extra-vascular routes. **Distribution** Tissue permeability of drugs, binding of drugs, apparent, volume of drug distribution, plasma and tissue protein binding of drugs, factors affecting protein-drug binding. Kinetics of protein binding, Clinical significance of protein binding of drugs	**10**	CO1
[2]	**Elimination:** Drug metabolism and basic understanding metabolic pathways renal excretion of drugs, factors affecting renal excretion of drugs, renal clearance, Non-renal routes of drug excretion of drugs **Bioavailability and Bioequivalence:** Definition and Objectives of bioavailability, absolute and relative bioavailability, measurement of bioavailability, *in-vitro* drug dissolution models, *in-vitro-in-vivo* correlations, bioequivalence studies, methods to enhance the dissolution rates and bioavailability of poorly soluble drugs.	**10**	CO1 CO5
[3]	**Pharmacokinetics:** Definition and introduction to Pharmacokinetics, Compartment models, Non-compartment models, physiological models, One compartment open model. (a). Intravenous Injection (Bolus) (b). Intravenous infusion and (c) Extra vascular administrations. Pharmacokinetics parameters - KE ,t1/2,Vd,AUC,Ka, Clt and CLR- definitions methods of eliminations, understanding of their significance and application.	**08**	CO1 CO2 CO5
[4]	**Multicompartment models:** Two compartment open model. IV bolus Kinetics of multiple dosing, steady state drug levels, calculation of loading and mainetnance doses and their significance in clinical settins.	**8**	CO2 CO4
[5]	**Nonlinear Pharmacokinetics:**	**7**	CO2

	a. Introduction, b. Factors causing Non-linearity. c. Michaelis-menton method of estimating parameters, Explanation with example of drugs.		CO4

C. TEXT BOOKS

1. Brahankar, D. M.; Jaiswal, S. B. *Biopharmaceutics and Pharmacokinetics : A Treatise*; Vallabh Prakashan: Delhi, 2014.

D. REFERENCE BOOKS

1. Abdou, H. M. Dissolution, Bioavailability and Bioequivalence; Mack Publishing Company: Easton, 1989.
2. Gibaldi, M. Biopharmaceutics and Clinical Pharmacokinetics; Lea & Febiger: Philadelphia, 1984.
3. Gibaldi, M.; Perrier, D. Pharmacokinetics; Infroma Healthcare: New York, 2007.
4. Notari, R. E. Biopharmaceutics and Pharmacokinetics : An Introduction; M. Dekker: New York, 1975.
5. Notari, R. E. Biopharmaceutics and Clinical Pharmacokinetics : An Introduction; M. Dekker: New York, 1987.
6. Remington, J. P.; Gennaro, A. R. Remington's Pharmaceutical Sciences; Mack Pub. Co: Easton, Pa., 1990.
7. Rowland, M.; Tozer, T. N. Clinical Pharmacokinetics and Pharmacodynamics : Concepts and Applications; Wolters Kluwer-Lippincott William & Wilkins: Philadelphia, 2011.
8. Shargel, L.; Yu, A. B. C. Applied Biopharmaceutics & Pharmacokinetics; Mcgraw-Hill Education: Singapore, 2016.
9. Gibaldi M and Prescott L, Hand Book of Clinical Pharmacokinetics, ADIS Health Science Press, 1989
10. Swarbrick, Biopharmaceutics, Lea & Febiger,U.S.,1971

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Remember and Understand	Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance.
CO2	Understand and Apply	To understand and apply plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination.
CO3	Understand	To understand the concepts of bioavailability and bioequivalence of drug products and their significance.
CO4	Understand and Remember	To understand various pharmacokinetic parameters and their significance.
CO5	Apply and evaluate	To apply the IVIVC co-relation for different dosage forms.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	3	2	1	2	1	2	2	3	3	3	3	2	2
CO2	3	2	3	3	1	2	-	2	2	1	2	3	3	3	2	2
CO3	3	2	2	3	2	2	2	2	-	1	3	3	3	3	2	2
CO4	3	2	2	3	1	1	-	3	-	2	3	3	2	2	2	2
CO5	3	3	3	3	2	1	2	3	2	2	2	3	3	3	1	2
Avg	3	2.2	2.6	3	1.6	1.4	1.2	2.2	1.2	1.6	2.6	3	2.8	2.8	1.8	2

B. PHARM. SEMESTER – VI (BPH)
SUBJECT: PHARMACEUTICAL BIOTECHNOLOGY-THEORY (BP605T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: Course enables the student to learn biotechnology, long promise to revolutionize the biological sciences and technology. Scientific application of biotechnology in the field of genetic engineering, medicine and fermentation technology makes the subject interesting. Biotechnology is leading to new biological revolutions in diagnosis, prevention and cure of diseases, new and cheaper pharmaceutical drugs. Biotechnology has already produced transgenic crops and animals and the future promises a lot more. It is basically a research-based subject.
Objectives: Upon completion of the course the student shall be able to understand Enzymes, Genetic engineering and fermentation technology and importance of biotechnology in industry.

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	a) Brief introduction to Biotechnology with reference to Pharmaceutical Sciences. b) Enzyme Biotechnology- Methods of enzyme immobilization and applications. c) Biosensors- Working and applications of biosensors in Pharmaceutical Industries. d) Brief introduction to Protein Engineering. e) Use of microbes in industry. Production of Enzymes- General consideration Amylase, Catalase, Peroxidase, Lipase, Protease, Penicillinase. f) Basic principles of genetic engineering.	**10**	CO1
[2]	a) Study of cloning vectors, restriction endonucleases and DNA ligase. b) Recombinant DNA technology. Application of genetic engineering in medicine. c) Application of r DNA technology and genetic engineering in the production of: i) Interferon ii) Vaccines- hepatitis- B iii) Hormones- Insulin. d) Brief introduction to PCR	**10**	CO2 CO3
[3]	Types of immunity- humoral immunity, cellular immunity a) Structure of Immunoglobulins b) Structure and Function of MHC c) Hypersensitivity reactions, Immune stimulation and Immune suppressions. d) General method of the preparation of bacterial vaccines, toxoids, viral vaccines, antitoxins, serum-immune blood derivatives and other products relative to immunity. e) Storage conditions and stability of official vaccines f) Hybridoma technology- Production, Purification and Applications	**10**	CO5
[4]	a) Immunoblotting techniques- ELISA, Western blotting, Southern blotting. b) Genetic organization of Eukaryotes and Prokaryotes	**08**	CO2 CO5

	c) Microbial genetics including transformation, transduction, conjugation, plasmids and transposons. d) Introduction to Microbial biotransformation and applications. **e)** Mutation: Types of mutation/mutants.		
[5]	a) Fermentation methods and general requirements, study of media, equipment, sterilization methods, aeration process, stirring. b) Large scale production fermenter design and its various controls. c) Study of the production of - penicillin, citric acid, Vitamin B12, Glutamic acid, Griseofulvin, d) Blood Products: Collection, Processing and Storage of whole human blood, dried human plasma, plasma substitutes.	**07**	CO4

C. TEXT BOOKS

1. Primrose, S. B. *Molecular Biotechnology*; Blackwell Scientific Publications: Oxford ; Boston, 2001.
2. Stanbury, P. F.; Whitaker, A.; Hall, S. J. *Principles of Fermentation Technology*; 2017.

D. REFERENCE BOOKS

1. Glick, B. R.; Patten, C. L. *Molecular Biotechnology: Principles and Applications of Recombinant DNA*; Asm Press: Washington, Dc, 2017.
2. Kindt, T. J.; Goldsby, R. A.; Anne, B. *Kuby Immunology*; W.H. Freeman and Company: New York, 2007.
3. Goding, J. W. *Monoclonal Antibodies: Principles and Practice: Production and Application of Monoclonal Antibodies in Cell Biology, Biochemistry and Immunology.*; Academic Press: London, 1996.
4. Walker, J. M.; Gingold, E. B. *Molecular Biology and Biotechnology*; Royal Society of Chemistry: London, 1993.
5. Zaborsky, O. R. *Immobilized Enzymes*; Krieger: Malabar, Fla., 1984.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Remember and Understand	To Understand the importance of Immobilized enzymes in Pharmaceutical Industries.
CO2	Remember and Understand	To learn genetic engineering applications in relation to production of pharmaceuticals
CO3	Understand and Apply	To learn Importance of Monoclonal antibodies in Industries
CO4	Understand and Remember	To learn the use of microorganisms in fermentation technology
CO5	Understand	To learn antigen-antibody reaction and immunity of Human system

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	–	1	3	–	-	1	1	1	3	3	3	3	3	2	3
CO2	2	–	2	3	–	1	1	1	2	3	3	2	3	3	3	3
CO3	2	–	2	3	–	-	1	1	2	3	3	3	3	3	3	3
CO4	2	–	2	3	–	2	1	1	2	3	3	3	3	3	2	3
CO5	2	–	2	2	–	2	2	1	1	2	2	1	2	3	1	1
Avg	2	–	1.8	2.8	–	1	1.2	1	1.6	2.8	2.8	2.4	2.8	3	2.2	2.6

B. PHARM. SEMESTER – VI (BPH)
SUBJECT: INSTRUMENTAL METHODS OF ANALYSIS - THEORY (BP606T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This course deals with the various aspects of quality control and quality assurance aspects of pharmaceutical industries. It deals with the important aspects like cGMP, QC tests, documentation, quality certifications and regulatory affairs.

Objectives: Upon completion of the course student shall be able to:

- understand the cGMP aspects in a pharmaceutical industry
- appreciate the importance of documentation
- understand the scope of quality certifications applicable to pharmaceutical industries
- understand the responsibilities of QA & QC departments

B. COURSE CONTENT

NO	TOPIC	L Hrs)	COs
[1]	**Quality Assurance and Quality Management concepts:** Definition and concept of Quality control, Quality assurance and GMP **Total Quality Management (TQM):** Definition, elements, philosophies **ICH Guidelines**: purpose, participants, process of harmonization, Brief overview of QSEM, with special emphasis on Q-series guidelines, ICH stability testing guidelines **Quality by design (QbD)**: Definition, overview, elements of QbD program, tools **ISO 9000 & ISO14000**: Overview, Benefits, Elements, steps for registration **NABL accreditation:** Principles and procedures	**10**	CO1 CO3
[2]	**Organization and personnel:** Personnel responsibilities, training, hygiene and personal records. **Premises:** Design, construction and plant layout, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination. **Equipments and raw materials:** Equipment selection, purchase specifications, maintenance, purchase specifications and maintenance of stores for raw materials.	**10**	CO1 CO3 CO4
[3]	**Quality Control:** Quality control test for containers, rubber closures and secondary packing materials. **Good Laboratory Practices:** General Provisions, Organization and Personnel, Facilities, Equipment, Testing Facilities Operation, Test and Control Articles, Protocol for Conduct of a Nonclinical Laboratory Study, Records and Reports, Disqualification of Testing Facilities	**10**	CO3 CO4
[4]	**Complaints:** Complaints and evaluation of complaints, Handling of return good, recalling and waste disposal. **Document maintenance in pharmaceutical industry:** Batch Formula Record, Master Formula Record, SOP, Quality audit, Quality Review and Quality documentation, Reports and documents, distribution records.	**08**	CO2
[5]	**Calibration and Validation:** Introduction, definition and general principles of calibration, qualification and validation, importance and	**07**	CO5

	scope of validation, types of validation, validation master plan. Calibration of pH meter, Qualification of UV-Visible spectrophotometer, General principles of Analytical method Validation. **Warehousing:** Good warehousing practice, materials management		

C. TEXT BOOKS

1. P P Sharma. *How to Practice GMPs*, 6th ed.; vandana publications Pvt. Ltd.: Delhi, 2010.
2. Hirsch, A. F. *Good Laboratory Practice Regulations*; M. Dekker: New York ; Basel, 1989.

D. REFERENCE BOOKS

1. Weinberg, S. *Good Laboratory Practice Regulations*; M. Dekker: New York, 1995.
2. World Health Organization. *Quality Assurance of Pharmaceuticals. 2: A Compendium of Guidelines and Related Materials*; 1999.
3. World Health Organization. Pharmaceuticals Programme. The International pharmacopoeia = Pharmacopoeia Internationalis. Vol. 4, Tests, methods and general requirements: quality specifications for pharmaceutical substances, excipients and dosage forms
4. ICH Official web site: ICH http://www.ich.org/.
5. ISO. ISO 14000 Environmental management https://www.iso.org/iso-14001-environmental-management.html.
6. Ghosh S K; Maitra K. *A Guide to Total Quality Management*, 4th ed.; Oxford Publishing House, 2005.
7. S K Ghosh. *Introduction to ISO 9000 and Total Quality Management*, 4th ed.; Oxford Publishing House, 2007.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and remember	To understand the cGMP, GLP and ICH aspects in a pharmaceutical industry
CO2	Understand Apply and Evaluate	To understand and appreciate the importance of QbD and documentation
CO3	Understand and remember	To understand the scope of quality certifications applicable to pharmaceutical industries
CO4	Understand and remember	To understand the responsibilities of QA & QC departments
CO5	Understand Apply and Evaluate	To learn the aspects of calibration, validation and Material management

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	-	-	3	3	2	2	-	3	3	3	1	2	3
CO2	3	2	2	2	-	3	3	2	2	-	3	3	3	1	2	3
CO3	3	2	1	-	-	3	3	2	2	2	3	3	3	1	2	3
CO4	3	2	1	-	2	3	3	2	2	-	3	3	3	1	2	3
CO5	3	2	1	-	-	2	2	2	2	2	3	3	3	1	2	2
Avg	3	2	1.2	0.4	0.4	2.8	2.8	2	2	0.8	3	3	3	1	2	2.8

B. PHARM. SEMESTER – VI (BPH)
SUBJECT: MEDICINAL CHEMISTRY III -PRACTICAL (BP607P)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
-	-	4	4	2	35	-	05	10	50

A. COURSE OVERVIEW

Medicinal Chemistry III practical subject imparts practical knowledge regarding synthesis and analysis of drugs by various methods via experiments in laboratory. The subject also focuses on chemical structure, reaction and mechanism drawing experiment using various offline and online tools. Experiments involving prediction of various physicochemical properties-drug likeness properties would help to understand important aspect of drug design.

Objectives: Upon completion of the course student shall be able to

- Use ChemDraw for chemical structure and reaction drawing
- Synthesize and purify organic compounds
- Perform analysis of drugs using various analytical methods

B. COURSE CONTENT

NO	TOPIC	P (Hrs)	COs
[1]	**Preparation of drugs and intermediates** 1 Sulphanilamide 2 7-Hydroxy, 4-methyl coumarin 3 Chlorobutanol 4 Triphenyl imidazole 5 Tolbutamide 6 Hexamine **Assay of drugs** 1 Isonicotinic acid hydrazide 2 Chloroquine 3 Metronidazole 4 Dapsone 5 Chlorpheniramine maleate 6 Benzyl penicillin **Preparation of medicinally important compounds or intermediates by Microwave irradiation technique** **Drawing structures and reactions using chem draw** **Determination of physicochemical properties** such as logP, clogP, MR, Molecular weight, Hydrogen bond donors and acceptors for class of drugs course content using drug design software Drug likeliness screening (Lipinski's RO5)	**60**	CO1 CO2 CO3 CO4 CO5

C. TEXT BOOKS

1. Kar, A. Advanced Practical Medicinal Chemistry, 3rd ed.; New Age International Publishers, India, 2020
2. Vogel, A.I., Tatchell, A.R., Furniss, B.S., Smith, P.W.G. Text book of practical organic chemistry, 5th ed.; Longman Scientific and Technical; New York, 2011

C. REFERENCE BOOKS

1. Lendnicer, D., Mitscher, L.A. The Organic Chemistry of Drug Synthesis, Volume I to VI, Wiley-Interscience, New Jersey, 2008
2. Mann, F.G., Saunders, B.G., Practical Organic Chemistry, 4th ed.; Pearson, India, 2009

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Apply, analysis and evaluate	To assess the drug-likeness properties of drugs using various online tools
CO2	Understand and apply	To draw chemical structure, reaction and mechanism drawing using offline and online tools
CO3	Apply	To synthesize some drugs and intermediates by conventional synthesis
CO4	Apply	To perform synthesis of selected drugs by microwave assisted organic synthesis technique
CO5	Apply and evaluate	To carry out analysis of various drugs

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	2	3	1	-	-	-	-	-	3	2	2	3	2	1
CO2	2	1	1	3	-	-	-	-	-	-	3	1	2	1	1	1
CO3	3	2	3	3	1	-	-	-	-	3	3	3	3	2	2	3
CO4	3	2	3	3	1	-	-	-	-	3	3	3	3	2	2	3
CO5	3	2	3	3	1	-	-	-	-	3	3	3	3	2	2	1
Avg	2.8	1.4	2.4	3	0.8	-	-	-	-	1.2	3	2.4	2.6	2	1.8	1.8

B. PHARM. SEMESTER – VI (BPH)
SUBJECT: PHARMACOLOGY-III–PRACTICAL (BP608P)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
-	-	4	4	2	35	10	05	-	50

A. COURSE OVERVIEW

Scope: This subject is intended to impart the fundamental knowledge on various aspects (classification, mechanism of action, therapeutic effects, clinical uses, side effects and contraindications) of drugs acting on respiratory and gastrointestinal system, infectious diseases, immuno-pharmacology and in addition, emphasis on the principles of toxicology and Chrono pharmacology.

Objectives: Upon completion of this course the student should be able to:

- Evaluate different types of toxicity studies.
- Apply different types of statistical analysis in different pharmacological experiments.
- Analyse and evaluate various receptor actions using isolated tissue preparation.
- Create the observation data and correlate them using statistical analysis.
- To evaluate the drugs on different organs/tissues from the laboratory animals by in vivo/in vitro analysis.

B. COURSE CONTENT

NO	TOPIC	P (Hrs)	COs
[1]	1) Dose calculation in pharmacological experiments. 2) Anti-allergic activity by mast-cell stabilization assay. 3) Study of anti-ulcer activity of a drug using pylorus ligand (SHAY) rat model and NSAIDS induced ulcer model. 4) Study of effect of drugs on gastrointestinal motility. 5) Effect of agonist and antagonists on guinea pig ileum. 6) Estimation of serum biochemical parameters by using semi- auto analyser. 7) Effect of saline purgative on frog intestine. 8) Insulin hypoglycaemic effect tin rabbit. 9) Test for pyrogens (rabbit method). 10) Determination of acute oral toxicity (LD50) of a drug from a given data. 11) Determination of acute skin irritation / corrosion of a test substance. 12) Determination of acute eye irritation /corrosion of a test substance. 13) Calculation of pharmacokinetic parameters from a given data. 14) Biostatistics methods in experimental pharmacology (student's t test, ANOVA) 15) Biostatistics methods in experimental pharmacology (Chi square test, Wilcoxon Signed Rank test)	**60**	CO1, CO2, CO3, CO4, CO5.

C. TEXT BOOKS

1. Tripathi, K. D. *Essentials of Medical Pharmacology*; Jaypee Brothers Medical Publishers: New Delhi, 2019.

D. REFERENCE BOOKS

1. Ritter, J.; Flower, R. J.; Henderson, G.; Yoon Kong Loke; Rang, H. P. *Rang and Dale's Pharmacology*, 9th ed.; Elsevier: Endinburgh, 2020.
2. Katzung, B. G. *Basic & Clinical Pharmacology*, 14th ed.; Mcgraw-Hill Education, Copyright: New York I 11 Pozostałych, 2018.
3. Louis Sanford Goodman; Gilman, A.; Brunton, L. L.; Chabner, B. A.; KnollmannB. C. *Goodman & Gilman's the Pharmacological Basis of Therapeutics*; Mcgraw-Hill Medical: New York, 2011.
4. Al, E. *Applied Therapeutics: The Clinical Use of Drugs*; Wolters Kluwer Health - Lippincott Williams & Wilkins, Cop: Philadelphia, 2013.
5. *Lippincott's Illustrated Reviews Bundle Lippincott's Illustrated Reviews: Biochemistry, 4th Ed + Lippincott's Illustrated Reviews, Pharmacology, North American Edition, 4th Ed + Lippincott's.*; Lippincott Williams & Wilkins, 2009.
6. Hl Sharma; Kk Sharma. *Principles of Pharmacology*; Paras: New Delhi, 2011.
7. Craig, C. R.; Stitzel, R. E. *Modern Pharmacology with Clinical Applications*; Lippincott Williams & Wilkins: Philadelphia, 2004.
8. *Fundamentals of Experimental Pharmacology*; Hilton & Company: Kolkata, 2015.
9. Kulkarni, S. *Handbook of Experimental Pharmacology*, 3rd Edition. Vallabh Prakashan: Delhi, 2005.
10. N Udupa; Gupta, P. D. *Concepts in Chronopharmacology*; Shyam Prakashan: Jaipur, 2009.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Remember and Evaluate.	Evaluate different types of toxicity studies.
CO2	Apply and Analyse	Apply different types of statistical analysis in different pharmacological experiments.
CO3	Analyse an Evaluate.	Analyse and evaluate various receptor actions using isolated tissue preparation.
CO4	Create and Correlate	Create the observation data and correlate them using statistical analysis.
CO5	Evaluate and analyse	To evaluate the drugs on different organs/tissues from the laboratory animals by in vivo/in vitro analysis.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	3	3	3	3	3	3	3	2	3	3	3	3	3
CO2	3	3	3	3	3	3	2	3	3	3	3	3	2	3	3	3
CO3	3	2	3	3	3	3	2	3	3	2	2	3	3	3	3	3
CO4	3	2	3	3	3	3	2	3	3	2	2	3	2	3	3	3
CO5	3	3	3	3	3	3	3	3	3	2	2	3	3	3	2	3
Avg	3	2.4	3	3	3	3	2.4	3	3	2.4	2.2	3	2.6	3	2.8	3

B. PHARM. SEMESTER – VI (BPH)
SUBJECT: HERBAL DRUG TECHNOLOGY - PRACTICAL (BP609P)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
-	-	4	4	2	35	10	05	-	50

A. COURSE OVERVIEW

Scope: This subject gives the student the knowledge of basic understanding of herbal drug industry, the quality of raw material, guidelines for quality of herbal drugs, herbal cosmetics, natural sweeteners, nutraceutical etc. The subject also emphasizes on Good Manufacturing
Practices (GMP), patenting and regulatory issues of herbal drugs
Objectives: Upon completion of this course the student should be able to:

- Understand raw material as source of herbal drugs from cultivation to herbal drug product
- Know the WHO and ICH guidelines for evaluation of herbal drugs
- Know the herbal cosmetics, natural sweeteners, nutraceuticals
- Appreciate patenting of herbal drugs, GMP.

B. COURSE CONTENT

NO	TOPIC	P (Hrs)	COs
[1]	1. To perform preliminary phytochemical screening of crude drugs. 2. Determination of the alcohol content of Asava and Arista 3. Evaluation of excipients of natural origin 4. Incorporation of prepared and standardized extract in cosmetic formulations like creams, lotions and shampoos and their evaluation. 5. Incorporation of prepared and standardized extract in formulations like syrups, mixtures and tablets and their evaluation as per Pharmacopoeia requirements. 6. Monograph analysis of herbal drugs from recent Pharmacopoeias 7. Determination of Aldehyde content. 8. Determination of Phenol content 9. Determination of total alkaloids.	**60**	CO1 CO2 CO3 CO4 CO5

C. TEXT BOOKS

1. Dr. Usman, R. Md., Darvhekar, VM., Dr.Akhila, S. &Dr. Kumar, V., A practical Book of "Herbal Drug Technology" 1st edition, NiraliPrakashan, 2019.
2. Dr. Lodhi, S. A practical Book fo "Herbal Drug Technology" Pee Vee Books, S. Vikas & Company (Medical Publishers) ,2020.
3.

D. REFERENCE BOOKS

1. Dr.Khadabadi, SS., Dr.Deore, SL. & Mr. Baviskar, BA., "Experimental Phytopharmacognosy" A comprehensive Guide, 1st edition, Nirali Prakashan, 2011.
2. Dr. Mukherjee, PK. &Dr.Verpoorte, R., "GMP for Botanicals" 1st Edition, Business Horizons Pharmaceutical Publishers, 2003.
3. Dr. Mukherjee, PK."Quality Control of Herbal Drugs: An Approach to Evaluation of botanicals" 1st Edition reprint, Elsevier Science Publication, 2017.

4. Agrawal, SS. & Paridhavi M., "Herbal Drug Technology" 2nd edition, Orient Blackswan , 2012.
5. Shah, B., & Seth, AK., "Textbook of Pharmacognosy & Phytochemistry" , 2nd Edition, CBS Publishers & Distributors PVT. Ltd., 2017.
6. Rangari VD., "Pharmacognosy & Phytochemistry" Volume-I 3rd Edition, Career Publications, 2017.
7. Rangari VD., "Pharmacognosy & Phytochemistry" Volume-II 3rd Edition, Career Publications, 2017.
8. Quadry, JS., "Textbook of Pharmacognosy (Theory & Practical)" 17th Edition, CBS Publishers & Distributors PVT. Ltd., 2020.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and Analyse	Analysis of Natural excipients.
CO2	create and standardise	Preparation and standardisation of herbal Products, herbal cosmetics and Ayurvedic formulations.
CO3	understand and apply	Description and application of phytochemical screening of crude drugs.
CO4	Understand and Analysis	Monograph Analysis of herbal drugs as per the Pharmacopoeial standard.
CO5	Understand and Analysis	To perform Quantitative analysis of phytoconstituents present in crude drugs.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	3	-	2	2	1	2	1	3	3	3	3	2	-
CO2	3	2	2	3	-	2	2	1	2	1	3	3	3	3	1	-
CO3	3	2	2	3	-	2	2	1	2	1	3	3	3	3	1	-
CO4	3	2	2	3	-	2	2	1	2	1	3	3	3	3	2	-
CO5	3	2	2	3	-	2	2	1	2	1	3	3	3	3	2	-
Avg	3	2	2	3	-	2	2	1	2	1	3	3	3	3	1.6	-

B. PHARM. SEMESTER – VII (BPH)
SUBJECT: INSTRUMENTAL METHODS OF ANALYSIS - THEORY (BP701T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This subject deals with the application of instrumental methods in qualitative and quantitative analysis of drugs. This subject is designed to impart a fundamental knowledge on the principles and instrumentation of spectroscopic and chromatographic technique. This also emphasizes on theoretical and practical knowledge on modern analytical instruments that are used for drug testing.

Objectives: Upon completion of the course the student shall be able to

- Understand the interaction of matter with electromagnetic radiations and its applications in drug analysis
- Understand the chromatographic separation and analysis of drugs.
- Perform quantitative & qualitative analysis of drugs using various analytical instruments.

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**UV Visible spectroscopy** Electronic transitions, chromophores, auxochromes, spectral shifts, solvent effect on absorption spectra, Beer and Lambert's law, Derivation and deviations. Instrumentation - Sources of radiation, wavelength selectors, sample cells, detectors- Photo tube, Photomultiplier tube, Photo voltaic cell, Silicon Photodiode. Applications - Spectrophotometric titrations, Single component and multi component analysis **Fluorimetry** Theory, Concepts of singlet, doublet and triplet electronic states, internal and external conversions, factors affecting fluorescence, quenching, instrumentation and applications	**10**	CO1 CO2 CO5
[2]	**IR spectroscopy** Introduction, fundamental modes of vibrations in poly atomic molecules, sample handling, factors affecting vibrations Instrumentation - Sources of radiation, wavelength selectors, detectors - Golay cell, Bolometer, Thermocouple, Thermister, Pyroelectric detector and applications **Flame Photometry-**Principle, interferences, instrumentation and applications **Atomic absorption spectroscopy**- Principle, interferences, instrumentation and applications **Nepheloturbidometry**- Principle, instrumentation and applications	**10**	CO1 CO2 CO5
[3]	**Introduction to chromatography** **Adsorption and partition column chromatography-**Methodology, advantages, disadvantages and applications. **Thin layer chromatography-** Introduction, Principle, Methodology, Rf values, advantages, disadvantages and applications. **Paper chromatography-**Introduction, methodology, development techniques, advantages, disadvantages and applications **Electrophoresis**– Introduction, factors affecting electrophoretic mobility,	**10**	CO3 CO4 CO5

	Techniques of paper, gel, capillary electrophoresis, applications		
[4]	**Gas chromatography -** Introduction, theory, instrumentation, derivatization, temperature programming, advantages, disadvantages and applications **High performance liquid chromatography (HPLC)-**Introduction, theory, instrumentation, advantages and applications.	**08**	CO3 CO4 CO5
[5]	**Ion exchange chromatography-** Introduction, classification, ion exchange resins, properties, mechanism of ion exchange process, factors affecting ion exchange, methodology and applications **Gel chromatography-** Introduction, theory, instrumentation and applications **Affinity chromatography-** Introduction, theory, instrumentation and applications	**07**	CO3 CO4 CO5

C. TEXT BOOKS

1. Mendham, A. *Vogel's Textbook of Quantitative Chemical Analysis.*; Pearson: New Delhi, 2009.
2. Connors, K. A. *A Textbook of Pharmaceutical Analysis*; Wiley: New York, 1982..

D. REFERENCE BOOKS

1. JW Munson. *Pharmaceutical Analysis - Modern Methods Part-B*; Marcel. Dekker Series.; Vol. 11.
2. Kalsi, P. S. *Spectroscopy of Organic Compounds.*; New Age International Pvt, 2016.
3. Silverstein, R. M.; Webster, F. X.; Kiemle, D. J.; Bryce, D. L. *Spectrometric Identification of Organic Compounds*; Wiley: Hoboken, Nj, 2015.
4. Skoog, D. A.; F James Holler; Crouch, S. R. *Principles of Instrumental Analysis*; Thomson, Brooks/Cole: Belmont, Ca, 2007.
5. Hobart Hurd Willard. *Instrumental Methods of Analysis*; Wadsworth: Belmont, 1993.
6. Kemp, W. *Organic Spectroscopy*; Palgrave: Basingstoke, 2001.
7. Sethi, P. D. *Quantitative Analysis of Drugs in Pharmaceutical Formulations*; Cbs Publishers & Distritutors: New Delhi, 2005.
8. Sharma B K. *Instrumental Methods of Chemical Analysis*, 27th edition.; Goel Publishing House: Meerut, 2011.
9. Sharma, Y. R. *Elementary Organic Spectroscopy : Principles and Chemical Applications*; S. Chand & Company: New Delhi, 2007.
10. Garratt, D. C. *The Quantitative Analysis of Drugs : Assisted by L. Brealey Etc.*; Chapman & Hall: London, 1964.
11. Finar, I. L. *Organic Chemistry.*; Pearson Education, (9Th Impression: Delhi, 2011.
12. Beckett, A. H.; Stenlake, J. B. *Practical Pharmaceutical Chemistry*; Athlone Press: London, 1988.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand	To understand the interaction of matter with electromagnetic radiations
CO2	Understand Apply and Evaluate	To apply the fundamentals of spectroscopy in drug analysis
CO3	Understand	To understand the chromatographic separation fundamentals
CO4	Understand Apply and Evaluate	To apply the fundamentals of various chromatographic techniques in drug analysis
CO5	Understand Apply and Evaluate	To learn quantitative & qualitative analysis of drugs using various analytical instruments.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	1	1	-	1	-	1	-	-	3	3	3	1	1	-
CO2	3	2	3	2	-	2	1	1	2	-	3	3	3	2	2	1
CO3	3	-	1	1	-	1	-	1	-	-	3	3	3	1	1	-
CO4	3	2	3	2	-	2	1	1	2	-	3	3	3	2	2	1
CO5	3	2	1	1	-	2	1	1	1	-	3	3	3	2	2	1
Avg	3	1.2	1.8	1.4	-	1.6	0.6	1	1	-	3	3	3	1.6	1.6	0.6

B. PHARM. SEMESTER – VII (BPH)
SUBJECT: INDUSTRIAL PHARMACY II -THEORY (BP702T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This course is designed to impart fundamental knowledge on pharmaceutical product development and translation from laboratory to market

Objectives: Upon completion of the course the student shall be able to

- Know the process of pilot plant and scale up of pharmaceutical dosage forms
- Understand the process of technology transfer from lab scale to commercial batch
- Know different Laws and Acts that regulate pharmaceutical industry
- Understand the approval process and regulatory requirements for drug products

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Pilot plant scale up techniques:** General considerations - including significance of personnel requirements, space requirements, raw materials, Pilot plant scale up considerations for solids, liquid orals, semi solids and relevant documentation, SUPAC guidelines, Introduction to platform technology	**10**	CO1
[2]	**Technology development and transfer:** WHO guidelines for Technology Transfer(TT): Terminology, Technology transfer protocol, Quality risk management, Transfer from R & D to production (Process, packaging and cleaning), Granularity of TT Process (API, excipients, finished products, packaging materials) Documentation, Premises and equipments, qualification and validation, quality control, analytical method transfer, Approved regulatory bodies and agencies, Commercialization - practical aspects and problems (case studies), TT agencies in India - APCTD, NRDC, TIFAC, BCIL, TBSE / SIDBI; TT related documentation - confidentiality agreement, licensing, MoUs, legal issues	**10**	CO2
[3]	**Regulatory affairs:** Introduction, Historical overview of Regulatory Affairs, Regulatory authorities, Role of Regulatory affairs department, Responsibility of Regulatory Affairs Professionals **Regulatory requirements for drug approval:** Drug Development Teams, Non-Clinical Drug Development, Pharmacology, Drug Metabolism and Toxicology, General considerations of Investigational New Drug (IND) Application, Investigator's Brochure (IB) and New Drug Application (NDA), Clinical research / BE studies, Clinical Research Protocols, Biostatistics in Pharmaceutical Product Development, Data Presentation for FDA Submissions, Management of Clinical Studies.	**10**	CO3 CO4
[4]	**Quality management systems:** Quality management & Certifications: Concept of Quality, Total Quality Management, Quality by Design (QbD), Six Sigma concept, Out of Specifications (OOS), Change control, Introduction to ISO 9000 series of quality systems standards, ISO 14000, NABL, GLP	**08**	CO5
[5]	**Indian Regulatory Requirements:** Central Drug Standard Control	**07**	CO3

	Organization (CDSCO) and State Licensing Authority: Organization, Responsibilities, Certificate of Pharmaceutical Product (COPP), Regulatory requirements and approval procedures for New Drugs.		CO4

C. TEXT BOOKS

1. B Nagarani. Industrial pharmacy-II. Blue Rose Publishers, New Delhi2021.

D. REFERENCE BOOKS

1. Regulatory Affairs from Wikipedia, the free encyclopedia modified on 7th April available at http,//en.wikipedia.org/wiki/Regulatory_ Affairs.
2. International Regulatory Affairs Updates, 2005. available athttp://www.iraup.com/about.php
3. Douglas J Pisano and David S. Mantus. Text book of FDA Regulatory Affairs A Guidefor Prescription Drugs, Medical Devices, and Biologics' Second Edition.
4. Regulatory Affairs brought by learning plus, inc. available athttp.//www.cgmp.com/ra.htm.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and apply	Understand and apply process of pilot plant and scale up of pharmaceutical dosage forms
CO2	Understand and remember	Understand and remember process of technology transfer from lab scale to commercial batch
CO3	Remember and apply	Remember and apply different Laws and Acts that regulate pharmaceutical industry
CO4	Understand, Remember and apply	Understand, Remember and apply approval process and regulatory requirements for drug products
CO5	Understand, apply and evaluate	Understand, apply and evaluate various aspects of quality and quality management

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	1	-	-	-	-	-	-	-	3	3	1	-	-
CO2	3	1	2	1	-	-	-	-	-	-	-	3	3	3	-	-
CO3	3	-	1	-	-	-	2	-	-	-	-	3	3	-	-	-
CO4	3	1	1	-	-	-	2	-	-	-	-	3	3	-	-	-
CO5	3	3	2	-	3	-	1	-	-	-	2	3	3	-	3	-
Avg	3	1.4	1.4	0.4	0.6	-	1	-	-	-	0.4	3	3	0.8	0.6	-

B. PHARM. SEMESTER – VII (BPH)
SUBJECT: PHARMACY PRACTICE -THEORY (BP703T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: In the changing scenario of pharmacy practice in India, for successful practice of Hospital Pharmacy, the students are required to learn various skills like drug distribution, drug information, and therapeutic drug monitoring for improved patient care. In community pharmacy, students will be learning various skills such as dispensing of drugs, responding to minor ailments by providing suitable safe medication, patient counselling for improved patient care in the community set up.

Objectives: Upon completion of the course the student shall be able to

- know various drug distribution methods in a hospital
- appreciate the pharmacy stores management and inventory control
- monitor drug therapy of patient through medication chart review and clinical review
- obtain medication history interview and counsel the patients
- identify drug related problems
- detect and assess adverse drug reactions
- interpret selected laboratory results (as monitoring parameters in therapeutics) of specific disease states
- know pharmaceutical care services
- do patient counselling in community pharmacy
- appreciate the concept of Rational drug therapy

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**a) Hospital and it's organization** Definition, Classification of hospital- Primary, Secondary and Tertiary hospitals, Classification based on clinical and non- clinical basis, Organization Structure of a Hospital, and Medical staffs involved in the hospital and their functions. **b) Hospital pharmacy and its organization** Definition, functions of hospital pharmacy, Organization structure, Location, Layout and staff requirements, and Responsibilities and functions of hospital pharmacists. **c) Adverse drug reaction** Classifications - Excessive pharmacological effects, secondary pharmacological effects, idiosyncrasy, allergic drug reactions, genetically determined toxicity, toxicity following sudden withdrawal of drugs, Drug interaction- beneficial interactions, adverse interactions, and pharmacokinetic drug interactions, Methods for detecting drug interactions, spontaneous case reports and record linkage studies, and Adverse drug reaction reporting and management. **d) Community Pharmacy** Organization and structure of retail and wholesale drug store, types and design, Legal requirements for establishment and maintenance of a drug store, Dispensing of proprietary products, maintenance of records of retail and wholesale drug store.	**10**	CO1 CO2

[2]	**a) Drug distribution system in a hospital** Dispensing of drugs to inpatients, types of drug distribution systems, charging policy and labelling, Dispensing of drugs to ambulatory patients, and Dispensing of controlled drugs. **b) Hospital formulary** Definition, contents of hospital formulary, Differentiation of hospital formulary and Drug list, preparation and revision, and addition and deletion of drug from hospital formulary. **c) Therapeutic drug monitoring** Need for Therapeutic Drug Monitoring, Factors to be considered during the Therapeutic Drug Monitoring, and Indian scenario for Therapeutic Drug Monitoring. **d) Medication adherence** Causes of medication non-adherence, pharmacist role in the medication adherence, and monitoring of patient medication adherence. **e) Patient medication history interview** Need for the patient medication history interview, medication interview forms. **f) Community pharmacy management** Financial, materials, staff, and infrastructure requirements.	**10**	CO2
[3]	**a) Pharmacy and therapeutic committee** Organization, functions, Policies of the pharmacy and therapeutic committee in including drugs into formulary, inpatient and outpatient prescription, automatic stop order, and emergency drug list preparation. **b) Drug information services** Drug and Poison information centre, Sources of drug information, Computerised services, and storage and retrieval of information. **c) Patient counselling** Definition of patient counselling; steps involved in patient counselling, and Special cases that require the pharmacist **d) Education and training program in the hospital** Role of pharmacist in the education and training program, Internal and external training program, Services to the nursing homes/clinics, Code of ethics for community pharmacy, and Role of pharmacist in the interdepartmental communication and community health education. **e) Prescribed medication order and communication skills** Prescribed medication order- interpretation and legal requirements, Communication skills- communication with prescribers and patients.	**10**	CO1 CO2 CO3
[4]	**a) Budget preparation and implementation** Budget preparation and implementation **b) Clinical Pharmacy** Introduction to Clinical Pharmacy, Concept of clinical pharmacy, functions and responsibilities of clinical pharmacist, Drug therapy monitoring - medication chart review, clinical review, pharmacist intervention, Ward round participation, Medication history and Pharmaceutical care. Dosing pattern and drug therapy based on Pharmacokinetic & disease pattern. **c) Over the counter (OTC) sales** Introduction and sale of over the counter, and Rational use of common over the counter medications.	**8**	CO4
[5]	**a) Drug store management and inventory control** Organisation of drug store, types of materials stocked and storage conditions, Purchase and inventory control: principles, purchase procedure,	**7**	CO4 CO5

	purchase order, procurement and stocking, Economic order quantity, Reorder quantity level, and Methods used for the analysis of the drug expenditure **b) Investigational use of drugs** Description, principals involved, classification, control, identification, role of hospital pharmacist, advisory committee. **c) Interpretation of Clinical Laboratory Tests** Blood chemistry, hematology, and urinalysis		

C. TEXT BOOKS

1. Tipnis Bajaj. Hospital Pharmacy, 1st ed. Maharashtra: Career Publications; 2008.
2. Merchant S.H. and Dr. J.S.Quadry. *A textbook of hospital pharmacy*, 4th ed. Ahmadabad: B.S. Shah Prakakshan; 2001.

D. REFERENCE BOOKS & JOURNALS

1. Parthasarathi G, Karin Nyfort-Hansen, Milap C Nahata. *A textbook of Clinical Pharmacy Practice- essential concepts and skills,* 1st ed. Chennai: Orient Longman Private Limited; 2004.
2. William E. Hassan. *Hospital pharmacy*, 5th ed. Philadelphia: Lea & Febiger; 1986.
3. Tipnis Bajaj. *Hospital Pharmacy*, 1st ed. Maharashtra: Career Publications; 2008.
4. Scott LT. *Basic skills in interpreting laboratory data*, 4thed. American Society of Health System Pharmacists Inc; 2009.
5. Parmar N.S. *Health Education and Community Pharmacy,* 18th ed. India: CBS Publishers & Distributers; 2008.

JOURNALS

1. Therapeutic drug monitoring. ISSN: 0163-4356(https://journals.lww.com/drug-monitoring/pages/default.aspx)
2. Journal of pharmacy practice. ISSN: 0974-8326 (https://ijopp.org/)
3. American journal of health system pharmacy. ISSN: 1535-2900 (online) (https://academic.oup.com/ajhp)
4. Pharmacy times (Monthly magazine) (https://www.pharmacytimes.com/)

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and Analyse	To understand the structure of healthcare system like hospital and community pharmacy and analyze adverse drug reactions
CO2	Remember, Understand and Evaluate	To get knowledge of various procedures carried out in the hospital and pharmacy and management of the pharmacy
CO3	Understand and remember	To know various committees and training programs in the hospitals and understand about communication skills
CO4	Understand and Remember	To understand basic clinical pharmacy practice and to know about financial management
CO5	Understand and evaluate	To understand the managemental practices of the drug store and know about interpretation of various biochemical laboratory tests

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	1	3	1	3	1	2	3	2	1	3	3	3	1	3
CO2	3	1	1	3	3	3	1	2	3	1	2	3	2	1	1	3
CO3	3	3	3	1	3	3	3	3	3	1	3	3	2	1	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2
CO5	3	3	3	3	3	3	3	3	3	1	3	3	3	3	3	2
Avg	3	2.2	2.2	2.6	2.6	3	2.2	2.6	3	1.6	2.4	3	2.6	2.2	2.2	2.6

B. PHARM. SEMESTER – VII (BPH)
SUBJECT: NOVEL DRUG DELIVERY SYSTEMS -THEORY (BP704T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This subject is designed to impart basic knowledge on the area of novel drug delivery systems.
Objectives: Upon completion of the course student shall be able

- To understand various approaches for development of novel drug delivery systems.
- To understand the criteria for selection of drugs and polymers for the development of novel drug delivery systems, their formulation and evaluation

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Controlled drug delivery systems:** Introduction, terminology/definitions and rationale, advantages, disadvantages, selection of drug candidates. Approaches to design controlled release formulations based on diffusion, dissolution and ion exchange principles. Physicochemical and biological properties of drugs relevant to controlled release formulations **Polymers:** Introduction, classification, properties, advantages and application of polymers in formulation of controlled release drug delivery systems.	**10**	CO4 CO2
[2]	**Microencapsulation:** Definition, advantages and disadvantages, microspheres/microcapsules, microparticles, methods of microencapsulation, applications **Mucosal Drug Delivery system:** Introduction, Principles of bioadhesion / mucoadhesion, concepts, advantages and disadvantages, transmucosal permeability and formulation considerations of buccal delivery systems **Implantable Drug Delivery Systems**: Introduction, advantages and disadvantages, concept of implants and osmotic pump	**10**	CO1 CO3 CO5
[3]	**Transdermal Drug Delivery Systems:** Introduction, Permeation through skin, factors affecting permeation, permeation enhancers, basic components of TDDS, formulation approaches **Gastroretentive drug delivery systems:** Introduction, advantages, disadvantages, approaches for GRDDS – Floating, high density systems, inflatable and gastroadhesive systems and their applications **Nasopulmonary drug delivery system:** Introduction to Nasal and Pulmonary routes of drug delivery, Formulation of Inhalers (dry powder and metered dose), nasal sprays, nebulizers	**10**	CO1 CO3 CO5
[4]	**Targeted drug Delivery:** Concepts and approaches advantages and disadvantages, introduction to liposomes, niosomes, nanoparticles, monoclonal antibodies and their applications	**08**	CO3 CO5
[5]	**Ocular Drug Delivery Systems:** Introduction, intra ocular barriers and methods to overcome –Preliminary study, ocular formulations and ocuserts **Intrauterine Drug Delivery Systems:** Introduction, advantages and disadvantages, development of intra uterine devices (IUDs) and applications	**07**	CO3 CO5

C. TEXT BOOKS

1. Jain, N. K. *Controlled and Novel Drug Delivery*; CBS Publishers & Distributors: New Delhi, India, 1997.
2. Vyas, S. P.; Khar, R. K. *Controlled Drug Delivery -Concepts and Advances,*; Vallabh Prakashan: New Delhi, 2002.

D. REFERENCE BOOKS

1. Chien, Y. W. *Novel Drug Delivery Systems, Second Edition*, 2nd ed.; CRC Press: Boca Raton, FL, 1991.
2. Robinson, J. R.; Lee, V. H. *Controlled Drug Delivery Systems*; Marcel Dekker, Inc: New York, 1992.
3. *Encyclopedia of Controlled Drug Delivery, 2 Volume Set*; Mathiowitz, E., Ed.; John Wiley & Sons: Nashville, TN, 1999.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand	To understand various approaches for development of novel drug delivery systems
CO2	Understand	To understand the criteria for selection of drugs and polymers for the development of Novel drug delivery systems
CO3	learn	Learn Aspects related to formulation and evaluation of various novel drug delivery systems
CO4	Understand and remember	Explain the principles and technology used in the design of sustained release and controlled release drug delivery systems
CO5	Analyse	Analyse various evaluation parameters for oral, parenteral, topical etc. drug delivery systems

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	2	-	2	-	2	2	3	2	3	3	3	3	2
CO2	3	2	2	3	-	2	-	2	3	2	1	2	3	3	3	1
CO3	3	3	3	3	-	2	-	2	3	3	2	2	3	3	3	2
CO4	3	2	3	2	-	2	-	2	3	2	2	3	3	3	2	2
CO5	3	3	3	3	-	2	-	2	2	1	1	2	3	3	3	1
Avg	3	2.6	2.6	2.6	-	2	-	2	2.6	2.2	1.6	2.4	3	3	2.8	1.6

B. PHARM. SEMESTER – VII (BPH)

SUBJECT: INSTRUMENTAL METHODS OF ANALYSIS - PRACTICAL (BP705P)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM		Total
-	-	4	4	2	35	10	5		50

A. COURSE OVERVIEW

Scope: This subject deals with the application of instrumental methods in qualitative and quantitative analysis of drugs. This subject is designed to impart a fundamental knowledge on the principles and instrumentation of spectroscopic and chromatographic technique. This also emphasizes on theoretical and practical knowledge on modern analytical instruments that are used for drug testing.

Objectives: Upon completion of the course the student shall be able to

- Understand spectroscopy and chromatographic techniques and their applications in drug analysis
- Perform quantitative & qualitative analysis of drugs using various analytical instruments.

B. COURSE CONTENT

NO	TOPIC	P (Hrs)	COs
[1]	Determination of absorption maxima and effect of solvents on absorption maxima of organic compounds Estimation of dextrose by colorimetry Estimation of sulfanilamide by colorimetry Simultaneous estimation of ibuprofen and paracetamol by UV spectroscopy Assay of paracetamol by UV- Spectrophotometry Estimation of quinine sulfate by fluorimetry Study of quenching of fluorescence	**30**	CO1 CO2 CO5
[2]	Determination of sodium by flame photometry Determination of potassium by flame photometry Determination of chlorides and sulphates by nephelo turbidometry Separation of amino acids by paper chromatography Separation of sugars by thin layer chromatography Separation of plant pigments by column chromatography Demonstration experiment on HPLC Demonstration experiment on Gas Chromatography	**30**	CO2 CO3 CO4 CO5

C. TEXT BOOKS

1. *Practical book of instrumental methods of analysis – Final Year BPharm – Semester 7*, first.; Abhishek Tiwari, Ed.; Nirali Prakashan, 2020.
2. Beckett, A. H.; Stenlake, J. B. *Practical Pharmaceutical Chemistry*; Athlone Press: London, 1988.

D. REFERENCE BOOKS

1. JW Munson. *Pharmaceutical Analysis - Modern Methods Part-B*; Marcel. Dekker Series.; Vol. 11.
2. Kalsi, P. S. *Spectroscopy of Organic Compounds.*; New Age International Pvt, 2016.
3. Silverstein, R. M.; Webster, F. X.; Kiemle, D. J.; Bryce, D. L. *Spectrometric Identification of Organic Compounds*; Wiley: Hoboken, Nj, 2015.

4. Skoog, D. A.; F James Holler; Crouch, S. R. *Principles of Instrumental Analysis*; Thomson, Brooks/Cole: Belmont, Ca, 2007.
5. Hobart Hurd Willard. *Instrumental Methods of Analysis*; Wadsworth: Belmont, 1993.
6. Kemp, W. *Organic Spectroscopy*; Palgrave: Basingstoke, 2001.
7. Sethi, P. D. *Quantitative Analysis of Drugs in Pharmaceutical Formulations*; Cbs Publishers & Distritutors: New Delhi, 2005.
8. Sharma B K. *Instrumental Methods of Chemical Analysis*, 27th edition.; Goel Publishing House: Meerut, 2011.
9. Sharma, Y. R. *Elementary Organic Spectroscopy : Principles and Chemical Applications*; S. Chand & Company: New Delhi, 2007.
10. Garratt, D. C. *The Quantitative Analysis of Drugs : Assisted by L. Brealey Etc.*; Chapman & Hall: London, 1964.
11. Finar, I. L. *Organic Chemistry.*; Pearson Education, (9Th Impression: Delhi, 2011.
12. Connors, K. A. *A Textbook of Pharmaceutical Analysis*; Wiley: New York, 1982.
13. Mendham, A. *Vogel's Textbook of Quantitative Chemical Analysis.*; Pearson: New Delhi, 2009.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and remember	To understand the fundamentals of spectroscopy in drug analysis
CO2	Understand Apply and Evaluate	To apply the fundamentals of spectroscopy in qualitative and quantitative drug analysis
CO3	Understand and remeber	To understand the fundamentals of chromatography in drug analysis
CO4	Understand Apply and Evaluate	To apply the fundamentals of chromatography in qualitative and quantitative drug analysis
CO5	Understand Apply and Evaluate	To understand working and handling of various analytical instruments.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	1	1	-	1	-	1	-	-	3	3	3	1	1	-
CO2	3	3	3	2	-	2	1	1	2	-	3	3	3	2	2	1
CO3	3	-	1	1	-	1	-	1	-	-	3	3	3	1	1	-
CO4	3	3	3	2	-	2	1	1	2	-	3	3	3	2	2	1
CO5	3	3	-	-	-	2	1	1	1	-	3	3	3	2	2	1
Avg	3	1.8	1.6	1.2	-	1.6	0.6	1	1	-	3	3	3	1.6	1.6	0.6

B. PHARM. SEMESTER – VII (BPH)
SUBJECT: PRACTICE SCHOOL (BP706PS)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM		Total
-	-	12	6	6	125	-	25		150

A. COURSE OVERVIEW

In the VII semester, every candidate shall undergo practice school for a period of 150 hours evenly distributed throughout the semester. The student shall opt any one of the domains for practice school declared by the program committee from time to time.
At the end of the practice school, every student shall submit a printed report (in triplicate) on the practice school he/she attended (not more than 25 pages). Along with the exams of semester VII, the report submitted by the student, knowledge and skills acquired by the student through practice school shall be evaluated by the subject experts at college Level and grade point shall be awarded.

B. PHARM. SEMESTER – VIII (BPH)

SUBJECT: BIOSTATISTICS AND RESEARCH METHODOLOGY -THEORY (BP801T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: To understand the applications of Biostatics in Pharmacy. This subject deals with descriptive statistics, Graphics, Correlation, Regression, logistic regression Probability theory, Sampling technique, Parametric tests, Non-Parametric tests, ANOVA, Introduction to Design of Experiments, Phases of Clinical trials and Observational and Experimental studies, SPSS, R and MINITAB statistical software's, analysing the statistical data using Excel.

Objectives: Upon completion of the course the student shall be able to

- Know the operation of M.S. Excel, SPSS, R and MINITAB®, DoE (Design of Experiment)
- Know the various statistical techniques to solve statistical problems
- Appreciate statistical techniques in solving the problems.

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Introduction:** Statistics, Biostatistics, Frequency distribution **Measures of central tendency:** Mean, Median, Mode- Pharmaceutical examples Measures of dispersion: Dispersion, Range, standard deviation, Pharmaceutical problems **Correlation:** Definition, Karl Pearson's coefficient of correlation, Multiple correlation - Pharmaceuticals examples	**10**	CO1 CO2
[2]	**Regression:** Curve fitting by the method of least squares, fitting the lines y= a + bx and x = a + by, Multiple regression, standard error of regression– Pharmaceutical Examples **Probability:** Definition of probability, Binomial distribution, Normal distribution, Poisson's distribution, properties - problems Sample, Population, large sample, small sample, Null hypothesis, alternative hypothesis, sampling, essence of sampling, types of sampling, Error-I type, Error-II type, Standard error of mean (SEM) - Pharmaceutical examples **Parametric test:** t-test (Sample, Pooled or Unpaired and Paired), ANOVA, (One way and Two way), Least Significance difference	**10**	CO1 CO2
[3]	**Non-Parametric tests:** Wilcoxon Rank Sum Test, Mann-Whitney U test, Kruskal-Wallis test, Friedman Test. **Introduction to Research:** Need for research, Need for design of Experiments, Experiential Design Technique, plagiarism **Graphs:** Histogram, Pie Chart, Cubic Graph, response surface plot, Counter Plot graph **Designing the methodology:** Sample size determination and Power of a study, Report writing and presentation of data, Protocol, Cohorts studies, Observational studies, Experimental studies, Designing clinical trial, various phases.	**10**	CO2 CO3 CO4

[4]	Blocking and confounding system for Two-level factorials **Regression modeling:** Hypothesis testing in Simple and Multiple regression models. **Introduction to Practical components of Industrial and Clinical Trials Problems:** Statistical Analysis Using Excel, SPSS, MINITAB®, DESIGN OF EXPERIMENTS, R - Online Statistical Software's to Industrial and Clinical trial approach	**08**	CO2 CO3 CO5
[5]	**Design and Analysis of experiments:** **Factorial Design:** Definition, 22, 23design. Advantage of factorial design **Response Surface methodology:** Central composite design, Historical design, Optimization Techniques	**07**	CO4 CO5

C. TEXT BOOKS

1. Bolton, Stanford. Pharmaceutical statistics: Practical and clinical applications; 2nd Ed; Marcel Dekker Inc: New York, 1997
2. Panneerselvam, R. Design and Analysis of Experiments; PHI: India, 2012

D. REFERENCE BOOKS

1. Gupta, SC. Fundamentals of Statistics;7th Ed; Himalaya Publishing House: India, 2018
2. Montgomery, DC. Design and Analysis of Experiments;10th Ed (student edition); John Wiley & Sons, 2019

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and Apply	To understand statistical techniques and apply to solve statistical problem
CO2	Remember, Understand and Apply	To understand various hypothesis testing techniques and application to pharmaceutical experiments.
CO3	Understand	To learn research methodology for pharmaceutical experiments
CO4	Understand and Remember	To understand optimization and design of experiments (DoE) for pharmaceutical experiments.
CO5	Understand and Apply	To know operation and application of different statistical software for statistical optimization of experiments.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	3	3	-	-	2	-	1	-	3	3	3	2	3	2
CO2	3	-	3	3	-	-	2	-	1	-	3	3	3	2	1	2
CO3	3	-	3	3	-	-	3	-	3	-	3	3	3	2	3	2
CO4	3	-	3	3	-	-	2	-	2	-	3	3	3	2	2	2
CO5	3	-	3	3	-	-	1	-	3	-	3	3	3	2	1	2
Avg	3	-	3	3	-	-	2		2	-	3	3	3	2	2	2

B. PHARM. SEMESTER – VIII (BPH)
SUBJECT: SOCIAL AND PREVENTIVE PHARMACY (BP802T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: The purpose of this course is to introduce to students a number of health issues and their challenges. This course also introduced a number of national health programmes. The roles of the pharmacist in these contexts are also discussed.

Objectives: After the successful completion of this course, the student shall be able to:

- Acquire high consciousness/realization of current issues related to health and Pharmaceutical problems within the country and worldwide.
- Have a critical way of thinking based on current healthcare development.
- Evaluate alternative ways of solving problems related to health and pharmaceutical issues.

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	a. Concept of health and disease: Definition, concepts and evaluation of public health. Understanding the concept of prevention and control of disease, social causes of diseases and social problems of the sick. b. Social and health education: Food in relation to nutrition and health, Balanced diet, Nutritional deficiencies, Vitamin deficiencies, Malnutrition and its prevention. c. Sociology and health: Socio cultural factors related to health and disease, Impact of urbanization on health and disease, Poverty and health d. Hygiene and health: personal hygiene and health care; avoidable habits	**10**	CO1 CO2
[2]	**Preventive medicine:** General principles of prevention and control of diseases such as cholera, SARS, Ebola virus, influenza, acute respiratory infections, malaria, chikungunya, dengue, lymphatic filariasis, pneumonia, hypertension, diabetes mellitus, cancer, drug addiction-drug substance abuse	**10**	CO2
[3]	**National health programs, its objectives, functioning and outcome of the following:** HIV AND AIDS control programme, TB, Integrated disease surveillance program (IDSP), National leprosy control programme, National mental health program, National programme for prevention and control of deafness, Universal immunization programme, National programme for control of blindness, Pulse polio programme.	**10**	CO3 CO4 CO5
[4]	National health intervention programme for mother and child, National family welfare programme, National tobacco control programme, National Malaria Prevention Program, National programme for the health care for the elderly, Social health programme; role of WHO in Indian national program	**08**	CO3 CO4 CO5
[5]	Community services in rural, urban and school health: Functions of PHC, Improvement in rural sanitation, national urban health mission, Health promotion and education in school.	**07**	CO3 CO4 CO5

C. TEXT BOOKS

1. Prabhakara, G. N. Short Textbook of Preventive and Social Medicine; Jaypee Brothers Medical Publishers: Bengaluru ; St. Louis (USA), 2010.
2. Rabindra, R.; Jaypee Brothers (Jaypeedigital. Mahajan & Gupta Textbook of Preventive and Social Medicine; Jaypee Brothers Medical Publisher (P) Ltd, 2013.

D. REFERENCE BOOKS & JOURNAL

1. Jain, V. Review of Preventive and Social Medicine (Including Biostatistics); 6th Edn. Jaypee Publication, New Delhi, 2014.
2. Lalita, H. D.; Dhananjaya, H. A. Essentials of Community Medicine—A Practical Approach; 2nd Edn. Jaypee Publications, New Delhi, 2012.
3. Park, K. Park's Textbook of Preventive and Social Medicine; 21st Edn. Bhanot Publishers: India, 2015.
4. Adepu, R. Community Pharmacy Practice; PharmaMed Press/BSP Books, Telangana, India, 2022.

JOURNAL:

1. Research in Social and Administrative Pharmacy, Elsevier, Ireland (https://www.sciencedirect.com/journal/research-in-social-and-administrative-pharmacy)

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and Analyse	To understand basic concept of health and effect of various social, mental and hygienic aspects on health
CO2	Remember, Understand and Evaluate	To get knowledge of various communicable and non-communicable diseases and its preventive measures
CO3	Understand Apply and Evaluate	To get knowledge about various state and central government health programs on various health problems
CO4	Understand and remember	To know government efforts on various critical health issues
CO5	Understand and remember	To know about health infrastructure and role of government in the development of infrastructure as well as importance of hygine

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	3	3	3	3	3	3	3	3	3	2	3	3	3	3
CO2	3	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	2	1	2	1	3	3	3	3	3	1	2	3	3	2	2	3
CO4	2	1	2	1	3	3	3	3	3	1	2	1	3	2	2	3
CO5	3	1	2	1	3	3	3	3	3	1	2	2	3	2	2	3
Avg	2.6	1	2.4	1.8	3	3	3	3	3	1.8	2.4	2.2	3	2.4	2.4	3

B. PHARM. SEMESTER – VIII (BPH)
SUBJECT: PHARMA MARKETING MANAGEMENT (Theory) (BP803ET)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: The pharmaceutical industry not only needs highly qualified researchers, chemists and, technical people, but also requires skilled managers who can take the industry forward by managing and taking the complex decisions which are imperative for the growth of the industry. The Knowledge and Know-how of marketing management groom the people for taking a challenging role in Sales and Product management.

Objectives: The course aims to provide an understanding of marketing concepts and techniques and their applications in the pharmaceutical industry.

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Marketing:** Definition, general concepts and scope of marketing; Distinction between marketing & selling; Marketing environment; Industry and competitive analysis; Analyzing consumer buying behavior; industrial buying behavior. **Pharmaceutical market:** Quantitative and qualitative aspects; size and composition of the market; demographic descriptions and socio-psychological characteristics of the consumer; market segmentation& targeting. Consumer profile; Motivation and prescribing habits of the physician; patients' choice of physician and retail pharmacist. Analyzing the Market; Role of market research.	**10**	CO1
[2]	**Product decision:** Classification, product line and product mix decisions, product life cycle, product portfolio analysis; product positioning; New product decisions; Product branding, packaging and labeling decisions, Product management in pharmaceutical industry.	**08**	CO2
[3]	**Promotion:** Methods, determinants of promotional mix, promotional budget; An overview of personal selling, advertising, direct mail, journals, sampling, retailing, medical exhibition, public relations, online promotional techniques for OTC Products.	**07**	CO3
[4]	**Pharmaceutical marketing channels:** Designing channel, channel members, selecting the appropriate channel, conflict in channels, physical distribution management: Strategic importance, tasks in physical distribution management. **Professional sales representative (PSR):** Duties of PSR, purpose of detailing, selection and training, supervising, norms for customer calls, motivating, evaluating, compensation and future prospects of the PSR.	**10**	CO4
[5]	**Pricing:** Meaning, importance, objectives, determinants of price; pricing methods	**10**	CO5

	and strategies, issues in price management in pharmaceutical industry. An overview of DPCO (Drug Price Control Order) and NPPA (National Pharmaceutical Pricing Authority). **Emerging concepts in marketing:** Vertical & Horizontal Marketing; Rural Marketing; Consumerism; Industrial Marketing; Global Marketing.		

C. TEXT BOOKS:

1. Patil, PA. & Thakare, HN., "Text book of Pharmaceutical marketing management" 1st edition, White Falcon Publishing, 2020.
2. Dr. Bhambere, DS., Dr. Ahirrao, SP., Dr. Kankate, RS. & Dr. Laddha UD., "Pharma Marketing Management", 1st edition, Bhumi Publishing 2021.

D. REFERENCE BOOKS:

1. Walker, OC., Boy, H. & Larreche, JC., "Marketing Strategy- Planning and Implementation", 1st edition, Tata MC Graw Hill Education, New Delhi., 1999.
2. Grewal, D., & Levy, M.,"Marketing", Indian Edition, Tata MC Graw Hill India. 2017.
3. Kumar A. & Meenakshi N. "Marketing Management", 3rd edition, Vikas Publishing House Pvt. Ltd., India., 2017.
4. Saxena, R., "Marketing Management", 6th edition, Tata MC Graw-Hill, 2019.
5. Ramaswamy, US & Nanakamari, S., "Marketing Managemnt" 5th edition, MC Graw Hill Education, New Delhi, 2017.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and Analyse	Describe the concept of pharmaceutical marketing in research area.
CO2	Create and Apply	Create and apply the idea of new product development in pharmaceutical Industry.
CO3	Understand, Remember and Analyse	Discuss the components of promotion of pharmaceutical products.
CO4	Remember, apply , understand and Evaluate	Explain pharmaceutical marketing channels. To evaluate the responsibility of professional sales representative.
CO5	Identify, Apply & Evaluate	Discuss responsibilities of pricing authorities in India.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	3	2	-	2	2	-	2	3	3	2	3	-
CO2	3	2	2	2	-	2	-	2	2	-	2	3	3	2	2	-
CO3	3	2	2	2	3	2	-	2	2	-	2	3	3	2	3	-
CO4	3	2	2	2	3	2	-	2	2	-	2	3	3	2	3	-
CO5	3	2	2	2	-	2	-	2	2	-	2	3	3	2	2	-
Avg	3	2	2	2	1.8	2	-	2	2	-	2	3	3	2	2.6	-

B. PHARM. SEMESTER – VIII (BPH)
SUBJECT: PHARMACEUTICAL REGULATORY SCIENCE - THEORY (BP804T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This course is designed to impart the fundamental knowledge on the regulatory requirements for approval of new drugs, and drug products in regulated markets of India & other countries like US, EU, Japan, Australia, UK etc. It prepares the students to learn in detail on the regulatory requirements, documentation requirements, and registration procedures for marketing the drug products.

Objectives: Upon completion of the subject student shall be able to;

- Know about the process of drug discovery and development
- Know the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
- Know the regulatory approval process and their registration in Indian and international markets

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**New Drug Discovery and development** Stages of drug discovery, Drug development process, pre-clinical studies, non-clinical activities, clinical studies, Innovator and generics, Concept of generics, Generic drug product development.	**10**	CO1
[2]	**Regulatory Approval Process** Approval processes and timelines involved in Investigational New Drug (IND), New Drug Application (NDA), Abbreviated New Drug Application (ANDA). Changes to an approved NDA / ANDA. **Regulatory authorities and agencies** Overview of regulatory authorities of India, United States, European Union, Australia, Japan, Canada (Organization structure and types of applications)	**10**	CO2 CO3 CO4
[3]	**Registration of Indian drug product in overseas market** Procedure for export of pharmaceutical products, Technical documentation, Drug Master Files (DMF), Common Technical Document (CTD), electronic Common Technical Document (eCTD), ASEAN Common Technical Document (ACTD)research.	**10**	CO3
[4]	**Clinical trials** Developing clinical trial protocols, Institutional Review Board / Independent Ethics committee - formation and working procedures, Informed consent process and procedures, GCP obligations of Investigators, sponsors & Monitors, Managing and Monitoring clinical trials, Pharmacovigilance - safety monitoring in clinical trials	**08**	CO5
[5]	**Regulatory Concepts** Basic terminology, guidance, guidelines, regulations, Laws and Acts, Orange book, Federal Register, Code of Federal Regulatory, Purple book	**07**	CO5

C. TEXT BOOKS

1. Itkar, S.; Vyawahare, N. S. *Drug Regulatory Affaira*, Kindle.; Nirali Prakashan, 2019.
2. Berry, I. R.; Martin, R. P. *The Pharmaceutical Regulatory Process*; Informa Healthcare: New York, 2008.

D. REFERENCE BOOKS

1. Guarino, R. A. *New Drug Approval Process*; Informa Healthcare, Cop: New York, 2009.
2. Weinberg, S. *Guidebook for Drug Regulatory Submissions*; Wiley: Hoboken, N.J., 2009.
3. Pisano, D. J. *FDA Regulatory Affairs : A Guide for Prescription Drugs, Medical Devices, and Biologics*; Informa Healthcare Usa: New York, 2008.
4. Kanfer, I.; Shargel, L. *Generic Drug Product Development : Solid Oral Dosage Forms*; Marcel Dekker: New York, 2005.
5. Rozovsky, F. A.; Adams, R. K. *Clinical Trials and Human Research : A Practical Guide to Regulatory Compliance*; Jossey-Bass: San Francisco, 2003.
6. Gallin, J. I.; Ognibene, F. P.; Laura Lee Johnson. *Principles and Practice of Clinical Research*; Elsevier/Academic Press: London ; San Diego, Ca, 2018.
7. Ng, R. *Drugs : From Discovery to Approval*; Wiley-Blackwell: Chichester, 2009.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand	To understand the process of drug discovery and development
CO2	Understand and remember	To understand the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
CO3	Understand and remember	To understand the regulatory approval process and their registration in international markets
CO4	Understand and remember	To understand the regulatory approval process and their registration in Indian markets
CO5	Understand remember and Apply	To Understand the regulatory concepts and clinical trial aspects

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	1	2	2	3	3	-	3	3	3	2	3	3
CO2	3	-	-	-	-	1	2	3	2	-	3	3	3	1	2	2
CO3	3	-	-	1	-	1	2	3	2	-	3	3	3	1	2	2
CO4	3	-	-	1	-	1	2	3	2	-	3	3	3	1	2	2
CO5	3	2	2	2	1	2	2	3	3	-	3	3	3	2	3	3
Avg	3	0.8	0.8	1.2	0.4	1.4	2	3	2.4	-	3	3	3	1.4	2.4	2.4

B. PHARM. SEMESTER – VIII (BPH)
SUBJECT: PHARMACOVIGILANCE (BP805ET)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This paper will provide an opportunity for the student to learn about development of pharmacovigilance as a science, basic terminologies used in pharmacovigilance, global scenario of Pharmacovigilance, train students on establishing pharmacovigilance programme in an organization, various methods that can be used to generate safety data and signal detection. This paper also develops the skills of classifying drugs, diseases and adverse drug reactions. The purpose of this course is to introduce to students a number of health issues and their challenges. This course also introduced a number of national health programmes. The roles of the pharmacist in these contexts are also discussed.

Objectives: At completion of this paper it is expected that students will be able to (know, do, and appreciate):

- Why drug safety monitoring is important?
- History and development of pharmacovigilance
- National and international scenario of pharmacovigilance
- Dictionaries, coding and terminologies used in pharmacovigilance
- Detection of new adverse drug reactions and their assessment
- International standards for classification of diseases and drugs
- Adverse drug reaction reporting systems and communication in pharmacovigilance
- Methods to generate safety data during pre-clinical, clinical and post approval phases of drugs' life cycle
- Drug safety evaluation in paediatrics, geriatrics, pregnancy and lactation
- Pharmacovigilance Program of India (PvPI) requirement for ADR reporting in India
- ICH guidelines for ICSR, PSUR, expedited reporting, pharmacovigilance planning
- CIOMS requirements for ADR reporting
- Writing case narratives of adverse events and their quality.

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Introduction to Pharmacovigilance** • History and development of Pharmacovigilance • Importance of safety monitoring of Medicine • WHO international drug monitoring programme • Pharmacovigilance Program of India(PvPI) **Introduction to adverse drug reactions** • Definitions and classification of ADRs • Detection and reporting • Methods in Causality assessment • Severity and seriousness assessment • Predictability and preventability assessment • Management of adverse drug reactions **Basic terminologies used in pharmacovigilance**	**10**	CO1 CO2

	• Terminologies of adverse medication related events • Regulatory terminologies		
[2]	**Drug and disease classification** • Anatomical, therapeutic and chemical classification of drugs • International classification of diseases • Daily defined doses • International Non-proprietary Names for drugs **Drug dictionaries and coding in pharmacovigilance** • WHO adverse reaction terminologies • MedDRA and Standardised MedDRA queries • WHO drug dictionary • Eudravigilance medicinal product dictionary **Information resources in pharmacovigilance** • Basic drug information resources • Specialised resources for ADRs **Establishing pharmacovigilance programme** • Establishing in a hospital • Establishment & operation of drug safety department in industry • Contract Research Organisations (CROs) • Establishing a national programme	**10**	CO2
[3]	**Vaccine safety surveillance** • Vaccine Pharmacovigilance • Vaccination failure • Adverse events following immunization **Pharmacovigilance methods** • Passive surveillance – Spontaneous reports and case series • Stimulated reporting • Active surveillance – Sentinel sites, drug event monitoring and registries • Comparative observational studies – Cross sectional study, case control study and cohort study • Targeted clinical investigations **Communication in pharmacovigilance** • Effective communication in Pharmacovigilance • Communication in Drug Safety Crisis management • Communicating with Regulatory Agencies, Business Partners, Healthcare facilities & Media	**10**	CO2 CO3
[4]	**Safety data generation** • Pre-clinical phase • Clinical phase • Post approval phase (PMS) **ICH Guidelines for Pharmacovigilance** • Organization and objectives of ICH • Expedited reporting • Individual case safety reports • Periodic safety update reports • Post approval expedited reporting • Pharmacovigilance planning • Good clinical practice in pharmacovigilance studies	**08**	CO4
[5]	**Pharmacogenomics of adverse drug reactions** • Genetics related ADR with example focusing PK parameters.	**07**	CO5

	Drug safety evaluation in special population • Paediatrics • Pregnancy and lactation • Geriatrics **CIOMS** • CIOMS Working Groups • CIOMS Form **CDSCO (India) and Pharmacovigilance** • D&C Act and Schedule Y • Differences in Indian and global pharmacovigilance requirements		

C. TEXT BOOKS

1. Gupta, S. K.; India. Textbook of Pharmacovigilance; Jaypee Brothers Medical Publishers: New Delhi, 2011.
2. Mohanta, G. P.; Manna, P. K. Text book of Pharmacovigilance: concept and practice; PharmaMed Press: Hydrabad, India, 2016.

D. REFERENCE BOOKS & WEBSITES

1. Cobert, B. L.; Biron, P. Practical Drug Safety from A to Z; Sudbury, Mass Jones and Bartlett, 2009.
2. Andrews, E. B.; Moore, N. Mann's Pharmacovigilance; John Wiley & Sons Inc: Chichester, West Sussex, Uk, 2014.
3. Stephens, M. D. B.; Talbot, J. C.C.; Waller, P. Stephens' Detection of New Adverse Drug Reactions; Wiley: Chichester; Hoboken, NJ, 2004.
4. Waller, P.; Harrison-Woolrych, M. An Introduction to Pharmacovigilance; Wiley Blackwell/John Wiley & Sons Inc: Chichester, West Sussex, Uk ; Hoboken, Nj, 2017.
5. Cobert, B. Cobert's Manual of Drug Safety and Pharmacovigilance; Jones And Bartlett Publishers: 1997, 2011.
6. Strom, B. L. Textbook of Pharmacoepidemiology.; Wiley-Blackwell: S.L., 2022.
7. Parthasarathi, G.; Nyfort-Hansen, K.; Nahata, M. C.; Elliott, R. A.; George, J.; Nation, R. L.; Rayner, C. R. A Text Book of Clinical Pharmacy Practice: Essential Concepts and Skills; Orient Longman Ltd: Hyderabad, 2004.
8. National Formulary of India
9. http://www.whoumc.org/DynPage.aspx?id=105825&mn1=7347&mn2=7259&mn3=7297
10. https://www.ich.org/
11. http://www.cioms.ch/
12. http://cdsco.nic.in/
13. http://www.who.int/vaccine_safety/en/
14. http://www.ipc.gov.in/PvPI/pv_home.html

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and Analyse	To know about basic aspects of Pharmacovigilance and Adverse Drug Reactions
CO2	Remember, Understand and Evaluate	To understand various terminologies related to drugs, coding and Adverse Drug Reactions and to know about organization of pharmacovigilance programs
CO3	Understand Apply and Evaluate	To get knowledge about various methods and communication techniques in Pharmacovigilance
CO4	Understand and remember	To know about various ICH guidelines related to Pharmacovigilance
CO5	Understand and remember	To understand basics of Pharmacogenomics and to know the rules and regulations related to Pharmacovigilance in India

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	3	2	3	2	3	3	3	3	3	3	3	2	2
CO2	3	3	2	3	3	3	1	3	3	1	3	3	3	3	3	2
CO3	3	3	3	3	3	3	1	3	3	1	3	3	3	3	3	2
CO4	3	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	1	3	3	3	3	3	3	3	3	3	2	3
Avg	3	2.6	2.8	3	2.4	3	2	3	3	2.2	3	3	3	3	2.6	2.4

B. PHARM. SEMESTER – VIII (BPH)

SUBJECT: QUALITY CONTROL AND STANDARDIZATION OF HERBALS – THEORY (BP806ET)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	--	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: In this subject the student learns about the various methods and guidelines for evaluation and standardization of herbs and herbal drugs. The subject also provides an opportunity for the student to learn cGMP, GAP and GLP in traditional system of medicines.

Objectives: Upon completion of the subject student shall be able to;

- know WHO guidelines for quality control of herbal drugs
- know Quality assurance in herbal drug industry
- know the regulatory approval process and their registration in Indian and international markets
- appreciate EU and ICH guidelines for quality control of herbal drugs

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	Basic tests for drugs – Pharmaceutical substances, Medicinal plants materials and dosage forms WHO guidelines for quality control of herbal drugs. Evaluation of commercial crude drugs intended for use	**10**	CO1
[2]	**Quality assurance in herbal drug industry** of cGMP, GAP, GMP and GLP in traditional system of medicine. WHO Guidelines on current good manufacturing Practices (cGMP) for Herbal Medicines WHO Guidelines on GACP for Medicinal Plants.	**10**	CO2
[3]	EU and ICH guidelines for quality control of herbal drugs. Research Guidelines for Evaluating the Safety and Efficacy of Herbal Medicines	**10**	CO3 CO4
[4]	Stability testing of herbal medicines. Application of various chromatographic techniques in standardization of herbal products. Preparation of documents for new drug application and export registration GMP requirements and Drugs & Cosmetics Act provisions.	**08**	CO5
[5]	Regulatory requirements for herbal medicines. WHO guidelines on safety monitoring of herbal medicines in pharmacovigilance systems Comparison of various Herbal Pharmacopoeias. Role of chemical and biological markers in standardization of herbal products	**07**	CO4 CO5

B. TEXT BOOKS

1. Dr. Pankaj Pradhan and Dr. Dillip Kumar Jena, "Quality Control and Standardization of Herbals", Thakur Publication PVT. LTD., Lucknow, 2021.
2. Dr. Antara Choudhury, "Quality control and standardization of herbals", Nirali Prakashan, India, 2021.

C. REFERENCE BOOKS

1. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002.
2. Shinde M.V., Dhalwal K., Potdar K., Mahadik K. Application of quality control principles to herbal drugs. International Journal of Phytomedicine 1(2009); p. 4-8.
3. WHO Quality Control Methods for Medicinal Plant Materials, World Health Organization, Geneva, 1998.
4. WHO Guidelines for the Appropriate Use of Herbal Medicines. WHO Regional Publications, Western Pacific Series No 3, WHO Regional office for the Western Pacific, Manila, 1998.
5. WHO The International Pharmacopeia, Vol. 2: Quality Specifications, 3rd edn. World Health Organization, Geneva, 1981.
6. WHO Quality Control Methods for Medicinal Plant Materials. World Health Organization, Geneva, 1999.
7. WHO Global Atlas of Traditional, Complementary and Alternative Medicine. 2 vol. set. Vol. 1 contains text and Vol. 2, maps. World Health Organization, Geneva, 2005.
8. WHO Guidelines on Good Agricultural and Collection Practices (GACP) for Medicinal Plants. World Health Organization, Geneva, 2004.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and evaluate	To evaluate crude drugs as per WHO guidelines.
CO2	Understand and apply	Discuss Quality assurance and techniques in herbal drug industry and herbal products.
CO3	Remember and evaluate	EU and ICH guidelines for quality control of herbal drugs and for Evaluating the Safety and Efficacy of Herbal Medicines.
CO4	Understand, remember and apply	Explain Regulatory requirements for herbal medicines.
CO5	Create and apply	To prepare documents for new drug application and apply GMP requirements and Drugs & Cosmetics Act provisions.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	3	0	1	3	1	2	1	2	3	3	3	2	2
CO2	3	2	2	3	0	2	2	2	2	2	3	3	3	3	2	2
CO3	3	2	3	3	1	2	3	2	2	2	2	3	2	3	2	2
CO4	3	2	2	3	2	2	2	2	2	3	3	3	3	3	2	2
CO5	3	2	2	3	2	3	2	2	2	2	2	3	3	3	3	2
Avg	3	2	2	3	1	2	2.4	1.8	2	2	2.4	3	2.8	3	2.2	2

B. PHARM. SEMESTER – VIII (BPH)
SUBJECT: COMPUTER AIDED DRUG DESIGN-THEORY (BP807ET)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This subject is designed to provide detailed knowledge of rational drug design process and various techniques used in rational drug design process.

Objectives: Upon completion of the course, the student shall be able to understand

- Design and discovery of lead molecules
- The role of drug design in drug discovery process
- The concept of QSAR and docking
- Various strategies to develop new drug like molecules.
- The design of new drug molecules using molecular modelling software

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Introduction to Drug Discovery and Development** Stages of drug discovery and development **Lead discovery and Analog Based Drug Design** Rational approaches to lead discovery based on traditional medicine, Random screening, Non-random screening, serendipitous drug discovery, lead discovery based on drug metabolism, lead discovery based on clinical observation. **Analog Based Drug Design:** Bioisosterism, Classification, Bioisosteric replacement. Any three case studies	**10**	CO1
[2]	**Quantitative Structure Activity Relationship (QSAR)** SAR versus QSAR, History and development of QSAR, Types of physicochemical parameters, experimental and theoretical approaches for the determination of physicochemical parameters such as Partition coefficient, Hammet's substituent constant and Tafts steric constant. Hansch analysis, Free Wilson analysis, 3D-QSAR approaches like COMFA and COMSIA	**10**	CO1 CO2
[3]	**Molecular Modeling and virtual screening techniques** **Virtual Screening techniques:** Drug likeness screening, Concept of pharmacophore mapping and pharmacophore-based Screening, **Molecular docking**: Rigid docking, flexible docking, manual docking, Docking based screening. De novo drug design.	**10**	CO1 CO2 CO3
[4]	**Informatics & Methods in drug design** Introduction to Bioinformatics, chemoinformatics. ADME databases, chemical, biochemical and pharmaceutical databases	**08**	CO1 CO4
[5]	**Molecular Modeling:** Introduction to molecular mechanics and quantum mechanics.Energy Minimization methods and Conformational Analysis, global conformational minima determination.	**07**	CO1 CO5

C. TEXT BOOKS

1. Mehta, S.K., Singh, R.K. A Text Book of Computer Aided Drug Design, 1st ed.; S. Vikas and Company, India, 2018
2. Siddiqui, A.A, Kumar, H., Khisal S. Computer-Aided Drug Design. 1st ed.; CBS Publishers, India, 2019

D. REFERENCE BOOKS

1. Hansch, C., Semmes, P.G., Taylor, J.B. Comprehensive Medicinal Chemistry, Volume I to VI, 1st ed.; Elsevier, India, 2005
2. Abraham, D.J. Burger's Medicinal Chemistry and Drug Discovery, Volume I to VI, 6th ed.; Wiley-Interscience, New Jersey, 2003
3. Patrick, G.L. An Introduction to Medicinal Chemistry, 3rd ed.; Oxford University Press, Oxford, 2006
4. Silverman, R.B. The Organic Chemistry of Drug Design and Drug Action, 2nd ed,; Academic Press, Burlington, 2004
5. Singh D.B. Computer-Aided Drug Design, 1st ed.; Springer, Singapore, 2020
6. Lemke, T.L., Williams, D.A. FOYE'S Principles of Medicinal Chemistry, 7th ed.; Lippincott Williams & Wilkins, Baltimore, 2013
7. Baele, J.M., Block J. H. Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry, 12th ed.; Lippincott Williams & Wilkins; Baltimore, 2011
8. Smith, J.H., Williams, H. Smith and Williamson's Introduction to the Principles of Drug Design and Action, 3rd ed; CRC Press, The Netherlands, 2005
9. Patrick, G.L. An Introduction to Medicinal Chemistry, 3rd ed.; Oxford University Press, Oxford, 2006

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and remember	To explain the process of drug discovery to development and different approaches of drug design and discovery
CO2	Understand and remember	To describe importance of Quantitative Structure Activity Relationship (QSAR) and various methods of QSAR in rational drug design
CO3	Understand and apply	To explain structure-based and ligand-based virtual screening approaches of drug design
CO4	Understand and apply	To discuss principles of bioinformatics and cheminformatics and their role in drug design and discovery
CO5	Understand and apply	To understand role of molecular modelling techniques in computer-aided drug design

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	-	3	-	-	-	-	-	-	3	2	3	3	1	-
CO2	3	-	-	3	-	-	-	-	-	-	3	2	3	3	1	-
CO3	3	-	2	3	-	-	-	-	-	-	3	2	3	3	1	-
CO4	3	-	2	3	-	-	-	-	-	-	3	2	3	3	1	-
CO5	3	-	1	3	-	-	-	-	-	-	3	2	3	3	1	-
Avg	3	-	1	3	-	-	-	-	-	-	3	2	3	3	1	-

B. PHARM. SEMESTER – VIII (BPH)
SUBJECT: CELL AND MOLECULAR BIOLOGGY (B808ET)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	---	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: Cell biology is a branch of biology that studies cells – their physiological properties, their structure, the organelles they contain, interactions with their environment, their life cycle, division, death and cell function. This is done both on a microscopic and molecular level. Cell biology research encompasses both the great diversity of single-celled organisms like bacteria and protozoa, as well as the many specialized cells in multi-cellular organisms such as humans, plants, and sponges

Objectives: Upon completion of the course the student shall be able to

- Summarize cell and molecular biology history.
- Summarize cellular functioning and composition.
- Describe the chemical foundations of cell biology.
- Summarize the DNA properties of cell biology.
- Describe protein structure and function.
- Describe cellular membrane structure and function.
- Describe basic molecular genetic mechanisms.
- Summarize the Cell Cycle

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	a) Cell And Molecular Biology: Definitions Theory and Basics and Applications. b) Cell And Molecular Biology: History and Summation. c) Properties Of Cells and Cell Membrane. d) Prokaryotic Versus Eukaryotic e) Cellular Reproduction f) Chemical Foundations – An Introduction and Reactions (Types)	**10**	CO1
[2]	a) DNA and the Flow of Molecular Information b) DNA Functioning c) DNA and RNA d) Types of RNA e) Transcription and Translation	**10**	CO2
[3]	a) Proteins: Defined and Amino Acids b) Protein Structure c) Regularities in Protein Pathways d) Cellular Processes e) Positive Control and significance of Protein Synthesis	**10**	CO1 CO2 CO3
[4]	a) Science of Genetics b) Transgenics and Genomic Analysis c) Cell Cycle analysis d) Mitosis and Meiosis e) Cellular Activities and Checkpoints	**08**	CO1 CO2 CO3 CO4 CO5

[5]	a) Cell Signals: Introduction b) Receptors for Cell Signals c) Signalling Pathways: Overview d) Misregulation of Signalling Pathways e) Protein-Kinases: Functioning	**07**	CO1 CO2 CO3 CO4 CO5

C. TEXT BOOKS

1. Cooper, J. W.; Gunn, C.; Sidney James Carter. Cooper and Gunn's Tutorial Pharmacy; Cbs Publishers: Editorial: New Delhi, 2005.
2. Hondermarck, H. Proteomics : Biomedical and Pharmaceutical Applications; Kluwer Academic Publishers: Dordrecht ; Boston, 2004.

D. REFERENCE BOOKS

1. Pelczar, M. J.; Chan, E. C. S.; Kreig, N. R. Laboratory Exercises in Microbiology; Mcgraw-Hill: New York, 1986.
3. Glick, B. R.; Thompson, J. E. Methods in Plant Molecular Biology and Biotechnology; Crc Press: Boca Raton, 1993.
4. Samuel Cate Prescott; Dunn, C. G.; Reed, G. Industrial Microbiology; Macmillan: New York, 1982.
5. Rose, A. H. Industrial Microbiology; Butterworths: London, 1961.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and remember	To know about the basics of cell, types of cells its basic functions, the structure and all the details
CO2	Remember, Understand and Apply	To get knowledge about DNA, RNA, Structure, function, translation and transcription
CO3	Understand Apply and Evaluate and remember	To understand about the protein structure, its synthesis and its regulations
CO4	Understand	To get knowledge about genomics, genomics analysis, cell cycle analysis, mitosis and Meiosis
CO5	Remember	To understand about cell signals, receptors for cell signals its functioning and misregulation

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	1	2	3	1	3	3	3	3	3	2	2	3	3	3	3
CO2	2	2	2	3	2	3	2	3	3	3	3	2	3	3	3	3
CO3	3	2	3	3	2	3	2	3	3	2	2	3	3	3	3	2
CO4	3	2	3	3	2	3	2	3	3	2	2	2	3	3	3	3
CO5	3	2	2	3	2	3	3	3	3	2	2	2	3	3	3	2
Avg	2.6	1.8	2.4	3	1.8	3	2.4	3	3	2.4	2.2	2.2	3	3	3	2.6

B. PHARM. SEMESTER – VIII (BPH)
SUBJECT: COSMETIC SCIENCE- THEORY (BP809ET)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope

This course is designed to impart knowledge and skills necessary for the fundamental need for cosmetic and cosmeceutical products.

Objectives

Upon completion of the course, the students shall be able to understand

- Key ingredients used in cosmetics and cosmeceuticals.
- Key building blocks for various formulations.
- Current technologies in the market
- Various key ingredients and basic science to develop cosmetics and cosmeceuticals
- Scientific knowledge to develop cosmetics and cosmeceuticals with desired Safety, stability, and efficacy.

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	Classification of cosmetic and cosmeceutical products, Definition of cosmetics as per Indian and EU regulations, Evolution of cosmeceuticals from cosmetics, cosmetics as quasi and OTC drugs **Cosmetic excipients:** Surfactants, rheologymodifiers, humectants, emollients, preservatives. Classification and application **Skin:** Basic structure and function of skin. **Hair:** Basic structure of hair. Hair growth cycle. **Oral Cavity:** Common problem associated with teeth and gums.	**10**	CO1 CO2 CO3
[2]	**Principles of formulation and building blocks of skin care products:** Face wash, Moisturizing cream, Cold Cream, Vanishing cream and their advantages and disadvantages.Application of these products in formulation of cosmecuticals. **Antiperspants & deodorants**- Actives & mechanism of action. **Principles of formulation and building blocks of Hair care products:** Conditioning shampoo, Hair conditioner,anti-dandruff shampoo. Hair oils. Chemistry and formulation of Para-phylene diamine based hair dye. Principles of formulation and building blocks of oral care products: Toothpaste for bleeding gums, sensitive teeth. Teeth whitening, Mouthwash.	**10**	CO1 CO2 CO3 CO4
[3]	Sun protection, Classification of Sunscreens and SPF. **Role of herbs in cosmetics:** Skin Care: Aloe and turmeric Hair care: Henna and amla. Oral care: Neem and clove **Analytical cosmetics:** BIS specification and analytical methods for shampoo, skincream and toothpaste.	**10**	CO1 CO5

[4]	Principles of Cosmetic Evaluation: Principles of sebumeter, corneometer. Measurement of TEWL, Skin Color, Hair tensile strength, Hair combing properties Soaps,and syndet bars. Evolution and skin benfits.	**8**	CO5 CO4
[5]	Oily and dry skin, causes leading to dry skin, skin moisturisation. Basic understanding of the terms Comedogenic, dermatitis. Cosmetic problems associated with Hair and scalp: Dandruff, Hair fall causes Cosmetic problems associated with skin: blemishes, wrinkles, acne, prickly heat andbody odor. Antiperspirants and Deodorants- Actives and mechanism of action	**7**	CO4 CO5

C. TEXT BOOKS

1. Sharma, P. P.; Vandana Publications. *Cosmetics : Formulation, Manufacturing & Quality Control*; Vandama Publications: Delhi, 2018.
2. Nanda S and Khar R, Text book of cosmelicology Tata Publishers.

D. REFERENCE BOOKS

1. Ralph Gordon Harry; Wilkinson, J. B.; Moore, R. J. *Cosmetología de Harry*; Díaz De Santos: España, 1990.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and Analyse	To uderstand and remember the key ingredients used in cosmetics and cosmeceuticals
CO2	Remember	To remeber the Key building blocks for various formulations.
CO3	Understand and remember	To apply current technologies in the market.
CO4	Understand and Remember	To understand various key ingredients and basic science to develop cosmetics and cosmeceuticals
CO5	understand and evaluate	To apply the scientific knowledge to develop cosmetics and cosmeceuticals with desired Safety, stability, and efficacy.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	1	2	-	1	1	2	2	1	3	3	2	3	1	2
CO2	3	1	1	2	-	1	-	2	2	-	2	3	2	1	1	2
CO3	3	2	3	3	2	2	2	3	3	-	3	3	3	1	3	3
CO4	3	2	3	3	2	-	-	2	3	2	2	3	3	3	3	2
CO5	3	2	3	3	1	2	-	2	3	2	3	3	3	3	3	2
Avg	3	1.6	2.2	2.6	1	1.2	0.6	2.2	2.6	1	2.6	3	2.6	2.2	2.2	2.2

B. PHARM. SEMESTER – VIII (BPH)
SUBJECT: PHARMACOLOGICAL SCREENING METHODS (BP810ET)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This subject is designed to impart the basic knowledge of preclinical studies in experimental animals including design, conduct and interpretations of results.

Objectives: Upon completion of the course the student shall be able to

- Appreciate the applications of various commonly used laboratory animals.
- Appreciate and demonstrate the various screening methods used in pre-clinical research.
- Appreciate and demonstrate the importance of biostatistics and research methodology.
- Design and execute a research hypothesis independently.

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Laboratory Animals:** Study of CPCSEA and OECD guidelines form maintenance, breeding and conduct of experiments on laboratory animals, Common lab animals: Description and applications of different species and strains of animals. Popular transgenic and mutant animals. Techniques for collection of blood and common routes of drug administration in laboratory animals, Techniques of blood collection and euthanasia.	**8**	CO1, CO4, CO5.
[2]	**Preclinical screening models** a. Introduction: Dose selection, calculation and conversions, preparation of drug solution/suspensions, grouping of animals and importance of sham negative and positive control groups. Rationale for selection of animal species and sex for the study. b. Study of screening animal models for Diuretics, nootropics, anti-Parkinson's, anti-asthmatics, Preclinical screening models :for CNS activity-analgesic, antipyretic, anti-inflammatory, general anaesthetics, sedative and hypnotics, antipsychotic, antidepressant, antiepileptic, anti-parkinsonism, Alzheimer's disease	**12**	CO2, CO3, CO4.
[3]	**Pre-clinical screening models:** for ANS activity, sympathomimetic, sympatholytic, parasympathomimetics, parasympatholytics, skeletal muscle relaxants, drugs acting on eye, local anaesthetics.	**10**	CO2, CO3, CO4.
[4]	**Preclinical screening models:** for CVS activity-antihypertensive, diuretics, antiarrhythmic, antidyslepidemic, anti-aggregatory, coagulants, and anticoagulants Preclinical screening models for other important drugs like antiulcer, antidiabetic, anticancer and anti-asthmatics.	**10**	CO2, CO3, CO4.
[5]	**Research methodology and Bio-statistics** Selection of research topic, review of literature, research hypothesis and study design Pre-clinical data analysis and interpretation using Students't' test and One-way ANOVA. Graphical representation of data	**05**	CO3.

C. TEXT BOOKS

1. Hans Gerhard Vogel. *Drug Discovery and Evaluation: Pharmacological Assays; Including a CD-ROM*; Springer: Berlin, 2002.

D. REFERENCE BOOKS

1. *Fundamentals of Experimental Pharmacology*; Hilton & Company: Kolkata, 2015.
2. Kulkarni, S. *Handbook of Experimental Pharmacology*, 3rd Edition. Vallabh Prakashan: Delhi, 2005.
3. Home: Committee for the Purpose of Control and Supervision of Experiments on Animals http://cpcsea.nic.in (accessed 2022 -04 -04).
4. Gupta, S. *Drug Screening Methods*; Sk Gupta, 2016.
5. Sundar, S.; Richard, J. *An Introduction to Biostatistics: A Manual for Students in Health Sciences*; Prentice/Hall Of India: New Delhi, 1996.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and apply	Appreciate the applications of various commonly used laboratory animals.
	Understand, analyse and evaluate	Understand, analyse and evaluate new and existing drugs in various screening methods used in preclinical research
CO3	Apply and Remember	Apply and Remember importance of biostatistics and research methodology
CO4	Create, hypothesis and apply	Design and execute a research hypothesis independently.
CO5	Understand and apply	Understand and maintain guidelines of CPCSEA and OECD.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	3	2	3	3	3	1	3	3	3	3	3	3	3
CO2	3	2	3	3	2	2	3	2	2	2	3	3	2	3	3	3
CO3	3	2	3	3	1	2	3	2	1	3	3	3	2	3	3	3
CO4	3	3	3	3	1	3	3	3	2	3	3	3	3	3	3	3
CO5	3	2	3	3	1	3	3	2	0	3	3	3	3	3	3	3
Avg	3	2.2	3	3	1.4	2.6	3	2.4	1.2	2.8	3	3	2.6	3	3	3

B. PHARM. SEMESTER – VIII (BPH)
SUBJECT: ADVANCED INSTRUMENTATION TECHNIQUES - THEORY (BP811T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This subject deals with the application of instrumental methods in qualitative and quantitative analysis of drugs. This subject is designed to impart advanced knowledge on the principles and instrumentation of spectroscopic and chromatographic hyphenated techniques. This also emphasizes on theoretical and practical knowledge on modern analytical instruments that are used for drug testing.

Objectives: Upon completion of the course the student shall be able to

- understand the advanced instruments used and its applications in drug analysis
- understand the chromatographic separation and analysis of drugs.
- understand the calibration of various analytical instruments
- know analysis of drugs using various analytical instruments.

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Nuclear Magnetic Resonance spectroscopy** Principles of H-NMR and C-NMR, chemical shift, factors affecting chemical shift, coupling constant, Spin - spin coupling, relaxation, instrumentation and applications **Mass Spectrometry**- Principles, Fragmentation, Ionization techniques – Electron impact, chemical ionization, MALDI, FAB, Analyzers-Time of flight and Quadrupole, instrumentation, applications s	**10**	CO1 CO2 CO5
[2]	**Thermal Methods of Analysis**: Principles, instrumentation and applications of ThermogravimetricAnalysis (TGA), Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC) **X-Ray Diffraction Methods:** Origin of X-rays, basic aspects of crystals, X- ray Crystallography, rotating crystal technique, single crystal diffraction,powder diffraction, structural elucidation and applications.	**10**	CO2 CO5
[3]	**Calibration and validation-**as per ICH and USFDA guidelines **Calibration of following Instruments** Electronic balance, UV-Visible spectrophotometer, IR spectrophotometer, Fluorimeter, Flame Photometer, HPLC and GC	**10**	CO4 CO5
[4]	**Radio immune assay:**Importance, various components, Principle, different methods, Limitation and Applications of Radio immuno assay **Extraction techniques**:General principle and procedure involved in the solid phase extraction and liquid-liquid extraction	**08**	CO1
[5]	**Hyphenated techniques**-LC-MS/MS, GC-MS/MS, HPTLC-MS.	**07**	CO1 CO2 CO3 CO5

C. TEXT BOOKS

1. Mendham, A. *Vogel's Textbook of Quantitative Chemical Analysis.*; Pearson: New Delhi, 2009.
2. Connors, K. A. *A Textbook of Pharmaceutical Analysis*; Wiley: New York, 1982..

D. REFERENCE BOOKS

1. JW Munson. *Pharmaceutical Analysis - Modern Methods Part-B*; Marcel. Dekker Series.; Vol. 11.
2. Kalsi, P. S. *Spectroscopy of Organic Compounds.*; New Age International Pvt, 2016.
3. Silverstein, R. M.; Webster, F. X.; Kiemle, D. J.; Bryce, D. L. *Spectrometric Identification of Organic Compounds*; Wiley: Hoboken, Nj, 2015.
4. Skoog, D. A.; F James Holler; Crouch, S. R. *Principles of Instrumental Analysis*; Thomson, Brooks/Cole: Belmont, Ca, 2007.
5. Hobart Hurd Willard. *Instrumental Methods of Analysis*; Wadsworth: Belmont, 1993.
6. Kemp, W. *Organic Spectroscopy*; Palgrave: Basingstoke, 2001.
7. Sethi, P. D. *Quantitative Analysis of Drugs in Pharmaceutical Formulations*; Cbs Publishers & Distritutors: New Delhi, 2005.
8. Sharma B K. *Instrumental Methods of Chemical Analysis*, 27th edition.; Goel Publishing House: Meerut, 2011.
9. Sharma, Y. R. *Elementary Organic Spectroscopy : Principles and Chemical Applications*; S. Chand & Company: New Delhi, 2007.
10. Garratt, D. C. *The Quantitative Analysis of Drugs : Assisted by L. Brealey Etc.*; Chapman & Hall: London, 1964.
11. Finar, I. L. *Organic Chemistry.*; Pearson Education, (9Th Impression: Delhi, 2011.
12. Beckett, A. H.; Stenlake, J. B. *Practical Pharmaceutical Chemistry*; Athlone Press: London, 1988.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand	To understand the advanced instruments used and its applications in drug analysis
CO2	Understand Apply and Evaluate	To apply the fundamentals of spectroscopy in drug analysis
CO3	Understand	To understand the chromatographic separation fundamentals and analysis of drugs
CO4	Understand and Apply	To understand the calibration of various analytical instruments
CO5	Understand Apply and Evaluate	To learn quantitative & qualitative analysis of drugs using various analytical instruments.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	2	3	-	2	1	1	2	-	3	3	3	2	2	1
CO2	3	2	3	2	-	2	1	1	2	-	3	3	3	2	2	1
CO3	3	-	1	-	-	1	-	1	-	-	3	3	3	1	1	-
CO4	3	2	3	2	-	2	1	1	2	-	3	3	3	2	2	1
CO5	3	2	1	1	-	2	1	1	1	-	3	3	3	2	2	1
Avg	3	1.4	2	1.6	-	1.8	0.8	1	1.4	-	3	3	3	1.8	1.8	0.8

B. PHARM. SEMESTER – VIII (BPH)

SUBJECT: DIETARY SUPPLEMENTS AND NUTRACEUTICALS – THEORY (BP812ET)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	--	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This subject covers foundational topic that are important for understanding the need and requirements of dietary supplements among different groups in the population.
Objective: This module aims to provide an understanding of the concepts behind the theoretical applications of dietary supplements. By the end of the course, students should be able to:

- Understand the need of supplements by the different group of people to maintain healthy life.
- Understand the outcome of deficiencies in dietary supplements.
- Appreciate the components in dietary supplements and the application.
- Appreciate the regulatory and commercial aspects of dietary supplements including health claims.

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	a. Definitions of Functional foods, Nutraceuticals and Dietary supplements. Classification of Nutraceuticals, Health problems and diseases that can be prevented or cured by Nutraceuticals i.e., weight control, diabetes, cancer, heart disease, stress, osteoarthritis, hypertension etc. b. Public health nutrition, maternal and child nutrition, nutrition and ageing, nutrition education in community. c. Source, Name of marker compounds and their chemical nature, Medicinal uses and health benefits of following used as nutraceuticals/functional foods: Spirulina, Soyabean, Ginseng, Garlic, Broccoli, Gingko, Flaxseeds	7	CO1 CO5
[2]	Phytochemicals as nutraceuticals: Occurrence and characteristic features (chemical nature medicinal benefits) of following a) Carotenoids- α and β-Carotene, Lycopene, Xanthophylls, leutin b) Sulfides: Diallyl sulfides, Allyl trisulfide. c) Polyphenolics: Reservetrol d) Flavonoids- Rutin, Naringin, Quercitin, Anthocyanidins, catechins, Flavones e) Prebiotics / Probiotics.: Fructo oligosaccharides, Lacto bacillum f) Phyto estrogens : Isoflavones, daidzein, Geebustin, lignans g) Tocopherols h) Proteins, vitamins, minerals, cereal, vegetables and beverages as functional foods: oats, wheat bran, rice bran, sea foods, coffee, tea and the like.	15	CO1 CO3
[3]	a) Introduction to free radicals: Free radicals, reactive oxygen species, production of free radicals in cells, damaging reactions of free radicals	07	CO1 CO2

	on lipids, proteins, Carbohydrates, nucleic acids. b) Dietary fibres and complex carbohydrates as functional food ingredients.		CO3
[4]	a) Free radicals in Diabetes mellitus, Inflammation, Ischemic reperfusion injury, Cancer, Atherosclerosis, Free radicals in brain metabolism and pathology, kidney damage, muscle damage. Free radicals involvement in other disorders. Free radicals theory of ageing. b) Antioxidants: Endogenous antioxidants – enzymatic and nonenzymatic antioxidant defence, Superoxide dismutase, catalase, Glutathione peroxidase, Glutathione Vitamin C, Vitamin E, α- Lipoic acid, melatonin, Synthetic antioxidants: Butylated hydroxy Toluene, Butylated hydroxy Anisole. c) Functional foods for chronic disease prevention	**10**	CO1 CO2 CO3
[5]	a) Effect of processing, storage and interactions of various environmental factors on the potential of nutraceuticals. b) Regulatory Aspects; FSSAI, FDA, FPO, MPO, AGMARK. HACCP and GMPs on Food Safety. Adulteration of foods. c) Pharmacopoeial Specifications for dietary supplements and nutraceuticals.	**06**	CO4 CO5

C. TEXT BOOKS

1. Dr. Tapan Behl, Dr. Sukhbir Singh, & Dr. Neelam Sharma Dietary Supplements & Nutraceuticals, R. Narain Publishers & Distributors, Agra, 2021.

D. REFERENCE BOOKS

1. K.T Agusti and P. Faizal, Role of dietary fibres and neutraceuticals in preventing diseases, B S Publication, 2019.
2. Cooper. K.A, Advanced Nutritional Therapies, Thomas Nelson Inc publisher, 1997.
3. Jean Carper The Food Pharmacy, Simon & Schuster publisher, UK Ltd., 2000.
4. James F. Balch and Phyllis A. Balch, Prescription for Nutritional Healing, 2nd Edn., Avery Publishing Group, NY, 1997.
5. G. Gibson and C.williams Editors 2000 Functional foods Woodhead Publ. Co. London.
6. Goldberg, I. Functional Foods, Chapman and Hall, New York, 1994
7. Labuza, T.P. Functional Foods and Dietary Supplements: Safety, Good Manufacturing Practice (GMPs) and Shelf-Life Testing in Essentials of Functional Foods M.K. Sachmidl and T.P. Labuza eds. Aspen Press, 2000.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and remember	Discuss the need and requirements of supplements by the different group of people to maintain healthy life.
CO2	Understand and evaluate	Describe the outcome of deficiencies in dietary supplements and evaluate it.
CO3	Remember and analyse	To analyse the components in dietary supplements and the application.
CO4	Apply	To apply regulatory and commercial aspects of dietary supplements including health claims.
CO5	Create	Explain nutrition education.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	2	2	2	1	3	2	3	2	3	3	3	2	2
CO2	3	3	2	2	2	2	1	3	2	2	3	3	3	3	2	2
CO3	3	2	3	2	2	2	1	3	2	2	2	3	2	3	2	2
CO4	3	2	3	2	2	2	2	3	2	3	3	3	3	3	2	2
CO5	3	2	2	2	2	2	1	3	2	2	2	3	3	3	3	2
Avg	3	2.4	2.4	2	2	2	1.2	3	2	2.4	2.4	3	2.8	3	2.2	2

B. PHARM. SEMESTER – VIII (BPH)
SUBJECT: PHARMACEUTICAL PRODUCT DEVELOPMENT (BP813ET)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This subject is designed to impart basic knowledge on pharmaceutical product development
Objectives: Upon completion of the course student shall be able

- Understand regulation related to pharmaceutical product development
- Understand selection and application of excipients in pharmaceutical formulations
- Understand QbD & optimization and its application in pharmaceutical product development
- Understand selection and quality control testing of packaging materials for pharmaceutical product development

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	Introduction to pharmaceutical product development, objectives, regulations related to preformulation, formulation development, stability assessment, manufacturing and quality control testing of different types of dosage forms	**10**	CO1
[2]	An advanced study of Pharmaceutical Excipients in pharmaceutical product development with a special reference to the following categories i. Solvents and solubilizers ii. Cyclodextrins and their applications iii. Non - ionic surfactants and their applications iv. Polyethylene glycols and sorbitols v. Suspending and emulsifying agents vi. Semi solid excipients	**10**	CO2 CO3
[3]	An advanced study of Pharmaceutical Excipients in pharmaceutical product development with a special reference to the following categories i. Tablet and capsule excipients ii. Directly compressible vehicles iii. Coat materials iv. Excipients in parenteral and aerosols products v. Excipients for formulation of NDDS Selection and application of excipients in pharmaceutical formulations with specific industrial applications	**10**	CO2 CO3
[4]	Optimization techniques in pharmaceutical product development. A study of various optimization techniques for pharmaceutical product development with specific examples. Optimization by factorial designs and their applications. A study of QbD and its application in pharmaceutical product development.	**08**	CO1 CO4
[5]	Selection and quality control testing of packaging materials for pharmaceutical product development- regulatory considerations.	**07**	CO5

C. TEXT BOOKS

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D. REFERENCE BOOKS

1. Bolton, S.; Bon, C. *Pharmaceutical Statistics : Practical and Clinical Applications*; Informa Healthcare Usa: New York, 2010.
2. Swarbrick, J. *Encyclopedia of Pharmaceutical Technology*; Marcel Dekker: New York, Ny, 2004.
3. Lachman, L.; Liebermann, H. A. *The Theory and Practice of Industrial Pharmacy*; Cbs Publishers & Distributors Pvt. Ltd: New Delhi, 2013.
4. Lieberman, H. A. *Pharmaceutical Dosage Forms Tablets, Vol. 1-3*; New York, Dekker, 1990.
5. Lieberman, H. A.; Rieger, M. M.; Banker, G. S. *Pharmaceutical Dosage Forms-- Disperse Systems. Volume 1-2*; Dekker: New York, 1998.
6. Avis, K. E.; Lieberman, H. A.; Lachman, L. *Pharmaceutical Dosage Forms: Parenteral Medications VOL 1-3*; M. Dekker: New York, 1992.
7. Remington, J. P.; Gennaro, A. R. *Remington's Pharmaceutical Sciences*; Mack Pub. Co: Easton, Pa., 1990.
8. Ansel, H. C.; Allen, L. V.; Popovich, N. G. *Pharmaceutical Dosage Forms and Drug Delivery Systems*; Philadelphia, Pa Lippincott-Williams & Wilkins, 1999.
9. Vyas, S. P.; Khar, R. K. *Targeted & Controlled Drug Delivery : Novel Carrier Systems*; Cbs Publishers & Distributors Pvt. Ltd: New Delhi, 2010.
10. Aulton, M. E.; Taylor, K. *Aulton's Pharmaceutics : The Design and Manufacture of Medicines*, 5th ed.; Elsevier: London, 2018.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand	Understand regulation related to pharmaceutical product development
CO2	Study	Study of Pharmaceutical Excipients in pharmaceutical product development
CO3	Understand	Understand selection and application of excipients in pharmaceutical formulations
CO4	Understand and Remember	Understand QbD & optimization and its application in pharmaceutical product development
CO5	Understand and analyse	Understand selection and quality control testing of packaging materials for pharmaceutical product development

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	3	1	2	3	2	2	3	2	3	2	2	3	3
CO2	3	2	2	3	1	2	1	2	3	2	2	3	3	3	3	2
CO3	3	1	3	3	1	2	1	2	3	3	2	2	3	3	3	2
CO4	3	2	3	3	1	2	1	2	3	2	2	3	3	3	2	2
CO5	3	3	3	3	1	2	2	2	2	2	2	2	3	3	3	1
Avg	3	2	2.6	3	1	2	1.6	2	2.6	2.4	2	2.6	2.8	2.8	2.8	2

B. PHARM. SEMESTER – VIII (BPH)
SUBJECT: PROJECT WORK (BP813PW)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
-	-	12	6	6	150	-	-	-	150

A. COURSE OVERVIEW

All the students shall undertake a project under the supervision of a teacher and submit a report. The area of the project shall directly relate any one of the elective subjects opted by the student in semester VIII. The project shall be carried out in group not exceeding 5 in number. The project report shall be submitted in triplicate (typed & bound copy not less than 25 pages).

The internal and external examiner appointed by the University shall evaluate the project at the time of the Practical examinations of other semester(s). Students shall be evaluated in groups for four hours (i.e., about half an hour for a group of five students).

2016

THE MASTER OF PHARMACY (M. PHARM.)

COURSE REGULATION 2014

(BASED ON NOTIFICATION IN THE GAZETTE OF INDIA NO. 362, DATED DECEMBER 11, 2014)

SCHEME AND SYLLABUS

PHARMACY COUNCIL OF INDIA
Combined Council's Building, Kotla Road,
Aiwan-E-Ghalib Marg, New Delhi-110 002.
Website : www.pci.nic.

CHAPTER – I: REGULATIONS

1. Short Title and Commencement

These regulations shall be called as "The Revised Regulations for the Master of Pharmacy (M. Pharm.)Degree Program - Credit Based Semester System (CBSS) of the Pharmacy Council of India, New Delhi". They shall come into effect from the Academic Year 2016-17. The regulations framed are subject to modifications from time to time by the authorities of the university.

2. Minimum qualification for admission

A Pass in the following examinations

a) B. Pharm Degree examination of an Indian university established by law in India from an institution approved by Pharmacy Council of India and has scored not less than 55 % of the maximum marks (aggregate of 4 years of B.Pharm.)

b) Every student, selected for admission to post graduate pharmacy program in any PCI approved institution should have obtained registration with the State Pharmacy Council or should obtain the same within one month from the date of his/her admission, failing which the admission of the candidate shall be cancelled.

Note: It is mandatory to submit a migration certificate obtained from the respective university where the candidate had passed his/her qualifying degree (B.Pharm.)

3. Duration of the program

The program of study for M.Pharm. shall extend over a period of four semesters (two academic years). The curricula and syllabi for the program shall be prescribed from time to time by Phamacy Council of India, New Delhi.

4. Medium of instruction and examinations

Medium of instruction and examination shall be in English.

5. Working days in each semester

Each semestershall consist of not less than 100 working days. The odd semesters shall be conducted from the month of June/July to November/December and the even semesters shall be conducted from the month of December/January to May/June in every calendar year.

6. Attendance and progress

A candidate is required to put in at least 80% attendance in individual courses considering theory and practical separately. The candidate shall complete the prescribed course satisfactorily to be eligible to appear for the respective examinations.

7. Program/Course credit structure

As per the philosophy of Credit Based Semester System, certain quantum of academic work viz. theory classes, practical classes, seminars, assignments, etc. are measured in terms of credits. On satisfactory completion of the courses, a candidate earns credits. The amount of credit associated with a course is dependent upon the number of hours of instruction per week in that course. Similarly the credit associated with any of the other academic, co/extra-curricular activities is dependent upon the quantum of work expected to be put in for each of these activities per week/per activity.

7.1. Credit assignment

7.1.1. Theory and Laboratory courses

Courses are broadly classified as Theory and Practical. Theory courses consist of lecture (L) and Practical (P) courses consist of hours spent in the laboratory. Credits (C) for a course is dependent on the number of hours of instruction per week in that course, and is obtained by using a multiplier of one (1) for lecture and a multiplier of half (1/2) for practical (laboratory) hours.Thus, for example, a theory course having four lectures per week throughout the semester carries a credit of 4. Similarly, a practical having four laboratory hours per week throughout semester carries a credit of 2.

The contact hours of seminars, assignments and research work shall be treated as that of practical courses for the purpose of calculating credits. i.e., the contact hours shall be multiplied by 1/2. Similarly, the contact hours of journal club, research work presentations and discussions with the supervisor shall be considered as theory course and multiplied by 1.

7.2. Minimum credit requirements

The minimum credit points required for the award of M. Pharm. degree is 95. However based on the credit points earned by the students under the head of co-curricular activities, a student shall earn a maximum of 100 credit points. These credits are divided into Theory courses, Practical, Seminars, Assignments,Research work, Discussions with the supervisor, Journal club and Co-Curricular activities over the duration of four semesters. The credits

are distributed semester-wise as shown in Table 14. Courses generally progress in sequence, building competencies and their positioning indicates certain academic maturity on the part of the learners. Learners are expected to follow the semester-wise schedule of courses given in the syllabus.

8. Academic work

A regular record of attendance both in Theory, Practical, Seminar, Assignment, Journal club, Discussion with the supervisor, Research work presentation and Dissertation shall be maintained by the department / teaching staff of respective courses.

9. Course of study

The specializations in M.Pharm program is given in Table 1.

Table – 1: List of M.Pharm. Specializations and their Code

S. No.	Specialization	Code
1.	Pharmaceutics	MPH
2.	Industrial Pharmacy	MIP
3.	Pharmaceutical Chemistry	MPC
4.	Pharmaceutical Analysis	MPA
5.	Pharmaceutical Quality Assurance	MQA
6.	Pharmaceutical Regulatory Affairs	MRA
7.	Pharmaceutical Biotechnology	MPB
8.	Pharmacy Practice	MPP
9.	Pharmacology	MPL
10.	Pharmacognosy	MPG

The course of study for M.Pharm specializations shall include Semester wise Theory & Practical as given in Table – 2 to 11. The number of hours to be devoted to each theory and practical course in any semester shall not be less than that shown in Table – 2 to 11.

Table – 2: Course of study for M. Pharm. (Pharmaceutics)

Course Code	Course	Credit Hours	Credit Points	Hrs./wk	Marks
Semester I					
MPH101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MPH102T	Drug Delivery System	4	4	4	100
MPH103T	Modern Pharmaceutics	4	4	4	100
MPH104T	Regulatory Affair	4	4	4	100
MPH105P	Pharmaceutics Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		**35**	**26**	**35**	**650**
Semester II					
MPH201T	Molecular Pharmaceutics (Nano Tech and Targeted DDS)	4	4	4	100
MPH202T	Advanced Biopharmaceutics & Pharmacokinetics	4	4	4	100
MPH203T	Computer Aided Drug Delivery System	4	4	4	100
MPH204T	Cosmetic and Cosmeceuticals	4	4	4	100
MPH205P	Pharmaceutics Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
	Total	**35**	**26**	**35**	**650**

Table – 6: Course of study for M. Pharm. (Pharmaceutical Quality Assurance)

Course Code	Course	Credit Hours	Credit Points	Hrs./wk	Marks
Semester I					
MQA101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MQA102T	Quality Management System	4	4	4	100
MQA103T	Quality Control and Quality Assurance	4	4	4	100
MQA104T	Product Development and Technology Transfer	4	4	4	100
MQA105P	Pharmaceutical Quality Assurance Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		**35**	**26**	**35**	**650**
Semester II					
MQA201T	Hazards and Safety Management	4	4	4	100
MQA202T	Pharmaceutical Validation	4	4	4	100
MQA203T	Audits and Regulatory Compliance	4	4	4	100
MQA204T	Pharmaceutical Manufacturing Technology	4	4	4	100
MQA205P	Pharmaceutical Quality Assurance Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
	Total	**35**	**26**	**35**	**650**

Table – 12: Course of study for M. Pharm. III Semester

(Common for All Specializations)

Course Code	Course	Credit Hours	Credit Points
MRM 301T	Research Methodology and Biostatistics*	4	4
-	Journal club	1	1
-	Discussion / Presentation (Proposal Presentation)	2	2
-	Research Work	28	14
Total		**35**	**21**

***** Non University Exam

Table – 13: Course of study for M. Pharm. IV Semester

(Common for All Specializations)

Course Code	Course	Credit Hours	Credit Points
-	Journal Club	1	1
-	Research Work	31	16
-	Discussion/Final Presentation	3	3
Total		**35**	**20**

Table – 14: Semester wise credits distribution

Semester	Credit Points
I	26
II	26
III	21
IV	20
Co-curricular Activities (Attending Conference, Scientific Presentations and Other Scholarly Activities)	Minimum=02 Maximum=07*
Total Credit Points	Minimum=95 Maximum=100*

*Credit Points for Co-curricular Activities

Table – 15: Guidelines for Awarding Credit Points for Co-curricular Activities

Name of the Activity	Maximum Credit Points Eligible / Activity
Participation in National Level Seminar/Conference/Workshop/Symposium/ Training Programs (related to the specialization of the student)	01
Participation in international Level Seminar/Conference/Workshop/Symposium/ Training Programs (related to the specialization of the student)	02
Academic Award/Research Award from State Level/National Agencies	01
Academic Award/Research Award from International Agencies	02
Research / Review Publication in National Journals (Indexed in Scopus / Web of Science)	01
Research / Review Publication in International Journals (Indexed in Scopus / Web of Science)	02

Note: International Conference: Held Outside India

International Journal: The Editorial Board Outside India

*The credit points assigned for extracurricular and or co-curricular activities shall be given by the Principals of the colleges and the same shall be submitted to the University. The criteria to acquire this credit point shall be defined by the colleges from time to time.

10. Program Committee

1. The M. Pharm. programme shall have a Programme Committee constituted by the Head of the institution in consultation with all the Heads of the departments.

2. The composition of the Programme Committee shall be as follows:

A teacher at the cadre of Professor shall be the Chairperson; One Teacher from eachM.Pharm specialization and four student representatives (two from each academic year), nominated by the Head of the institution.

3. Duties of the Programme Committee:

i. Periodically reviewing the progress of the classes.
ii. Discussing the problems concerning curriculum, syllabus and the conduct of classes.
iii. Discussing with the course teachers on the nature and scope of assessment for the course and the same shall be announced to the students at the beginning of respective semesters.

Tables – 16: Schemes for internal assessments and end semester examinations (Pharmaceutics- MPH)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
SEMESTER I								
MPH 101T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MPH 102T	Drug Delivery System	10	15	1 Hr	25	75	3 Hrs	100
MPH 103T	Modern Pharmaceutics	10	15	1 Hr	25	75	3 Hrs	100
MPH 104T	Regulatory Affair	10	15	1 Hr	25	75	3 Hrs	100
MPH 105P	Pharmaceutics Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								**650**
SEMESTER II								
MPH 201T	Molecular Pharmaceutics(Nano Tech and Targeted DDS)	10	15	1 Hr	25	75	3 Hrs	100
MPH 202T	Advanced Biopharmaceutics & Pharmacokinetics	10	15	1 Hr	25	75	3 Hrs	100
MPH 203T	Computer Aided Drug Delivery System	10	15	1 Hr	25	75	3 Hrs	100
MPH	Cosmetic	10	15	1 Hr	25	75	3 Hrs	100

204T	and Cosmeceuticals							
MPH 205P	Pharmaceutics Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								**650**

Tables – 20: Schemes for internal assessments and end semester examinations (Pharmaceutical Quality Assurance-MQA)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
SEMESTER I								
MQA101T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MQA102T	Quality Management System	10	15	1 Hr	25	75	3 Hrs	100
MQA103T	Quality Control and Quality Assurance	10	15	1 Hr	25	75	3 Hrs	100
MQA104T	Product Development and Technology Transfer	10	15	1 Hr	25	75	3 Hrs	100
MQA105P	Pharmaceutical Quality Assurance Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								**650**
SEMESTER II								
MQA201T	Hazards and Safety Management	10	15	1 Hr	25	75	3 Hrs	100
MQA202T	Pharmaceutical Validation	10	15	1 Hr	25	75	3 Hrs	100
MQA203T	Audits and Regulatory Compliance	10	15	1 Hr	25	75	3 Hrs	100
MQA204T	Pharmaceutical Manufacturing Technology	10	15	1 Hr	25	75	3 Hrs	100
MQA205P	Pharmaceutical Quality Assurance Practical II	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								**650**

Tables – 26: Schemes for internal assessments and end semester examinations (Semester III& IV)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
SEMESTER III								
MRM301T	Research Methodology and Biostatistics*	10	15	1 Hr	25	75	3 Hrs	100
-	Journal club	-	-	-	25	-	-	25
-	Discussion / Presentation (Proposal Presentation)	-	-	-	50	-	-	50
-	Research work*	-	-	-	-	350	1 Hr	350
Total								**525**
SEMESTER IV								
-	Journal club	-	-	-	25	-	-	25
-	Discussion / Presentation (Proposal Presentation)	-	-	-	75	-	-	75
-	Research work and Colloquium	-	-	-	-	400	1 Hr	400
Total								**500**

***Non University Examination**

11.2. Internal assessment: Continuous mode

The marks allocated for Continuous mode of Internal Assessment shall be awarded as per the scheme given below.

Table – 27: Scheme for awarding internal assessment: Continuous mode

Theory	
Criteria	**Maximum Marks**
Attendance (Refer Table – 28)	8
Student – Teacher interaction	2
Total	**10**
Practical	
Attendance (Refer Table – 28	10
Based on Practical Records, Regular viva voce, etc.	10
Total	**20**

Table – 28: Guidelines for the allotment of marks for attendance

Percentage of Attendance	Theory	Practical
95 – 100	8	10
90 – 94	6	7.5
85 – 89	4	5
80 – 84	2	2.5
Less than 80	0	0

11.2.1. Sessional Exams

Two sessional exams shall be conducted for each theory / practical course as per the schedule fixed by the college(s). The scheme of question paper for theory and practical sessional examinations is given in the table. The average marks of two sessional exams shall be computed for internal assessment as per the requirements given in tables.

12. Promotion and award of grades

A student shall be declared PASS and eligible for getting grade in a course of M.Pharm.programme if he/she secures at least 50% marks in that particular courseincluding internal assessment.

13. Carry forward of marks

In case a student fails to secure the minimum 50% in any Theory or Practical course as specified in 12, then he/she shall reappear for the end semester examination of that course. However his/her marks of the Internal Assessment shall be carried over and he/she shall be entitled for grade obtained by him/her on passing.

14. Improvement of internal assessment

A student shall have the opportunity to improve his/her performance only once in the sessional exam component of the internal assessment. The re-conduct of the sessional exam shall be completed before the commencement of next end semester theory examinations.

15. Reexamination of end semester examinations

Reexamination of end semester examination shall be conducted as per the schedule given in table 29. The exact dates of examinations shall be notified from time to time.

Table – 29: Tentative schedule of end semester examinations

Semester	For Regular Candidates	For Failed Candidates
I and III	November / December	May / June
II and IV	May / June	November / December

16. Allowed to keep terms (ATKT):

No student shall be admitted to any examination unless he/she fulfills the norms given in 6. ATKT rules are applicable as follows:

A student shall be eligible to carry forward all the courses of I and IIsemesters till the III semester examinations. However, he/she shall not be eligible to attend the courses of IV semester until all the courses of I, II and III semesters are successfully completed.

A student shall be eligible to get his/her CGPA upon successful completion of the courses of I to IV semesters within the stipulated time period as per the norms.

Note: Grade AB should be considered as failed and treated as one head for deciding ATKT. Such rules are also applicable for those students who fail to register for examination(s) of any course in any semester.

17. Grading of performances

17.1. Letter grades and grade points allocations:

Based on the performances, each student shall be awarded a final letter grade at the end of the semester for each course.The letter grades and their corresponding grade points are given in Table – 30.

Table – 30: Letter grades and grade points equivalent to *Percentage of marks and performances*

Percentage of Marks Obtained	Letter Grade	Grade Point	Performance
90.00 – 100	O	10	Outstanding
80.00 – 89.99	A	9	Excellent
70.00 – 79.99	B	8	Good
60.00 – 69.99	C	7	Fair
50.00 – 59.99	D	6	Average
Less than 50	F	0	Fail
Absent	AB	0	Fail

A learner who remains absent for any end semester examination shall be assigned a letter grade of AB and a corresponding grade point of zero. He/she should reappear for the said evaluation/examination in due course.

18. The Semester grade point average (SGPA)

The performance of a student in a semester is indicated by a number called 'Semester Grade Point Average' (SGPA). The SGPA is the weighted average of the grade points obtainedin all the courses by the student during the semester. For example, if a student takes five courses (Theory/Practical) in a semester with credits C1, C2, C3 and C4 and the student's grade points in these courses are G1, G2, G3 and G4, respectively, and then students' SGPA is equal to:

$$SGPA = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4G_4}{C_1 + C_2 + C_3 + C_4}$$

The SGPA is calculated to two decimal points. It should be noted that, the SGPA for any semester shall take into consideration the F and ABS grade awarded in that semester. For example if a learner has a F or ABS grade in course 4, theSGPA shall then be computed as:

$$SGPA = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4{*}\ ZERO}{C_1 + C_2 + C_3 + C_4}$$

19. Cumulative Grade Point Average (CGPA)

The CGPA is calculated with the SGPA of all the IV semesters to two decimal points and is indicated in final grade report card/final transcript showing the grades of all IV semesters and their courses. The CGPA shall reflect the failed statusin case of F grade(s), till the course(s) is/are passed. When the course(s) is/are passedby obtaining a pass grade on subsequent examination(s) theCGPA

shall only reflect the new grade and not the fail grades earned earlier.The CGPA is calculated as:

$$\text{CGPA} = \frac{C_1S_1 + C_2S_2 + C_3S_3 + C_4S_4}{C_1 + C_2 + C_3 + C_4}$$

where C_1, C_2, C_3,.... is the total number of credits for semester I,II,III,…. and S_1,S_2, S_3,....is the SGPA of semester I,II,III,…. .

20. Declaration of class

The class shall be awarded on the basis of CGPA as follows:

First Class with Distinction	= CGPA of. 7.50 and above
First Class	= CGPA of 6.00 to 7.49
Second Class	= CGPA of 5.00 to 5.99

21. Project work

All the students shall undertake a project under the supervision of a teacher in Semester III to IV and submit a report. 4 copies of the project report shall be submitted (typed & bound copy not less than 75 pages).

The internal and external examiner appointed by the University shall evaluate the project at the time of the Practical examinations of other semester(s). The projects shall be evaluated as per the criteria given below.

Evaluation of Dissertation Book:

Objective(s) of the work done	50 Marks
Methodology adopted	150 Marks
Results and Discussions	250 Marks
Conclusions and Outcomes	50 Marks
Total	**500 Marks**

Evaluation of Presentation:

Presentation of work	100 Marks
Communication skills	50 Marks
Question and answer skills	100 Marks
Total	**250 Marks**

22. Award of Ranks

Ranks and Medals shall be awarded on the basis of final CGPA. However, candidates who fail in one or more courses during the M.Pharm program shall not be eligible for award of ranks. Moreover, the candidates should have completed the M. Pharm program in minimum prescribed number of years, (two years) for the award of Ranks.

23. Award of degree

Candidates who fulfill the requirements mentioned above shall be eligible for award of degree during the ensuing convocation.

24. Duration for completion of the program of study

The duration for the completion of the program shall be fixed as double the actual duration of the program and the students have to pass within the said period, otherwise they have to get fresh Registration.

25. Revaluation / Retotaling of answer papers

There is no provision for revaluation of the answer papers in any examination. However, the candidates can apply for retotaling by paying prescribed fee.

26. Re-admission after break of study

Candidate who seeks re-admission to the program after break of study has to get the approval from the university by paying a condonation fee.

M. PHARM. SEMESTER – I (MPH)
SUBJECT: MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES – THEORY (MPH101T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
4	--	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This subject deals with various advanced analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are NMR, Mass spectrometer, IR, HPLC, GC etc.

Objectives: After completion of course student is able to know about

- Chemicals and excipients
- The analysis of various drugs in single and combination dosage forms
- Theoretical and practical skills of the instruments

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**a. UV-Visible spectroscopy**: Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect and Applications of UV-Visible spectroscopy, Difference/ Derivative spectroscopy. **b. IR spectroscopy**: Theory, Modes of Molecular vibrations, Sample handling, Instrumentation of Dispersive and Fourier -Transform IR Spectrometer, Factors affecting vibrational frequencies and Applications of IR spectroscopy, Data Interpretation. **c. Spectrofluorimetric**: Theory of Fluorescence, Factors affecting fluorescence (Characteristics of drugs that can be analysed by fluorimetry), Quenchers, Instrumentation and Applications of fluorescence spectrophotometer. **d. Flame emission spectroscopy and Atomic absorption spectroscopy**: Principle, Instrumentation, Interferences and Applications.	**11**	CO1 CO2 CO5
[2]	**NMR spectroscopy**: Quantum numbers and their role in NMR, Principle, Instrumentation, Solvent requirement in NMR, Relaxation process, NMR signals in various compounds, Chemical shift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant, Nuclear magnetic double resonance, Brief outline of principles of FT-NMR and 13C NMR. Applications of NMR spectroscopy	**11**	CO1 CO2 CO5
[3]	**Mass Spectroscopy**: Principle, Theory, Instrumentation of Mass Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and Applications of Mass spectroscopy.	**11**	CO1 CO2 CO5
[4]	**Chromatography**: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution, isolation of drug from excipients, data interpretation and applications of the following: ● Thin Layer chromatography ● Paper Chromatography	**11**	CO3 CO4 CO5

	• Ion exchange chromatography • Column chromatography • Gas chromatography • High Performance Liquid chromatography • Affinity chromatography		
[5]	**a. Electrophoresis**: Principle, Instrumentation, Working conditions, factors affecting separation and applications of the following: a) Paper electrophoresis b) Gel electrophoresis c) Capillary electrophoresis d) Zone electrophoresis e) Moving boundary electrophoresis f) Iso electric focusing **b. X ray Crystallography**: Production of X rays, Different X ray methods, Bragg's law, Rotating crystal technique, X ray powder technique, Types of crystals and applications of X-ray diffraction.	**11**	CO5
[6]	Immunological assays : RIA (Radio immuno assay), ELISA, Bioluminescence assays.	**05**	CO5

C. TEXT BOOKS

1. Connors, K. A. *A Textbook of Pharmaceutical Analysis*; Wiley: New York, 1982..
2. Mendham, A. *Vogel's Textbook of Quantitative Chemical Analysis.*; Pearson: New Delhi, 2009.

D. REFERENCE BOOKS

1. JW Munson. *Pharmaceutical Analysis - Modern Methods Part-B*; Marcel. Dekker Series.; Vol. 11.
2. Kalsi, P. S. *Spectroscopy of Organic Compounds.*; New Age International Pvt, 2016.
3. Silverstein, R. M.; Webster, F. X.; Kiemle, D. J.; Bryce, D. L. *Spectrometric Identification of Organic Compounds*; Wiley: Hoboken, Nj, 2015.
4. Skoog, D. A.; F James Holler; Crouch, S. R. *Principles of Instrumental Analysis*; Thomson, Brooks/Cole: Belmont, Ca, 2007.
5. Hobart Hurd Willard. *Instrumental Methods of Analysis*; Wadsworth: Belmont, 1993.
6. Kemp, W. *Organic Spectroscopy*; Palgrave: Basingstoke, 2001.
7. Sethi, P. D. *Quantitative Analysis of Drugs in Pharmaceutical Formulations*; Cbs Publishers & Distritutors: New Delhi, 2005.
8. Sharma B K. *Instrumental Methods of Chemical Analysis*, 27th edition.; Goel Publishing House: Meerut, 2011.
9. Sharma, Y. R. *Elementary Organic Spectroscopy : Principles and Chemical Applications*; S. Chand & Company: New Delhi, 2007.
10. Beckett, A. H.; Stenlake, J. B. *Practical Pharmaceutical Chemistry*; Athlone Press: London, 1988.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and remember	To understand the fundamentals of various spectroscopic techniques
CO2	Understand Apply and Evaluate	To apply the fundamentals of spectroscopy in single and combination drug analysis
CO3	Understand and remember	To understand the chromatographic separation fundamentals
CO4	Understand Apply and Evaluate	To apply the fundamentals of various chromatographic techniques in single and combination drug analysis
CO5	Understand Apply and Evaluate	To learn theoretical and practical aspects of various analytical instruments.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	-	1	1	-	1	-	1	-	-	3	2	-	-	-
CO2	3	2	3	2	-	2	1	1	2	-	3	3	1	1	-
CO3	3	-	1	1	-	1	-	1	-	-	3	2	-	-	-
CO4	3	2	3	2	-	2	1	1	2	-	3	3	1	1	-
CO5	3	2	1	1	-	2	1	1	1	-	3	3	1	1	-
Avg	3	1.2	1.8	1.4	-	1.6	0.6	1	1	-	3	2.6	0.6	0.6	-

M. PHARM. SEMESTER – I (MPH)
SUBJECT: DRUG DELIVERY SYSTEMS (MPH102T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
4	-	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This course is designed to impart knowledge on the area of advances in novel drug delivery systems.

Objectives: Upon completion of the course, student shall be able to understand

- The various approaches for development of novel drug delivery systems.
- The criteria for selection of drugs and polymers for the development of delivering system
- The formulation and evaluation of Novel drug delivery systems

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	Sustained Release (SR) and Controlled Release (CR) formulations: Introduction & basic concepts, advantages/ disadvantages, factors influencing, Physicochemical & biological approaches for SR/CR formulation, Mechanism of Drug Delivery from SR/CR formulation. Polymers: introduction, definition, classification, properties and application Dosage Forms for Personalized Medicine: Introduction, Definition, Pharmacogenetics, And Categories of Patients for Personalized Medicines: Customized drug delivery systems, Bioelectronic Medicines, 3D printing of pharmaceuticals, Telepharmacy.	**10**	CO5 CO2
[2]	Rate Controlled Drug Delivery Systems: Principles & Fundamentals, Types, Activation; Modulated Drug Delivery Systems; Mechanically activated, pH activated, Enzyme activated, and Osmotic activated Drug Delivery Systems Feedback regulated Drug Delivery Systems; Principles & Fundamentals.	**10**	CO5 CO2
[3]	Gastro-Retentive Drug Delivery Systems: Principle, concepts advantages and disadvantages, Modulation of GI transit time approaches to extend GI transit. Buccal Drug Delivery Systems: Principle of muco adhesion, advantages and disadvantages, Mechanism of drug permeation, Methods of formulation and its evaluations.	**10**	CO1 CO3 CO4
[4]	Occular Drug Delivery Systems: Barriers of drug permeation, Methods to overcome barriers.	**06**	CO1 CO3 CO4
[5]	Transdermal Drug Delivery Systems: Structure of skin and barriers, Penetration enhancers, Transdermal Drug Delivery Systems, Formulation and evaluation.	**10**	CO1 CO3 CO4
[6]	Protein and Peptide Delivery: Barriers for protein delivery. Formulation and Evaluation of delivery systems of proteins and other macromolecules.	**08**	CO1 CO3 CO4
[7]	Vaccine delivery systems: Vaccines, uptake of antigens, single shot vaccines, mucosal and transdermal delivery of vaccines.	**06**	CO1 CO3 CO4

C. TEXT BOOKS

1. N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, New Delhi, First edition 1997 (reprint in 2001).
2. S.P.Vyas and R.K.Khar, Controlled Drug Delivery - concepts and advances, Vallabh Prakashan, New Delhi, First edition 2002

D. REFERENCE BOOKS

1. Y W. Chien, Novel Drug Delivery Systems, 2nd edition, revised and expanded, Marcel Dekker, Inc., New York, 1992.
2. Robinson, J. R., Lee V. H. L, Controlled Drug Delivery Systems, Marcel Dekker,Inc., New York, 1992.
3. Encyclopedia of controlled delivery, Editor- Edith Mathiowitz, Published by WileyInterscience Publication, John Wiley and Sons, Inc, New York, Chichester/Weinheim

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand	To understand the various approaches for development of novel drug delivery system
CO2	Learn	To learn the criteria for selection of drugs and polymers for the development of delivery system
CO3	Learn	To learn the formulation and evaluation of Novel drug delivery systems.
CO4	Analyse	Analyse various evaluation parameters for oral, parenteral, topical etc. drug delivery systems
CO5	Understand and analyse	Explain the principles and technology used in the design of sustained release and controlled release drug delivery systems

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	-	2	-	2	2	3	1	3	3	2	2
CO2	3	2	2	2	-	3	-	2	2	2	2	2	3	2	2
CO3	3	2	3	3	-	2	-	3	2	2	3	3	3	2	2
CO4	3	2	3	3	-	2	-	2	2	2	2	3	3	3	3
CO5	3	2	2	2	-	2	-	3	2	3	3	3	3	2	3
Avg	3	2	2.4	2.4	-	2.2	-	2.4	2	2.4	2.2	2.8	3	2.2	2.4

M. PHARM. SEMESTER – I (MPH)
SUBJECT: MODERN PHARMACEUTICS (MPH103T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
4	-	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: Course designed to impart advanced knowledge and skills required to learn various aspects and concepts at pharmaceutical industries.

Objectives: Upon completion of the course, student shall be able to understand

- The elements of preformulation studies.
- The Active Pharmaceutical Ingredients and Generic drug Product development
- Industrial Management and GMP Considerations.
- Optimization Techniques & Pilot Plant Scale Up Techniques
- Stability Testing, sterilization process & packaging of dosage forms.

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	a. Preformation Concepts – Drug Excipient interactions - different methods, kinetics of stability, Stability testing. Theories of dispersion and pharmaceutical Dispersion (Emulsion and Suspension, SMEDDS) preparation and stability Large and small volume parental – physiological and formulation consideration, Manufacturing and evaluation. b. Optimization techniques in Pharmaceutical Formulation: Concept and parameters of optimization, Optimization techniques in pharmaceutical formulation and processing. Statistical design, Response surface method, Contour designs, Factorial designs and application in formulation	**20**	CO1 CO4
[2]	Validation: Introduction to Pharmaceutical Validation, Scope & merits of Validation, Validation and calibration of Master plan, ICH & WHO guidelines for calibration and validation of equipments, Validation of specific dosage form, Types of validation. Government regulation, Manufacturing Process Model, URS, DQ, IQ, OQ & P.Q. of facilities.	**10**	CO2 CO3
[3]	cGMP & Industrial Management: Objectives and policies of current good manufacturing practices, layout of buildings, services, equipments and their maintenance Production management: Production organization, , materials management, handling and transportation, inventory management and control, production and planning control, Sales forecasting, budget and cost control, industrial and personal relationship. Concept of Total Quality Management.	**10**	CO2 CO3
[4]	Compression and compaction: Physics of tablet compression, compression, consolidation, effect of friction, distribution of forces, compaction profiles.	**10**	CO5
[5]	Study of Solubility parameters, Diffusion parameters, Dissolution parameters and Pharmacokinetic parameters, Heckle plots, Similarity factors – f2 and f1, Higuchi and Peppas plot, Linearity Concept of significance, Standard deviation, Chi square test, students T-test, ANOVA test.	**10**	CO5

C. TEXT BOOKS

1. Lachman, L.; Liebermann, H. A. The Theory and Practice of Industrial Pharmacy; Cbs Publishers & Distributors Pvt. Ltd: New Delhi, 2013

D. REFERENCE BOOKS

1. Lieberman, H. A. *Pharmaceutical Dosage Forms Tablets, Vol. 1-3*; New York, Dekker, 1990.
2. Lieberman, H. A.; Rieger, M. M.; Banker, G. S. *Pharmaceutical Dosage Forms-- Disperse Systems. Volume 1-2*; Dekker: New York, 1998.
3. Avis, K. E.; Lieberman, H. A.; Lachman, L. *Pharmaceutical Dosage Forms: Parenteral Medications VOL 1-3*; M. Dekker: New York, 1992.
4. Banker, G. S.; Rhodes, C. T. *Modern Pharmaceutics*; Dekker: New York, 1996.
5. Remington, J. P.; Gennaro, A. R. *Remington's Pharmaceutical Sciences*; Mack Pub. Co: Easton, Pa., 1990.
6. Bean, H. S.; Carless, J. E.; Arnold Heyworth Beckett. *Advances in Pharmaceutical Sciences*; Academic Press: London, 1964.
7. Sinko, P. J.; Martin, A. N. *Martin's Physical Pharmacy Pharmaceutical Sciences: Physical Chemical Principles in the Pharmaceutical Sciences.*; Lippincott Williams & Wilkins: Philadelphia, 2006.
8. Arthur Owen Bentley; Ernest Alexander Rawlins. *Bentley's Textbook of Pharmaceutics.*; All India Traveller Book Seller: New Delhi, 2002.
9. Willig, S. H. *Good Manufacturing Practices for Pharmaceuticals: A Plan for Total Quality Control from Manufacturer to Consumer*; Marcel Dekker, Inc: New York, N.Y., 2001.
10. Kohli, D. P. S.; Shah, D. H. *Drug Formulations Manual*; Business Horizons: New Delhi, 2012.
11. Sharma, P.P. *How to practice GMPs*. Vandana publication, 2001.
12. Berry, I. R.; Nash, R. A. *Pharmaceutical Process Validation*; Marcel Dekker: New York, 1993.
13. James Robert Evans. *Applied Production and Operations Management*; Info Access & Distribution: Singapore, 1994.
14. Swarbrick, J. *Encyclopedia of Pharmaceutical Technology*; Marcel Dekker: New York, Ny, 2004.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Learn	Learn the elements of preformulation studies.
CO2	Understand	Understand validations of processes and equipments used in Pharmaceutical Industry
CO3	Learn	Learn Industrial Management and GMP Considerations.
CO4	Understand and Remember	Understand and remember Optimization Techniques & Statistical designs
CO5	Understand and analyse	Understand physics of tablet compression and analyse dissolution & diffusion parameters

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	-	2	-	2	2	2	1	3	2	1	1
CO2	3	2	2	3	-	2	-	2	2	3	2	3	3	3	2
CO3	3	1	2	2	-	3	-	3	2	3	2	3	3	3	2
CO4	3	2	3	3	-	2	-	2	2	2	3	3	2	3	3
CO5	3	3	3	3	-	2	-	2	2	2	2	3	1	3	3
Avg	3	2	2.4	2.6	-	2.2	-	2.2	2	2.4	2	3	2.2	2.6	2.2

M. PHARM. SEMESTER – I (MPH)
SUBJECT: REGULATORY AFFAIRS - THEORY (MPH104T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
4	--	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: Course designed to impart advanced knowledge and skills required to learn the concept of generic drug and their development, various regulatory filings in different countries, different phases of clinical trials and submitting regulatory documents: filing process of IND, NDA and ANDA

Objectives: Upon completion of the course, it is expected that the students will be able to understand

- The Concepts of innovator and generic drugs, drug development process
- The Regulatory guidance's and guidelines for filing and approval process
- Preparation of Dossiers and their submission to regulatory agencies in different countries
- Post approval regulatory requirements for actives and drug products
- Submission of global documents in CTD/ eCTD formats
- Clinical trials requirements for approvals for conducting clinical trials
- Pharmacovigilance and process of monitoring in clinical trials.

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**a. Documentation in Pharmaceutical industry**: Master formula record, DMF (Drug Master File), distribution records. Generic drugs product development Introduction , Hatch- Waxman act and amendments, CFR (CODE OF FEDERAL REGULATION) ,drug product performance, in-vitro, ANDA regulatory approval process, NDA approval process, BE and drug product assessment, in –vivo, scale up process approval changes, post marketing surveillance, outsourcing BA and BE to CRO. **b. Regulatory requirement for product approval**: API, biologics, novel, therapies obtaining NDA, ANDA for generic drugs ways and means of US registration for foreign drugs	**15**	CO1 CO2 CO3 CO4
[2]	CMC, post approval regulatory affairs. Regulation for combination products and medical devices.CTD and ECTD format, industry and FDA liaison. ICH - Guidelines of ICH-Q, S E, M. Regulatory requirements of EU, MHRA, TGA and ROW countries.	**15**	CO2 CO3
[3]	**Non clinical drug development**: Global submission of IND, NDA, ANDA. Investigation of medicinal products dossier, dossier (IMPD) and investigator brochure (IB).	**15**	CO2 CO5
[4]	**Clinical trials**: Developing clinical trial protocols. Institutional review board/ independent ethics committee Formulation and working procedures informed Consent process and procedures. HIPAA- new, requirement to clinical study process, ● pharmacovigilance safety monitoring in clinical trials.	**15**	CO2 CO5

C. TEXT BOOKS

1. Berry, I. R.; Martin, R. P. *The Pharmaceutical Regulatory Process*; Informa Healthcare: New York, 2008.
2. Guarino, R. A. *New Drug Approval Process*; Informa Healthcare, Cop: New York, 2009.

D. REFERENCE BOOKS

1. Kanfer, I.; Shargel, L. *Generic Drug Product Development : Solid Oral Dosage Forms*; Marcel Dekker: New York, 2005.
2. Weinberg, S. *Guidebook for Drug Regulatory Submissions*; Wiley: Hoboken, N.J., 2009.
3. Pisano, D. J. *FDA Regulatory Affairs : A Guide for Prescription Drugs, Medical Devices, and Biologics*; Informa Healthcare Usa: New York, 2008.
4. Rozovsky, F. A.; Adams, R. K. *Clinical Trials and Human Research : A Practical Guide to Regulatory Compliance*; Jossey-Bass: San Francisco, 2003.
5. Administration, A. G. D. of H. T. G. TGA basics http://www.tga.gov.au/tga-basics
6. Your gateway to the European Union http://europa.eu/index_en.htm.
7. ICH Official web site : ICH http://www.ich.org/.
8. Commissioner, O. of the. U.S. Food and Drug Administration http://www.fda.gov/.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and remeber	To understand the Concepts of innovator and generic drugs, drug development process
CO2	Understand and Apply	To understand the Regulatory guidance and guidelines for filing and approval process
CO3	Understand and remeber	To understand Preparation of Dossiers and their submission to regulatory agencies in different countries in CTD/ eCTD formats
CO4	Understand and remember	To understand Post approval regulatory requirements for actives and drug products
CO5	Understand and remember	To acquire knowledge about Non-clinical development, Clinical trials requirements, Pharmacovigilance and process of monitoring in clinical trials.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	-	-	-	-	2	2	3	3	-	3	-	3	2	-
CO2	3	-	-	-	-	2	2	3	2	-	3	-	3	2	-
CO3	3	-	-	-	1	2	2	3	2	-	3	-	3	2	-
CO4	3	-	-	-	-	2	2	3	3	-	3	-	3	-	-
CO5	3	2	1	1	1	2	2	3	3	-	3	-	1	2	1
Avg	3	0.4	0.2	0.2	0.4	2	2	3	2.6	-	3	-	2.6	1.6	0.2

M. PHARM. SEMESTER – I (MPH)
SUBJECT: PHARMACEUTICS PRACTICAL – I (MPH105P)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
-	-	12	12	6	100	30	20	-	150

A. COURSE OVERVIEW

Scope: This subject is designed to impart basic knowledge and skills on analytical techniques and development of various NDDS dosage forms

Objectives: objectives of the course is to make students able to

- Understand, learn and application of various spectrophotometric and chromatographic analytical methods in analysis of drugs and drug products.
- Application of preformulation concepts in Preparation, characterization and evaluation of conventional and novel drug delivery systems

B. COURSE CONTENT

NO	TOPIC	P (Hrs)	COs
[1]	1. Analysis of pharmacopoeial compounds and their formulations by UV Vis-spectrophotometer 1. Simultaneous estimation of multi component containing formulations by UV spectrophotometry 2. Experiments based on HPLC 3. Experiments based on Gas Chromatography 4. Estimation of riboflavin/quinine sulphate by fluorimetry 5. Estimation of sodium/potassium by flame photometry	**90**	CO1 CO2
[2]	1. To perform In-vitro dissolution profile of CR/ SR marketed formulation 2. Formulation and evaluation of sustained release matrix tablets 3. Formulation and evaluation osmotically controlled DDS 4. Preparation and evaluation of Floating DDS- hydro dynamically balanced DDS 5. Formulation and evaluation of Muco adhesive tablets. 6. Formulation and evaluation of trans dermal patches. 7. To carry out preformulation studies of tablets. 8. To study the effect of compressional force on tablets disintegration time. 9. To study Micromeritic properties of powders and granulation. 10. To study the effect of particle size on dissolution of a tablet. 11. To study the effect of binders on dissolution of a tablet. 12. To plot Heckal plot, Higuchi and peppas plot and determine similarity factors.	**90**	CO2 CO3 CO4 CO5

C. TEXT BOOKS

D. REFERENCE BOOKS

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Assessment	Assessment of the drug/s using various spectroscopic and chromatographic techniques
CO2	Learn	Handling and operations of various analytical instruments
CO3	understand	Preparation and evaluation of modified release drug delivery systems
CO4	Understand and Remember	To understand effect of various excipients and process parameters on various dosage forms
CO5	Understand and apply	application of the various model dependent and model independent approaches for the assessment of dosage forms

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3	1	2	1	2	2	2	1	3	1	1	1
CO2	3	3	2	2	2	3	2	3	2	3	2	3	2	2	2
CO3	3	3	3	2	2	2	1	3	2	3	2	3	3	2	2
CO4	3	3	3	3	1	2	1	2	2	2	3	3	3	3	3
CO5	3	3	3	3	1	2	1	2	2	3	2	3	3	3	3
Avg	3	3	2.6	2.6	1.4	2.2	1.2	2.4	2	2.6	2	3	2.4	2.2	2.2

M. PHARM. SEMESTER – II (MPH)
SUBJECT: MOLECULAR PHARMACEUTICS (NANO TECHNOLOGY & TARGETED DDS) (NTDS) (MPH201T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
4	-	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This course is designed to impart knowledge on the area of advances in novel drug delivery systems.

Objectives: Upon completion of the course, student shall be able to understand

- The various approaches for development of novel drug delivery systems.
- The criteria for selection of drugs and polymers for the development of delivering system
- The formulation and evaluation of novel drug delivery systems

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	Targeted Drug Delivery Systems: Concepts, Events and biological process involved in drug targeting. Tumor targeting and Brain specific delivery.	**12**	CO5
[2]	Targeting Methods: introduction preparation and evaluation. Nano Particles & Liposomes: Types, preparation and evaluation.	**12**	CO5 CO3
[3]	Micro Capsules / Micro Spheres: Types, preparation and evaluation, Monoclonal Antibodies; preparation and application, preparation and application of Niosomes, Aquasomes, Phytosomes, Electrosomes.	**12**	CO2 CO3
[4]	Pulmonary Drug Delivery Systems : Aerosols, propellents, Containers Types, preparation and evaluation, Intra Nasal Route Delivery systems; Types, preparation and evaluation.	**12**	CO1 CO2
[5]	Nucleic acid based therapeutic delivery system : Gene therapy, introduction (ex-vivo & in-vivo gene therapy). Potential target diseases for gene therapy (inherited disorder and cancer). Gene expression systems (viral and nonviral gene transfer). Liposomal gene delivery systems. Biodistribution and Pharmacokinetics. knowledge of therapeutic antisense molecules and aptamers as drugs of future.	**12**	CO4

C. TEXT BOOKS

1. N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, New Delhi, First edition 1997 (reprint in 2001).
2. S.P.Vyas and R.K.Khar, Controlled Drug Delivery - concepts and advances, Vallabh Prakashan, New Delhi, First edition 2002

D. REFERENCE BOOKS

1. Y W. Chien, Novel Drug Delivery Systems, 2nd edition, revised and expanded, Marcel Dekker, Inc., New York, 1992.
2. Robinson, J. R., Lee V. H. L, Controlled Drug Delivery Systems, Marcel Dekker,Inc., New York, 1992.
3. Encyclopedia of controlled delivery, Editor- Edith Mathiowitz, Published by WileyInterscience Publication, John Wiley and Sons, Inc, New York, Chichester/Weinheim

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand	To understand the various approaches for development of novel drug delivery systems.
CO2	Learn	To learn the criteria for selection of drugs and polymers for the development of NDDS
CO3	Understand	To understand the concepts of formulation and evaluation of Nano carrier-based drug delivery systems.
CO4	learn	To learn the nucleic acid-based drug delivery systems.
CO5	Understand and analyse	To understand concepts and methods of targeted drug delivery systems.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	-	2	-	2	2	3	1	3	3	2	2
CO2	3	3	3	3	-	2	-	2	2	2	1	2	3	2	2
CO3	3	2	3	2	-	2	-	3	2	2	3	2	3	2	3
CO4	3	2	2	2	-	2	-	2	2	2	3	2	3	3	2
CO5	3	2	2	2	-	2	-	3	2	3	3	3	3	2	3
Avg	3	2.2	2.4	2.2	-	2	-	2.4	2	2.4	2.2	2.4	3	2.2	2.4

M. PHARM. SEMESTER – II (MPH)
SUBJECT: ADVANCED BIOPHARMACEUTICS & PHARMACOKINETICS (MPH202T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
3	1	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This course is designed to impart knowledge and skills necessary for dose calculations, dose adjustments and to apply biopharmaceutics theories in practical problem solving. Basic theoretical discussions of the principles of biopharmaceutics and pharmacokinetics are provided to help the students to clarify the concepts.

Objectives: Upon completion of this course it is expected that students will be able understand,

- The basic concepts in biopharmaceutics and pharmacokinetics. The use raw data and derive the pharmacokinetic models and parameters the best describe the process of drug absorption, distribution, metabolism and elimination.
- The critical evaluation of biopharmaceutic studies involving drug product equivalency.
- The design and evaluation of dosage regimens of the drugs using pharmacokinetic and biopharmaceutic parameters.
- The potential clinical pharmacokinetic problems and application o basics of pharmacokinetic

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Drug Absorption from the Gastrointestinal Tract:** Gastrointestinal tract, Mechanism of drug absorption, Factors affecting drug absorption, pH–partition theory of drug absorption. Formulation and physicochemical factors: Dissolution rate, Dissolution process, Noyes–Whitney equation and drug dissolution, Factors affecting the dissolution rate. Gastrointestinal absorption: role of the dosage form: Solution (elixir, syrup and solution) as a dosage form, Suspension as a dosage form, Capsule as a dosage form, Tablet as a dosage form, Dissolution methods ,Formulation and processing factors, Correlation of in vivo data with in vitro dissolution data. Transport model: Permeability-Solubility-Charge State and the pH Partition Hypothesis, Properties of the Gastrointestinal Tract (GIT), pH Microclimate Intracellular pH Environment, Tight-Junction Complex.	**12**	CO1 CO2
[2]	**Biopharmaceutic considerations in drug product design and In Vitro Drug Product Performance:** Introduction, biopharmaceutic factors affecting drug bioavailability, rate-limiting steps in drug absorption, physicochemical nature of the drug formulation factors affecting drug product performance, in vitro: dissolution and drug release testing, compendial methods of dissolution, alternative methods of dissolution testing, meeting dissolution requirements, problems of variable control in dissolution testing performance of drug products. In vitro–in vivo correlation, dissolution profile comparisons, drug product stability, considerations in the design of a drug product.	**12**	CO1 CO2
[3]	**Pharmacokinetics:** Basic considerations, pharmacokinetic models, compartment modeling: one compartment model- IV bolus, IV infusion,	**12**	CO3

	extra-vascular. Multi compartment model: two compartment - model in brief, non-linear pharmacokinetics: cause of non-linearity, Michaelis – Menten equation, estimation of kmax and vmax. Drug interactions: introduction, the effect of protein binding interactions, the effect of tissue-binding interactions, cytochrome p450-based drug interactions, drug interactions linked to transporters.		
[4]	**Drug Product Performance, In Vivo:** Bioavailability and Bioequivalence: drug product performance, purpose of bioavailability studies, relative and absolute availability. Methods for assessing bioavailability, bioequivalence studies, design and evaluation of bioequivalence studies, study designs, crossover study designs, evaluation of the data, bioequivalence example, study submission and drug review process. Biopharmaceutics classification system, methods. Permeability: In-vitro, in-situ and In-vivo methods. Generic biologics (biosimilar drug products), clinical significance of bioequivalence studies, special concerns in bioavailability and bioequivalence studies, generic substitution.	**12**	CO4
[5]	**Application of Pharmacokinetics:** Modified-Release Drug Products, Targeted Drug Delivery Systems and Biotechnological Products. Introduction to Pharmacokinetics and pharmacodynamic, drug interactions. Pharmacokinetics and pharmacodynamics of biotechnology drugs. Introduction, Proteins and peptides, Monoclonal antibodies, Oligonucleotides, Vaccines (immunotherapy), Gene therapies.	**12**	CO5

C. TEXT BOOKS

1. Jaiswal, Sunil B., and Brahmankar, D. M.. Biopharmaceutics and Pharmacokinetics: A Treatise. India, Vallabh Prakashan, 2005.

D. REFERENCE BOOKS

1. Gibaldi, M. Biopharmaceutics and Clinical Pharmacokinetics. India: Pharmamed Press. 2005.
2. Yu, Andrew B.C., and Shargel, Leon. Applied Biopharmaceutics & Pharmacokinetics, Seventh Edition. Singapore, McGraw-Hill Education, 2015.
3. Gibaldi, Milo, and Perrier, Donald. Pharmacokinetics., 2nd edition, Marcel Dekker Inc., New York, 1982
4. Swarbrick. J. Current Concepts in the Pharmaceutical Sciences: Biopharmaceutics. United States: Lea & Febiger. 1970.
5. Malcolm Rowland and Thom N. Tozer. Clinical Pharmacokinetics, Concepts and Applications. 3rd edition. Lea and Febiger, Philadelphia, 1995
6. Abdou. H.M, Dissolution, Bioavailability and Bioequivalence, Mack Publishing Company, Pennsylvania 1989
7. Robert. E. Notari. Biopharmaceutics and Clinical Pharmacokinetics, An Introduction, 4th edition, Marcel Dekker Inc, New York and Basel,1987.
8. John. G Wagner and M. Pemarowski. Biopharmaceutics and Relevant Pharmacokinetics, 1st edition, Drug Intelligence Publications, Hamilton, Illinois, 1971.
9. James Swarbrick, James. G. Boylan. Encyclopedia of Pharmaceutical Technology, Vol 13, Marcel Dekker Inc, New York, 1996.
10. Sunil S Jambhekar and Philip J Breen. Basic Pharmacokinetics, 1st edition, pharmaceutical press, RPS Publishing, 2009.
11. Alex Avdeef. Absorption and Drug Development- Solubility, Permeability, and Charge State, John Wiley & Sons, Inc, 2003.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand	Understand basic concepts and factors affecting of absorption of drugs form GIT and bioavailability.
CO2	Understand and Apply	Understand and apply biopharmaceutic considerations and in-vitro dissolution in drug product design.
CO3	Understand and Utilize	Understand and utilize the pharmacokinetic models for the determination of pharmacokinetic parameters.
CO4	Understand, Analyze and Evaluate	Understand and analyze the bioavailability of a drug and evaluate the bioequivalence between drug products.
CO5	Remember and Understand	Remember and Understand applications of biopharmaceutics and apply in designing dosage forms

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	1	2	2	1	2	1	1	3	2	2	3	2	3	2
CO2	3	2	3	2	1	3	2	2	2	2	3	3	3	3	2
CO3	2	1	2	3	1	2	2	2	1	1	2	2	3	3	3
CO4	3	2	2	2	1	2	1	1	3	2	3	3	2	3	2
CO5	3	2	3	3	1	2	2	2	2	2	2	3	3	3	2
Avg	2.8	1.6	2.4	2.4	1	2.2	1.6	1.6	2.2	1.8	2.4	2.8	2.6	3	2.2

M. PHARM. SEMESTER – II (MPH)
SUBJECT: COMPUTER AIDED DRUG DEVELOPMENT (MPH203T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
4	-	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This course is designed to impart knowledge and skills necessary for computer Applications in pharmaceutical research and development who want to understand the application of computers across the entire drug research and development process. Basic theoretical discussions of the principles of more integrated and coherent use of computerized information (informatics) in the drug development process are provided to help the students to clarify the concepts.

Objectives: Upon completion of this course it is expected that students will be able to understand,

- History of Computers in Pharmaceutical Research and Development
- Computational Modeling of Drug Disposition
- Computers in Preclinical Development
- Optimization Techniques in Pharmaceutical Formulation
- Computers in Market Analysis
- Computers in Clinical Development
- Artificial Intelligence (AI) and Robotics
- Computational fluid dynamics (CFD)

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**a. Computers in Pharmaceutical Research and Development:** A General Overview: History of Computers in Pharmaceutical Research and Development. Statistical modeling in Pharmaceutical research and development: Descriptive versus Mechanistic Modeling, Statistical Parameters, Estimation, Confidence Regions, Nonlinearity at the Optimum, Sensitivity Analysis, Optimal Design, Population Modeling **b. Quality-by-Design in Pharmaceutical Development:** Introduction, ICH Q8 guideline, Regulatory and industry views on QbD, Scientifically based QbD - examples of application.	**12**	CO1 CO2
[2]	**Computational Modeling of Drug Disposition:** Introduction, Modeling Techniques: Drug Absorption, Solubility, Intestinal Permeation, Drug Distribution, Drug Excretion, Active Transport; P-gp, BCRP, Nucleoside Transporters, hPEPT1, ASBT, OCT, OATP, BBB-Choline Transporter.	**12**	CO3 CO4
[3]	**Computer-aided formulation development:** Concept of optimization, Optimization parameters, Factorial design, Optimization technology & Screening design. Computers in Pharmaceutical Formulation: Development of pharmaceutical emulsions, microemulsion drug carriers Legal Protection of Innovative Uses of Computers in R&D, The Ethics of Computing in Pharmaceutical Research, Computers in Market analysis	**12**	CO1 CO2

[4]	**a. Computer-aided biopharmaceutical characterization:** Gastrointestinal absorption simulation. Introduction, Theoretical background, Model construction, Parameter sensitivity analysis, Virtual trial, Fed vs. fasted state, In vitro dissolution and in-vitro-in-vivo correlation, Biowaiver considerations **b. Computer Simulations in Pharmacokinetics and Pharmacodynamics:** Introduction, Computer Simulation: Whole Organism, Isolated Tissues, Organs, Cell, Proteins and Genes. **c. Computers in Clinical Development:** Clinical Data Collection and Management, Regulation of Computer Systems	**12**	CO3 CO4
[5]	**Artificial Intelligence (AI), Robotics and Computational fluid dynamics:** General overview, Pharmaceutical Automation, Pharmaceutical applications, Advantages and Disadvantages. Current Challenges and Future Directions.	**12**	CO5

C. TEXT BOOKS

1. Ekins, S. Computer Applications in Pharmaceutical Research and Development Ekins/Computer Applications in Pharmaceutical Research and Development; Hoboken, Nj, USA John Wiley & Sons, Inc, 2006.

D. REFERENCE BOOKS

1. Jelena Djuris. Computer-Aided Applications in Pharmaceutical Technology; Woodhead Publishing: Oxford, 2013.
2. Swarbrick, J. Encyclopaedia of Pharmaceutical Technology; Vol 1-3; Marcel Dekker: New York, Ny, 2004.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and Apply	To know role of computers and application of statistical modeling in pharmaceutical research.
CO2	Understand and Apply	To understand application of QbD and optimization techniques in pharmaceutical product development.
CO3	Understand	To know computational modeling techniques of drug disposition and biopharmaceutical process.
CO4	Understand and Remember	To know and understand application of computers modeling techniques in pharmacokinetic and pharmacodynamic of drugs.
CO5	Understand and Remember	To understand artificial intelligence in development of drug product.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	1	1	3	-	-	-	-	2	-	3	-	3	0	3
CO2	3	2	3	3	-	-	3	3	2	-	3	-	3	1	3
CO3	3	2	2	3	-	-	3	3	3	-	3	-	3	3	3
CO4	3	2	2	3	-	-	3	3	3	-	3	2	3	3	3
CO5	3	1	2	3	-	-	3	2	2	-	3	3	3	0	3
Avg	3	1.6	2	3	-	-	2.4	2.2	2.4	-	3	1	3	1.4	3

M. PHARM. SEMESTER – II (MPH)
SUBJECT: COSMETIC AND COSMECEUTICALS (MPH204T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
4	-	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This course is designed to impart knowledge and skills necessary for the fundamental need for cosmetic and cosmeceutical products.

Objectives: Upon completion of the course the student shall be able to

- Key ingredients used in cosmetics and cosmeceuticals.
- Key building blocks for various formulations.
- Current technologies in the market
- Various key ingredients and basic science to develop cosmetics and cosmeceuticals.
- Scientific knowledge to develop cosmetics and cosmeceuticals with desired Safety, stability, and efficacy.

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	Cosmetics – Regulatory : Definition of cosmetic products as per Indian regulation. Indian regulatory requirements for labeling of cosmetics Regulatory provisions relating to import of cosmetics., Misbranded and spurious cosmetics. Regulatory provisions relating to manufacture of cosmetics – Conditions for obtaining license, prohibition of manufacture and sale of certain cosmetics, loan license, offences and penalties.	**12**	CO3
[2]	Cosmetics - Biological aspects : Structure of skin relating to problems like dry skin, acne, pigmentation, prickly heat, wrinkles and body odor. Structure of hair and hair growth cycle. Common problems associated with oral cavity. Cleansing and care needs for face, eye lids, lips, hands, feet, nail, scalp, neck, body and under-arm.	**12**	CO1 CO4 CO5
[3]	Formulation Building blocks: Building blocks for different product formulations of cosmetics/cosmeceuticals. Surfactants – Classification and application. Emollients, rheological additives: classification and application. Antimicrobial used as preservatives, their merits and demerits. Factors affecting microbial preservative efficacy. Building blocks for formulation of a moisturizing cream, vanishing cream, cold cream, shampoo and toothpaste. Soaps and syndet bars. Perfumes; Classification of perfumes. Perfume ingredients listed as allergens in EU regulation. Controversial ingredients: Parabens, formaldehyde liberators, dioxane.	**12**	CO1 CO2 CO3 CO4 CO5
[4]	Design of cosmeceutical products: Sun protection, sunscreens classification and regulatory aspects. Addressing dry skin, acne, sun-protection, pigmentation, prickly heat, wrinkles, body odor., dandruff, dental cavities, bleeding gums, mouth odor and sensitive teeth through cosmeceutical formulations.	**12**	CO1 CO2 CO4 CO5
[5]	Herbal Cosmetics: Herbal ingredients used in Hair care, skin care and oral care. Review of guidelines for herbal cosmetics by private bodies like cosmos with respect to preservatives, emollients, foaming agents, emulsifiers and rheology modifiers. Challenges in formulating herbal cosmetics.	**12**	CO1 CO2 CO4 CO5

C. TEXT BOOKS

1. Butler, H.; Poucher, W. A. Poucher's Perfumes, Cosmetics, and Soaps.; Kluwer Academic Publishers: Dordrecht ; Boston, 2000.

D. REFERENCE BOOKS

1. Ralph Gordon Harry; Rosen, M. R. *Harry's Cosmeticology*; Chemical Publishing Company: New York, 2015.

3. Sharma, P. P.; Vandana Publications. *Cosmetics : Formulation, Manufacturing & Quality Control*; Vandama Publications: Delhi, 2018.

4. Barel, A. O.; Paye, M.; Maibach, H. I. *Handbook of Cosmetic Science and Technology*; Taylor & Francis: Boca Raton, 2014.

5 And, T. *CTFA Membership Directory.*; Cosmetic, Toiletry And Fragrance Association, Inc: Washington, D.C., 1981.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Remember, Understand and Evaluate	To understand the key ingredients used in cosmetics and cosmeceuticals.
CO2	Remember, Understand and Evaluate	To learn key building blocks for various formulations.
CO3	Understand Apply and Evaluate	To learn the current technologies and regulatory requirements of cosmetics in the market
CO4	Understand and Remember	To understand the various basic science to develop cosmetics and cosmeceuticals
CO5	Remember, Understand and Evaluate	To learn the scientific knowledge to develop cosmetics and cosmeceuticals with desired Safety, stability, and efficacy.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	3	1	1	1	3	2	3	1	3	1	3	2
CO2	3	2	3	3	1	1	1	3	3	3	1	2	2	3	2
CO3	3	3	3	3	1	1	2	2	3	2	2	2	2	3	2
CO4	3	2	3	3	1	1	2	2	3	3	1	2	2	3	2
CO5	3	3	3	3	1	2	2	3	2	2	2	3	3	3	2
Avg	3	2.4	3	3	1	1.2	1.6	2.6	2.6	2.6	1.4	2.4	2	3	2

M. PHARM. SEMESTER – I (MPH)
SUBJECT: PHARMACEUTICS PRACTICAL – II (MPH205P)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
-	-	12	12	6	100	30	20	-	100

A. COURSE OVERVIEW

Scope: This subject is designed to impart basic knowledge and skills on analytical techniques and development of various NDDS dosage forms

Objectives: Upon completion of the course student shall be able

- Formulation and evaluation of different novel drug delivery systems
- Application of QbD principles in designing dosage form.

B. COURSE CONTENT

NO	TOPIC	P (Hrs)	COs
[1]	1. To study the effect of temperature change , non solvent addition, 2. incompatible polymer addition in microcapsules preparation 3. Preparation and evaluation of Alginate beads 4. Formulation and evaluation of gelatin /albumin microspheres 5. Formulation and evaluation of liposomes/niosomes 6. Formulation and evaluation of spherules 7. Improvement of dissolution characteristics of slightly soluble drug by Solid dispersion technique. 8. Comparison of dissolution of two different marketed products /brands 9. Development and evaluation of Creams 10. Development and evaluation of Shampoo and Toothpaste base 11. To incorporate herbal and chemical actives to develop products 12. To address Dry skin, acne, blemish, Wrinkles, bleeding gums and dandruff	**90**	CO1 CO3 CO5
[2]	1. Protein binding studies of a highly protein bound drug & poorly protein bound drug 2. Bioavailability studies of Paracetamol in animals. 3. Pharmacokinetic and IVIVC data analysis by WinnolineR software 4. In vitro cell studies for permeability and metabolism 5. DoE Using Design Expert® Software 6. Formulation data analysis Using Design Expert® Software 7. Quality-by-Design in Pharmaceutical Development 8. Computer Simulations in Pharmacokinetics and Pharmacodynamics 9. Computational Modeling Of Drug Disposition 10. To develop Clinical Data Collection manual 11. To carry out Sensitivity Analysis, and Population Modeling.	**90**	CO2 CO4

C. TEXT BOOKS

D. REFERENCE BOOKS

E. COURSE OUTCOMES

(Minimum 5 Cos are required)

CO Number	Skill	Statement
CO1	understand and analyse	Formulate and characterize various novel drug delivery systems
CO2	Learn	Pharmacokinetic and IVIVC data analysis, simulation of pharmacokinetic using appropriate computational program/s
CO3	Understand	Preparation and characterization of cosmetic preparations, herbal active containing products and toiletry items
CO4	Understand and Remember	Applications of design of experiment software/s and Quality-by Design in pharmaceutical development.
CO5	Understand and apply	Solubility improvement techniques & Dissolution profile comparison by various tools

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3	1	2	2	2	2	2	1	3	3	1	1
CO2	3	3	2	2	2	3	2	3	2	3	2	2	3	3	3
CO3	3	3	3	2	2	2	2	3	2	3	2	3	3	2	1
CO4	3	3	3	3	1	2	1	2	2	2	3	2	3	2	3
CO5	3	3	3	3	1	2	2	2	2	3	2	2	3	3	3
Avg	3	3	2.6	2.6	1.4	2.2	1.8	2.4	2	2.6	2	2.4	3	2.2	2.2

M. PHARM. SEMESTER – II (MQA)
SUBJECT: MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES - THEORY (MQA101T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
4	--	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This subject deals with various advanced analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are NMR, Mass spectrometer, IR, HPLC, GC etc.

Objectives: After completion of course, student is able to know about

1. Chemicals and excipients
2. The analysis of various drugs in single and combination dosage forms
3. Theoretical and practical skills of the instruments

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**a. UV-Visible spectroscopy**: Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect and Applications of UV-Visible spectroscopy, Difference/ Derivative spectroscopy. **b. IR spectroscopy**: Theory, Modes of Molecular vibrations, Sample handling, Instrumentation of Dispersive and Fourier -Transform IR Spectrometer, Factors affecting vibrational frequencies and Applications of IR spectroscopy, Data Interpretation. **c. Spectroflourimetry**: Theory of Fluorescence, Factors affecting fluorescence (Characterestics of drugs that can be analysed by flourimetry), Quenchers, Instrumentation and Applications of fluorescence spectrophotometer. **d. Flame emission spectroscopy and Atomic absorption spectroscopy**: Principle, Instrumentation, Interferences and Applications.	**11**	CO1 CO2 CO5
[2]	**NMR spectroscopy**: Quantum numbers and their role in NMR, Principle, Instrumentation, Solvent requirement in NMR, Relaxation process, NMR signals in various compounds, Chemical shift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant, Nuclear magnetic double resonance, Brief outline of principles of FT-NMR and 13C NMR. Applications of NMR spectroscopy	**11**	CO1 CO2 CO5
[3]	**Mass Spectroscopy**: Principle, Theory, Instrumentation of Mass Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and Applications of Mass spectroscopy.	**11**	CO1 CO2 CO5
[4]	**Chromatography**: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution, isolation of drug from excipients, data interpretation and applications of the following: ● Thin Layer chromatography ● High Performance Thin Layer Chromatography	**11**	CO3 CO4 CO5

	• Ion exchange chromatography • Column chromatography • Gas chromatography • High Performance Liquid chromatography • Ultra High Performance Liquid chromatography • Affinity chromatography • Gel Chromatography.		
[5]	**a. Electrophoresis**: Principle, Instrumentation, Working conditions, factors affecting separation and applications of the following: a) Paper electrophoresis b) Gel electrophoresis c) Capillary electrophoresis d) Zone electrophoresis e) Moving boundary electrophoresis f) Iso electric focusing **b. X ray Crystallography**: Production of X rays, Different X ray methods, Bragg's law, Rotating crystal technique, X ray powder technique, Types of crystals and applications of X-ray diffraction.	**11**	CO5
[6]	**a. Potentiometry**: Principle, working, Ion selective Electrodes and Application of potentiometry. **b. Thermal Techniques**: Principle, thermal transitions and Instrumentation (Heat flux and power-compensation and designs), Modulated DSC, Hyper DSC, experimental parameters (sample preparation, experimental conditions, calibration, heating and cooling rates, resolution, source of errors) and their influence, advantage and disadvantages, pharmaceutical applications. Differential Thermal Analysis (DTA): Principle, instrumentation and advantage and disadvantages, pharmaceutical applications, derivative differential thermal analysis (DDTA). TGA: Principle, instrumentation, factors affecting results, advantage and disadvantages, pharmaceutical applications.	**05**	CO5

C. TEXT BOOKS

1. Connors, K. A. *A Textbook of Pharmaceutical Analysis*; Wiley: New York, 1982..
2. Mendham, A. *Vogel's Textbook of Quantitative Chemical Analysis.*; Pearson: New Delhi, 2009.

D. REFERENCE BOOKS

1. JW Munson. *Pharmaceutical Analysis - Modern Methods Part-B*; Marcel. Dekker Series.; Vol. 11.
2. Kalsi, P. S. *Spectroscopy of Organic Compounds.*; New Age International Pvt, 2016.
3. Silverstein, R. M.; Webster, F. X.; Kiemle, D. J.; Bryce, D. L. *Spectrometric Identification of Organic Compounds*; Wiley: Hoboken, Nj, 2015.
4. Skoog, D. A.; F James Holler; Crouch, S. R. *Principles of Instrumental Analysis*; Thomson, Brooks/Cole: Belmont, Ca, 2007.
5. Hobart Hurd Willard. *Instrumental Methods of Analysis*; Wadsworth: Belmont, 1993.
6. Kemp, W. *Organic Spectroscopy*; Palgrave: Basingstoke, 2001.
7. Sethi, P. D. *Quantitative Analysis of Drugs in Pharmaceutical Formulations*; Cbs Publishers & Distributors: New Delhi, 2005.
8. Beckett, A. H.; Stenlake, J. B. *Practical Pharmaceutical Chemistry*; Athlone Press: London, 1988.

9. Sharma B K. *Instrumental Methods of Chemical Analysis*, 27th edition.; Goel Publishing House: Meerut, 2011.
10. Sharma, Y. R. *Elementary Organic Spectroscopy : Principles and Chemical Applications*; S. Chand & Company: New Delhi, 2007.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and remember	To understand the fundamentals of various spectroscopic techniques
CO2	Understand Apply and Evaluate	To apply the fundamentals of spectroscopy in single and combination drug analysis
CO3	Understand and remember	To understand the chromatographic separation fundamentals
CO4	Understand Apply and Evaluate	To apply the fundamentals of various chromatographic techniques in single and combination drug analysis
CO5	Understand Apply and Evaluate	To learn theoretical and practical aspects of various analytical instruments.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	-	1	1	-	1	-	1	-	-	3	2	-	-	-
CO2	3	2	3	2	-	2	1	1	2	-	3	3	1	1	-
CO3	3	-	1	1	-	1	-	1	-	-	3	2	-	-	-
CO4	3	2	3	2	-	2	1	1	2	-	3	3	1	1	-
CO5	3	2	1	1	-	2	1	1	1	-	3	3	1	1	-
Avg	3	1.2	1.8	1.4	-	1.6	0.6	1	1	-	3	2.6	0.6	0.6	-

M. PHARM. SEMESTER – I (MQA)
SUBJECT: QUALITY MANAGEMENT SYSTEM-THEORY (MQA102T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
4	0	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This course is designed to impart fundamental knowledge and concepts about various quality management principles and systems utilized in the manufacturing industry. It also aids in understanding the quality evaluation in the pharmaceutical industries.

Objectives: At completion of this course, it is expected that students will be able to understand-

- The importance of quality
- ISO management systems
- Tools for quality improvement
- Analysis of issues in quality
- Quality evaluation of pharmaceuticals
- Stability testing of drug and drug substances
- Statistical approaches for quality

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Introduction to Quality:** Evolution of Quality, Definition of Quality, Dimensions of Quality **Quality as a Strategic Decision:** Meaning of strategy and strategic quality management, mission and vision statements, quality policy, Quality objectives, strategic planning and implementation, McKinsey 7s model, Competitive analysis, Management commitment to quality **Customer Focus:** Meaning of customer and customer focus, Classification of customers, Customer focus, Customer perception of quality, Factors affecting customer perception, Customer requirements, Meeting customer needs and expectations, Customer satisfaction and Customer delight, Handling customer complaints, Understanding customer behavior, concept of internal and external customers. Case studies. **Cost of Quality:** Cost of quality, Categories of cost of Quality, Models of cost of quality, Optimising costs, Preventing cost of quality.	**12**	CO1 CO3
[2]	**Pharmaceutical quality Management:** Basics of Quality Management, Total Quality Management (TQM), Principles of Six sigma, ISO 9001:2008, 9001:2015, ISO 14001:2004, Pharmaceutical Quality Management – ICH Q10, Knowledge management, Quality Metrics, Operational Excellence and Quality Management Review. OSHAS guidelines, NABL certification and accreditation, CFR-21 part 11, WHO-GMP requirements.	**12**	CO1 CO2 CO3
[3]	**Six System Inspection model:** Quality Management system, Production system, Facility and Equipment system, Laboratory control system, Materials system, Packaging and labeling system. Concept of self inspection. Quality systems: Change Management/ Change control. Deviations, Out of Specifications (OOS), Out of Trend (OOT), Complaints - evaluation and handling, Investigation and determination of root cause,	**12**	CO4

	Corrective & Preventive Actions (CAPA), Returns and Recalls, Vendor Qualification, Annual Product Reviews, Batch Review and Batch Release. Concept of IPQC, area clearance/ Line clearance.		
[4]	**Drug Stability:** ICH guidelines for stability testing of drug substances and drug products. Study of ICH Q8, Quality by Design and Process development report Quality risk management: Introduction, risk assessment, risk control, risk review, risk management tools, HACCP, risk ranking and filtering according to ICH Q9 guidelines.	**12**	CO5
[5]	**Statistical Process control (SPC):** Definition and Importance of SPC, Quality measurement in manufacturing, Statistical control charts - concepts and general aspects, Advantages of statistical control, Process capability, Estimating Inherent or potential capability from a control chart analysis, Measuring process control and quality improvement, Pursuit of decreased process variability.	**08**	CO1 CO3 CO4
[6]	Regulatory Compliance through Quality Management and development of Quality Culture Benchmarking: Definition of benchmarking, Reasons for benchmarking, Types of Benchmarking, Benchmarking process, Advantages of benchmarking, Limitations of benchmarking.	**04**	CO1 CO3 CO4

C. TEXT BOOKS

1. Fairfield-Sonn, J. W. Corporate Culture and the Quality Organization; Quorum Books: Westport, Conn., 2001.

D. REFERENCE BOOKS

1. Endres, A. C. Implementing Juran's Road Map for Quality Leadership : Benchmarks and Results; Wiley: New York, 2000.
2. Antony J, David P, Routledge, Understanding, Managing and Implementing Quality: Frameworks, Techniques and Cases, 2002
3. Okes D, Root Cause Analysis, The Core of Problem Solving and Corrective Action, 2009, ASQ Publications.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and Remember	To understand importance of quality and Tools for quality improvement
CO2	Understand	To study the ISO management systems
CO3	Understand and Apply	To understand the Analysis of issues in quality and Statistical approaches for quality
CO4	Understand and Remember	To study the Quality evaluation of pharmaceuticals
CO5	Understand and Apply	To understand the Stability testing of drug and drug substances

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	1	2	1	2	2	1	2	2	2	2	2
CO2	3	3	3	3	1	3	0	2	1	2	3	3	3	3	3
CO3	3	2	2	2	1	2	0	2	2	1	2	2	2	2	2
CO4	3	3	3	3	1	3	1	2	1	2	3	3	3	3	3
CO5	3	3	3	3	1	3	0	2	2	2	3	3	3	3	3
Avg	3	2.6	2.6	2.6	1	2.6	0.4	2	1.6	1.6	2.6	2.6	2.6	2.6	2.6

M. PHARM. SEMESTER – I (MQA)
SUBJECT: QUALITY CONTROL AND QUALITY ASSURANCE (MQA103T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
4	0	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This course deals with the various aspects of quality control and quality assurance aspects of pharmaceutical industries. It covers the important aspects like cGMP, QC tests, documentation, quality certifications, GLP and regulatory affairs.

Objectives: Upon completion of this course the student should be able to

Understand the cGMP aspects in a pharmaceutical industry

- To appreciate the importance of documentation
- To understand the scope of quality certifications applicable to
- Pharmaceutical industries
- To understand the responsibilities of QA & QC departments.

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Introduction:** Concept and evolution and scopes of Quality Control and Quality Assurance, Good Laboratory Practice, GMP, Overview of ICH Guidelines - QSEM, with special emphasis on Q-series guidelines. Good Laboratory Practices: Scope of GLP, Definitions, Quality assurance unit, protocol for conduct of non clinical testing, control on animal house, report preparation and documentation. CPCSEA guidelines.	**12**	CO1 CO2 CO5
[2]	cGMP guidelines according to schedule M, USFDA (inclusive of CDER and CBER) Pharmaceutical Inspection Convention(PIC), WHO and EMEA covering: Organization and personnel responsibilities, training, hygiene and personal records, drug industry location, design, construction and plant lay out, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination and Good Warehousing Practice.	**12**	CO1 CO2 CO5
[3]	Analysis of raw materials, finished products, packaging materials, in process quality control (IPQC), Developing specification (ICH Q6 and Q3), purchase specifications and maintenance of stores for raw materials. In process quality control and finished products quality control for following dosage forms in Pharma industry according to Indian, US and British pharmacopoeias: tablets, capsules, ointments, suppositories, creams, parenterals, ophthalmic and surgical products (How to refer pharmacopoeias).	**12**	CO1 CO2 CO4 CO5
[4]	Documentation in pharmaceutical industry: Three tier documentation, Policy, Procedures and Work instructions, and records (Formats), Basic principles- How to maintain, retention and retrieval etc. Standard operating procedures (How to write), Master Batch Record, Batch Manufacturing Record, Quality audit plan and reports. Specification and test procedures, Protocols and reports. Distribution records. Electronic data handling. Concepts of controlled and uncontrolled documents. Submission documents for regulators DMFs, as Common Technical	**12**	CO2 CO3 CO5

	Document and Electronic Common Technical Documentation (CTD, eCTD). Concept of regulated and non regulated markets.		
[5]	Manufacturing operations and controls: Sanitation of manufacturing premises, mix-ups and cross contamination, processing of intermediates and bulk products, packaging operations, IPQC, release of finished product, process deviations, charge-in of components, time limitations on production, drug product inspection, expiry date calculation, calculation of yields, production record review, change control, sterile products, aseptic process control, packaging, reprocessing, salvaging, handling of waste and scrap disposal. Introduction, scope and importance of intellectual property rights. Concept of trade mark, copyright and patents.	**12**	CO1 CO2 CO3 CO4 CO5

C. TEXT BOOKS

1. Quality Assurance of Pharmaceuticals- A compedium of Guide lines and Related materials Vol I & II, 2 nd edition, WHO Publications, 1999.

D. REFERENCE BOOKS

1. Weinberg, S. Good Laboratory Practice Regulations; M. Dekker: New York, 1995.
2. Sarker, D. K. *Quality Systems and Control for Pharmaceuticals*; John Wiley & Sons: Chichester, West Sussex ; Hoboken, Nj, 2008.
3. Willig, S. H.; Stoker, J. R. Good Manufacturing Practices for Pharmaceuticals : A Plan for Total Quality Control; Marcel Dekker: New York, 1997.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and remember	To Understand the cGMP aspects in a pharmaceutical industry
CO2	Understand	To appreciate the importance of documentation
CO3	Understand and apply	To understand the scope of quality certifications applicable to pharmaceutical industries
CO4	Understand and evaluate	To Analyse of raw materials, finished products, packaging materials in process quality control (IPQC)
CO5	Understand and apply	To understand the responsibilities of QA & QC departments.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	1	2	1	2	2	1	3	3	3	2	1
CO2	3	2	2	2	1	2	1	2	1	2	3	3	3	3	1
CO3	3	2	2	2	1	2	-	2	2	1	3	3	3	2	1
CO4	3	2	2	2	2	3	1	2	1	3	3	3	3	3	1
CO5	3	2	2	2	3	3	-	2	2	3	3	3	3	3	1
Avg	3	2	2	2	1.6	2.4	0.6	2	1.6	2	2.6	3	3	2.6	1

M. PHARM. SEMESTER – I (MPH)
SUBJECT: PRODUCT DEVELOPMENT AND TECHNOLOGY TRANSFER (MQA104T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
4	-	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: Scope This deal with technology transfer covers the activities associated with Drug Substance, Drug Product and analytical tests and methods, required following candidate drug selection to completion of technology transfer from R&D to the first receiving site and technology transfer related to post-marketing changes in manufacturing places.

Objectives: Upon completion of this course the student should be able to

- To understand the new product development process
- To understand the necessary information to transfer technology from R&D to actual manufacturing by sorting out various information obtained during R&D
- To elucidate necessary information to transfer technology of existing products between various manufacturing places

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Principles of Drug discovery and development:** Introduction, Clinical research process. Development and informational content for Investigational New Drugs Application (IND), New Drug Application (NDA), Abbreviated New Drug Application (ANDA), Supplemental New Drug Application (SNDA), Scale Up Post Approval Changes (SUPAC) and Bulk active chemical Post approval changes (BACPAC), Post marketing surveillance, Product registration guidelines – CDSCO, USFDA.	**12**	CO1 CO2
[2]	**Pre-formulation studies:** Introduction/concept, organoleptic properties, purity, impurity profiles, particle size, shape and surface area. Solubility, Methods to improve solubility of Drugs: Surfactants & its importance, co-solvency. Techniques for the study of Crystal properties and polymorphism. Pre-formulation protocol, Stability testing during product development.	**12**	CO3 CO4
[3]	**Pilot plant scale up:** Concept, Significance, design, layout of pilot plant scales up study, operations, large scale manufacturing techniques (formula, equipment, process, stability and quality control) of solids, liquids, semisolid and parenteral dosage forms. New era of drug products: opportunities and challenges.	**12**	CO1 CO2
[4]	**Pharmaceutical packaging:** Pharmaceutical dosage form and their packaging requirements, Pharmaceutical packaging materials, Medical device packaging, Enteral Packaging, Aseptic packaging systems, Container closure systems, Issues facing modern drug packaging, Selection and evaluation of Pharmaceutical packaging materials. **Quality control test**: Containers, closures and secondary packing materials.	**12**	CO3 CO4

[5]	**Technology transfer:** Development of technology by R & D, Technology transfer from R & D to production, Optimization and Production, Qualitative and quantitative technology models. Documentation in technology transfer: Development report, technology transfer plan and Exhibit.	**12**	CO5

C. TEXT BOOKS

1. Lachman, L.; Liebermann, H. A. The Theory and Practice of Industrial Pharmacy; Cbs Publishers & Distributors Pvt. Ltd: New Delhi, 2013.

D. REFERENCE BOOKS

1. Smith, C. G.; O'donnell, J. The Process of New Drug Discovery and Development; Informa Healthcare: New York, 2006.
2. Willig, S. H.; Tuckerman, M. M.; Hitchings, W. S. Good Manufacturing Practices for Pharmaceuticals: A Plan for Total Quality Control; M. Dekker: New York, 1982.
3. Lieberman, H. A. Pharmaceutical Dosage Forms. Tablets, Vol. 1-3; New York, Ny Dekker, 1989.
4. Gibaldi, M. Biopharmaceutics and Clinical Pharmacokinetics; Pharmamed Press: Hyderabad, India, 2013.
5. Vandana Patravale; Disouza, J. I.; Maharukh Rustomjee. Pharmaceutical Product Development: Insights into Pharmaceutical Processes, Management and Regulatory Affairs; CRC Press: Boca Raton, 2016.
6. Abdou, H. M. Dissolution, Bioavailability and Bioequivalence; Mack Publishing Company: Easton, 1989.
7. Remington, J. P.; Gennaro, A. R. Remington: The Science and Practice of Pharmacy; Lippincott Williams & Wilkins: Baltimore, Md., 2000.
8. Dr. D.A.Savant. The Pharmaceutical Sciences; the Pharma Path Way 'Pure and Applied Pharmacy; Pragathi Books Pvt. Ltd, 2018.
9. Dean, D. A.; Evans, E. R.; Hall, I. H. Pharmaceutical Packaging Technology.; Taylor And Francis: London, 2000.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand	To understand new drug approval process and product registration guideline
CO2	Understand and Apply	To understand and apply preformulation studies in drug product development.
CO3	Understand	To understand development of drug product from R&D to Large scale manufacturing.
CO4	Understand and Evaluate	To understand and evaluate packaging requirement for drug products.
CO5	Understand and Create	To understand regulation for technology transfer for drug product development

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	3	-	3	-	3	-	3	3	0	3	3	2	2	-
CO2	3	3	3	3	-	1	-	3	0	0	3	3	3	3	1
CO3	3	3	1	3	3	3	3	3	3	3	3	3	3	2	2
CO4	3	-	3	3	-	0	1	0	1	2	3	3	3	3	2
CO5	3	3	3	3	3	3	3	3	3	2	3	3	3	3	2
Avg	3	2.4	2	3	1.2	2	1.4	2.4	2	1.4	3	3	2.8	2.6	1.4

M. PHARM. SEMESTER – I (MQA)
SUBJECT: PHARMACEUTICAL QUALITY ASSURANCE – PRACTICAL-I (MQA105P)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
-	-	12	12	6	100	30	20	--	150

A. COURSE OVERVIEW

Scope: This subject deals with various advanced analytical instrumental techniques for identification, characterization and quantification of drugs dosage forms, preformulation study, stability study etc. as well as Instruments dealt are NMR, Mass spectrometer, IR, HPLC, GC etc.

Objectives: After completion of course, student is able

- To understand and apply the fundamentals of spectroscopy and chromatography in single and combination drug analysis
- To understand the role of analytical techniques in preformulation, stability study, formulation analysis, QC testing and Modern statistical tools in analysis
- To understand working and handling of various analytical instruments.

B. COURSE CONTENT

NO	TOPIC	P (hrs)	COs
[1]	**1**.Analysis of Pharmacopoeial compounds in bulk and in their formulations (tablet/ capsules/ semisolids) by UV Vis spectrophotometer **2**. Simultaneous estimation of multi-drug component containing formulations by UV spectrophotometry **3.** Experiments based on HPLC **4**. Experiments based on Gas Chromatography **5**. Estimation of riboflavin/quinine sulphate by fluorimetry **6**. Estimation of sodium/potassium by flame photometry or AAS **7**. Assay of raw materials as per official monographs **8.**Testing of related and foreign substances in drugs and raw materials	**90**	CO1 CO2 CO3 CO5
[2]	**1.** Case studies on • Total Quality Management • Six Sigma • Change Management/ Change control. Deviations, • Out of Specifications (OOS) • Out of Trend (OOT) • Corrective & Preventive Actions (CAPA) • Deviations **2.** Development of Stability study protocol **3** Estimation of process capability **4.** In process and finished product quality control tests for tablets, capsules,parenterals and semisolid dosage forms. **5.**To carry out pre formulation study for tablets, parenterals (2 experiment). **6**. To study the effect of pH on the solubility of drugs, (1 experiment) **7**. Quality control tests for Primary and secondary packaging materials **8**. Accelerated stability studies (1 experiment) **9**. Improved solubility of drugs using surfactant systems (1 experiment) **10**. Improved solubility of drugs using co-solvency method (1 experiment) 19. Determination of Pka and Log p of drugs.	**90**	CO2 CO3 CO4 CO5

C. TEXT BOOKS

1. Beckett, A. H.; Stenlake, J. B. *Practical Pharmaceutical Chemistry*; Athlone Press: London, 1988.
2. Lachman, L.; Liebermann, H. A. *The Theory and Practice of Industrial Pharmacy*; Cbs Publishers & Distributors Pvt. Ltd: New Delhi, 2013.

D. REFERENCE BOOKS

1. *Indian Pharmacopoeia*; Indian Pharmacopoeial Commission, Ministry of health and family welfare, Government of India: Ghaziabad, 2014; Vol. 1-4.
2. JW Munson. *Pharmaceutical Analysis - Modern Methods Part-B*; Marcel. Dekker Series.; Vol. 11.
3. Skoog, D. A.; F James Holler; Crouch, S. R. *Principles of Instrumental Analysis*; Thomson, Brooks/Cole: Belmont, Ca, 2007.
4. Sethi, P. D. *Quantitative Analysis of Drugs in Pharmaceutical Formulations*; Cbs Publishers & Distritutors: New Delhi, 2005.
5. Sharma B K. *Instrumental Methods of Chemical Analysis*, 27th edition.; Goel Publishing House: Meerut, 2011.
6. Garratt, D. C. *The Quantitative Analysis of Drugs : Assisted by L. Brealey Etc.*; Chapman & Hall: London, 1964.
7. Mendham, A. *Vogel's Textbook of Quantitative Chemical Analysis.*; Pearson: New Delhi, 2009.
8. Connors, K. A. *A Textbook of Pharmaceutical Analysis*; Wiley: New York, 1982.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and remember	To understand and apply the fundamentals of spectroscopy in single and combination drug analysis
CO2	Understand Apply and Evaluate	To understand and apply the fundamentals of chromatography in single and combination drug analysis
CO3	Understand Apply and Evaluate	To understand the role of analytical techniques in preformulation, stability study and formulation analysis.
CO4	Understand Apply and Evaluate	To understand the role of analytical techniques in QC testing and applications of modern statistical tools in analysis
CO5	Understand Apply and Evaluate	To understand working and handling of various analytical instruments.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	1	2	1	1	1	-	3	3	1	1	-
CO2	3	3	3	2	1	2	1	1	1	-	3	3	1	1	-
CO3	3	3	3	2	1	2	1	1	1	-	3	3	1	1	-
CO4	3	3	3	2	1	2	1	1	1	-	3	3	1	3	-
CO5	3	2	-	-	1	2	1	1	-	-	3	2	1	-	-
Avg	3	2.8	2.4	1.6	1	2	1	1	0.8	-	3	2.8	1	1.2	-

M. PHARM. SEMESTER – II (MQA)
SUBJECT: HAZARDS AND SAFETY MANAGEMENT (MQA201T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
4	0	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This course is designed to convey the knowledge necessary to understand issues related to different kinds of hazard and their management. Basic theoretical and practical discussions integrate the proficiency to handle the emergency situation in the pharmaceutical product development process and provides the principle-based approach to solve the complex tribulations.

Objectives: At completion of this course, it is expected that students will be able to

- Understand about environmental problems among learners.
- Impart basic knowledge about the environment and its allied problems.
- Develop an attitude of concern for the industry environment.
- Ensure safety standards in pharmaceutical industry
- Provide comprehensive knowledge on the safety management
- Empower an ideas to clear mechanism and management in different kinds of hazard management system
- Teach the method of Hazard assessment, procedure, methodology for provide safe industrial atmosphere.

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Multidisciplinary nature of environmental studies**: Natural Resources, Renewable and non-renewable resources, Natural resources and associated problems, a) Forest resources; b) Water resources; c) Mineral resources; d) Energy resources; e) Land resources Ecosystems: Concept of an ecosystem and Structure and function of an ecosystem. Environmental hazards: Hazards based on Air, Water, Soil and Radioisotopes.	**12**	CO1
[2]	**Air based hazards**: Sources, Types of Hazards, Air circulation maintenance industry for sterile area and non sterile area, Preliminary Hazard Analysis (PHA) Fire protection system: Fire prevention, types of fire extinguishers and critical Hazard management system.	**12**	CO2 CO3 CO4 CO5
[3]	**Chemical based hazards:** Sources of chemical hazards, Hazards of Organic synthesis, sulphonating hazard, Organic solvent hazard, Control measures for chemical hazards, Management of combustible gases, Toxic gases and Oxygen displacing gases management, Regulations for chemical hazard, Management of over-Exposure to chemicals and TLV concept.	**12**	CO2 CO3 CO4 CO5
[4]	**Fire and Explosion :** Introduction, Industrial processes and hazards potential, mechanical electrical, thermal and process hazards. Safety and hazards regulations, Fire protection system: Fire prevention, types of fire extinguishers and critical Hazard management system mechanical and chemical explosion, multiphase reactions, transport effects and global rates. Preventive and protective management from fires and explosion-	**12**	CO2 CO3 CO4 CO5

	electricity passivation, ventilation, and sprinkling, proofing, relief systems -relief valves, flares, scrubbers.		
[5]	**Hazard and risk management**: Self-protective measures against workplace hazards. Critical training for risk management, Process of hazard management, ICH guidelines on risk assessment and Risk management methods and Tools Factory act and rules, fundamentals of accident prevention, elements of safety programme and safety management, Physicochemical measurements of effluents, BOD, COD, Determination of some contaminants, Effluent treatment procedure, Role of emergency services.	**12**	CO2 CO3 CO4 CO5

C. TEXT BOOKS

1. Bharucha E, The Biodiversity of India, Mapin Pu blishing Pvt. Ltd., Ahmedabad – 380 013, India.
2. Gajjar D, Nagdev S, A TEXTBOOK OF HAZARDS AND SAFETY MANAGEMENT, PV books, 2020.

D. REFERENCE BOOKS

1. Y.K. Sing, Environmental Science, New Age International Pvt, Publishers, Bangalore
2. T S S Dikshith. Hazardous Chemicals Safety Management and Global Regulations; Crc Press: Boca Raton, Florida, 2017.
3. "Quantitative Risk Assessment in Chemical Process Industries" American Institute of Chemical Industries, Centre for Chemical Process safety.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and apply	To understand about environmental problems among learners and impart basic knowledge about the environment and its allied problems.
CO2	Understand and Analyse	Development of attitude of concern for the industry environment and ensure safety standards in pharmaceutical industry
CO3	Understand and Remember	To provide comprehensive knowledge on the safety management
CO4	Understand and Apply	To empower ideas to clear mechanism and management in different kinds of hazard management system
CO5	Understand and Remember	To understand the method of Hazard assessment, procedure, methodology for provide safe industrial atmosphere

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	1	3	2	3	1	2	3	3	-	1	-	-
CO2	3	3	3	1	3	2	1	1	3	3	3	-	1	-	-
CO3	3	3	3	1	3	2	-	1	3	3	3	-	1	-	-
CO4	3	3	3	1	3	2	-	1	3	3	3	-	1	-	-
CO5	3	3	3	1	3	2	-	1	3	3	3	-	1	-	-
Avg	3	3	3	1	3	2	0.8	1	2.8	3	3	-	1	-	-

M. PHARM. SEMESTER – II (MPH)
SUBJECT: PHARMACEUTICAL VALIDATION (MQA202T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect.	Tut	Prac.	Total		Ext	Sess.	CM	Prac.	Total
04	-	-	04	04	75	15	10	-	100

A. COURSE OVERVIEW

Scope:The main purpose of the subject is to understand about validation and how it can be applied to industry and thus improve the quality of the products. The subject covers the complete information about validation, types, methodology and application.

Objectives:

At completion of this course, it is expected that students will be able to understand:

- Understand and remember the concept of calibration, qualification and validation
- Learn the theoretical aspects about the qualification of various equipments and instruments
- Understand and learn process validation of different dosage forms
- Learn the validation of analytical methods developed for quantification of drugs
- Understand and learn the cleaning validation of equipments employed in the manufacture of pharmaceuticals
- Learn the importance of patent and intellectual property rights

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	Introduction to validation: Definition of Calibration, Qualification and Validation, Scope, frequency and importance. Difference between calibration and validation. Calibration of weights and measures. Advantages of Validation, scope of Validation, Organization for Validation, Validation Master plan, Types of Validation, Streamlining of qualification & Validation process and Validation Master Plan. Qualification: User requirement specification, Design qualification, Factory Acceptance Test (FAT)/Site Acceptance Test (SAT), Installation qualification, Operational qualification, Performance qualification, Re-Qualification (Maintaining status- Calibration Preventive Maintenance, Change management).	**10**	CO1
[2]	Qualification of manufacturing equipment: Dry Powder Mixers, Fluid Bed and Tray dryers, Tablet Compression (Machine), Dry heat sterilization/Tunnels, Autoclaves, Membrane filtration, Capsule filling machine. Qualification of analytical instruments: UV-Visible spectrophotometer, FTIR, DSC, GC, HPLC, HPTLC, LC-MS.	**10**	CO2
[3]	Qualification of laboratory equipments: Hardness tester, Friability test apparatus, tap density tester, Disintegration tester, Dissolution test apparatus Validation of Utility systems: Pharmaceutical water system & pure steam, HVAC system, Compressed air and nitrogen.	**10**	CO2
[4]	Process Validation: Concept, Process and documentation of Process Validation. Prospective, Concurrent & Retrospective Validation, Re validation criteria, Process Validation of various formulations (Coated tablets, Capsules, Ointment/Creams, Liquid Orals and aerosols.), Aseptic filling: Media fill validation, USFDA guidelines on Process Validation- A life cycle approach. Analytical method validation: General principles, Validation of analytical method as per ICH guidelines and USP.	**10**	CO3 CO4

[5]	Cleaning Validation: Cleaning Method development, Validation of analytical method used in cleaning, Cleaning of Equipment, Cleaning of Facilities. Cleaning in place (CIP). Validation of facilities in sterile and non-sterile plant. Computerized system validation: Electronic records and digital signature - 21 CFR Part 11 and GAMP	**10**	CO5
[6]	General Principles of Intellectual Property: Concepts of Intellectual Property (IP), Intellectual Property Protection (IPP), Intellectual Property Rights (IPR); Economic importance, mechanism for protection of Intellectual Property –patents, Copyright, Trademark; Factors affecting choice of IP protection; Penalties for violation; Role of IP in pharmaceutical industry; Global ramification and financial implications. Filing a patent applications; patent application forms and guidelines. Types patent applications-provisional and non provisional, PCT and convention patent applications; International patenting requirement procedures and costs; Rights and responsibilities of a patentee; Practical aspects regarding maintaining of a Patent file; Patent infringement meaning and scope. Significance of transfer technology (TOT), IP and ethics-positive and negative aspects of IPP; Societal responsibility, avoiding unethical practices.	**10**	CO6

C. TEXT BOOKS

1. Berry, I. R.; Nash, R. A. *Pharmaceutical Process Validation*; Marcel Dekker: New York, 1993.
2. Syed Imtiaz Haider. *Pharmaceutical Master Validation Plan : The Ultimate Guide to FDA, GMP, and GLP Compliance*; St. Lucie Press: Boca Raton, 2002.

D. REFERENCE BOOKS

1. Loftus, B. T.; Nash, R. A. *Pharmaceutical Process Validation*; M. Dekker: New York ; Basel, 1984.
2. Carleton, F. J.; Agalloco, J. P. *Validation of Pharmaceutical Processes : Sterile Products*; M. Dekker: New York, 1999.
3. Lachman, L.; Liebermann, H. A. *The Theory and Practice of Industrial Pharmacy*; Cbs Publishers & Distributors Pvt. Ltd: New Delhi, 2013.
4. Syed Imtiaz Haider. *Validation Standard Operating Procedures a Step by Step Guide for Achieving Compliance in the Pharmaceutical, Medical Device, and Biotech Industries*; Informa Healthcare, 2001.
5. Cloud, P. A. *Pharmaceutical Equipment Validation : The Ultimate Qualification Handbook*; Informa Healthcare: New York, 2007. Validation of Pharmaceutical Processes: Sterile Products, Frederick J. Carlton (Ed.) and James Agalloco (Ed.), Marcel Dekker
6. Chung Chow Chan. *Analytical Method Validation and Instrument Performance Verification*; John Wiley & Sons: Hoboken, N.J., 2004.
7. Ludwig Huber. *Validation and Qualification in Analytical Laboratories*; Informa Healthcare: New York, 2007.
8. Respect, I.; Al, E. *Principles of Qualification and Validation in Pharmaceutical Manufacture : Recommendations on : Validation Master Plan : Installation and Operational Qualification : Non-Sterile Process Validation : Cleaning Validation*; S.L.] [S.N, 1996.
9. Destin Leblanc. *Validated Cleaning Technologies for Pharmaceutical Manufacturing*; Crc Press, 2000

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and remember	Understand and remember the concept of calibration, qualification and validation
CO2	Learn	Learn the theoretical aspects about the qualification of various equipments and instruments
CO3	Understand and learn	Understand and learn analytical method validation and Pharmaceutical process validation
CO4	Learn	Understand and learn the cleaning validation of equipments employed in the manufacture of pharmaceuticals
CO5	Understand and learn	Learn the importance of patent and intellectual property rights

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	1	-	-	-	-	-	-	1	-	3	2	2	1	2
CO2	3	3	2	1	1	1	1	1	1	-	3	3	3	3	3
CO3	3	3	2	1	1	1	1	1	1	-	3	3	3	3	3
CO4	3	3	2	1	1	1	1	1	1	-	3	3	3	3	3
CO5	3	-	-	-	-	2	3	2	2	-	3	1	1	-	-
Avg.	3	2	1.2	0.6	0.6	1	1.2	1	1.2	-	3	2.4	2.4	2	2.2

M. PHARM. SEMESTER – II (MQA)
SUBJECT: AUDITS AND REGULATORY COMPLIANCE (MQA203T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
4	-	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This course deals with the understanding and process for auditing in pharmaceutical industries. This subject covers the different aspects like methodology involved in the auditing process of different in pharmaceutical industries, preparing audit report and audit checklist preparation etc.

Objectives: Upon completion of this course the student should be able to

- To understand the importance of auditing
- To understand the methodology of auditing
- To carry out the audit process
- To prepare the auditing report
- To prepare the check list for auditing

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**Introduction: Objectives,** Management of audit, Responsibilities, Planning process, information gathering, administration, Classifications of deficiencies	**12**	CO1 CO2
[2]	**Role of quality systems and audits in pharmaceutical manufacturing environment:** cGMP Regulations, Quality assurance functions, Quality systems approach, Management responsibilities, Resource, Manufacturing operations, Evaluation activities, Transitioning to quality system approach, Audit checklist for drug industries.	**12**	CO1 CO2 CO5
[3]	**Auditing of vendors and production department:** Bulk Pharmaceutical Chemicals and packaging material Vendor audit, Warehouse and weighing, Dry Production: Granulation, tableting, coating, capsules, sterile production and packaging.	**12**	CO3 CO4 CO5
[4]	**Auditing of Microbiological laboratory:** Auditing the manufacturing process, Product and process information, General areas of interest in the building raw materials, Water, Packaging materials.	**12**	CO3 CO4 CO5
[5]	**Auditing of Quality Assurance and engineering department:** Quality Assurance Maintenance, Critical systems: HVAC, Water, Water for Injection systems, ETP	**12**	CO3 CO4 CO5

C. TEXT BOOKS

1. Ginsbury, K., Bismuth, G. Compliance auditing for Pharmaceutical Manufacturers, Interpharm/CRC, London, 2018

D. REFERENCE BOOKS

1. Gad, C.S. Pharmaceutical Manufacturing Handbook, Wiley-Interscience,1st ed,; New Jersey, 2008
2. Baird, R.M., Hodges, N.A., Denyar, S.P. Handbook of microbiological Quality control, 1st ed,; CRC Press, London, 2017.
3. Singer, D.C., Stefan, R., Van Staden, J.F. Laboratory auditing for quality and regulatory compliance, 1st ed,; Taylor and Francis, Boca Raton, 2005

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and remember	To discuss the importance of auditing
CO2	Understand and remember	To explain the methodology of auditing
CO3	Apply and evaluate	To describe the audit process
CO4	Analysis, Apply and Create	To prepare the audit report
CO5	Apply and create	To prepare the check list for auditing

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	2	1	1	2	1	-	-	-	-	-	3	2	2	1	2
CO2	2	1	0	3	1	-	-	-	-	-	3	2	3	2	2
CO3	2	1	2	2	1	-	-	-	-	-	3	3	3	3	2
CO4	2	2	1	2	1	-	-	2	-	-	3	2	3	2	2
CO5	3	1	1	2	2	-	-	2	-	-	3	1	3	1	3
Avg	2.2	1.2	1	2.2	1.2	-	-	0.8	-	-	3	2	2.8	1.8	2.2

M. PHARM. SEMESTER – II (MQA)
SUBJECT: PHARMACEUTICAL MANUFACTURING TECHNOLOGY (MQA204T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
4	-	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: This course is designed to impart knowledge and skills necessary to train the students with the industrial activities during Pharmaceutical Manufacturing.

Objectives: Upon completion of the course the student shall be able to

- The common practice in the pharmaceutical industry developments, plant layout and production planning
- Will be familiar with the principles and practices of aseptic process technology, non-sterile manufacturing technology and packaging technology.
- Have a better understanding of principles and implementation of Quality by design (QbD) and process analytical technology (PAT) in pharmaceutical manufacturing

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	Pharmaceutical industry developments: Legal requirements and Licenses for API and formulation industry, Plant location- Factors influencing. Plant layout: Factors influencing, Special provisions, Storage space requirements, sterile and aseptic area layout. Production planning: General principles, production systems, calculation of standard cost, process planning, routing, loading, scheduling, dispatching of records, production control.	**12**	CO1 CO5
[2]	Aseptic process technology: Manufacturing, manufacturing flowcharts, in process-quality control tests for following sterile dosage forms: Ointment, Suspension and Emulsion, Dry powder, Solution (Small Volume & large Volume). Advanced sterile product manufacturing technology : Area planning & environmental control, wall and floor treatment, fixtures and machineries, change rooms, personnel flow, utilities & utilities equipment location, engineering and maintenance. Process Automation in Pharmaceutical Industry: With specific reference to manufacturing of sterile semisolids, Small Volume Parenterals & Large Volume Parenterals (SVP & LVP), Monitoring of Parenteral manufacturing facility, Cleaning in Place (CIP), Sterilization in Place (SIP), Prefilled Syringe, Powdered Jet, Needle Free Injections, and Form Fill Seal Technology (FFS). Lyophilization technology: Principles, process, equipment.	**12**	CO1 CO2 CO4
[3]	Non sterile manufacturing process technology: Manufacturing, manufacturing flowcharts, in process-quality control tests for following Non-Sterile solid dosage forms: Tablets (compressed & coated), Capsules (Hard & Soft). Advance non-sterile solid product manufacturing technology: Process Automation in Pharmaceutical Industry with specific reference to manufacturing of tablets and coated products, Improved Tablet Production: Tablet production process, granulation and pelletization equipments, continuous and batch mixing, rapid mixing granulators, rota granulators, spheronizers and marumerisers, and other specialized granulation and drying equipment. Problems encountered.	**12**	CO1 CO3 CO4

	Coating technology: Process, equipments, particle coating, fluidized bed coating, application techniques. Problems encountered.		
[4]	Containers and closures for pharmaceuticals: Types, performance, assuring quality of glass; types of plastics used, Drug plastic interactions, biological tests, modification of plastics by drugs; different types of closures and closure liners; film wrapper; blister packs; bubble packs; shrink packaging; foil / plastic pouches, bottle seals, tape seals, breakable seals and sealed tubes; quality control of packaging material and filling equipment, flexible packaging, product package compatibility, transit worthiness of package, Stability aspects of packaging. Evaluation of stability of packaging material.	**12**	CO4 CO5
[5]	Quality by design (QbD) and process analytical technology (PAT): Current approach and its limitations. Why QbD is required, Advantages, Elements of QbD, Terminology: QTPP. CMA, CQA, CPP, RLD, Design space, Design of Experiments, Risk Assessment and mitigation/minimization. Quality by Design, Formulations by Design, QbD for drug products, QbD for Drug Substances, QbD for Excipients, Analytical QbD. FDA initiative on process analytical technology. PAT as a driver for improving quality and reducing costs: quality by design (QbD), QA, QC and GAMP. PAT guidance, standards and regulatory requirements.	**12**	CO3

C. TEXT BOOKS

1. Lachman, L.; Liebermann, H. A. *The Theory and Practice of Industrial Pharmacy*; Cbs Publishers & Distributors Pvt. Ltd: New Delhi, 2013.

D. REFERENCE BOOKS

1. Martin, A.; Bustamante, P.; Chun, A. H. C. *Physical Pharmacy : Physical Chemical Principles in the Pharmaceutical Sciences*; Lea & Febiger: Philadelphia, 1993.
2. Lieberman, H. A. *Pharmaceutical Dosage Forms Tablets, Vol. 1-3*; New York, Ny [U.A.] Dekker, 1990.
4. Banker, G. S.; Rhodes, C. T. *Modern Pharmaceutics*; Marcel Dekker: New York, 2002.
5. Willig, S. H.; Stoker, J. R. *Good Manufacturing Practices for Pharmaceuticals : A Plan for Total Quality Control*; Marcel Dekker: New York, 1997.
6. Ministry, India. *Indian Pharmacopoeia, 1996. Veterinary Supplement 2000*; Controller Of Publications: Delhi, 2000.
7. Great Britain. Stationery Office. *British Pharmacopoeia 2016.*; The Stationary Office: London, 2015.
8. United States Pharmacopœial Convention. *The United States Pharmacopoeia : The National Formulary*; United States Pharmacopoeial Convention: Rockville, Md, 2019.
9. Jean, U. K.; Goupale, D. C.; S Nayak. *Pharmaceutical Packaging Technology*; Hyderabad Pharmamed Pres, 2008..
10. Bauer, E. J. *Pharmaceutical Packaging Handbook*; Informa Healthcare: New York, 2009.
11. Shayne Cox Gad. *Pharmaceutical Manufacturing Handbook.*; Wiley-Interscience, 2008.

E. COURSE OUTCOMES

(Minimum 5 Cos are required)

CO Number	Skill	Statement
CO1	Understand and Analyse	To learn the common practice in the pharmaceutical industry developments, plant layout and production planning
CO2	Understand and Analyse	To be familiar with the principles and practices of aseptic process technology technology
CO3	Understand Apply and Evaluate	To have a better understanding of principles and implementation of Quality by design (QbD) process analytical technology (PAT) in pharmaceutical manufacturing
CO4	Understand and apply	To understand non sterile manufacturing technology, Process Automation in Pharmaceutical Industry with specific reference to manufacturing of tablets and coated products
CO5	Understand and analyse	To learn the quality control of packaging material, container and closure and evaluation of stability of packaging material

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg	3	3	3	3	2.8	2.8	3	3	3	3	3	3	3	3	3

M. PHARM. SEMESTER – II (MQA)

SUBJECT: PHARMACEUTICAL QUALITY ASSURANCE – PRACTICAL-II (MQA105P)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
-	-	12	12	6	100	30	20	--	150

A. COURSE OVERVIEW

Scope: The main purpose of the subject is to understand about method validation, process validation, equipment qualification and how it can be applied to industry and thus improve the quality of the products. The subject also covers drugs and environmental analysis as well as Qbd and PAT.

Objectives

At completion of this course, it is expected that students will be able

- To Understand the fundamentals of analytical method, instrument and Pharmaceutical process validation.
- To Understand the fundamentals of pharmaceutical equipment and analytical instrument qualification. And aspects of Pat, QbD

B. COURSE CONTENT

NO	TOPIC	P (Hrs)	COs
[1]	• Organic contaminants residue analysis by HPLC • Estimation of Metallic contaminants by Flame photometer • Identification of antibiotic residue by TLC • Estimation of Hydrogen Sulphide in Air. • Estimation of Chlorine in Work Environment. • Sampling and analysis of SO2 using Colorimetric method • Validation of an analytical method for a drug • Qualification of at least two analytical instruments	**90**	CO1 CO2 CO3
[2]	• Check list for Bulk Pharmaceutical Chemicals vendors • Check list for tableting production. • Check list for sterile production area • Check list for Water for injection. • Design of plant layout: Sterile and non-sterile • Case study on application of QbD • Case study on application of PAT • Validation of a processing area • Qualification of Pharma equipments like Autoclave, Hot air oven, Powder Mixer (Dry), Tablet Compression Machine • Cleaning validation of one equipment • Qualification of Pharmaceutical Testing Equipment (Dissolution testing apparatus, Friability Apparatus, Disintegration Tester)	**90**	CO2 CO3 CO4 CO5

C. TEXT BOOKS

1. Lachman, L.; Liebermann, H. A. *The Theory and Practice of Industrial Pharmacy*; Cbs Publishers & Distributors Pvt. Ltd: New Delhi, 2013.
2. Loftus, B. T.; Nash, R. A. *Pharmaceutical Process Validation*; M. Dekker: New York ; Basel, 1984.

D. REFERENCE BOOKS

1. Indian Pharmacopoeia, Indian Pharmacopoeial Commission, Ministry of health and family welfare, Government of India, Vol- I, II, III, 2014.
2. JW Munson. *Pharmaceutical Analysis - Modern Methods Part-B*; Marcel. Dekker Series.; Vol. 11.
3. Skoog, D. A.; F James Holler; Crouch, S. R. *Principles of Instrumental Analysis*; Thomson, Brooks/Cole: Belmont, Ca, 2007.
4. Sethi, P. D. *Quantitative Analysis of Drugs in Pharmaceutical Formulations*; Cbs Publishers & Distritutors: New Delhi, 2005.
5. Sharma B K. *Instrumental Methods of Chemical Analysis*, 27th edition.; Goel Publishing House: Meerut, 2011.
6. Chung Chow Chan; Netlibrary, I.; Al, E. *Analytical Method Validation and Instrument Performance Verification*; John Wiley & Sons: Hoboken, N.J., 2004.
7. *International conference on harmonisation of technical requirements for registration of pharmaceuticals for human use ich harmonised tripartite guideline validation of analytical procedures: text and methodology Q2(R1).*
8. Cloud, P. A. *Pharmaceutical Equipment Validation : The Ultimate Qualification Handbook*; Informa Healthcare: New York, 2007.
9. Mendham, A. *Vogel's Textbook of Quantitative Chemical Analysis.*; Pearson: New Delhi, 2009.
10. Beckett, A. H.; Stenlake, J. B. *Practical Pharmaceutical Chemistry*; Athlone Press: London, 1988.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand Apply and Evaluate	To apply the fundamentals of spectroscopy and chromatography in drug and environmental analysis
CO2	Understand Apply and Evaluate	To Understand and apply the fundamentals of analytical method and Pharmaceutical process and utilities validation.
CO3	Understand Apply and Evaluate	To Understand and apply the fundamentals of pharmaceutical equipment and analytical instrument qualification.
CO4	Understand and Analyse	To understand the role of modern tools like QbD and PAT in Pharmaceutical processing.
CO5	Understand and Remember	To remember checklists for various dosage forms

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	1	2	1	1	1	3	3	2	1	1	-
CO2	3	3	3	2	1	2	1	1	1	-	3	2	2	2	3
CO3	3	3	3	2	1	2	1	1	1	-	3	2	2	2	3
CO4	3	-	-	2	-	1	-	1	-	-	3	3	2	3	-
CO5	3	-	-	-	-	1	-	1	-	-	3	1	1	1	-
Avg	3	1.8	1.8	1.6	0.6	1.6	0.6	1	0.6	0.6	3	2	1.6	1.8	1.2

M. PHARM. SEMESTER – III (MPH)

SUBJECT: RESEARCH METHODOLOGY AND BIOSTATISTICS -THEORY (MRM301T)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	CM	Prac	Total
4	-	-	4	4	75	15	10	-	100

A. COURSE OVERVIEW

Scope: To understand the applications of Biostatics in Pharmacy. This subject also deals to understand research methodology process, ethics in medical, clinical and pre-clinical research.

Objectives: Upon completion of the course the student shall be able to

- Know the various statistical techniques to solve statistical problems
- Appreciate statistical techniques in solving the problems.
- To know and understand medical research and ethical practise in clinical and non-clinical research

B. COURSE CONTENT

NO	TOPIC	L (Hrs)	COs
[1]	**General Research Methodology:** Research, objective, requirements, practical difficulties, review of literature, study design, types of studies, strategies to eliminate errors/bias, controls, randomization, crossover design, placebo, blinding techniques.	**12**	CO1
[2]	**Biostatistics:** Definition, application, sample size, importance of sample size, factors influencing sample size, dropouts, statistical tests of significance, type of significance tests, parametric tests (students "t" test, ANOVA, Correlation coefficient, regression), non-parametric tests (wilcoxan rank tests, analysis of variance, correlation, chi square test), null hypothesis, P values, degree of freedom, interpretation of P values.	**15**	CO2
[3]	**Medical Research:** History, values in medical ethics, autonomy, beneficence, non-maleficence, double effect, conflicts between autonomy and beneficence/non-maleficence, euthanasia, informed consent, confidentiality, criticisms of orthodox medical ethics, importance of communication, control resolution, guidelines, ethics committees, cultural concerns, truth telling, online business practices, conflicts of interest, referral, vendor relationships, treatment of family members, sexual relationships, fatality.	**15**	CO3
[4]	**CPCSEA** guidelines for laboratory animal facility: Goals, veterinary care, quarantine, surveillance, diagnosis, treatment and control of disease, personal hygiene, location of animal facilities to laboratories, anaesthesia, euthanasia, physical facilities, environment, animal husbandry, record keeping, SOPs, personnel and training, transport of lab animals.	**10**	CO4
[5]	**Declaration of Helsinki:** History, introduction, basic principles for all medical research, and additional principles for medical research combined with medical care.	**08**	CO3 CO5

C. TEXT BOOKS

1. Kothari, C R. Research Methodology: Methods & Techniques. New Delhi, New Age International (P) Ltd., Publishers, Cop, 2004.

D. REFERENCE BOOKS

1. Prabhat Pandey, and Meenu Mishra Pandey. Research Methodology: Tools & Techniques. New Delhi, Bridge Center, 2015.
2. De, James E. Basic Statistics and Pharmaceutical Statistical Applications. New York, Marcel Dekker, 1999.
3. "GUIDELINES: Committee for the Purpose of Control and Supervision of Experiments on Animals." Cpcsea.nic.in, cpcsea.nic.in/Content/55_1_GUIDELINES.aspx.
4. Ulf Schmidt, et al. Ethical Research: The Declaration of Helsinki, and the Past, Present and Future of Human Experimentation. New York, Ny, Oxford University Press, 2020.
5. World Medical Association. "WMA - the World Medical Association-Declaration of Helsinki." Wma.net, WMA - The World Medical Association-Declaration of Helsinki, 2014, www.wma.net/what-we-do/medical-ethics/declaration-of-helsinki/.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand and Apply	To understand research methodology and application of study design in clinical research.
CO2	Remember, Understand and Apply	To learn and apply various biostatistical techniques in hypothesis testing of research.
CO3	Understand and Create	To know process of ethical medical research and protocol designing
CO4	Understand and Remember	To understand ethics and regulations use of animals in research.
CO5	Understand and Remember	To know ethics and regulation in clinical research.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	3	3	-	3	3	2	-	3	3	1	-	3
CO2	3	1	1	3	-	1	-	-	3	-	3	2	2	-	3
CO3	3	3	2	1	3	3	3	3	3	3	3	2	2	-	3
CO4	3	3	2	1	2	3	3	3	3	3	3	2	2	-	3
CO5	3	1	2	2	3	3	3	3	2	3	3	3	3	-	3
Avg	3	2	2	2	2.2	2	2.4	2.4	2.6	1.8	3	2.4	2	-	3

B.D.S FIRST YEAR
SUBJECT : BIOCHEMISTRY

Teaching Scheme				Credits	Examination Scheme				
					External		Sessional		Total
Lect	Prac	Clinical	Total		Theory	Pract	Theory	Pract	
78	75	-	153		1	1	3	3	8

A. COURSE OVERVIEW

The major aim is to provide a sound but crisp knowledge on the biochemical basis of the life processes relevant to the human system and to dental/medical practice. The contents should be organised to build on the already existing information available to the students in the pre-university stage and reorienting.
The chemistry portion should strive towards providing information on the functional groups, Hydrophobic and hydrophilic moieties and weak valence forces that organise macromolecules. Discussion on metabolic processes should put emphasis on the overall change, interdependence and molecular turnover
At the end of the course, the student would be able to acquire a useful core of information, which can be retained for a long time

B. COURSE CONTENT

NO	TOPIC	L+P (hrs)	CLs
1	CHEMISTRY OF BIOORGANIC MOLECULES	8+8	CL 1,2,3,4,5,6
2	MACRONUTERIENTS AND DIGESTION	10+8	CL 1,2,3,4,5,6
3	MICRONUTRIENTS	10+8	CL 1,2,3,4,5,6
4	ENERGY METABOLISM	10+8	CL 1,2,3,4,5,6
5	SPECIAL ASPECTS OF METABOLISM	8+8	CL 1,2,3,4,5,6
6	BIOCHEMICAL GENETICS AND PROTEIN SYNTHESIS	8+8	CL 1,2,3,4,5,6
7	ENZYME AND METABOLIC REGULATION	8+9	CL 1,2,3,4,5,6
8	STRUCTURAL COMPONENTS AND BLOOD PROTEINS	8+9	CL 1,2,3,4,5,6
9	MEDICAL BIOCHEMISTRY	8+9	CL 1,2,3,4,5,6

C. TEXT BOOKS

1. T.N. PATTABIRAMAN; CONCISE TEXT BOOK OF BIOCHEMISTRY ,3RD EDITION, 2001.
2. S. RAMAKRISHNAN AND S.V. RAO; NUTRITIONAL BIOCHEMISTRY, 1ST EDITION 1995.
3. J.K. KANDLISH; LECTURE NOTES IN BIOCHEMISTRY ,1984.

D. REFERENCE BOOKS

1. T.N. DEVLIN ;TEXT BOOK OF BIOCHEMISTRY WITH CLINICAL CORRELATIONS, 1997.
2. R.K. MURRAY ET.AL; HARPER'S BIOCHEMISTRY, 1996.
3. R.A.D. WILLIAMS & J.C. ELLIOT; BASIC AND APPLIED DENTAL BIOCHEMISTRY, 1979

E.COMPETENCY LEVEL

CL Number	Skill	Statement
CL1	Knowledge	• knowledge on the biochemical basis of the life processes relevant to the human system and to dental/medical practice • Introduction to biochemical genetics and molecular biology
CL2	Investigations	• Should have adequate knowledge about the various tests carried out in the field of biochemistry and their interpretation
CL3	Patient Care: Diagnosis	• Know the microscopic structure of the various tissues, a pre-requisite for understanding of the disease processes.
CL4	Patient Care: Treatment planning	• Ethically Integrate multiple disciplines of biochemistry and use it as an adjunct while determining a treatment plan for the patient
CL5	Patient Care: Treatment	• Should be able to apply the basis of the biochemistry knowledge into the practical aspects of dentistry.
CL6	Research and Innovation	• Upgradation of knowledge and skill from time to time, familiarize with new concept and equipment in the field of biochemistry.

PROGRAM SPECIFIC OUTCOME (PSO)

PSO1		• Conduct the experiments designed for the study of biochemistry.

F. COURSE MATRIX

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PS O1
CL1	3	3	3	1	3	1	1	1	1	1	1	1	1	1	1	3
CL2	2	2	2	2	2	2	1	3	2	1	2	2	1	1	1	3
CL3	3	3	3	3	3	3	3	3	2	1	2	2	1	1	1	3
CL4	2	2	2	3	2	3	2	2	2	1	2	2	1	1	1	3
CL5	2	2	2	3	2	3	3	2	2	2	2	2	3	2	1	3
CL6	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	3
Avg	**2.3**	**2.3**	**2.3**	**2.3**	**2.3**	**2.1**	**1.8**	**2**	**1.6**	**1.6**	**1.6**	**1.6**	**1.3**	**1.1**	**1**	**3**

B.D.S FIRST YEAR

SUBJECT: DENTAL ANATOMY, EMBRYOLOGY AND ORAL HISTOLOGY

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
					External		Sessional		Total
Lect	Prac	Clinical	Total		Theory	Pract	Theory	Pract	
156	364	-	520		1	1	3	3	8

A. COURSE OVERVIEW

After a course on Dental Anatomy including Embryology and Oral Histology,
1. The student is expected to appreciate the normal development, morphology, structure & functions of oral tissues & variations in different pathological/non-pathological states.
2. The student should understand the histological basis of various dental treatment procedures and physiologic ageing process in the dental tissues.
3. The students must know the basic knowledge of various research methodologies.

B. COURSE CONTENT

NO	TOPIC	L+P (hrs)	CLs
1	TOOTH MORPHOLOGY: Introduction to tooth morphology:	5+8	CL 1
2	TOOTH MORPHOLOGY :Morphology of permanent teeth	33+115	CL1,46
3	TOOTH MORPHOLOGY : Morphology of Deciduous teeth	8+35	CL1,4,5
4	TOOTH MORPHOLOGY : Occlusion :	6+17	CL1,5,6
5	ORAL EMBRYOLOGY :Development of teeth	6+11	CL2,4,5
6	ORAL EMBRYOLOGY :Eruption of deciduous & Permanent teeth	6+11	CL1,2,4
7	ORAL EMBRYOLOGY : Shedding of teeth	5+8	CL1,2,4
8	ORAL HISTOLOGY: Detailed microscopic study of Enamel, Dentine, Cementum & Pulp tissue	20+41	CL2,3,4,5
9	ORAL HISTOLOGY :Detailed microscopic study of Periodontal ligament & alveolar bone, age changes, histological changes in periodontal ligament & bone in normal & orthodontic tooth movement, applied aspects of alveolar bone resorption.	8+17	CL2,3,4,5
10	ORAL HISTOLOGY: Detailed microscopic study of Oral Mucosa, variation in structure in relation to functional requirements, mechanisms of keratinization, clinical parts of gingiva, Dentogingival &Mucocutaneous junctions & lingual papillae. Age changes & clinical considerations	10+17	CL2,3,4,5
11	ORAL HISTOLOGY :Salivary Glands	4+8	CL1,2,3,5
12	ORAL HISTOLOGY :TM Joint	4+8	CL1,2,3,5
13	ORAL HISTOLOGY : Maxillary Sinus	4+8	CL1,2,3,5
14	ORAL HISTOLOGY : Processing of Hard & soft tissues for microscopic study	4+8	CL2,3,5,6
15	ORAL HISTOLOGY: Basic histochemical staining patterns of oral tissues.	4+8	CL2,3,5,6
16	ORAL PHYSIOLOGY: Saliva	4+8	CL1,4
17	ORAL PHYSIOLOGY : Mastication :	4+8	CL1,4
18	ORAL PHYSIOLOGY : Deglutition	4+8	CL1,4
19	ORAL PHYSIOLOGY: Calcium, Phosphorous & fluoride metabolism	4+9	CL4

20	ORAL PHYSIOLOGY :Theories of Mineralization	4+9	CL4
21	ORAL PHYSIOLOGY :Physiology of Taste	4+9	CL2,4
22	ORAL PHYSIOLOGY : Physiology of Speech	4+9	CL4

C. TEXT BOOKS

D. REFERENCE BOOKS

1. S.N. Bhaskar; Orban's Oral Histology & Embryology, 15th edition, Elsevier publications, 2019.
2. James & Avery ; Oral Development & Histology, 3rd edition, Thyme publications, 2011.
3. Major M. Ash; Wheeler's Dental Anatomy, Physiology & Occlusion, 8th edition, Saunders publications, 2013.
4. Woelfel & Schel; Dental Anatomy - Its relevance in dentistry, 8th edition, Lippincott, Williams & Wilkins,2011.
5. Lavelle; Applied Physiology of the mouth, 2nd edition, Butterworth - Heinemann, 2013.
6. Jenkins; Physiology & Biochemistry of the mouth, 3rd edition, Wiley - Blackwell, 1978.

E.COMPETENCY LEVEL

CL Number	Skill	Statement
CL1	Knowledge	• Have knowledge about the normal development, morphology, structure & functions of oral tissues & variations in different pathological/non-pathological states. • The students must know the basic knowledge of various research methodologies
CL2	Investigations	• Microscopic study of Oral tissues
CL3	Patient Care: Diagnosis	• Should understand the histological basis of various dental treatment procedures and physiologic ageing process in the dental tissues.
CL4	Patient Care: Treatment planning	• Appreciate the normal development, morphology, structure & functions of oral tissues & variations in different pathological/non-pathological states.
CL5	Patient Care: Treatment	• Carving of crowns of permanent teeth in wax., Microscopic study of Oral tissues, Identification of Deciduous & Permanent teeth, Age estimation by patterns of teeth eruption from plaster casts of different age groups
CL6	Research and Innovation	• Upgradation of knowledge and skill from time to time, familiarize with new concept and equipment in this field.

PROGRAM SPECIFIC OUTCOME (PSO)

PSO1	KNOWLEDGE	• The student is expected to appreciate the normal development, morphology, structure & functions of oral tissues & variations in different pathological/non-pathological states.
PSO2	KNOWLEDGE	• The student should understand the histological basis of various dental treatment procedures and physiologic ageing process in the dental tissues.

F. COURSE MATRIX

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PS O1	PS O2
CL1	3	3	2	1	1	3	2	2	3	1	3	2	2	2	2	3	2
CL2	3	3	3	3	1	3	2	3	3	2	3	1	3	3	3	3	3
CL3	2	2	3	2	2	2	3	2	2	2	2	1	2	2	2	3	3
CL4	2	3	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
CL5	3	3	3	2	1	2	1	3	1	1	2	1	3	1	1	3	3
CL6	1	3	3	1	1	1	1	2	2	1	1	1	1	1	1	2	2
Avg	**2.3**	**2.8**	**2.8**	**2**	**1.5**	**2.3**	**2.5**	**2.5**	**2.3**	**1.5**	**2.1**	**1.6**	**2.3**	**2**	**2**	**2.8**	**2.6**

B.D.S FIRST YEAR

SUBJECT: HUMAN ANATOMY, EMBRYOLOGY, HISTOLOGY & MEDICAL GENETICS

Teaching Scheme				Credits	Examination Scheme				
					External		Sessional		Total
Lect	Prac(P)	Clinical	Total		Theory	Pract	Theory	Pract	
182	286	-	468		1	1	3	3	8

A. COURSE OVERVIEW

The students should gain the knowledge and insight into, the functional anatomy of the normal human head and neck, functional histology and an appreciation of the genetic basis of inheritance and disease, and the embryological development of clinically important structures. Therefore, those relevant anatomical & scientific foundations are laid down for the clinical years of the BDS course.

B. COURSE CONTENT

NO	TOPIC	L+P (hrs)	CLs
1	INTRODUCTION	5+0	CL 1,3,6
2	HEAD & NECK	42+65	CL 1,2,3,4,5,6
3	THORAX	26+40	CL 1,2,3,4,5,6
4	ABDOMEN	22+40	CL 1,2,3,4,5,6
5	CLINICAL PROCEDURES	20+32	CL4,5
6	EMBRYOLOGY	22+40	CL 1,2,3,4,5,6
7	HISTOLOGY	30+40	CL 1,2,3,4,5,6
8	MEDICAL GENETICS	15+20	CL 1,2,3,4,5,6

C. TEXT BOOKS

D. REFERENCE BOOKS

1. Richard S. Snell; Clinical Anatomy for Medical Students,5th edition; Little Brown & company,1995.
2. Chummy S. Sinnatamby; RJ LAST'S Anatomy, 12th edition, Churchill Livingstone, 2011.
3. Romanes; Cunningham Manual of Practical Anatomy: Head & Neck & Brain, 15th edition, Oxford Medical publication, 1986.
4. Wheater; burkitt & Daniels; Functional Histology,6th edition, Churchill Livingstone,2013.
5. Sadler; Langman's, Medical Embryology, 14th edition, Lippincott Williams & Wilkins, 2018.
6. James A Anderson; Grant's Atlas of Anatomy, 14th edition, Wolters Kluwer India Pvt Ltd., 2016.
7. Williams; Gray's Anatomy, 38th edition,Churchill Livingstone,1995.
8. Peter Turnpenny, Sian Ellard; Emery's Elements of Medical Genetics, 15th edition, Elsevier publication, 2017.

E. COMPETENCY LEVEL

CL Number	Skill	Statement
CL1	Knowledge	• Know the normal disposition of the structures in the body while clinically examining a patient and while conducting clinical procedures. • Know the anatomical basis of disease and injury
CL2	Investigations	• Know the sectional anatomy of head neck and brain to read the features in radiographs and pictures taken by modern imaging techniques
CL3	Patient Care: Diagnosis	• Know the microscopic structure of the various tissues, a pre-requisite for understanding of the disease processes.
CL4	Patient Care: Treatment planning	• Ethically Integrate multiple disciplines into an individual comprehensive sequence treatment plan using diagnostic and prognostic information
CL5	Patient Care: Treatment	• To locate various structures of the body and to mark the topography of the living anatomy. • To identify various tissues under microscope and to detect various congenital abnormalities. .
CL6	Research and Innovation	• Upgradation of knowledge and skill from time to time, familiarize with new concept and equipment in this field.

PROGRAM SPECIFIC OUTCOME (PSO)

PSO1	KNOWLEDGE	By emphasising on the relevant information the anatomy taught integrally with other basic sciences & clinical subjects not only keeps the curiosity alive in the learner but also lays down the scientific foundation for making a better doctor, a benefit to the society.

F. COURSE MATRIX

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO1
CL1	3	3	3	1	3	1	1	1	1	1	1	1	1	1	1	3
CL2	2	2	2	2	2	2	1	3	2	1	2	2	1	1	1	3
CL3	3	3	3	3	3	3	3	3	2	1	2	2	1	1	1	3
CL4	2	2	2	3	2	3	2	2	2	1	2	2	1	1	1	3
CL5	2	2	2	3	2	3	3	2	2	2	2	2	3	2	1	3
CL6	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	3
Avg	**2.3**	**2.3**	**2.3**	**2.3**	**2.3**	**2.1**	**1.8**	**2**	**1.6**	**1.6**	**1.6**	**1.6**	**1.3**	**1.1**	**1**	**3**

B.D.S FIRST YEAR
SUBJECT: HUMAN PHYSIOLOGY

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
					External		Sessional		Total
Lect	Prac(P)	Clinical	Total		Theory	Pract	Theory	Pract	
169	120	-	289		1	1	3	3	8

A. COURSE OVERVIEW

The broad goal of the teaching undergraduate students in Human Physiology aims at providing the Student comprehensive knowledge of the normal functions of the organ systems of the body to facilitate an understanding of the physiological basis of health and disease.

B. COURSE CONTENT

NO	TOPIC	L+P (hrs)	CLs
1	GENERAL PHYSIOLOGY 1. Homeostasis: Basic concept, Feed back mechanisms 2. Structure of cell membrane, transport across cell membrane 3. Membrane potentials	15+10	CL1,2,3,4,5,6
2	BLOOD	16+11	CL1,2,3,4,5,6
3	DIGESTIVE SYSTEM	16+10	CL1,2,3,4,5,6
4	EXCRETORY SYSTEM	16+12	CL1,2,3,4,5,6
5	BODY TEMPERATURE & FUNCTIONS OF SKIN	16+11	CL1,2,3,4,5,6
6	ENDOCRINOLOGY	16+11	CL1,2,3,4,5,6
7	REPRODUCTION	15+12	CL1,2,3,4,5,6
8	CARDIO VASCULAR SYSTEM	15+10	CL1,2,3,4,5,6
9	RESPIRATORY SYSTEM	15+11	CL1,2,3,4,5,6
10	CENTRAL NERVOUS SYSTEM	15+11	CL1,2,3,4,5,6
11	SPECIAL SENSES	15+11	CL1,2,3,4,5,6

C. TEXT BOOKS

1. Guyton and Hall; Text book of Medical Physiology, 14th edition, Saunders publication, 2015.
2. Ganong; Review of Medical Physiology, 26th edition,Mc grow Hill, 2019.
3. Vander; Human physiology, 5th edition, Mc grow Hill, 2020.
4. Choudhari; Concise Medical Physiology, 2nd edition, NCBA publications, 2002.
5. Chaterjee; Human Physiology, 11th edition, CBS Publisher & Distributer, 2017.
6. A.K. Jain; Human Physiology for BDS students, 7th edition, Avichal publishing company,2017.
7. Berne & Levey; Physiology, 1st South Asia edition, Elsevier publications, 2017.
8. West-Best & Taylor's; Physiological basis of Medical Practice, 13th edition, Walters Kluwer Pvt Ltd,2011.

D. REFERENCE BOOKS

1. Rannade; Practical Physiology, 4th edition, 2021.
2. Ghai; A text book of practical physiology, 8th edition, Jaypee Brothers Medical Publisher,2013.
3. Hutchison's; Clinical Methods, 24th edition, Elsevier, 2021.

E.COMPETENCY LEVEL

CL Number	Skill	Statement
CL1	Knowledge	• Know the normal disposition of the structures in the body while clinically examining a patient and while conducting clinical procedures. • Know the anatomical basis of disease and injury
CL2	Investigations	• Know the sectional anatomy of head neck and brain to read the features in radiographs and pictures taken by modern imaging techniques
CL3	Patient Care: Diagnosis	• Know the microscopic structure of the various tissues, a pre-requisite for understanding of the disease processes.
CL4	Patient Care: Treatment planning	• Ethically Integrate multiple disciplines into an individual comprehensive sequence treatment plan using diagnostic and prognostic information
CL5	Patient Care: Treatment	• To locate various structures of the body and to mark the topography of the living anatomy. • To identify various tissues under microscope and to detect various congenital abnormalities. .
CL6	Research and Innovation	• Upgradation of knowledge and skill from time to time, familiarize with new concept and equipment in this field.

PROGRAM SPECIFIC OUTCOME (PSO)

PSO1	KNOWLEDGE	By emphasising on the relevant information the anatomy taught integrally with other basic sciences & clinical subjects not only keeps the curiosity alive in the learner but also lays down the scientific foundation for making a better doctor, a benefit to the society.

F. COURSE MATRIX

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PS O1
CL1	3	3	3	1	3	1	1	1	1	1	1	1	1	1	1	3
CL2	2	2	2	2	2	2	1	3	2	1	2	2	1	1	1	3
CL3	3	3	3	3	3	3	3	3	2	1	2	2	1	1	1	3
CL4	2	2	2	3	2	3	2	2	2	1	2	2	1	1	1	3
CL5	2	2	2	3	2	3	3	2	2	2	2	2	3	2	1	3
CL6	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	3
Avg	**2.3**	**2.3**	**2.3**	**2.3**	**2.3**	**2.1**	**1.8**	**2**	**1.6**	**1.6**	**1.6**	**1.6**	**1.3**	**1.1**	**1**	**3**

B.D.S SECOND YEAR YEAR

SUBJECT: DENTAL MATERIALS

Teaching Scheme				Credits	Examination Scheme				
					External		Sessional		Total
Lect	Prac	Clinical	Total		Theory	Pract	Theory	Pract	
103	364	-	467		1	1	3	3	8

A. COURSE OVERVIEW

Aim of the course is to present basic chemical and physical properties of Dental materials as they are related to its manipulation to give a sound educational background so that the practice of the dentistry emerged from art to empirical status of science as more information through further research becomes available. It is also the aim of the course of Dental materials to provide with certain criteria of selection and which will enable to discriminate between facts and propaganda about claims of manufactures.
To understand the evolution and development of science of dental material.
To explain purpose of course in dental materials to personnels concerned with the profession of the dentistry. Knowledge of physical and chemical properties. Knowledge of biomechanical requirements of particular restorative procedure. An intelligent compromise of the conflicting as well as co-ordinating factors into the desired Ernest. Laying down standards or specifications of various materials to guide to manufacturers as well as to help professionals.

B. COURSE CONTENT

NO	TOPIC	L+P (hrs)	CLs
1	STRUCTURE OF MATTER AND PRINCIPLES OF ADHESION	10+10	CL1
2	IMPORTANT PHYSICAL PROPERTIES APPLICABLE TO DENTAL MATERIALS	10+10	CL1,6
3	BIOLOGICAL CONSIDERATIONS IN USE OF DENTAL MATERIALS.	5+4	CL1,4,5
4	GYPSUM & GYPSUM PRODUCTS.	10+60	CL1,2,3,4,6
6	SYNTHETIC RESINS USED IN DENTISTRY.	10+85	CL1,2,3,4,6
7	METAL AND ALLOYS:	8+20	CL1,2,3,4,6
8	DENTAL WAXES INCLUDING INLAY CASTING WAX	5+55	CL1,4,5,6
9	DENTAL CASTING INVESTMENTS	8+20	CL1,6
11	DENTAL CEMENTS	10+30	CL1,3,4,5,6
12	DENTAL CERAMICS	6+10	CL1,5,6
13	ABRASION & POLISHING AGENTS	5+20	CL1,5,6
14	DIE AND COUNTER DIE MATERIALS INCLUDING ELECTROFORMING AND ELECTROPOLISHING	6+15	CL1,5,6
15	DENTAL IMPLANTS	5+5	CL1,4,5,6
16	MECHANICS OF CUTTING	5+20	CL1,4,5

C. TEXT BOOKS

1. Kenneth J Anusavice; Phillips's science of dental materials; 10th edition; Elsevier,2014

D. REFERENCE BOOKS

1. Robert G Craig; Restorative dental materials, 10th edition, Elsevier, 2021.
2. E.C.Combe; Notes on dental materials; 4th Revised edition,3 Harcourt Brace/Churchill Livingstone,1981.
3. Dr.M.S Koudi & Dr. Sanjay Gouda B. patil; Manual for undergraduates- Dental materials, Elsevier, 2007.
4. Dr. M.S. Koudi & Dr. SanjayGouda B. Patil; Prep. Manual for undergraduates-Dental Materials

E. COMPTENCY LEVEL

CL Number	Skill	Statement
CL1	Knowledge	• The need for the dentist to possess adequate knowledge of materials to exercises his best through knowledge of properties of different types of materials.
CL2	Investigations	• To recognize and physical, chemical and biological properties of the dental materials.
CL3	Patient Care: Diagnosis	• Diagnose the patient's problem and get familiarized with materials to be used for the procedures.
CL4	Patient Care: Treatment planning	• To demonstrate and apply basic facts, concepts and theories in the field of Dental Materials
CL5	Patient Care: Treatment	• Be thorough with the preclinical exercises.
CL6	Research and Innovation	• Search for newer and better materials which may answer our requirements with greater satisfaction

PROGRAM SPECIFIC OUTCOME (PSO)

PSO1		To understand the evolution and development of science of dental material. To explain purpose of course in dental materials to personnels concerned with the profession of the dentistry. Knowledge of physical and chemical properties. Knowledge of biomechanical requirements of particular restorative procedure

F. COURSE MATRIX

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO1
CL1	3	3	3	3	3	3	2	2	2	2	3	3	3	3	3	3
CL2	3	3	3	3	3	3	2	2	2	2	3	3	3	3	3	2
CL3	3	3	3	3	3	2	1	2	2	2	3	3	3	3	3	2
CL4	3	3	3	3	3	2	1	2	2	1	3	2	2	3	3	1
CL5	3	3	3	3	3	2	1	2	2	1	3	2	2	3	3	1
CL6	2	2	2	2	2	2	1	2	2	1	3	2	2	3	3	1
Avg	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**2.3**	**1.5**	**2**	**2**	**1.5**	**3**	**2.5**	**2.5**	**3**	**3**	**1.7**

B.D.S SECOND YEAR YEAR

SUBJECT: GENERAL AND DENTAL PHARMACOLOGY AND THERAPEUTICS

Teaching Scheme				Credits	Examination Scheme				
					External		Sessional		Total
Lect	Prac	Clinical	Total		Theory	Pract	Theory	Pract	
78	75	-	153		1	1	3	3	8

A. COURSE OVERVIEW

The broad goal of teaching under graduate students in pharmacology is to inculcate rational and scientific basis of therapeutics keeping in view of dental curriculum and Profession.
At the end of the course the student shall be able to:
i) Describe the pharmacokinetics and pharmacodynamics of essential and commonly used drugs in general and in dentistry in particular.
ii) List the indications, contraindications; interactions, and adverse reactions of commonly used drugs with reason.
iii) Tailor the use of appropriate drugs in disease with consideration to its cost, efficacy, safety for individual and mass therapy needs.
iv) Indicate special care in prescribing common and essential drugs in special medical situations such as pregnancy, lactation, old age, renal, hepatic damage and immuno compromised patients.
v) Integrate the rational drug therapy in clinical pharmacology.
vi) Indicate the principles underlying the concepts of "Essential drugs

B. COURSE CONTENT

NO	TOPIC	L+P (hrs)	CLs
1	GENERAL PHARMACOLOGY: Principles	6+6	CL 1
2	CNS drugs; General anaesthetics, hypnotics, analgescis psychotropic drugs, anti – epileptics, muscle relaxants, local anaesthetics, Implications of these drugs in clinical dentistry.	6+6	CL1,3,4
3	Autonomic drugs; sympathomimetics, antiadrenergic drugs parasympothomimetics and parasympatholytics, Implications of Autonomic drugs in clinical dentistry	6+6	CL1,2,3,4
4	Cardiovascular drugs; Cardiac stimulants ; antihypertensive drugs, vasopressor agents, treatment of shock, Antianginal agents and diuretics, Implications of these drugs in clinical dentistry	6+6	CL1,2,3,4
5	Autocoids: Histamine, antihistamines, prostaglandins, leukotriens and bronchodilators, Implications of Autocoids in clinical dentistry.	6+6	CL1,2,3,4
6	Drugs acting on blood : coagulants and anticoagulants, hematinics, Implications of these drugs in clinical dentistry	6+6	CL1,2,3,4
7	G.I.T. Drugs, Purgatives, anti-diarrhoeal, antacids, anti-emetics, Implications of these drugs in clinical dentistry.	6+5	CL1,2,3,4
8	Endocrines; Emphasis on treatment of diabetes and glucocorticoids, thyroid and antithyroid agents, drugs affecting calcium balance and anabolic steroids, Implications of these drugs in clinical dentistry.	6+5	CL1,2,3
9	Chemotherapy	5+5	CL1,6
10	Vitamins	5+5	CL1,2,3
11	Pharmacotherapy of emergencies in dental office and emergency drugs tray Implications of Pharmacotherapy in clinical dentistry.	5+5	CL1,5

12	Chealating agents	5+5	CL1
13	DENTAL PHARMACOLOGY Anti - septics, astrigents, obtundents, mummifying agents, bleaching agents, styptics, disclosing agents, dentifrices, mouth washes, caries and fluorides	5+5	CL1,5,6
14	DENTAL PHARMACOLOGY Pharmacotherapy of common oral conditions in dentistry	5+5	CL1,5,6

C. TEXT BOOKS

1. Robbins – Pathologic Basis of Disease Cotran, Kumar, Robbins

D. REFERENCE BOOKS

1. R.S.Satoskar, Kale Bhandarkar's; Pharmacology and Pharmacolherapentics, 10th Edition, Bombay Popular Prakashan,1991.
2. Bertam G Katzung; Basic and Clinical pharmacology, 6th edition, Appleton & Lange, 1997.
3. Lauerence D.R; Clinical Pharmacology, 8th edition, Churchill Livingstone,1997.
4. Satoskar R.S. & Bhandarkar S.D; Pharmacology and Pharmaco Therapeutics part I & part ii, 13th edition, Popular Prakashan Bombay, 1993.
5. Tripathi K.D; Essentials of Medical Pharmacology, 4th edition, Jaypee Brothers, 1999

E. COMPETENCY LEVEL

CL Number	Skill	Statement
CL1	Knowledge	• Knowledge about the pharmacokinetics and pharmacodynamics of essential and commonly used drugs in general and in dentistry in particular.
CL2	Investigations	• Observe experiments designed for study of effects of drugs. • Critically evaluate drug formulations and be able to interpret the clinical pharmacology of marketed preparations commonly used in.dentistry
CL3	Patient Care: Diagnosis	• Indicate special care in prescribing common and essential drugs in special medical situations such as pregnancy, lactation, old age, renal, hepatic damage and immuno compromised patients
CL4	Patient Care: Treatment planning	• List the indications, contraindications; interactions, and adverse reactions of commonly used drugs with reason
CL5	Patient Care: Treatment	• Prescribe drugs for common dental and medical ailments with consideration to its cost, efficacy, safety for individual and mass therapy needs
CL6	Research and Innovation	• Upgradation of knowledge and skill from time to time, familiarize with new concept and equipment in pharmacology

PROGRAM SPECIFIC OUTCOME (PSO)

PSO1		Practical knowledge of use of drugs in clinical practice will be acquired through integrated teaching with clinical departments.

F. COURSE MATRIX

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO1
CL1	3	3	3	1	3	1	1	3	2	1	1	1	1	1	1	3
CL2	2	2	2	2	2	2	1	3	2	1	1	1	1	1	1	3
CL3	3	3	3	3	3	3	2	2	2	2	2	2	2	1	1	3
CL4	2	2	2	3	2	3	3	2	2	1	1	3	1	1	2	3
CL5	2	2	2	3	2	3	3	3	2	3	2	2	2	1	2	3
CL6	1	1	1	1	1	1	1	1	1	1	3	2	1	1	1	3
Avg	**2.2**	**2.2**	**2.2**	**2.2**	**2.2**	**2.2**	**1.8**	**2.3**	**1.8**	**1.5**	**1.6**	**1.8**	**1.3**	**1**	**1.3**	**3**

B.D.S SECOND YEAR YEAR

SUBJECT: GENERAL PATHOLOGY

Teaching Scheme				Credits	Examination Scheme				
					External		Sessional		Total
Lect	Prac	Clinical	Total		Theory	Pract	Theory	Pract	
78	75	-	153		1	1	3	3	8

A. COURSE OVERVIEW

At the end of the course, the student should be competent to:
Apply the scientific study of disease processes, which result in morphological and functional alterations in cells, tissues and organs to the study of pathology and the practice of dentistry.

B. COURSE CONTENT

NO	TOPIC	L+P (hrs)	CLs
1	Introduction to Pathology	1+0	CL1
2	Etiology and Pathogenesis of Disease	3+3	CL1,2
3	Degenerations Amyloidosis Fatty change Cloudy swelling Hyaline change, mucoid degeneration	3+3	CL
4	Cell death & Necrosis	4+3	CL1
5	Inflammation	4+3	CL1,2
6	Healing	2+0	CL1,2,3
7	Tuberculosis	2+3	CL1,2,3,4,5
8	Syphilis	4+3	CL1,2,3,4,5
9	Typhoid	2+3	CL1,2,3,4,5
10	Thrombosis	3+3	CL1,2
11	Embolism	2+3	CL1,2
12	Ischaemia and Infraction	3+3	CL1
13	Derangements of body fluids	2+3	CL1,2,4
14	Disorders of circulation	2+3	CL1,2,4
15	Nutritional Disorders	3+3	CL2,3,4,5
16	Immunological mechanisms in disease	2+3	CL1,2,4
17	AIDS and Hepatitis	3+3	CL2,3,4
18	Hypertension	2+3	CL2,3,5
19	Diabetes Mellitus	3+3	CL2,3,4,5,6
20	Adaptive disorders of growth	2+0	CL1
21	General Aspects of neoplesia	4+3	CL1
22	Anaemias	2+3	CL1,2,3
23	Leukaemias	4+3	CL1,2,3
24	Diseases of Lymph nodes	3+3	CL1,2,3
25	Diseases of oral cavity	3+3	CL1,2,3,4,5,6
26	Diseases of salivary glands	2+3	CL1,2,3,4,5,6
27	Common diseases of Bones	3+3	CL1,2
28	Diseases of Cardiovascular system	3+0	CL1,2
29	Haemorrhagic Disorders	2+3	CL1,2

C. TEXT BOOKS

1. Robbins & Cotran; Pathologic Basis of Disease - 10th Edition, Elsevier publications,2017.
2.Ivan Damjanaov & James Linder; Andersons's Pathology Vol 1& 2, 10th edition, Mosby publications, 2011
3.Bithell, Foerster, Athens, Lukens;Wintrobe's clinical Haematology, 14th edition, LWW publications, 2019.

D. REFERENCE BOOKS

E. COMPETENCY LEVEL

CL Number	Skill	Statement
CL1	Knowledge	• Adequate knowledge of the development, structure and function of the human body in health and disease and its relationship with dentistry while bearing physical and social well-being of the patient.
CL2	Investigations	• To recognize and analyze pathological changes at macroscopically and microscopical levels and explain their observations in terms of disease processes
CL3	Patient Care: Diagnosis	• Diagnose the patient's problem and get familiarized with concepts of general pathology.
CL4	Patient Care: Treatment planning	• To demonstrate and apply basic facts, concepts and theories in the field of Pathology
CL5	Patient Care: Treatment	• To Integrate knowledge from the basic sciences, clinical medicine and dentistry in the study of Pathology • To demonstrate understanding of the capabilities and limitations of morphological Pathology in its contribution to medicine, dentistry and biological research.
CL6	Research and Innovation	• Upgradation of knowledge and skill from time to time, familiarize with new concept and equipment in general pathology.

PROGRAM SPECIFIC OUTCOME (PSO)

PSO1		• To recognize and analyze pathological changes at macroscopically and microscopical levels and explain their observations in terms of disease processes
PSO2		• To Integrate knowledge from the basic sciences, clinical medicine and dentistry in the study of Pathology

F. COURSE MATRIX

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO1	PSO2
CL1	3	3	3	1	3	1	1	1	1	1	1	1	1	1	1	3	3
CL2	2	2	2	2	2	2	1	3	2	1	2	2	1	1	1	3	3
CL3	3	3	3	3	3	3	3	3	2	1	2	2	1	1	1	3	3
CL4	2	2	2	3	2	3	2	2	2	1	2	2	1	1	1	3	3
CL5	2	2	2	3	2	3	3	2	2	2	2	2	3	2	1	3	3
CL6	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	2
Avg	**2.3**	**2.3**	**2.3**	**2.3**	**2.3**	**2.1**	**1.8**	**2**	**1.6**	**1.6**	**1.6**	**1.6**	**1.3**	**1.1**	**1**	**2.6**	**2.5**

B.D.S SECOND YEAR
SUBJECT: MICROBIOLOGY

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
					External		Sessional		Total
Lect	Prac(P)	Clinical	Total		Theory	Pract	Theory	Pract	
78	75	-	153		1	1	3	3	8

A. COURSE OVERVIEW

To introduce the students to the exciting world of microbes. To make the students aware of various branches of microbiology, importance, significance and contribution of each branch to mankind and other fields of medicine

B. COURSE CONTENT

NO	TOPIC	L+P (hrs)	CLs
1	GENERAL MICROBIOLOGY	10+12	CL1,2,3,4,5,6
2	IMMUNOLOGY	13+12	CL1,2,3,4,5,6
3	SYSTEMATIC BACTERIOLOGY	15+15	CL1,2,3,4,5,6
4	VIROLOGY:	14+12	CL1,2,3,4,5,6
5	MYCOLOGY	13+12	CL1,2,3,4,5,6
6	PARASITOLOGY:	13+12	CL1,2,3,4,5,6

C. TEXT BOOKS

1. Robbins – Pathologic Basis of Disease Cotran, Kumar, Robbins
R. Ananthnarayan & C K Jayaram Paniker; editor Reba Kanungo; 11th edition; Universities press Ind. Pvt.Ltd.; 3rd July 2020

D. REFERENCE BOOKS

1. David greenwood, Richard slack, John peutherer, Mike Barer; Medical microbiology;17th edition; Churchill livingstone; 6th June 2007.
2. Prescott; Medical Microbiology; Joanne willey,Kathelene sandman, Dorothy wood; 11th edition; Mc Graw hill publications; 2020
3. Bernard D Davis; Microbiology; Harper & roo; 1st January 1968
4. Barbara J hardward; clinical and pathogenic microbiology: Mosby Inc. subsequent edition; 1st January 1994.
5. Moselio schaechter,et al; Mechanisms of microbial diseases; 6th edition; wolters kluwers; December 2021
6. Tizard; 1immunology an introduction; Saunders publications; 27th janauary 1995
7. Evan Roitt; immunology; 13th edition ; wiley balkwell; 27th January 1995.

E. COMPETENCY SKILL

CL Number	Skill	Statement
CL1	Knowledge	• Understand the basics of various branches of microbiology and able to apply the knowledge relevantly
CL2	Investigations	• To recognize and analyze microbiological changes at macroscopically and microscopical levels and explain their observations in terms of disease processes
CL3	Patient Care: Diagnosis	• Have a sound understanding of various infectious diseases and lesions in the oral cavity
CL4	Patient Care: Treatment planning	• To demonstrate and apply basic facts, concepts and theories in the field of microbiology
CL5	Patient Care: Treatment	• Practice various methods of Sterilisation and disinfection in dental clinics
CL6	Research and Innovation	• Upgradation of knowledge and skill from time to time, familiarize with new concept and equipment in microbiology .

PROGRAM SPECIFIC OUTCOME (PSO)

PSO1		To recognize and analyze microbiological changes at macroscopically and microscopical levels and explain their observations in terms of disease processes
PSO2		To Integrate knowledge from the basic sciences, clinical medicine and dentistry in the study of microbiology.

F. COURSE MATRIX

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PS O1	PS O2
CL1	3	3	3	1	3	1	1	1	1	1	1	1	1	1	1	3	3
CL2	2	2	2	2	2	2	1	3	2	1	2	2	1	1	1	3	3
CL3	3	3	3	3	3	3	3	3	2	1	2	2	1	1	1	3	3
CL4	2	2	2	3	2	3	2	2	2	1	2	2	1	1	1	3	3
CL5	2	2	2	3	2	3	3	2	2	2	2	2	3	2	1	3	3
CL6	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	2	2
Avg	**2.3**	**2.3**	**2.3**	**2.3**	**2.3**	**2.1**	**1.8**	**2**	**1.6**	**1.6**	**1.6**	**1.6**	**1.3**	**1.1**	**1**	**2.8**	**2.8**

B.D.S THIRD YEAR YEAR

SUBJECT : GENERAL MEDICINE

Teaching Scheme				Credits	Examination Scheme				
					External		Sessional		Total
Lect	Prac	Clinical	Total		Theory	Pract	Theory	Pract	
104	-	216	420		1	1	3	3	8

A. COURSE OVERVIEW

Special emphasis should be given throughout on the importance of various diseases as applicable to dentistry.

- Special precautions/ contraindication of anaesthesia and various dental procedures in different systemic diseases.
- Oral manifestations of systemic diseases.
- Medical emergencies in dental practice.
- A dental student should be taught in such a manner he/she is able to record the arterial pulse, blood pressure and be capable of suspecting by sight and superficial examination of the body – diseases of the heart, lungs, kidneys, blood etc. He should be capable of handling medical emergencies encountered in dental practice.

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B. COURSE CONTENT

NO	TOPIC	L+P (hrs)	CLs
1	Aims of medicine Definitions of signs, symptoms, diagnosis, differential diagnosis treatment & prognosis	10+20	CL1,2,3,6
2	Infections	10+28	CL2,3,5
3	G.I.T.	10+20	CL1,2,3,4
4	CVS	10+20	CL1,2,3,4
5	RS	10+20	CL1,2,3,4
6	Hematology	10+20	CL1,2,3,4
7	Renal System	10+20	CL1,2,3,4
8	Nutrition	10+20	CL1,2,3,4
9	CNS	10+20	CL1,2,3,4
10	Endocrines	10+20	CL1,2,3,4
11	Critical care	4+8	CL1,2,3,4,6

C. TEXT BOOKS

D. REFERENCE BOOKS

1. Stuart H.Ralson et al; Davidson's Principles and practice of medicine, 23rd edition, Elsevier,2018.
2. Micheal Glynn and William Drake; Hutchinson's Clinical methods- An intergrated approach to clinical practice, 24th edition, Elsevier, 2017

E. COMPETENCY LEVEL

CL Number	Skill	Statement
CL1	Knowledge	• Adequate knowledge of the development, structure and function of the human body in health and disease and its relationship with dentistry while bearing physical and social well-being of the patient.
CL2	Investigations	• Adequate knowledge about common laboratory investigations and interpretation of their results
CL3	Patient Care: Diagnosis	• Diagnose the patient's problem and get familiarized with concepts of general medicine.
CL4	Patient Care: Treatment planning	• Ethically Integrate multiple disciplines into an individual comprehensive sequence treatment plan using diagnostic and prognostic information
CL5	Patient Care: Treatment	The student must be able to take history, do general physical examination (including build, nourishment, pulse, BP, respiration, clubbing, cyanosis, jaundice, lymphadenopathy, oral cavity) and be able to examine CVS, RS and abdomen and facial nerve.
CL6	Research and Innovation	• Upgradation of knowledge and skill from time to time, familiarize with new concept and equipment in general medicine .

PROGRAM SPECIFIC OUTCOME (PSO)

PSO1		Special precautions/ contraindication of anaesthesia and various dental procedures in different systemic diseases
PSO2		Oral manifestations of systemic diseases.
PSO3		Medical emergencies in dental practice

F. COURSE MATRIX

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PS O1	PS O2	PS O3
CL1	3	3	3	1	3	1	1	1	1	1	1	1	1	1	1	2	2	2
CL2	3	3	3	2	2	2	3	2	3	2	1	2	2	1	1	1	2	1
CL3	2	2	2	2	2	3	2	3	2	1	1	2	1	1	1	3	3	3
CL4	2	2	2	3	2	3	2	2	2	1	1	2	2	1	1	3	3	3
CL5	2	2	2	3	2	3	3	3	3	3	3	3	2	1	1	3	3	3
CL6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2
Avg	**2.2**	**2.2**	**2.2**	**2**	**2**	**2.2**	**2**	**2**	**2**	**1.5**	**1.3**	**1.3**	**1.5**	**1**	**1**	**2.3**	**2.5**	**2.3**

B.D.S THIRD YEAR

SUBJECT : GENERAL SURGERY

Teaching Scheme				Credits	Examination Scheme				
					External		Sessional		Total
Lect	Prac	Clinical	Total		Theory	Pract	Theory	Pract	
104	-	216	420		1	1	3	3	8

A. COURSE OVERVIEW

To acquaint the student with various diseases, which may require surgical expertise and to train the student to analyze the history and be able to do a thorough physical examination of the patient. The diseases as related to head and neck region are to be given due importance, at the same time other relevant surgical problems are also to be addressed. At the end of one year of study the student should have a good theoretical knowledge of various ailments, and be practically trained to differentiate benign and malignant diseases and be able to decide which patient requires further evaluation.

B. COURSE CONTENT

NO	TOPIC	L+C (hrs)	CLs
1	HISTORY OF SURGERY	14+12	CL1
2	GENERAL PRINCIPLES OF SURGERY:	18+12	CL1,4,5
3	WOUNDS:	18+15	CL1,2,3
4	INFLAMMATION:	18+15	CL1,2,3
5	INFECTIONS:	18+15	CL2,3,4
6	TRNSMISSABLE VIRAL INFECTIONS	18+15	CL3,4
7	SHOCK AND HAEMORRHAGE	18+13	CL1,5
8	TUMOURS, ULCERS, CYSTS, SINUS AND FISTULAE	18+12	CL 2,3,4,5,6
9	DISEASES OF LYMPHATIC SYSTEM	18+12	CL1,2
10	DISEASES OF THE ORAL CAVITY	18+12	CL2,3,4,5
11	DISEASES OF LARYNX, NASOPHARYNX	18+12	CL1,2,3
12	NERVOUS SYSTEM:	18+12	CL1,2,3
13	FRACTURES:	18+12	CL2,3,4,5
14	PRINCIPLES OF OPERATIVE SURGERY:	18+12	CL4,5
15	ANOMOLIES OF DEVELOPMENT OF FACE	18+12	CL1,2,3,4
16	DISEASES OF THYROID AND PARATHYROID	18+12	CL1,2,3
17	SWELLINGS OF THE JAW	18+12	CL3,4,5
18	BIOPSY	18+12	CL2

C. TEXT BOOKS

1. Norman S. Williams et al; Bailey & Love's, Short practice of Surgery, 27th edition CRC Press, 2017.

D. REFERENCE BOOKS

E. COMPETENCY LEVEL

CL Number	Skill	Statement
CL1	Knowledge	• Adequate knowledge of the development, structure and function of the human body in health and disease and its relationship with dentistry while bearing physical and social well-being of the patient.
CL2	Investigations	• Adequate knowledge about common laboratory investigations and interpretation of their results
CL3	Patient Care: Diagnosis	• Train the student to analyse the history and be able to do a thorough physical examination of the patient.
CL4	Patient Care: Treatment planning	• Ethically Integrate multiple disciplines into an individual comprehensive sequence treatment plan using diagnostic and prognostic information
CL5	Patient Care: Treatment	• Should be able to differentiate benign and malignant diseases and be able to decide which patient requires further evaluation.
CL6	Research and Innovation	• Upgradation of knowledge and skill from time to time, familiarize with new concept and equipment in general surgery.

PROGRAM SPECIFIC OUTCOME (PSO)

PSO1		Diseases as related to head and neck region are to be given due importance, at the same time other relevant surgical problems are also to be addressed.
PSO2		Have a good theoretical knowledge of various ailments, and be practically trained to differentiate benign and malignant diseases and be able to decide which patient requires further evaluation

F. COURSE MATRIX

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PS O1	PS O2
CL1	3	3	3	1	3	1	1	1	1	1	1	1	1	1	1	2	3
CL2	2	2	2	2	2	2	1	3	1	1	2	2	2	1	1	2	2
CL3	3	3	3	3	3	3	2	2	2	2	2	2	1	1	1	2	3
CL4	2	2	2	3	2	2	2	2	2	2	2	3	1	1	1	3	3
CL5	2	2	2	3	2	3	3	3	3	3	3	3	3	2	1	3	3
CL6	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	3	3
Avg	**2.3**	**2.3**	**2.3**	**2.3**	**2.3**	**2.2**	**1.8**	**2.2**	**1.8**	**1.8**	**2**	**2.2**	**1.7**	**1.2**	**1**	**2.5**	**2.8**

B.D.S THIRD YEAR YEAR

SUBJECT : ORAL PATHOLOGY & ORAL MICROBIOLOGY

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
					External		Sessional		Total
Lect	Prac(P)	Clinical(C)	Total		Theory	Pract	Theory	Pract	
156	195	-	351		1	1	3	3	8

A. COURSE OVERVIEW

At the end of Oral Pathology & Oral Microbiology course, the student should be able to comprehend -

1. The different types of pathological processes, that involve the oral cavity.
2. The manifestations of common diseases, their diagnosis & correlation with clinical pathological processes.
3. The student should understand the underlying biological principles governing treatment of oral diseases.
4. The principles of certain basic aspects of Forensic Odontology.
5. Microscopic study of common lesions affecting oral tissues through microscopic slides & projectionslides..
6. Study of teeth anomalies/polymorphisms through tooth specimens & plaster casts.
7. Microscopic study of plaque pathogens and study of haematological preparations (blood films) of anaemias & leukemias.

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B. COURSE CONTENT

NO	TOPIC	L+P (hrs)	CLs
1	INTRODUCTION:	2+1	CL1
2	Developmental disturbances of teeth, jaws and soft tissues of oral & paraoral region	13+12	CL1,CL3
3	Dental Caries	9+11	CL4, CL5
4	Pulp & Periapical Pathology & Osteomyelitis	5+7	CL4
5	Periodontal Diseases	5+7	CL2
6	Microbial infections of oral soft tissues	13+12	CL2,CL6
7	Common non- inflammatory diseases involving the jaws	13+15	CL4
8	Diseases of TM Joint	5+7	CL4
9	Cysts of the Oral & Paraoral region :	16+18	CL2, CL5
10	Tumours of the Oral Cavity	16+18	CL4,CL5
11	Traumatic, Reactive & Regressive lesions of Oral Cavity	4+7	CL4
12	Non neoplastic Salivary Gland Diseases	4+7	CL4
13	Systemic Diseases involving Oral cavity	5+7	CL2
14	Mucocutaneous Lesions	8+11	CL2,CL4
15	Diseases of the Nerves	4+7	CL4
16	Pigmentation of Oral & Paraoral region & Discolouration of teeth	7+9	CL2,CL3
17	Diseases of Maxillary Sinus	3+6	CL3
18	ORAL PRECANCER	15+16	CL2,CL4
19	Principles of Basic Forensic Odontology (Pre-clinical Forensic Odontology	8+7	CL2,CL6

C. TEXT BOOKS

D. REFERENCE BOOKS

1. Shafers ; Oral Pathology, 8th edition, Elsevier, 2020.
2. Regezi & Sciubba; Oral Pathology - Clinical Pathologic correlations, 7th edition, Saunders Publications, 2016.
3. Soames & Southam; Oral Pathology, 5th edition, Oup oxford, 2018.
4. Prabhu, Wilson, Johnson & Daftary; Oral Pathology in the Tropics

E. COMPETENCY LEVEL

CL Number	Skill	Statement
CL1	Knowledge	• Student should understand the underlying biological principles governing treatment of oral diseases .
CL2	Investigations	• Microscopic study of common lesions affecting oral tissues through microscopic slides & projection slides. • Study of the disease process by surgical specimens. • Study of teeth anomalies/polymorphisms through tooth specimens & plaster casts. • Microscopic study of plaque pathogens. • Study of haematological preparations (blood films) of anaemias & leukemias.
CL3	Patient Care: Diagnosis	• An understanding of the oral manifestations of systemic diseases should help in correlating with the systemic physical signs & laboratory findings
CL4	Patient Care: Treatment planning	• Manifestations of common diseases, their diagnosis & correlation with clinical pathological processes
CL5	Patient Care: Treatment	• Comprehend the different types of pathological processes, that involve the oral cavity.
CL6	Research and Innovation	• Upgradation of knowledge and skill from time to time, familiarize with new concept and equipment in oral pathology & oral microbiology .

PROGRAM SPECIFIC OBJECTIVE(PSO)

PSO1		An understanding of the oral manifestations of systemic diseases should help in correlating with the systemic physical signs & laboratory findings.
PSO2		Basic exercises in Forensic Odontology such as histological methods of age estimation and appearance of teeth in injuries

F. COURSE MATRIX

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO1	PSO2
CL1	3	3	1	1	3	1	1	2	3	1	3	3	3	3	2	1	1
CL2	2	2	3	3	3	3	2	2	3	3	3	3	3	2	2	3	3
CL3	3	2	2	3	1	3	2	3	3	3	3	3	3	2	2	3	1
CL4	2	1	3	3	1	3	2	3	3	1	3	3	1	2	1	3	1
CL5	2	1	2	3	2	3	3	1	1	3	3	3	3	1	1	3	1
CL6	2	2	3	3	1	3	3	3	1	1	3	1	1	3	3	3	3
Avg	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**2**	**2**	**2**	**2**	**3**	**2**

B.D.S. FINAL YEAR
SUBJECT: ORAL MEDICINE AND RADIOLOGY

Teaching Scheme				Credits	Examination Scheme				
					External		Sessional		Total
Lect	Prac	Clinical	Total		Theory	Pract	Theory	Pract	
78	-	370	448		1	1	3	3	8

A. COURSE OVERVIEW

To train the students to diagnose the common disorders of Orofacial region by clinical examination and with the help of such investigations as may be required and medical management of oro-facial disorders with drugs and physical agents. To train the students about the importance, role, use and techniques of radiographs/digital radiograph and other imaging methods in diagnosis. The principles of the clinical and radiographic aspects of Forensic Odontology.

B. COURSE CONTENT

NO	TOPIC	L+P+C (hrs)	CL
1	PART I ORAL MEDICINE AND DIAGNOSTIC AIDS SECTION (A) – DIAGNOSTIC METHODS	16+0+78	CL1,3,6
2	PART I ORAL MEDICINE AND DIAGNOSTIC AIDS SECTION (B) – DIAGNOSIS, DIFFERENTIAL DIAGNOSIS	16+0+78	CL2,3,6
3	PART I ORAL MEDICINE AND DIAGNOSTIC AIDS SECTION (C): ORAL MEDICINE AND THERAPEUTICS.	16+0+74	CL2,3,5
4	Part – II BEHAVIOURAL SCIENCES AND ETHICS.	16+0+70	CL4
5	Part – III ORAL RADIOLOGY	14+0+70	CL1,2,6

C. TEXT BOOKS

1. Burket; Oral Medicine, 11th edition, Elsevier, 2008.

2.White & Goaz; Oral Radiology Principles and Interpretation, 3rd edition, Mosby publications,1994

D. REFERENCE BOOKS

a) Oral Diagnosis, Oral Medicine & Oral Pathology

1. 2. Coleman – Principles of Oral Diagnosis, 1st edition, Mosby,1993.
2. Jones; Oral Manifestations of Systemic Diseases – W.B. Saunders company
3. Mitchell; Oral Diagnosis & Oral Medicine, 3rd edition, Lea & Febiger, 1974.
4. Kerr; Oral Diagnosis, 4th edition, Mosby , 1974.
5. Miller; Oral Diagnosis & Treatment, 2rd edition, Lea & Febiger, 1994.
6. Hutchinson; Clinical Methods, 24th edition, Elsevier, 2019.
7. Shafers ; Oral Pathology, 8th edition, Elsevier, 2020.
8. Sonis.S.T., Fazio.R.C. and Fang.L; Principles and practice of Oral Medicine, 2nd edition, W.B Saunders, 2008.

b) Oral Radiology

1. 2. Wuehrmann; Dental Radiology, 4th edition, C.V. Mosby Company,1977.
2. Stafne – Oral Roentgenographic Diagnosis,4th edition, W.B.Saunders Co, 1975.

c) Forensic Odontology

1. Derek H.Clark; Practical Forensic Odontology, Butterworth-Heinemann,1992.
2. C Michael Bowers, Gary Bell; Manual of Forensic Odontology, 3rd edition, Forensic Pr ,1995.

E. COMPETENCY LEVEL

CL Number	Skill	Statement
CL1	Knowledge	• Adequate knowledge of the development, structure and function of the teeth, mouth and jaws and associated tissues both in health and disease and their relationship and effect on general state of health and also bearing on physical and social well-being of the patient.
CL2	Investigations	• Competent to take intra-oral radiographs and interpret the radiographic findings • Gain adequate knowledge of various extra-oral radiographic procedures, TMJ radiography and sialography. Should have an adequate knowledge about common laboratory investigations and interpretation of their results
CL3	Patient Care: Diagnosis	• Able to diagnose precancerous and cancerous lesions of the oral cavity, common disorders of orofacial region by clinical examination
CL4	Patient Care: Treatment planning	• Ethically Integrate multiple disciplines into an individual comprehensive sequence treatment plan using diagnostic and prognostic information
CL5	Patient Care: Treatment	• Prescription of drugs and physical agents, pre-operative, prophylactic and therapeutic requirement for oro facial disorders
CL6	Research and Innovation	• Upgradation of knowledge and skill from time to time, familiarize with new concept and equipment in oral medicine and radiology.

Program Specific Outcome

PSO1	**Diagnosis**	• Diagnose the common disorders of Orofacial region by clinical examination and with the help of such investigations as may be required and medical management of oro-facial disorders with drugs and physical agents
PSO2	**Investigations**	• Competent to take intra-oral radiographs and interpret the radiographic findings
PSO3	**Treatment**	• Ethically Integrate multiple disciplines into an individual comprehensive sequence treatment plan using diagnostic and prognostic information

F. COURSE MATRIX

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PS O1	PS O2	PS O3
CL1	3	3	3	1	3	2	1	1	2	2	2	2	1	1	1	3	1	1
CL2	2	2	2	3	2	3	2	3	2	2	2	2	1	1	1	1	3	1
CL3	2	2	2	1	2	3	2	3	2	2	2	2	2	1	2	3	2	2
CL4	2	2	2	3	2	2	3	2	2	2	2	3	2	2	1	2	2	3
CL5	2	2	1	3	3	2	3	1	2	2	2	2	2	1	2	2	2	3
CL6	1	1	2	1	1	1	1	2	1	2	2	1	2	2	2	2	2	2
Avg	**2**	**2**	**2**	**2**	**2.2**	**2.2**	**2**	**2**	**1.8**	**2**	**2**	**2**	**1.7**	**1.3**	**1.5**	**2.2**	**2**	**2**

B.D.S FINAL YEAR

SUBJECT: PAEDIATRIC & PREVENTIVE DENTISTRY

Teaching Scheme				Credits	Examination Scheme				
					External		Sessional		Total
Lect	Prac	Clinical	Total		Theory	Pract	Theory	Pract	
78	-	370	448		1	1	3	3	8

A. COURSE OVERVIEW

Is to educate and counsel the patients as well as parents regarding importance of maintaining optimal oral health and instil a lifelong positive attitude towards dental health in children. Provide both primary and comprehensive preventive and therapeutic oral healthcare for children.

B. COURSE CONTENT

NO	TOPIC	L+P+C (hrs)	CLs
1	INTRODUCTION TO PEDODONTICS & PREVENTIVE DENTISTRY	3+0+0	CL1
2	GROWTH & DEVELOPMENT	3+0+17	CL1
3	DEVELOPMENT OF OCCLUSION FROM BIRTH THROUGH ADOLESCENCE	3+0+17	CL1
4	DENTAL ANATOMY AND HISTOLOGY	3+0+17	CL1
5	DENTAL RADIOLOGY RELATED TO PEDODONTICS	3+0+18	CL2,3
6	ORAL SURGICAL PROCEDURES IN CHILDREN	3+0+15	CL2,4,5
7	DENTAL CARIES	3+0+16	CL1,2,4,5
8	GINGIVAL & PERIODONTAL DISEASES IN CHILDREN	3+0+15	CL2,4,5
9	CHILD PSYCHOLOGY	4+0+15	CL1,2,3
10	BEHAVIOUR MANAGEMENT	3+0+15	CL1,3,4,5
11	PEDIATRIC OPERATIVE DENTISTRY	3+0+15	CL4,5,6
12	PEDIATRIC ENDODONTICS	3+0+15	CL2,3,4,5
13	TRAUMATIC INJURIES IN CHILDREN	4+0+15	CL1,2,4,5
14	PREVENTIVE & INTERCEPTIVE ORTHODONTICS	3+0+15	CL1,2,4,5
15	ORAL HABITS IN CHILDREN:	3+0+15	CL2,4,5
16	DENTAL CARE OF CHILDREN WITH SPECIAL NEEDS	3+0+15	CL1,2,4,5

17	CONGENITAL ABNORMALITIES IN CHILDREN	3+0+15	CL1,2,4,5
18	DENTAL EMERGENCIES IN CHILDREN & THEIR MANAGEMENT	3+0+15	CL2,4,5,
19	DENTAL MATERIALS USED IN PEDIATRIC DENTISTRY.	3+0+15	CL1,4,5
20	PREVENTIVE DENTISTRY	3+0+15	CL1,2,4,6
21	DENTAL HEALTH EDUCATION & SCHOOL DENTAL HEALTH PROGRAMMES	3+0+15	CL1,2,4
22	FLUORIDES:	3+0+15	CL2,4,5
23	CASE HISTORY RECORDING	3+0+15	CL1,2,3,4
24	CASE HISTORY RECORDING	3+0+15	CL1,2,3,4,
25	ETHICS	3+0+15	CL1,4

C. TEXT BOOKS

D. REFERENCE BOOKS

1. Pinkham; Pediatric Dentistry (Infancy through Adolescences), 6th edition, Elsevier,2018.

2. Stephen H. Wei; Clinical Use of Fluorides, 1st edition, Lea & Febiger, 1984.

3. Niki Foruk; Understanding of Dental Caries, 1st edition, John Wiley & Sons, 1985.

4. Kenneth. D; Handbook of Clinical Pedodontics, 1st edition, Mosby, 1980.

5. Mc. Donald; Dentistry for the Child and Adolescence, 11th edition, Mosby, 2021.

6. Damle S. G; Pediatric Dentistry, 5th edition, Arya Medi Publishing House, 2018.

7. Wright; Behaviour Management ,3rd edition, Wiley Blackwell, 2021.

8. Andreason; Traumatic Injuries, 3rd edition, Wiley Blackwell, 2011.

9. Dr. Shobha Tandon; Textbook of Pedodontics, 3rd edition, Paras Medical, 2018.

E. COMPETENCY LEVEL

CL Number	Skill	Statement
CL1	Knowledge	• Adequate knowledge of the development, structure and function of the teeth, mouth and jaws and associated tissues both in health and disease and their relationship and effect on general state of health and also bearing on physical and social well-being of the patient.
CL2	Investigations	• Competent to take intra-oral radiographs and interpret the radiographic findings and adequate knowledge about common laboratory investigations and interpretation of their results
CL3	Patient Care: Diagnosis	• Diagnose the child's dental problem
CL4	Patient Care: Treatment planning	• Ethically guide and counsel the parents in regards to various treatment modalities including different facets of preventive dentistry.
CL5	Patient Care: Treatment	• Able to treat dental diseases occurring in child patient. • Able to manage the physically and mentally challenged disabled children effectively and efficiently, tailored to the needs of individual requirement and conditions.
CL6	Research and Innovation	• Upgradation of knowledge and skill from time to time, familiarize with new concept and equipment in paediatric & preventive dentistry.

PROGRAM SPECIFIC OUTCOME (PSO)

PSO1		Understand the principles of prevention and preventive dentistry right from birth to adolescence and application of the same in day-to-day dentistry.

F. COURSE MATRIX

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO1
CL1	3	3	3	1	3	3	3	1	3	2	3	3	3	3	3	3
CL2	3	3	3	2	3	3	2	2	3	3	3	3	3	2	3	3
CL3	1	2	3	3	1	3	1	3	1	1	1	1	1	2	2	1
CL4	2	2	3	3	2	3	3	2	3	2	3	3	2	2	3	3
CL5	2	2	3	3	2	3	3	1	2	3	3	3	2	2	3	3
CL6	2	2	2	3	1	2	2	1	2	1	3	1	1	3	2	3
Avg	**2.1**	**2.3**	**2.8**	**2.5**	**2**	**2.8**	**2.3**	**1.7**	**2.3**	**2**	**2.7**	**2.3**	**2**	**2.3**	**2.7**	**2.7**

B.D.S FINAL YEAR
SUBJECT: PUBLIC HEALTH DENTISTRY

Teaching Scheme				Credits	Examination Scheme				
					External		Sessional		Total
Lect	Prac	Clinical	Total		Theory	Pract	Theory	Pract	
104	-	230	334		1	1	3	3	8

A. COURSE OVERVIEW

At the conclusion of the course, the student shall have a knowledge of the basis of public health, preventive dentistry, public health problems in India, Nutrition, Environment and their role in health, basics of dental statistics, epidemiological methods, National oral health policy with emphasis on oral health policy

At the conclusion of the course the students shall have require at the skill of identifying health Problems affecting the society, conducting health surveys, conducting health education classes and deciding health strategies. Students should develop a positive attitude towards the problems of the society and must take responsibilities in providing health

At the conclusions of the course the student should be able to communicate the needs of the community efficiently, inform the society of all the recent methodologies in preventing oral disease

B. COURSE CONTENT

NO	TOPIC	L+C (hrs)	CLs
1	Introduction to Dentistry	8+20	CL 1
2	Public Health	10+50	CL 1,2,3
3	Dental Public Health	20+50	CL1,2,3,6
4	Research Methodology and Dental Statistics	16+50	CL 3,1,4
5	Practice Management	16+40	CL4,5
6	Dentist Act 1948 with amendment	6+20	CL1,6,4
7	Dental Council of India and State Dental Councils	8+0	CL1
8	Composition and responsibilities	8+0	CL1,4
9	Indian Dental Association	8+0	CL1,6
10	Head Office, State, local and branches.	4+0	CL1,5

C. TEXT BOOKS

D. REFERENCE BOOKS

1. David F. Striffler and Brain A. Burt; Dentistry Dental Practice and Community, W. B. Saunders Company, 1983.
2. James Morse Dunning; Principles of Dental Public Health, IVth Edition, Harward University Press,1986.
3. Anthony Jong; Dental Public Health and Community Dentistry, The C. V. Mosby Company 1981.
4. Patricia P. Cormier and Joyce I. Levy; Community Oral Health-A system approach, Appleton-Century-Crofts/ New York, 1981.
5. Stephen L. Silverman and Ames F. Tryon; Community Dentistry-A problem oriented approach by P. C. Dental Hand book series,1st edition, Inc. Littleton Massachuseltts, 1980.
6. Geoffrey L. Slack and Brain Burt; Dental Public Health- An Introduction to Community Dentistry. 1st Edition,John Wrigth and sons Bristol, 1980.
7. Oral Health Surveys- Basic Methods, 4th edition,W. H. O. Geneva,1997.
8. Maxcy and Rosenau; Preventive Medicine and Hygiene, Appleton Century Crofts, 1986.
9. J. O. Forrest; Preventive Dentistry, John Wright and sons Bristoli, 1980.
10. Murray; Preventive Dentistry,1997.

11. Park and park; Text Book of Preventive and Social Medicine, 14th edition.
12. Dr. Soben Peter; Community Dentistry.
13. B. K. Mahajan; Introduction to Bio-statistics
14. Grewal; Introduction to Statistical Methods

E. COMPETENCY LEVEL

CL Number	Skill	Statement
CL1	Knowledge	• Have knowledge of the organization and provision of health care in community and in the hospital service • Have knowledge of the prevalence of common dental conditions in India. • Have knowledge of community based preventive measures and social, cultural and env. Factors, which contribute to health or illness.
CL3	Investigations	• Competent to take intra-oral radiographs and interpret the radiographic findings and adequate knowledge about common laboratory investigations and interpretation of their results
CL2	Patient Care: Diagnosis	• Understand and apply the principles of health promotion and disease prevention
CL4	Patient Care: Treatment planning	• Ethically Integrate multiple disciplines into an individual comprehensive sequence treatment plan using diagnostic and prognostic information
CL5	Patient Care: Treatment	• Competent to perform thorough oral prophylaxis, subgingival scaling, root planning and minor periodontal surgical procedures.
CL6	Research and Innovation	• Upgradation of knowledge and skill from time to time, familiarize with new concept and equipment in public health dentistry.

PROGRAM SPECIFIC OUTCOME (PSO)

PSO1		Educate patients concerning the aetiology and prevention of oral disease and encourage them to assure responsibility for their oral health and do periodic recall and evaluation.

F. COURSE MATRIX

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO1
CL1	3	3	3	1	3	1	1	1	1	1	1	1	1	1	1	1
CL2	1	1	1	2	1	2	2	3	2	2	2	2	2	1	1	3
CL3	2	2	2	3	2	3	3	3	3	2	2	2	2	1	1	3
CL4	2	2	2	3	2	2	3	2	3	2	2	3	3	3	3	3
CL5	1	1	1	3	1	2	3	2	3	3	3	3	3	3	3	3
CL6	1	1	1	1	1	1	1	1	1	1	3	1	3	3	3	2
Avg	**1.6**	**1.6**	**1.6**	**1.8**	**1.6**	**1.8**	**2.2**	**2**	**2.1**	**1.8**	**2.2**	**2.3**	**2.3**	**2**	**2**	**2.5**

B.D.S FINAL YEAR
SUBJECT: PERIODONTOLOGY

Teaching Scheme				Credits	Examination Scheme				
					External		Sessional		Total
Lect	Prac(P)	Clinical(C)	Total		Theory	Pract	Theory	Pract	
88	-	370	458		1	1	3	3	8

A. COURSE OVERVIEW

The student shall acquire the skill to perform dental scaling, diagnostic tests of periodontal diseases; to use the instruments for periodontal therapy and maintenance of the same.

The student shall develop attitude to impart the preventive measures namely, the prevention of periodontal diseases and prevention of the progress of the disease. The student shall also develop an attitude to perform the treatment with full aseptic precautions; shall develop an attitude to prevent iatrogenic diseases; to conserve the tooth to the maximum possible time by maintaining periodontal health and to refer the patients who require specialist's care.

B. COURSE CONTENT

NO	TOPIC	L+C (hrs)	CLs
1	Introduction	1+2	CL1
2	Development of perio-dontal tissues	3+2	CL1
3	Defensive mechanisms in the oral cavity	3+2	CL1+2
4	Age changes in periodontal structures and their significance in Geriatric dentistry	3+2	CL1
5	Classification of periodontal diseases	2+2	CL1+3
6	Gingival diseases	4+10	CL1+3
7	Epidemiology of periodontal diseases	8+15	CL1+2
8	Extension of inflammation from gingiva	3+18	CL1+2+3
9	Pocket	3+13	CL1+2+3
10	Etiology	4+23	CL1+2
11	Risk factors	3+13	CL1+2
12	Host response	4+5	CL1+2
13	Periodontitis	6+23	CL1+2+3
14	Diagnosis	3+20	CL1+2+3
15	Prognosis	1+20	CL1+2+3
16	Treatment plan	2+28	CL1+2+3+4
17	Periodontal therapy	3+24	CL1+5
18	Pocket eradication procedures	4+26	CL1+5
19	Osseous Surgery	5+23	CL1+5+6
20	Mucogingival surgery & Periodontal plastic surgeries	5+15	CL1+6
21	Splints	1+5	CL1+5
22	Hypersensitivity	1+8	CL1+5
23	Implants	3+8	CL1+6
24	Maintenance phase (SPT)	2+8	CL1+5
25	Pharmaco-therapy	2+2	CL1+5
26	Periodontal management of medically compromised patients	2+4	CL1+5
27	Inter-disciplinary care	3+15	CL1+4+5
28	Systemic effects of periodontal diseases in brief	3+17	CL1+2+3+4
29	Infection control protocol	1+10	CL1
30	Ethics	1+3	CL1

C. TEXT BOOKS

1. Newman's and Carranza; Clinical Periodontology, 13th edition, Saunders publication, 2018.

D. REFERENCE BOOKS

1. Torquil MacPhee; Essentials of Periodontology and Periodontics, 2nd edition, Blackwell Science Ltd., 1975.
2. Cohen; Contemporary Periodontics, 6th edition, Mosby, 1990.
3. Goldman; Periodontal therapy, 6th edition, Mosby, 1980.
4. Orban; Orbans' Periodontics, 4th edition, Mosby Inc., 1972.
5. W.H.O; Oral Health Survey , 5th edition, World Health Organization, 2014.
6. Young and Stiffler; Preventive Periodontics.
7. Slack; Dental Public Health : An introduction to community dentistry, 1st edition, Wright, 1974.
8. John Prichard; Advanced Periodontal Disease, 2nd edition, W.B Saunders Company, 1972.
9. Forrest; Preventive Dentistry, 2nd edition, Butterworth-Heinemann Ltd., 1981.
10. Jan Lindhe; Clinical Periodontology, 7th edition, Wiley Blackwell, 2021.
11. Baer & Morris; Periodontics, 1st edition , Lippincott Williams and Wilkins, 1977.

E. COMPETENCY LEVEL

CL Number	Skill	Statement
CL1	Knowledge	• Adequate knowledge of the development, structure and function of the teeth, mouth and jaws and associated tissues both in health and disease and their relationship and effect on general state of health and also bearing on physical and social well-being of the patient.
CL2	Investigations	• Competent to take intra-oral radiographs and interpret the radiographic findings and adequate knowledge about common laboratory investigations and interpretation of their results
CL3	Patient Care: Diagnosis	• Diagnose the patient's periodontal problem and get familiarized with concepts of Pathogenesis regeneration and osseointegration and basic surgical aspects of periodontal diseases, conditions and implantology
CL4	Patient Care: Treatment planning	• Ethically Integrate multiple disciplines into an individual comprehensive sequence treatment plan using diagnostic and prognostic information
CL5	Patient Care: Treatment	• Competent to perform thorough oral prophylaxis, subgingival scaling, root planning and minor periodontal surgical procedures.
CL6	Research and Innovation	• Upgradation of knowledge and skill from time to time, familiarize with new concept and equipment in periodontology.

PROGRAM SPECIFIC OUTCOME (PSO)

PSO1	DIAGNOSIS AND TREATMENT PLANNING	Students should be able to record a detailed periodontal case history, determine diagnosis, prognosis and plan treatment
PSO2	TREATMENT	Student should perform scaling, root planning local drug delivery and SPT.

F. COURSE MATRIX

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PS O1	PS O2
CL1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1	3	3
CL2	1	1	3	3	2	2	2	3	1	1	1	1	1	1	1	3	1
CL3	2	2	3	3	3	3	3	1	1	1	1	1	1	1	1	3	1
CL4	3	1	3	3	3	3	2	1	1	2	1	1	1	1	1	3	1
CL5	2	1	2	3	2	3	3	1	3	3	1	1	1	1	1	1	3
CL6	1	1	1	2	1	2	2	2	2	1	1	1	1	3	1	1	3
Avg	**2**	**1.5**	**2.5**	**2.8**	**2.3**	**2.7**	**2.5**	**1.8**	**1.8**	**1.8**	**1.3**	**1.3**	**1.3**	**1.7**	**1**	**2.3**	**2**

B.D.S FINAL YEAR
SUBJECT: ORTHODONTICS & DENTOFACIAL ORTHOPAEDICS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
					External		Sessional		Total
Lect	Prac	Clinical	Total		Theory	Pract	Theory	Pract	
78	-	370	448		1	1	3	3	8

A. COURSE OVERVIEW

Undergraduate programme in Orthodontics is designed to enable the qualifying dental surgeon to diagnose, analyse and treat common orthodontic problems by preventive, interceptive and corrective orthodontic procedures.

B. COURSE CONTENT

NO	TOPIC	L+C (hrs)	CLs
1	Introduction, Definition, Historical Background, Aims And Objectives Of Orthodontics And Need For Orthodontics Care.	3+10	CL1
2	Growth And Development	3+8	CL1
3	Morphologic Development Of Craniofacial Structures.	3+8	CL1
4	Functional Development Of Dental Arches And Occlussion	4+8	CL1,2
5	Clinical Application Of Growth And Development	3+8	CL1,2,3
6	Malocclusion - In General	3+8	CL1,2,3
7	Classification of Malocclusion	3+8	CL1,3
8	Normal And Abnormal Function Of Stomatognathic System	2+8	CL2,3,4,5
9	Etiology Of Malocclusion	4+8	CL1,3
10	Diagnosis And Diagnostic Aids	3+8	CL2,3,4,5
11	General Principles In Orthodontic Treatment Planning Of Dental And Skeletal Malocclusions	3+8	CL1,3
12	Anchorage In Orthodontics	3+25	CL4,5,6
13	Biomechanical Principles In Orthodontic Tooth Movement	4+20	CL1,2,4,5
14	Preventive Orthodontics	3+25	CL5
15	Interceptive Orthodontics	3+25	CL2,5
16	Corrective Orthodontics	3+25	CL2,4,5,6,
17	Orthodontic Appliances: General	4+25	CL4,5
18	Ethics	2+10	CL5
19	REMOVABLE ORTHODONTIC APPLIANCE	4+50	CL2,4,5
20	FIXED ORTHODONTIC APPLIANCES	2+8	CL2,4,5,6
21	EXTRAORAL APPLIANCES	3+8	CL4,5
22	MYOFUNCTIONAL APPLIANCES	3+9	CL5
23	Orthodontic Management Of Cleft Lip And Palate	3+10	CL2,4,5
24	Principles Of Surgical Orthodontics	2+10	CL2,4,5
25	Principle, Differential Diagnosis & Methods Of Treatment	4+10	CL2,3,4,5
26	Retention And Relapse	3+10	CL5

C. TEXT BOOKS

D. REFERENCE BOOKS

1. William R. Proffit ;Contemporary Orthodontics, 6th edition,Mosby,2018.
2. White And Gardiner ;Orthodontics For Dental Students, 2nd edition, OUP India,1999.
3. Moyers; Handbook Of Orthodontics, 4th revised edition, Mosby, 1988.
4. Graber; Orthodontics - Principles And Practice, 4th edition, Elsevier,2009.
5. Philip Adams; Design, Construction And Use Of Removable Orthodontic Appliances, 5th edition, Butterworth-Heinemann Ltd., 1984.
6. Salzmann ; Clinical Orthodontics: Vol1 & 2, Lippincott Williams and Wilkins, 1974.

E. COMPETENCY LEVEL

CL Number	Skill	Statement
CL1	Knowledge	• Should have knowledge to diagnose the various malocclusion categories • Understand about normal growth and development of facial skeleton and dentition
CL2	Investigations	• Competent to take intra-oral radiographs and interpret the radiographic findings and adequate knowledge about common laboratory investigations and interpretation of their results
CL3	Patient Care: Diagnosis	• Diagnose and appropriately refer patients with complex malocclusion to the specialist
CL4	Patient Care: Treatment planning	• Pinpoint operations in growth process both dental and skeletal and plan necessary treatment
CL5	Patient Care: Treatment	• Ethically plan and execute preventive and interceptive orthodontic • Manage treatment of simple malocclusion such as anterior spacing using removable appliances • Handle delivery and activation of removable orthodontic appliances
CL6	Research and Innovation	• Upgradation of knowledge and skill from time to time, familiarize with new concept and equipment in. orthodontics & dental orthopaedics

PROGRAM SPECIFIC OUTCOME(PSO)

PSO1	DIAGNOSIS AND TREATMENT PLANNING	• Should have knowledge to diagnose the various malocclusion categories
PSO2	TREATMENT	• Plan and execute preventive orthodontics (space maintainers or space regainers) • Plan and execute interceptive orthodontics (habit breaking appliances)
PSO3	TREATMENT	• Manage treatment of simple malocclusion such as anterior spacing using removable appliances

F. COURSE MATRIX

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PS O1	PS O2	PS O3
CL1	3	3	2	2	2	2	2	2	2	2	3	2	2	2	2	1	2	2
CL2	3	2	3	2	2	3	2	2	3	3	3	3	3	3	3	3	3	2
CL3	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2
CL4	2	2	2	3	2	2	2	2	2	3	2	2	3	2	2	3	3	3
CL5	2	2	3	3	2	3	3	3	3	3	2	1	3	3	3	2	3	3
CL6	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	3	2	1
Avg	**2.3**	**2**	**2.1**	**2.1**	**1.8**	**2.1**	**2**	**2.1**	**2.1**	**2.3**	**2.1**	**2**	**2.3**	**2.1**	**2.1**	**2.3**	**2.5**	**2.1**

B.D.S FINAL YEAR
SUBJECT: CONSERVATIVE DENTISTRY AND ENDODONTICS

Teaching Scheme				Credits	Examination Scheme				
					External		Sessional		Total
Lect	Prac	Clinical	Total		Theory	Pract	Theory	Pract	
152	273	370	795		1	1	3	3	8

A. COURSE OVERVIEW

The graduate should acquire the following knowledge during the period of training.

- To diagnose and treat simple restorative and endodontic treatment.
- To gain knowledge about aesthetic restorative material and endodontic treatment and to translate the same to patient's needs. To carry out simple luxation of tooth and its treatment and to provide emergency endodontic treatment. He should be able to motivate the patient for proper dental treatment at the same time proper maintenance of oral hygiene should be emphasise which will help to maintain the restorative work and prevent future damage..

B. COURSE CONTENT

NO	TOPIC	L+P+C (hrs)	CLs
1	Nomenclature Of Dentition	2+15+5	CL1,3
2	Principles Of Cavity Preparation	4+30+20	CL1,5,6
3	Dental Caries	4+20+30	CL1,2,3,4
4	Treatment Planning For Operative Dentistry	2+0+20	CL1,4,5
5	Gnathological Concepts Of Restoration	2+0+5	CL1,5
6	Armamentarium For Cavity Preparation	2+30+10	CL1,3,4,5
7	Control of Operating Filed:	2+0+7	CL1,2,3,4,5
8	Amalgam Restoration	4+70+20	CL1,4
9	Pulp Protection :	3+30+20	CL1,4,5
10	Anterior Restorations	3+10+13	CL1,2,3,4,5,6
11	Direct Filling Gold Restorations	2+0+15	CL1,6
12	Preventive Measures In Restorative Practice	2+0+2	CL1,3,2,6,
13	Temporisation or Interim Restoration	1+0+5	CL1,2,3,4,5
14	Pin Amalgam Restoration Indication Contra Indication	2+0+5	CL1,4
15	Management Of Deep Carious Lesions Indirect And Direct Pulp Capping	4+5+10	CL1,2,3,4,5,6
16	Non Carious Destruction's Tooth Structures Diagnosis and Clinical Management	3+0+10	CL1,2,3,4,5,6
17	Hyper Sensitive Dentine And Its Management	2+0+5	CL1,2,3,4,5,6,
18	Cast Restorations	5+20+3	CL1,2,4,6
19	Die Materials And Preparation Of Dies	2+0+2	CL1,2,5
20	Gingival Tissue Management For Cast Restoration And Impression Procedures	2+0+2	CL1,3,4
21	Recent Cavity Modification Amalgam Restoration	2+0+15	CL1,4,5
22	Differences between Amalgam And Inlay Cavity preparation with note on all the types of Bewels used for Cast Restoration	2+0+3	CL1,5
23	Control Of Pain During Operative Procedures.	2+0+10	CL1,3,4,6

24	Treatment Planning For Operative Dentistry Detailed Clinical Examination Radiographic Examination	3+0+10	CL1,2,3,4,5,6
25	Vitality Tests, Diagnosis And Treatment Planning And Preparation Of Case Sheet.	4+0+10	CL1,2,3,4,5,6
26	Applied Dental Materials.	2+10+2	CL5
27	Endodontics: introduction definition scope and future of endodontics	4+0+0	CL1,2,3
28	Clinical diagnostic methods	3+0+10	CL1,2,3,4,5,6
29	Emergency endodontic procedures	3+0+3	CL1,2,3,4,5,6
30	Pulpal diseases causes, types and treatment	3++0+10	CL1,2,,3,4,5,6
31	Periapical diseases: acute periapical abscess, acute periodontal abscess phoeix abscess, chronic alveolar abscess granuloma cysts condensing osteits, external resorption	4+0+10	CL1,2,3,4,5,6
32	Vital pulp therapy:	2+0+15	CL1,2,3,4,5,6
33	Apexogenisis and apexification or problems of open apex	2+0+3	CL1,4,5,
34	Rationale of endodontic treatment	4+0+5	CL1,2,4,5
35	Principles of root canal treatment mouth preparation root canal instruments, hand instruments, power driven instruments, standardisation color coding principle of using endodontic instruments. Sterilisation of root canal instruments and materials rubber dam application.	5+20+3	CL1,2,3,4,5,6
36	Anatomy of the pulp	3+0+5	CL1,2,3,4,5
37	Preparation of root canal space	3+0+3	CL1,2,3,4,5,6
38	Disinfection of root canal space	3+0+3	CL1,2,3,4,5,6
39	Problems during cleaning and shaping of root canal spaces	3+0+5	CL1,5,6
40	Methods of cleaning and shaping	4+0+3	CL1,5,6
41	Obturation of the root canal system	2+0+3	CL1,5,6
42	Root canal sealers. Ideal properties classification	2+0+3	CL1,5,6
43	Root canal sealers. Ideal properties classification	2+0+2	CL,1,5,6
44	smear layer	3+0+5	CL1,4
45	discoloured teeth.	5+0+5	CL1,4,5,6
46	traumatised teeth classification of fractured teeth..	5+0+5	CL1,2,3,45,6
47	endodontic surgeries indication contraindications	3+0+5	CL1,2,3,4,5,6
48	root resorption.	3+0+3	CL1,4,5
49	emergency endodontic procedures	2+0+2	CL1,2,3,45,6
50	lasers in conservative endodontics (i	1+0+2	CL1,5,6
51	professional association dentist act 1948 and its amendment 1993	1+0+1	CL1
52	duties towards the govt. Like payments of professional tax, income tax.	1+0+1	CL1
53	financial management of practice	2+0+1	CL1
54	dental material and basic equipment management	2+5+2	CL1
55	Ethics	2+3+2	CL1

C. TEXT BOOKS

D. REFERENCE BOOKS

1. Scharer & others; Esthetic guidelines for restorative dentistry, 1st edition, Quintessence Publishing Co Inc., 1982.
2. Chiche & Pinault; Esthetics of anterior fixed prosthodontics, 1st edition, Quintessence Publishing Co Inc., 1994.
3. Mc Namara; Esthetic & the treatment of facial form, Vol 28, Centre for human growth and developement, University of Michigan, 1992.
1. Scharer & others; Esthetic guidelines for restorative dentistry, 1st edition, Quintessence Publishing Co Inc., 1982.
2. Chiche & Pinault; Esthetics of anterior fixed prosthodontics, 1st edition, Quintessence Publishing Co Inc., 1994.
3. Mc Namara; Esthetic & the treatment of facial form, Vol 28, Centre for human growth and developement, University of Michigan, 1992

E. COMPETENCY LEVEL

CL Number	Skill	Statement
CL1	Knowledge	• Should have knowledge to diagnose all carious lesions. • Understand the principles of aesthetic dental procedures.
CL2	Investigations	• Competent to take intra-oral radiographs and interpret the radiographic findings and adequate knowledge about common laboratory investigations and interpretation of their results
CL3	Patient Care: Diagnosis	• Able to diagnose all carious lesions.
CL4	Patient Care: Treatment planning	• Ethically Integrate multiple disciplines into an individual comprehensive sequence treatment plan using diagnostic and prognostic information
CL5	Patient Care: Treatment	• Competent to perform Class I and Class II cavities and their restoration with amalgam , class V and Class III cavities with glass ionomer cement, ,small composite restorations. • Carry out pulp capping procedures and RCT for anterior teeth
CL6	Research and Innovation	• Upgradation of knowledge and skill from time to time, familiarize with new concept and equipment in conservative dentistry and endodontics.

PROGRAM SPECIFIC OUTCOME (PSO)

PSO1	KNOWLEDGE	• Gain knowledge about restorative and endodontic material and treatment.
PSO2	TREATMENT	• Manage treatment of simple restorative, endodontic and esthetic treatment.

F. COURSE MATRIX

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO1	PSO2
CL1	3	2	3	2	2	3	2	3	3	2	3	3	3	3	3	3	2
CL2	3	2	2	3	2	3	2	3	3	2	3	3	3	3	3	3	2
CL3	2	2	3	3	2	3	3	3	3	2	3	3	3	3	3	3	2
CL4	3	2	2	3	2	3	2	3	3	3	3	3	3	3	3	3	3
CL5	3	2	3	2	3	3	2	3	3	2	3	3	3	3	3	3	3
CL6	3	2	3	3	2	3	2	2	3	3	3	3	3	3	3	3	3
Avg	**3**	**2**	**2.5**	**2.5**	**2**	**3**	**2**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**2.5**

B.D.S FINAL YEAR

SUBJECT: ORAL & MAXILLOFACIAL SURGERY

Teaching Scheme				Credits	Examination Scheme				
					External		Sessional		Total
Lect	Prac	Clinical	Total		Theory	Pract	Theory	Pract	
78	-	370	448		1	1	3	3	8

A. COURSE OVERVIEW

To produce a graduate who is competent in performing extraction of teeth under both local and general anaesthesia, prevent and manage related complications, acquire a reasonable knowledge and
understanding of the various diseases, injuries, infections occurring in the Oral & Maxillofacial region and offer solutions to such of those common conditions and has an exposure in to the in-patient management of maxillofacial problems

B. COURSE CONTENT

NO	TOPIC	L+C (hrs)	CLs
1	Introduction, definition, scope, aims and objectives	2+12	CL1
2	Diagnosis in oral surgery	3+12	CL2, CL3
3	Principles of infection control and cross-infection control with particular reference to HIV/AIDS and Hepatitis.	2+16	CL4
4	Principles of Oral Surgery	2+18	CL1, CL4
5	Exodontia: General considerations	4+18	CL5
6	Impacted teeth	4+18	CL4, CL5
7	Pre-prosthetic Surgery:	2+16	CL1, CL,2 CL4, CL5
8	Diseases of the maxillary sinus	3+18	CL1, CL2 CL4, CL5
9	Disorders of T.M. Joint	4+20	CL1, CL2, CL4, CL5
10	Infections of the Oral cavity	4+15	CL1, CL2, CL3, CL4, CL5
11	Benign cystic lesions of the jaws	3+15	CL1, CL2, CL3, CL4
12	Tumours of the Oral cavity	3+18	CL1, CL3 CL4, CL5
13	Fractures of the jaws	8+20	CL1, CL2, CL3, CL4
14	Salivary gland diseases	3+16	CL1, CL2, CL3, CL4
15	Jaw deformities	4+14	CL1, CL3
16	Neurological disorders -	3+12	CL1, CL5, CL6

17	Cleft Lip and Palate	2+10	CL1, CL5, CL6
18	Medical Emergencies in dental practice	4+18	CL4
19	Emergency drugs & Intra muscular I.V. Injections	2+18	CL6
20	Oral Implantology	3+20	CL4
21	Ethics	4+16	CL1, CL5
22	LOCAL ANAESTHESIA	5+18	CL1, CL5
23	GENERAL ANAESTHESIA	4+12	CL1, CL6

C. TEXT BOOKS

D. REFERENCE BOOKS

1. ALLING JOHN F & ET AL; IMPACTED TEETH, 1S EDITION, SAUNDERS , 1993.
2. PETERSON LJ & ET AL; PRINCIPLES OF ORAL AND MAXILLOFACIAL SURGERY; VOL.1,2 & 3, 3RD EDITION, B.C DECKER PUBLICATIONS, 2012.
3. MALAMED SF; HANDBOOK OF MEDICAL EMERGENCIES IN THE DENTAL OFFICE, 7TH EDITION, MOSBY, 2014.
4. BANKS P; KILLEYS FRACTURES OF THE MANDIBLE, 4TH EDITION, VARGHESE PUBLISHING HOUSE, 2018.
5. BANKS P; KILLEYS FRACTURES OF THE MIDDLE 3RD OF THE FACIAL SKELETON, SUBSEQUENT EDITION, JOHN WRIGHT, 1998.
6. SEWARD GR & ET AL; KILLEY AND KAYS -OUTLINE OF ORAL SURGERY – PART-1,BUTTERWORTH-HEINEMANN LTD., 1987.
7. MC CARTHY FM; ESSENTIALS OF SAFE DENTISTRY FOR THE MEDICALLY COMPROMISED PATIENTS, SAUNDERS, 1989.
8. HOWE, GL; EXTRACTION OF TEETH, 2ND EDITION, BUTTERWORTH-HEINEMANN LTD., 1974.
9. HOWE, GL; MINOR ORAL SURGERY, 3ND EDITION, BUTTERWORTH-HEINEMANN LTD., 1985.

E. COMPETENCY LEVEL

CL Number	Skill	Statement
CL1	Knowledge	• Adequate knowledge of the development, structure and function of the teeth, mouth and jaws and associated tissues both in health and disease and their relationship and effect on general state of health and also bearing on physical and social well-being of the patient.
CL2	Investigations	• Competent to take intra-oral radiographs and interpret the radiographic findings and adequate knowledge about common laboratory investigations and interpretation of their results
CL3	Patient Care: Diagnosis	• Should have acquired the skill to examine any patient with a basic oral surgical problem in an orderly manner • Get familiarized with concepts of osseointegration and basic surgical aspects of implantology
CL4	Patient Care: Treatment planning	• Ethically Integrate multiple disciplines into an individual comprehensive sequence treatment plan using diagnostic and prognostic information
CL5	Patient Care: Treatment	• Should be competent in the extraction of the teeth under both local and general anaesthesia • Competent to carry out certain minor oral surgical procedure under LA like trans-alveolar extraction, frenectomy, dentoalveolar procedures, simple impaction, biopsy, dental emergencies,etc.
CL6	Research and Innovation	• Upgradation of knowledge and skill from time to time, familiarize with new concept and equipment in oral and maxillofacial surgery.

PROGRAM SPECIFIC OUTCOME (PSO)

PSO1	TREATMENT	Competent to assess, prevent and manage common complications that arise during and after minor oral surgery
PSO2		Able to provide primary care and manage medical emergencies in the dental office

F. COURSE MATRIX

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PS O1	PS O2
CL1	3	3	3	1	3	1	2	1	1	1	1	1	1	1	1	1	1
CL2	2	2	2	2	2	2	2	3	1	2	2	1	1	1	1	2	1
CL3	2	2	2	3	2	3	2	2	3	2	2	2	2	1	1	2	1
CL4	2	2	2	2	2	3	2	2	3	3	3	3	3	3	3	3	3
CL5	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	3	3
CL6	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1
Avg	**2.1**	**2.1**	**2.1**	**2**	**2.1**	**2.1**	**2.1**	**2**	**2**	**2**	**2**	**1.8**	**1.8**	**1.7**	**1.7**	**2**	**1.7**

B.D.S FINAL YEAR

SUBJECT: PROSTHODONTICS AND CROWN & BRIDGE

Teaching Scheme				Credits	Examination Scheme				
					External		Sessional		Total
Lect	Prac	Clinical	Total		Theory	Pract	Theory	Pract	
241	364	370	975		1	1	3	3	8

A. COURSE OVERVIEW

- Adequate knowledge of the Prosthodontic scientific foundation required for general dental practice.
- To diagnose and manage common prosthodontic requirements, keeping in mind the expectations and the right treatment whenever possible.
- To develop a willingness to apply the current knowledge and maintain a high standard of professional ethics.

B. COURSE CONTENT

NO	TOPIC	L+P+C (hrs)	CLs
1	Complete Dentures Applied Anatomy and Physiology	6+10+10	CL1,2,3,4
2	Communicating with the patient	3+4+4	CL1,2,3,4
3	Diagnosis and treatment planning for patients	3+5+5	CL1,2,3,4
4	Articulators- discussion	6+5+5	CL1,2,3,4,5
5	Improving the patient's denture foundation and ridge relation -an overview.	3+10+10	CL1,2,3,4
6	Principles of Retention, Support and Stability	6+15+15	CL1,2,3,4,5
7	Impressions - detail.	6+25+30	CL1,2,3,4,5
8	Record bases and occlusion rims- in detail.	6+25+20	CL1,2,3,4,5
9	Biological consideration in jaw relation & jaw movements - craniomandibular relations.	6+10+15	CL1,2,3,4,5
10	Relating the patient to the articulator	3+5+5	CL1,2,3,4,5
11	Recording maxillo mandibular relation.	6+15+15	CL1,2,3,4,5
12	Tooth selection and arrangement.	6+30+20	CL1,2,3,4,5
13	Relating inclination of teeth to concept of occlusion- in brief.	3+10+10	CL1,2,6
14	Trial dentures.	3+10+10	CL1,2,3,4,5
15	Laboratory procedures.	6+15+15	CL1,2,6
16	Laboratory procedures.	3+15+15	CL1,2,6
17	Treating problems with associated denture use – discuss in brief (tabulation/flow-chart form).	5+5+5	CL1,2,5
18	Treating abused tissues - discuss in brief	3+15+15	CL1,2,4,5

19	Relining and rebasing of dentures- discuss in brief	6+2+2	CL1,2,3,4,5
20	Immediate complete dentures construction procedure- discuss in brief.	3+2+2	CL1,2
21	The single complete denture- discuss in brief.	3+2+2	CL1,2
22	Overdentures denture- discuss in brief.	3+2+2	CL1,2
23	Dental implants in complete denture - discuss in brief.	3+2+2	CL1,2,6
	Removable Flexible Dentures		
24	Introduction	1.5+3+3	CL1,2,3,4,5
25	Classification	6+6+6	CL1,2,3,4,5
26	Examination, Diagnosis & Treatment planning & evaluation of diagnostic data.	3+8+8	CL1,2,3,4,5
27	Components of a removable partial denture	3+3+3	CL1,2,6
28	Components of a Removable Partial Denture.	6+6+6	CL1,2,3,6
29	Principles of Removable Partial Denture Design	3+3+3	CL1,2,3,4
30	Survey and design – in brief.	3+6+6	CL1,2,3,4
31	Mouth preparation and master cast.	1.5+3+3	CL1,2,3,4
32	Impression materials and procedures for removable partial dentures	3+6+10	CL1,2,3,4,6
33	Preliminary jaw relation and esthetic try-in for some anterior replacement teeth.	3+9+9	CL1,2,6
34	Laboratory procedures for framework construction-in brief	3+8+8	CL1,2,3,4,5
35	Fitting the framework - in brief.	3+8+6	CL1,2,3,4,5
36	Try-in of the partial denture - in brief	3+8+6	CL1,2,3,4,5
37	Completion of the partial denture - in brief	3+3+3	CL1,2,3,4,5
38	Inserting the Removable Partial Denture - in brie	3+6+6	CL1,2,3,4,5
39	Postinsertion observations.	3+4+4	CL1,2,3,4,5
40	Temporary Acrylic Partial Dentures.	3+4+4	CL1,2
41	Immediate Removable Partial Denture.	3+3+3	CL1,2
42	Immediate Removable Partial Denture.	3+3+3	CL1,2
	Fixed Partial Dentures		
43	Introduction	3+2+2	CL1,2
44	Fundamentals of occlusion – in brief	3+2+2	CL1,2
45	Articulators	3+2+2	CL1,2,6
46	Treatment planning for single tooth restorations.	3+2+2	CL1,2,3,4,5
47	Treatment planning for the replacement of missing teeth including selection and choice of abutment teeth	3+1+2	CL1,2,3,4,5
48	Fixed partial denture configurations.	3+1+2	CL1,2,3,4
49	Principles of tooth preparations.	6+5+2	CL1,2,3,4,5
50	Preparations for full veneer crowns – in detail.	3+4+6	CL1,2,3,4,5
51	Preparations for partial veneer crowns – in brief.	3+4+6	CL1,2,3,4
52	Provisional Restorations	3+4+2	CL1,2,3,4,5
53	Fluid Control and Soft Tissue Management	3+4+6	CL1,2,3,4,5,6
54	Fluid Control and Soft Tissue Management	2+1+4	CL1,2,3,4,5,6
55	Working Casts and Dies	3+5+4	CL1,2,3
56	Wax Patterns	3+5+4	CL1,2,3
57	Wax Patterns	3+5+4	CL1,2,3
58	Esthetic Considerations	3+2+2	CL1,2,3,4,5,6

59	Finishing and Cementation	3+1+2	CL1,2,3,4,5
60	Solder Joints and Other Connectors	3+1+2	CL1,2,6
61	All - Ceramic Restorations	3+2+2	CL1,2,6
62	Metal - Ceramic Restorations	3+2+2	CL1,2,3,4,5
63	Preparations of intracoronal restorations.	3+2+2	CL1,2
64	Preparations for extensively damaged teeth.	3+1+2	CL1,2
65	Preparations for periodontally weakened teeth	3+2+1	CL1,2
66	The Functionally Generated Path Technique	3+1+1	CL1,2,6
67	Investing and Casting	3+2+1	CL1,2,6
68	Resin - Bonded Fixed Partials Denture	3+1+1	CL1,2,6

C. TEXT BOOKS

D. REFERENCE BOOKS

1. Charles M. Heartwell Jr. and Arthur O. Rahn; Syllabus of Complete denture,4th edition, Lea & Febiger,1992.
2.Zarb, Bolender; Boucher's "Prosthodontic treatment for edentulous patients" , 13th edition, Mosby Publicatons, 2012.
3. Sheldon Winkler; Essentials of complete denture prosthodontics , 3rd edition, AITBS Publishers, 2015.
4. Willam R.Laney; Maxillofacial prosthetics, 1st edition, Psg Pub.Co., 1979.
5. McCraken's Removable partial prosthodontics, 12th edition,Elsevier Publications,2012.
6. Ernest L. Miller and Joseph E. Grasso; Removable partial prosthdontics, 3rd edition,Mosby publications,1990.

E. COMPETENCY SKILL

CL Number	Skill	Statement
CL1	Knowledge	• Adequate knowledge of the development, structure and function of the teeth, mouth and jaws and associated tissues both in health and disease and their relationship and effect on general state of health and also bearing on physical and social well-being of the patient.
CL2	Investigations	• Competent to take intra-oral radiographs and interpret the radiographic findings and adequate knowledge about common laboratory investigations and interpretation of their results
CL3	Patient Care: Diagnosis	• Diagnose the patient's prosthodontic problem and get familiarized with concepts of osseointegration and basic surgical aspects of implantology
CL4	Patient Care: Treatment planning	• Ethically Integrate multiple disciplines into an individual comprehensive sequence treatment plan using diagnostic and prognostic information
CL5	Patient Care: Treatment	• Competent to carry out treatment of conventional complete and partial removable dentures and • Fabricate fixed partial dentures • Able to carry out treatment of routine prosthodontic procedures
CL6	Research and Innovation	• Upgradation of knowledge and skill from time to time, familiarize with new concept and equipment in prosthodontics and crown & bridge.

PROGRAM SPECIFIC OUTCOME (PSO)

PSO1	DIAGNOSIS AND TREATMENT PLANNING	To diagnose and manage common prosthodontic requirements, keeping in mind the expectations and the right treatment whenever possible.
PSO2	ATTITUDE	To develop a willingness to apply the current knowledge and maintain a high standard of professional ethics

F. COURSE MATRIX

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PS O1	PS O2
CL1	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CL2	2	2	2	2	2	2	2	2	2	2	3	2	2	3	3	2	2
CL3	3	3	3	3	3	3	2	3	3	2	3	2	2	3	3	3	3
CL4	2	2	2	2	2	2	1	2	2	1	3	2	2	3	3	2	2
CL5	3	3	3	3	3	3	2	3	2	2	3	2	2	3	3	3	2
CL6	2	2	2	2	2	2	2	2	2	1	3	2	2	3	3	2	2
Avg	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2**	**2.5**	**2.3**	**1.6**	**3**	**2.1**	**2.1**	**3**	**3**	**2.5**	**2.3**

M.D.S
SUBJECT: CONSERVATIVE DENTISTRY AND ENDODONTICS

Teaching Scheme				Credits	Examination Scheme				
					External		Internal		Total
Lect	Prac(P)	Clinical(C)	Total		Theory	Pract	Theory	Pract	
936	936	4860	6732		2	1	1	1	5

A. COURSE OVERVIEW

Conservative dentistry deals with prevention and treatment of the diseases and injuries of the hard tissues and the pulp of the tooth and associated periapical lesions, along with restoration of those teeth to normal form function and aesthetics

Knowledge about aetiology, pathophysiology, periapical diagnosis and management of common restorative situations, endodontic situations that will include contemporary management of dental caries, management of trauma and pulpal pathosis including periodontal situations.

B. COURSE CONTENT

NO	TOPIC	L+P+C (hrs)	CLs
1	Applied Anatomy of Head and Neck	18+0+0	CL1
2	Anatomy and Development of Teeth	6+0+0	CL1
3	Applied Physiology	12+0+0	CL1
4	Pathology	12+0+0	CL1
5	Microbiology	12+0+0	CL1
6	Pharmacology	12+0+0	CL1
7	Biostatistics	30+0+0	CL1
8	Research Methodology	15+0+0	CL1
9	Applied Dental Materials	15+0+0	CL1,5,6
10	Conservative Dentistry	12+30+60	CL1,2,3,4,5,6
11	Examination, diagnosis and treatment plan	30+60+180	CL1,2,3,4,5,6
12	Occlusion	12+30+90	CL1,2,3,4,5
13	Dental caries	18+30+120	CL1,2,3,4,5,6
14	Hand and rotary cutting instrumen	12+30+90	CL1,2,4,3,5
15	Dental burs	12+30+90	CL1,2,3,5
16	Infection control procedures i	12+0+090	CL1,5
17	Direct concepts in tooth preparation for amalgam, composite, GIC and restorative techniques, failures and management.	60+120+240	CL1,2,3,4,5,6
18	Biologic response of pulp	12+0+120	CL1,2,3,4,5,6
19	Direct and indirect composite restorations	12+30+90	CL1,2,3,5,6
20	Indirect tooth colored restorations	12+30+120	CL1,2,3,5,6
21	Impression procedures used for indirect restorations	6+24+60	CL1,5
22	Cast metal restorations	18+30+120	CL1,5
23	Direct gold restorations	6+18+30	CL1,5
24	Recent advances in restorative materials	6+18+30	CL,1,5
25	Esthetics including smile design	6+18+120	CL1,4,5,6
26	Management of non-carious lesions.	6+0+90	CL1,2,3,4,5,6
27	Management of discolored tooth	6+0+60	CL1,4,56,

28	Minimal intervention dentistry	6+18+60	CL1,5
29	Recent advances in restoration of endodontically treated teeth and grossly mutilated teeth	40+90+150	CL1,4,5,6
30	Hypersensitivity	6+0+30	CL1,4,5,6
31	Lasers	6+0+30	CL1,4,5,6
32	CAD-CAM in restorative dentistry	6+0+30	CL1,5
33	Digital imaging and its applications in restorative dentistry	6+0+30	CL1,2,3,4,6
	Endodontics		
34	Rationale of endodontics.	6+0+60	CL1,5
35	Pulp and periapical pathology	12+0+60	CL1,2,3
36	Pathobiology of periapex	12+0+60	CL1,2,3
37	Diagnostic procedures	12+0+120	CL1,2,3,4
38	Case selection and treatment planning	12+0+90	CL1,2,3,4
39	Principles of endodontic therapy	6+0+60	CL1,5
40	Infection control procedures used in Endodontics	6+0+90	CL1,5
41	Endodontic emergencies and management	6+0+90	CL,1,5
42	Access cavity preparation	18+60+150	CL1,5,6
43	Endodontic instruments and instrumentation	18+60+150	CL1,5,6
44	Working length determination, c	30+60+150	CL1,5,6
45	Root canal irrigants and intra canal medicaments.	18+60+150	CL1,5,6
46	Obturation materials, techniques and recent advances	30+60+150	CL1,5,6
47	Traumatic injuries and management	30+0+180	CL1,2,3,4,5,6
48	Endodontic surgeries, recent developments in technique and devices and wound healing	18+0+120	CL1,6
49	Endoperio interrelationship and management	12+0+90	CL1,2,3,4,5,6
50	Lasers and Geriatric Endodontics.	6+0+30	CL1,4
51	Multidisciplinary approach to endodontic situations.	6+0+120	CL1,2,3,4,5,6
52	Radiology and CBCT in endodontic practice.	18+0+30	CL1,2,3
53	Procedural errors in endodontics and their management.	18+0+120	CL1,2,3,4,5,6
54	Endodontic failures and retreatment.	12+0+120	CL1,4,5
55	Resorptions and its management.	6+0+30	CL1,2,3,4,5,6
56	Microscopes and Microsurgery in endodontics.	6+0+180	CL1,4,5,6
57	Single visit endodontics, current concepts and controversies.	6+0+180	CL1,5,6
58	Regenerative Endodontic	12+0+30	CL1,5,6
59	TEACHING / LEARNING ACTIVITIES		
60	Preclinical exercises		

C. TEXT BOOKS

D. REFERENCE BOOKS

1. Scharer & others; Esthetic guidelines for restorative dentistry, 1st edition, Quintessence Publishing Co Inc., 1982.
2. Chiche & Pinault; Esthetics of anterior fixed prosthodontics, 1st edition, Quintessence Publishing Co Inc., 1994.
3. Mc Namara; Esthetic & the treatment of facial form, Vol 28, Centre for human growth and developement, University of Michigan, 1992.

1. Scharer & others; Esthetic guidelines for restorative dentistry, 1st edition, Quintessence Publishing Co Inc., 1982.
2. Chiche & Pinault; Esthetics of anterior fixed prosthodontics, 1st edition, Quintessence Publishing Co Inc., 1994.

3. Mc Namara; Esthetic & the treatment of facial form, Vol 28, Centre for human growth and developement, University of Michigan, 1992

E. COMPETENCY LEVEL

CL Number	Skill	Statement
CL1	Knowledge	• knowledge of basic sciences as relevant to conservative / restorative dentistry and Endodontics • proper knowledge of sterilization procedures • Understand the principles of aesthetic dental procedures.
CL2	Investigations	• Competent to take intra-oral radiographs and interpret the radiographic findings and adequate knowledge about common laboratory investigations and interpretation of their results
CL3	Patient Care: Diagnosis	• Take proper chair side history, examine the patient and perform medical and dental diagnostic procedures as well as perform relevant tests and interpret to them to come to a reasonable diagnosis about the dental condition in general and Conservative Dentistry – Endodontics in particular
CL4	Patient Care: Treatment planning	• Ethically Integrate multiple disciplines into an individual comprehensive sequence treatment plan using diagnostic and prognostic information
CL5	Patient Care: Treatment	• Perform all levels of restorative work, surgical and non-surgical Endodontics as well as endodontic-periodontal surgical procedures as part of multidisciplinary approach to clinical condition. • Provide basic life saving support in emergency situations. • Manage acute pulpal and pulpo periodontal situations
CL6	Research and Innovation	• Upgradation of knowledge and skill from time to time, familiarize with new concept and equipment in conservative dentistry and endodontics.

PROGRAM SPECIFIC OUTCOME (PSO)

PSO1	KNOWLEDGE	• Gain knowledge about restorative and endodontic material and treatment.
PSO2	TREATMENT	• Ethically Manage treatment of restorative, endodontic and esthetic treatment.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CL1	2	3	3	3	2	2	2	3	3	3	3	2	2	3	3	3	3
CL2	3	3	3	3	2	2	2	3	3	3	2	2	2	3	3	3	3
CL3	2	3	3	3	2	2	2	3	3	3	3	3	2	3	3	3	3
CL4	2	3	3	3	2	2	3	3	3	3	3	2	3	3	3	3	3
CL5	2	3	3	3	3	3	2	3	3	3	3	2	3	3	3	3	3
CL6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg	**2.3**	**3**	**3**	**3**	**2.3**	**2.3**	**2.3**	**3**	**3**	**3**	**2**	**2.3**	**2.5**	**3**	**3**	**3**	**3**

MDS

SUBJECT: ORAL PATHOLOGY & ORAL MICROBIOLOGY

Teaching Scheme				Credits	Examination Scheme				
					External		Internal		Total
Lect	Prac(P)	Clinical(C)	Total		Theory	Pract	Theory	Pract	
936	936	4860	6732		2	1	1	1	5

A. COURSE OVERVIEW

Oral & Maxillofacial Pathology and Oral Microbiology deals with the nature of oral diseases, their causes, processes and effects. It relates the clinical manifestation of oral diseases to the physiologic and anatomic changes associated with these diseases. The course aims to train a postgraduate dental surgeon to ensure higher competence in both general and special pathology dealing with the nature of oral diseases, their causes, processes and effects.

B. COURSE CONTENT

NO	TOPIC	L+P+C (hrs)	CLs
1	Biostatistics and Research Methodology	45+10+80	CL1,6
2	Applied Gross Anatomy of head and neck, histology and genetics	15+20+80	CL1,2,3
3	Physiology (General & Oral) :	20+15+80	CL1,2,3
4	Cell Biology	10+5+25	CL1,2,6
5	General Histology	40+20+80	CL1,2,3
6	Biochemistry	25+65+0	CL1,2,3
7	General Pathology	40+25+80	CL1,2,3,4
8	General Microbiology	25+10+60	CL1,2,3
9	Basic Immunology	10+10+40	CL1,2,3,6
10	Systemic Microbiology / Applied Microbiology	25+10+50	CL2,3,4
11	Dental Histology	60+20+80	CL1,2,3
12	Oral Anatomy (carving of permanent teeth)	20+30+40	CL2,3
13	Histopathology Staining Technique	10+30+820	CL2,3
14	Cytology Staining Technique	20+30+800	CL2,3
15	Decalcified Section	5+20+60	CL2,3
16	Ground Section	5+20+60	CL2,3
17	Recent Molecular Techniques:	20+20+60	CL2,3,6
18	Histopathology – Slide discussion	105+150+900	CL2,3,4,5,6
19	Recording of Case History	10+30+80	CL2,3,4,5,6
20	Clinico Pathological Discussion	10+30+80	CL2,3,4,5
21	Forensic odontology	30+20+50	CL2,3,4,6
22	Giant cell lesions	5+10+30	CL2,3,6
23	Clear cell lesions	3+10+30	CL2,3,4,5
24	Round cell lesions	3+10+30	CL2,3,4,5
25	Spindle cell lesions	3+10+30	CL2,3,4,5
26	Pigmented lesions	8+10+20	CL2,3,4,5
27	Fibro-osseous lesions	10+10+20	CL2,3,4,5
28	Mechanism of formation and expansion of odontogenic cysts	20+20+60	CL2,3,4,5
29	Mechanism of formation and expansion of developmental cysts	10+20+60	CL2,3,4,5

30	Odontogenic Tumors	20+20+60	CL2,3,4,5
31	Lab diagnosis of bacterial infections	10+20+40	CL2,3,4
32	Lab diagnosis of viral infections	15+20+40	CL2,3,4
33	Lab diagnosis of fungal infections	10+20+40	CL2,3,4
34	Hamartomas	5+5+20	CL2,3,4,5
35	Phakomatoses	5+5+10	CL2,3,4,5
36	Vascular tumors of oro-facial region	10+10+30	CL2,3,4,5
37	Genodermatoses	10+10+20	CL2,3,4,5
38	Histogenesis of salivary gland tumors	15+10+40	CL2,3,4,5
39	Blue cell lesions	10+10+20	CL2,3,4,5
40	Tumor markers	10+10+40	CL2,3,4,6
41	Concept of premalignancy	10+10+40	CL2,3,4,5,6
42	Mechanism of Growth and metastasis of tumor	10+10+30	CL2,3,4,5
43	Tumor angiogenesis	10+10+20	CL1,2,3
44	Viral oncogenesis	5+5+20	CL1,2,3
45	Techniques to assess the prognosis of neoplastic lesions	10+20+20	CL2,3,4,6
46	Haemopoietic malignancy	10+5+20	CL2,3,4
47	Molecular basics of oral squamous cell carcinoma	20+20+80	CL2,3,4,5,6
48	Lymphoreticular malignancy	5+5+20	CL2,3,4,5
49	Oral aspects of metabolic disorders	25+5+10	CL2,3,4,5
50	Current concepts in OSMF	10+10+40	CL2,3,4,5,6
51	Matrix remodelling in pathological condition	10+5+20	CL1,2,3
52	Etiopathogenesis of developmental defects of teeth	20+3+30	CL2,3,4,5
53	Lesions associated with impacted and missing teeth	10+3+30	CL2,3,4,5
54	Syndromes affecting oro-facial region	10+5+20	CL2,3,4,5
55	Hereditary oral defects	6+2+20	CL2,3,4,5
56	Vesiculo-bullous lesions	10+5+40	CL2,3,4,5
57	Micronutrients	5+5+10	CL1,2,3
58	Hormones and oro-maxillofacial lesions	5+5+20	CL2,3,4,5
59	Matrix metalloproteinases	3+3+10	CL1,2,6
60	Current concepts in HIV related oral diseases	5+10+20	CL2,3,4,5,6
61	Epithelial –connective tissue interaction	5+10+30	CL1,2,6
62	Stem cell research	10+10+30	CL1,2,3,6

C. TEXT BOOKS

D. REFERENCE BOOKS

1. Shafers ; Oral Pathology, 8th edition, Elsevier, 2020.
2. Regezi & Sciubba; Oral Pathology - Clinical Pathologic correlations, 7th edition, Saunders Publications, 2016.
3. Soames & Southam; Oral Pathology, 5th edition, Oup oxford, 2018.
4. Prabhu, Wilson, Johnson & Daftary; Oral Pathology in the Tropics

E. COMPETENCY LEVEL

CL Number	Skill	Statement
CL1	Knowledge	• Student should understand the underlying biological principles governing treatment of oral diseases .
CL2	Investigations	• Perform routine histopathological evaluation of specimens relating to oral and perioral tissues, to carry out routine diagnostic procedures including hematological, cytological, microbiological, Immunological and ultra structural investigations • Microscopic study of common lesions affecting oral tissues through microscopic slides & projection slides. • Study of the disease process by surgical specimens. • Study of teeth anomalies/polymorphisms through tooth specimens & plaster casts. • Microscopic study of plaque pathogens. • Study of haematological preparations (blood films) of anaemias & leukemias.
CL3	Patient Care: Diagnosis	• An understanding of the oral manifestations of systemic diseases should help in correlating with the systemic physical signs & laboratory findings
CL4	Patient Care: Treatment planning	• Manifestations of common diseases, their diagnosis & correlation with clinical pathological processes
CL5	Patient Care: Treatment	• Comprehend the different types of pathological processes, that involve the oral cavity.
CL6	Research and Innovation	• Understanding of current research methodology, collection and interpretation of data, ability to carry out research projects on clinical and or epidemiological aspects, a working knowledge on current databases, automated data retrieval systems, referencing and skill in writing scientific papers.

PROGRAM SPECIFIC OBJECTIVE (PSO)

PSO1		An understanding of the oral manifestations of systemic diseases should help in correlating with the systemic physical signs & laboratory findings.
PSO2		Perform routine histopathological evaluation of specimens relating to oral and perioral tissues, to carry out routine diagnostic procedures including hematological, cytological, microbiological, Immunological and ultra structural investigations.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CL1	1	3	2	3	2	3	2	1	1	3	1	1	1	1	1	3	1
CL2	3	3	3	3	2	3	3	2	1	2	2	3	3	3	3	3	3
CL3	3	3	3	2	2	3	3	3	2	2	3	3	3	3	3	3	3
CL4	3	3	3	3	3	3	3	3	2	3	2	3	3	3	3	3	3
CL5	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3	2	2
CL6	2	3	3	3	3	1	1	2	3	3	3	2	1	1	1	1	1
Avg	**2.5**	**3**	**2.8**	**2.8**	**2.5**	**2.5**	**2.5**	**2.3**	**1.8**	**2.6**	**2.3**	**2.5**	**2.3**	**2.3**	**2.3**	**2.5**	**2.1**

M.D.S
SUBJECT: ORTHODONTICS & DENTOFACIAL ORTHOPAEDICS

Teaching Scheme				Credits	Examination Scheme				
					External		Internal		Total
Lect	Prac(P)	Clinical(C)	Total		Theory	Pract	Theory	Pract	
936	936	4860	6732		2	1	1	1	5

A. COURSE OVERVIEW

Orthodontics and Dentofacial Orthopaedics deals with prevention and correction of oral anomalies and malocclusion and the harmonising of the structures involved, so that the dental mechanisms function in a normal way. The postgraduate student should have knowledge about etiology, pathophysiology, diagnosis and treatment planning of various common Orthodontic problem

B. COURSE CONTENT

NO	TOPIC	L+P+C (hrs)	CLs
1	Applied Anatomy	36+0+0	CL 1
2	Physiology	38+0+0	CL 1
3	Dental Materials:	34+0+0	CL 1
4	Genetics	36+0+0	CL 1
5	Physical Anthropology	33+0+0	CL 1
6	Pathology:	34+0+0	CL 1
7	Biostatistics:	38+0+0	CL 1
8	Applied Research Methodology In Orthodontics	39+0+0	CL 1
9	Applied Pharmacology	36+0+0	CL 1
10	Basic Orthodontics	36+0+0	CL 1
11	OrthodonticHistory	40+0+240	CL 1
12	Concepts of Occlusion and Esthetics	33+0+246	CL 1
13	Concepts of Occlusion and Esthetics	32+0+241	CL 1
14	Dentofacial Anomalies:	39+0+245	CL1,2,3
15	Diagnostic Procedures and Treatment Planning in Orthodontics	36+0+243	CL1,2,3
15	Practice Management in Orthodontics	36+0+242	CL,12,3
16	Cephalometrics	36+0+242	CL1,2
	Paper-II:Clinical Orthodontics		
17	Myofunctional Orthodontics	25+0+240	CL1,2,3,4
18	Dentofacial Orthopedics	25+0+241	CL2,3,4,5
19	Cleft lip and palate rehabilitation	25+0+246	CL2,3,4,5,6
20	Biology of tooth movement:	25+0+245	CL2,3,4,6
21	Orthodontic / Orthognathic surgery:	23+0+242	CL2,3,4,5,6
22	Ortho / Perio / Prostho/Endo inter relationship:	27+0+243	CL2,3,4,5
23	Ortho / Perio / Prostho/Endo inter relationship:	24+0+244	CL2,3,4,5
24	Applied preventive aspects in Orthodontics	26+0+240	CL2,3,4,5,6
25	Interceptive Orthodontics:	22+0+246	CL2,3,4,5
26	Evidence Based Orthodontic	24+0+240	CL3,4,5,6
27	Different types of fixed Mechanotherapy:	28+0+246	CL2,3,4,5
28	Orthodontic Management of TMJ problems, sleep-apnoea etc.	25+0+244	CL2,3,4,5,6

29	Retention and relapse:	25+0+242	CL2,3,4,5
30	Recent Advances	36+0+90	CL2,3,4,5,6
31	PRE – CLINICAL EXERCISES	0+936+0	CL3,4,5

C. TEXT BOOKS

D. REFERENCE BOOKS

1. William R. Proffit ;Contemporary Orthodontics, 6th edition,Mosby,2018.
2. White And Gardiner ;Orthodontics For Dental Students, 2nd edition, OUP India,1999.
3. Moyers; Handbook Of Orthodontics, 4th revised edition, Mosby, 1988.
4. Graber; Orthodontics - Principles And Practice, 4th edition, Elsevier,2009.
5. Philip Adams; Design, Construction And Use Of Removable Orthodontic Appliances, 5th edition, Butterworth-Heinemann Ltd., 1984.
6. Salzmann ; Clinical Orthodontics: Vol1 & 2, Lippincott Williams and Wilkins, 1974.

E. COMPETENCY LEVEL

CL Number	Skill	Statement
CL1	Knowledge	• Should have knowledge to diagnose the various malocclusion categories and the dynamic interaction of biologic processes and mechanical forces acting on the stomatognathic system during orthodontic treatment • Understand about normal growth and development of facial skeleton and dentition
CL2	Investigations	• Competent to take intra-oral radiographs and interpret the radiographic findings and adequate knowledge about common laboratory investigations and interpretation of their results
CL3	Patient Care: Diagnosis	• To obtain proper clinical history, methodical examination of the patient, perform essential diagnostic procedures, and interpret them and arrive at a reasonable diagnosis about the Dento-facial deformities.)
CL4	Patient Care: Treatment planning	• Pinpoint operations in growth process both dental and skeletal and plan necessary treatment (preventive, interceptive and corrective)
CL5	Patient Care: Treatment	• Ethically fabricate and manage the most appropriate appliance – intra or extra oral, removable or fixed, mechanical or functional, and active or passive – for the treatment of any orthodontic problem to be treated singly or as a part of multidisciplinary treatment of oro-facial deformities
CL6	Research and Innovation	• Upgradation of knowledge and skill from time to time, familiarize with new concept and equipment in. orthodontics & dental orthopaedics.

PROGRAM SPECIFIC OUTCOME (PSO)

PSO1	TREATMENT	• To obtain proper clinical history, methodical examination of the patient, perform essential diagnostic procedures, and interpret them and arrive at a reasonable diagnosis about the Dento-facial deformities.)
PSO2	TREATMENT	To be competent to fabricate and manage the most appropriate appliance – intra or extra oral, removable or fixed, mechanical or functional, and active or passive – for the treatment of any orthodontic problem to be treated singly or as a part of multidisciplinary treatment of oro-facial deformities
PSO3		• Develop adequate communication skills particularly with the patients giving them the various options available to manage a particular Dento-facial problem and to obtain a true informed consent from them for the most appropriate treatment available at that point of time

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2	PSO3
CL1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
CL2	3	3	3	2	2	2	3	2	3	3	2	2	2	2	2	3	2	2
CL3	3	2	2	3	3	2	3	3	3	3	3	3	3	3	3	3	3	3
CL4	2	2	2	2	2	3	3	3	2	2	3	3	3	3	3	2	3	3
CL5	2	1	2	3	1	2	2	3	3	3	2	3	3	3	2	3	3	2
CL6	1	3	1	1	3	1	1	2	2	3	3	2	2	1	1	2	1	3
Avg	**2.3**	**2.3**	**2.1**	**2.3**	**2.5**	**2**	**2.4**	**2.5**	**2.5**	**2.6**	**2.5**	**2.5**	**2.5**	**2.3**	**2.1**	**2.5**	**2.3**	**2.5**

M.D.S

SUBJECT: ORAL & MAXILLOFACIAL SURGERY

Teaching Scheme				Credits	Examination Scheme				
					External		Internal		Total
Lect	Prac(P)	Clinical(C)	Total		Theory	Pract	Theory	Pract	
936	936	4860	6732		2	1	1	1	5

A. COURSE OVERVIEW

To produce a post graduate who is competent in performing extraction of teeth under both local and general anaesthesia, perform with competence minor oral surgical procedures and common maxillofacial surgery, prevent and manage related complications, acquire a reasonable knowledge and understanding of the various diseases, injuries, infections occurring in the Oral & Maxillofacial region and offer solutions to such of those common conditions and has an exposure in to the in-patient management of maxillofacial problems

B. COURSE CONTENT

NO	TOPIC	L+P+C	CLs
1	Applied Anatomy	14+14+70	CL1
2	Physiology	14+14+70	CL1
3	Biochemistry	14+14+70	CL1
4	Pathology	14+14+70	CL1
5	Oral Pathology:	14+14+70	CL1,2
6	Microbiology	14+14+70	CL1
7	Applied Pharmacology and Therapeutics:	14+14+70	CL1
	Oral and Maxillofacial Surgery		
8	Evolution of Maxillofacial surgery	2+0+10	CL1
9	Diagnosis, history taking, clinical examination, investigations	2+0+10	CL1
10	Informed consent/medico-legal issues	2+0+10	CL1
11	Concept of essential drugs and rational use of drugs	4+0+20	CL1
12	Communication skills with patients	2+0+10	CL1
13	Principles of surgical audit	14+0+70	CL1
14	Principles of evidence based surgery	14+0+70	CL1
15	Principles of surgery	26+0+130	CL1
16	Medical emergencies	26+0+130	CL1
17	Pre operative workup	13+0+65	CL1,2,3
18	Surgical sutures, drains	2+0+10	CL1
19	Post operative care	2+0+10	CL1
20	Wound management	2+0+10	CL1
21	Surgical Infections	6+0+30	CL1,2,3,5
22	Airway obstruction/management –	7+0+35	CL1,2,4,5
23	Anesthesia –	14+0+70	CL1,2,4,5
24	Facial pain; Facial palsy and nerve injuries	6+0+30	CL1,2,5
25	Pain control	6+0+30	CL1,2,5,6
26	General patient management	30+0+150	CL1,2,4,5,6

27	Clinical oral surgery	32+0+160	CL1,2,5,6
28	Pre-prosthetic surgery	20+0+100	CL1,4,5,6
29	Temporomandibular joint disorders	35+0+175	CL1,2,3,4,5,6
30	Tissue grafting	20+0+100	CL1,2,3,4,5,6
31	Reconstructive oral and maxillofacial surgery	20+0+100	CL1,2,4,6
32	Cyst and tumors of head and neck region	40+0+200	CL1,2,3,4,5,6
33	Neurological disorders	20+0+100	CL1,2,3,4,5
34	Maxillofacial trauma	60+0+300	CL1,2,3,4,5,6
35	Assessment of trauma-multiple injuries patient	35+0+175	CL1,2,3,4,5,6
36	Orthognathic surgery	40+0+200	CL1,2,3,4,5,6
37	Laser surgery	20+0+100	CL1,2,5,6
38	Distraction osteogenesis in maxillofacial region	30+0+300	CL1,2,3,4,5,6
39	Cryosurgeries	24+0+120	CL1,2,6
40	Cleft lip and palate surgery	30+0+150	CL1,2,3,4,6
41	Craniofacial surgery	30+0+150	CL1,2,3,4,6
42	Head and neck oncology	50+0+250	CL1,2,3,4,6
43	Micro vascular surgery	20+0+100	CL1,2,3,4,6
44	Implantology	30+0+150	CL1,2,3,4,5,6
45	Maxillofacial radiology/ radio diagnosi	20+0+100	CL1,2,3,6
46	Other diagnostic methods and imaging technique	16+0+90	CL1,2,3,6
47	General medicine	13+90+0	CL1,2,3
48	General surgery	13+90+0	CL1,2,3
49	Neuro – surgery	13+90+0	CL1,2,3
50	ENT/Ophthalmology	13+90+0	CL1,2,3
51	Orthopedic	13+90+0	CL1,2,3
52	Anesthesiology	14+90+0	CL1,2,3
53	Plastic Surgery	13+90+0	CL1,2,3
54	PRE – CLINICAL EXERCISES	0+208+0	CL1,2

C. TEXT BOOKS

D. REFERENCE BOOKS

1. ALLING JOHN F & ET AL; IMPACTED TEETH, 1S EDITION, SAUNDERS , 1993.
2. PETERSON LJ & ET AL; PRINCIPLES OF ORAL AND MAXILLOFACIAL SURGERY; VOL.1,2 & 3, 3RD EDITION, B.C DECKER PUBLICATIONS, 2012.
3. MALAMED SF; HANDBOOK OF MEDICAL EMERGENCIES IN THE DENTAL OFFICE, 7TH EDITION, MOSBY, 2014.
4. BANKS P; KILLEYS FRACTURES OF THE MANDIBLE, 4TH EDITION, VARGHESE PUBLISHING HOUSE, 2018.
5. B29ANKS P; KILLEYS FRACTURES OF THE MIDDLE 3RD OF THE FACIAL SKELETON, SUBSE30QUENT EDITION, JOHN WRIGHT, 1998.
6. SEWARD GR & ET AL; KILLEY AND KAYS -OUTLINE OF ORAL SURGERY – PART-1,BUTTERWORTH-HEINEMANN LTD., 1987.

7. MC CARTHY FM; ESSENTIALS OF SAFE DENTISTRY FOR THE MEDICALLY COMPROMISED PATIENTS, SAUNDERS, 1989.
8. HOWE, GL; EXTRACTION OF TEETH, 2ND EDITION, BUTTERWORTH-HEINEMANN LTD., 1974.
9. HOWE, GL; MINOR ORAL SURGERY, 3ND EDITION, BUTTERWORTH-HEINEMANN LTD., 1985.

E. COMPETENCY LEVEL

CL Number	Skill	Statement
CL1	Knowledge	• To have acquired adequate knowledge and understanding of the etiology, pathophysiology and diagnosis, treatment planning of various common oral and Maxillofacial surgical problems both minor and major in nature • To have understood the general surgical principles like pre and post surgical management, particularly evaluation, post surgical care, fluid and electrolyte management, blood transfusion and post surgical pain management.
CL2	Investigations	• Competent to take intra-oral radiographs and interpret the radiographic findings and adequate knowledge about common laboratory investigations and interpretation of their results
CL3	Patient Care: Diagnosis	• Should have acquired the skill to examine any patient with a basic oral surgical problem in an orderly manner • Get familiarized with concepts of osseointegration and basic surgical aspects of implantology
CL4	Patient Care: Treatment planning	• Ethically Integrate multiple disciplines into an individual comprehensive sequence treatment plan using diagnostic and prognostic information
CL5	Patient Care: Treatment	• Should be competent in the extraction of the teeth under both local and general anaesthesia • Competent to carry out certain minor oral surgical procedure and common maxillofacial surgery under LA like trans-alveolar extraction, frenectomy, dentoalveolar procedures, simple impaction, biopsy, etc.
CL6	Research and Innovation	• Upgradation of knowledge and skill from time to time, familiarize with new concept and equipment in oral and maxillofacial surgery.

PROGRAM SPECIFIC OUTCOME (PSO)

PSO1	TREATMENT	• Understanding of basic sciences relevant to practice of oral and maxillofacial surgery • Essential knowledge of personal hygiene and infection control, prevention of cross infection and safe disposal of hospital waste keeping in view the high prevalence of hepatitis and HIV.
PSO2		• To perform with competence minor oral surgical procedures and common maxillofacial surgery. To treat both surgically and medically the problems of the oral and Maxillofacial and the related area

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CL1	3	2	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3
CL2	3	1	3	3	3	3	3	1	3	2	2	3	2	3	3	3	1
CL3	3	3	3	3	2	2	2	3	3	3	2	2	2	3	3	3	3
CL4	2	3	3	3	2	2	3	3	3	3	3	2	3	3	3	3	3
CL5	3	3	3	3	3	2	3	3	1	3	2	1	3	3	2	1	3
CL6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg	**2.8**	**2.5**	**3**	**3**	**2.6**	**2.5**	**2.8**	**2.5**	**2.6**	**2.8**	**2.5**	**2.3**	**2.6**	**3**	**2.8**	**2.6**	**2.6**

M.D.S

SUBJECT: PERIODONTOLOGY

Teaching Scheme				Credits	Examination Scheme				
					External		Internal		Total
Lect	Prac(P)	Clinical(C)	Total		Theory	Pract	Theory	Pract	
936	936	4860	6732		2	1	1	1	5

A. COURSE OVERVIEW

The student shall acquire the skill to perform dental scaling, diagnostic tests of periodontal diseases; to use the instruments for periodontal therapy and maintenance of the same.
The student shall develop attitude to impart the preventive measures namely, the prevention of periodontal diseases and prevention of the progress of the disease. The student shall also develop an attitude to perform the treatment with full aseptic precautions; shall develop an attitude to prevent iatrogenic diseases; to conserve the tooth to the maximum possible time by maintaining periodontal health.

B. COURSE CONTENT

NO	TOPIC	L+P+C	CLs
1	APPLIED ANATOMY	**50+0+0**	CL1
2	PHYSIOLOGY:	50+0+0	CL1
3	BIOCHEMISTRY	36+0+0	CL1
4	PATHOLOGY:	45+0+0+	CL1
5	MICROBIOLOGY:	49+0+0	CL1
6	PHARMACOLOGY	50+0+0	CL1
7	BIOSTATISTICS	32+0+0	CL1
8	ETIOPATHOGENESIS:	110+0+124	CL1,2,3
	CLINICAL AND THERAPEUTIC PERIODONTOLOGY AND ORAL IMPLANTOLOGY		
9	GINGIVAL DISEASES	65+0+210	CL1,2,3,4
10	PERIODONTAL DISEASES	72+0+726	CL1,2,3,4
11	TREATMENT OF PERIODONTAL DISEASES	300+0+3500	CL1,2,3,4,5,6
12	ORAL IMPLANTOLOGY	52+0+200	CL1,2,3,4,5,6
13	MANAGEMENT OF MEDICAL EMERGENCIES IN PERIODONTAL PRACTICE	25+0+100	CL1,2,3,4,5
14	PRE – CLINICAL EXERCISES	0+936+0	CL1

C. TEXT BOOKS

1. Newman's and Carranza; Clinical Periodontology, 13th edition, Saunders publication, 2018.

D. REFERENCE BOOKS

1. Torquil MacPhee; Essentials of Periodontology and Periodontics, 2nd edition, Blackwell Science Ltd., 1975.
2. Cohen; Contemporary Periodontics, 6th edition, Mosby, 1990.
3. Goldman; Periodontal therapy, 6th edition, Mosby, 1980.
4. Orban; Orbans' Periodontics, 4th edition, Mosby Inc., 1972.

5. W.H.O; Oral Health Survey , 5th edition, World Health Organization, 2014.
6. Young and Stiffler; Preventive Periodontics.
7. Slack; Dental Public Health : An introduction to community dentistry, 1st edition, Wright, 1974.
8. John Prichard; Advanced Periodontal Disease, 2nd edition, W.B Saunders Company, 1972.
9. Forrest; Preventive Dentistry, 2nd edition, Butterworth-Heinemann Ltd., 1981.
10. Jan Lindhe; Clinical Periodontology, 7th edition, Wiley Blackwell, 2021.
11. Baer & Morris; Periodontics, 1st edition , Lippincott Williams and Wilkins, 1977.

E. COMPETENCY LEVEL

CL Number	Skill	Statement
CL1	Knowledge	• Have adequate knowledge about etiology, pathogenesis, diagnosis and management of common periodontal • diseases with emphasis on Indian population • Familiarize with the biochemical, microbiologic and immunologic genetic aspects of periodontal pathology. • To learn the principal of lip repositioning and perio esthetics surgeries.
CL2	Investigations	• Competent to take intra-oral radiographs and interpret the radiographic findings and adequate knowledge about common laboratory investigations and interpretation of their results
CL3	Patient Care: Diagnosis	• Take a proper clinical history, thorough examination of intra oral, extra oral, medical history evaluation, advice essential diagnostic procedures and interpret them to come to a reasonable diagnosis and and get familiarized with concepts of periodontal diseases, osseointegration, and basic surgical aspects of implantology.
CL4	Patient Care: Treatment planning	• Ethically Integrate multiple disciplines into an individual comprehensive sequence treatment plan using diagnostic and prognostic information
CL5	Patient Care: Treatment	• Competent to perform thorough oral prophylaxis, subgingival scaling, root planning and minor periodontal surgical procedures and oral implantology.
CL6	Research and Innovation	• Upgradation of knowledge and skill from time to time, familiarize with new concept and equipment in periodontology.

PROGRAM SPECIFIC OUTCOME (PSO)

PSO1	DIAGNOSIS AND TREATMENT PLANNING	Students should be able to record a detailed periodontal case history, determine diagnosis, prognosis and plan treatment
PSO2	TREATMENT	Student should perform scaling, root planning local drug delivery and SPT, various periodontal surgeries.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CL1	3	2	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3
CL2	3	3	3	3	3	3	3	1	3	2	2	3	2	3	3	3	1
CL3	3	1	3	3	3	3	3	1	3	2	2	3	2	3	3	3	1
CL4	3	1	2	3	3	3	3	1	3	2	2	3	2	3	2	3	2
CL5	3	3	3	3	3	2	3	3	1	3	2	1	3	3	2	1	3
CL6	3	1	3	3	3	2	3	1	1	3	3	2	3	1	1	1	3
Avg	**3**	**1.8**	**2.8**	**3**	**3**	**2.7**	**3**	**1.5**	**2.3**	**2.5**	**2.3**	**2.5**	**2.5**	**2.5**	**2.3**	**2.3**	**2.2**

Faculty of Dental Sciences
Dharmsinh Desai University

MDS PROGRAM OBJECTIVES

The goals of the post-graduate training in various specialities is to train the graduate in Dental Surgery who will,

1.Practice respective speciality efficiently and effectively, backed by scientific knowledge and skill;

2. Exercise empathy and a caring attitude and maintain high ethical standards;

3.Continue to evince keen interest in professional education in the speciality and allied specialities whether in teaching or practice;

4. Willing to share the knowledge and skills with any learner, junior or a colleague;

5.To develop the faculty for critical analysis and evaluation of various concepts and views and to adopt the most rational approach.

OBJECTIVES

(a)KNOWLEDGE

6.Demonstrate understanding of basic sciences relevant to speciality;

7.Describe etiology, pathophysiology, principles of diagnosis and management of common problems within the speciality in adults and children;

8. Identify social, economic, environmental and emotional determinants in a given case and take them into account for planned treatment;

9. Recognise conditions that may be outside the area of speciality or competence and to refer them to the concerned specialist;

10. Update knowledge by self study and by attending courses, conferences

and seminars pertaining to speciality;

11. Undertake audit, use information technology and carry out research in both basic and clinical with the aim of publishing or presenting the work at various scientific gathering;

(b) SKILLS:

12. Take a proper clinical history, examine the patient, perform essential diagnostic procedures and order relevant tests and interpret them to come to a reasonable diagnosis about the condition;

13. Acquire adequate skills and competence in performing various procedures as required in the speciality.

(c) HUMAN VALUES, ETHICAL PRACTICE AND COMMUNICATION ABILITIES

14. Adopt ethical principles in all aspects of practice; deliver patient care without any discrimination, and establish good communication skills.

15. Respect patient's rights and privileges including patient's right to information and right to seek a second opinion

M.D.S

SUBJECT: PROSTHODONTICS AND CROWN & BRIDGE

Teaching Scheme				Credits	Examination Scheme				
					External		Internal		Total
Lect	Prac(P)	Clinical(C)	Total		Theory	Pract	Theory	Pract	
936	936	4860	6732		2	1	1	1	5

A. COURSE OVERVIEW

Training program for the dental post graduates in Prosthetic dentistry– removable dental prosthodontics, fixed dental prosthodontics (Crown & Bridge), implantology, maxillofacial prosthodontics and esthetic dentistry and Crown & Bridge including Implantology is structured to achieve knowledge and skill in theoretical and clinical laboratory, attitude, communicative skills and ability to perform research with a good understanding of social, cultural, educational and environmental background of the society

B. COURSE CONTENT

NO	TOPIC	L+P+C(hrs)	CLs
1	APPLIED ANATOMY OF HEAD AND NECK	15+10+10	CL1,2,3,6
2	APPLIED PHYSIOLOGY AND NUTRITION	15+10+10	CL1,2,3,6
3	APPLIED BIOCHEMISTRY	10+10+10	CL1,2,3,6
4	APPLIED PHARMACOLOGY AND THERAPEUTICS	10+10+10	CL1,2,3,6
5	APPLIED PATHOLOGY	10+10+10	CL1,2,3,4,5,6
6	APPLIED MICROBIOLOGY:	10+10+10	CL1,2,3,4,5,6
7	APPLIED ORAL PATHOLOGY	10+10+10	CL1,2,3,4,5,6
8	LABORATORY DETERMINATIONS	10+10+10	CL1,2,3,4,5,6
9	BIOSTATISTICS	10+10+10	CL1,3,6
10	RESEARCH METHODOLOGY	20+10+10	CL1,6
11	APPLIED RADIOLOGY	10+10+10	CL1,2,3,4,5,6
12	APPLIED MEDICINE	10+10+10	CL1,2,3,4,5,6
13	APPLIED SURGERY & ANESTHESIA	10+10+10	CL1,2,3,4,5,6
14	APPLIED PLASTIC SURGERY	10+10+10	CL1,2,3,4,5,6
15	APPLIED DENTAL MATERIALS	20+30+50	CL1,6
16	NON-SURGICAL AND SURGICAL METHODS OF PROSTHODONTICS AND IMPLANTOLOGY	350+376+2000	CL1,2,3,4,5,6
17	MAXILLOFACIAL REHABILITATION	50+40+200	CL1,2,3,4,5,6
18	OCCLUSION	30+20+200	CL1,2,3,4,5
19	FIXED PROSTHODONTICS	266+250+1570	CL1,2,3,4,5
20	ESTHETICS	30+20+200	CL1,2,3,4,5,6
21	Teaching / Learning Activities	30+60+500	CL1,2,3,4,5,6

C. TEXT BOOKS

D. REFERENCE BOOKS

1. Charles M. Heartwell Jr. and Arthur O. Rahn; Syllabus of Complete denture,4th edition, Lea & Febiger,1992.
2.Zarb, Bolender; Boucher's "Prosthodontic treatment for edentulous patients" , 13th edition, Mosby Publicatons, 2012.3. Sheldon Winkler; Essentials of complete denture prosthodontics , 3rd edition, AITBS Publishers, 2015.
4. Willam R.Laney; Maxillofacial prosthetics, 1st edition, Psg Pub.Co., 1979.
5. McCraken's Removable partial prosthodontics, 12th edition,Elsevier Publications,2012.
6. Ernest L. Miller and Joseph E. Grasso; Removable partial prosthdontics, 3rd edition,Mosby publications,1990.

E. COMPETENCY SKILL

CL Number	Skill	Statement
CL1	Knowledge	• Possess knowledge of applied basic and systemic medical sciences. • Knowledge of various Dental Materials used in the specialty. • principles involved for support, retention, stability, esthetics, phonation, mastication, occlusion, behavioral, psychological, preventive and social aspects of Prosthodontics science of Oral and Maxillofacial Prosthodontics and Implantology
CL2	Patient Care: Diagnosis	• Students shall acquire knowledge and practice of history taking, Diagnosis, treatment planning, prognosis, record maintenance of oral, craniofacial and systemic region
CL3	Investigations	• Should be able to interpret various radiographs like IOPA, OPG, CBCT and CT. Should and be able to plan and modify treatment plan based on radiographic findings • adequate knowledge about common laboratory investigations and interpretation of their results
CL4	Patient Care: Treatment planning	• Ethically Integrate multiple disciplines into an individual comprehensive sequence treatment plan using diagnostic and prognostic information • Ability for comprehensive rehabilitation concept with pre prosthetic treatment plan including surgical re-evaluation and prosthodontic treatment planning, impressions, jaw relations, utility of face bows, articulators, selection and positioning of teeth, teeth • arrangement for retention, stability, esthetics, phonation, psychological comfort, fit and insertion
CL5	Patient Care: Treatment	• To perform Clinical and Laboratory procedures with a clear understanding of biomaterials, tissue conditions related to prosthesis and have required dexterity & skill for performing clinical and laboratory all procedures in fixed, removable, implant, maxillofacial, TMJ and esthetics Prosthodontics. • To carry out necessary adjunctive procedures to prepare the patient before prosthesis like tissue preparation and preprosthetic surgery and to prepare the patient before prosthesis / prosthetic procedures
CL6	Research and Innovation	• Upgradation of knowledge and skill from time to time, familiarize with new concept and equipment in prosthodontics and crown & bridge.

PROGRAM SPECIFIC OUTCOME (PSO)

PSO1	DIAGNOSIS AN	• Possess knowledge of applied basic and systemic medical sciences. • Knowledge of various Dental Materials used in the specialty and be able to provide appropriate indication, understand the manipulation characteristics, compare with other materials available, be adept with recent advancements of the same • The theoretical knowledge and clinical practice shall include principles involved for support, retention, stability, esthetics, phonation, mastication, occlusion, behavioral, psychological, preventive and social aspects of Prosthodontics science of Oral and Maxillofacial Prosthodontics and Implantology
PSO2	ATTITUDE	• To develop a willingness to apply the current knowledge and maintain a high standard of professional ethics

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CL1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CL2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CL3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CL4	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3
CL5	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3
CL6	3	3	3	3	3	2	2	2	2	2	3	3	3	3	3	3	3
Avg	**3**	**3**	**3**	**3**	**3**	**2.8**	**2.5**	**2.8**	**2.8**	**2.8**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

BBA (HM) SEM - I	
SUBID	SUBNAME
HM101	Front office – I
HM102	House Keeping – I
HM103	Food and Beverage Service – I
HM104	Food and Beverage Production – I
HM105	Communication Skills – I
HM106	Financial Accounting For Managers
HM107	Principles of Management
HM108	Tourism Management – I

BBA (HM) SEM – II	
SUBID	SUBNAME
HM201	Front office – II
HM202	House Keeping – II
HM203	Food and Beverage Service – II
HM204	Food and Beverage Production - II
HM205	Communication Skills – II
HM206	Principles OF Economics
HM207	Human Resource Management
HM208	Tourism Management- II

BBA (HM) SEM – III	
SUBID	SUBNAME
HM301	Front office – III
HM302	House Keeping – III
HM303	Food and Beverage Service - III
HM304	Food and Beverage Production - III
HM305	Communication Skills – III
HM306	Computers in Hotel – I
HM307	Human Resource Management – II
HM308	Nutrition

BBA (HM) SEM – V	
SUBID	SUBNAME
HM501	Front office – IV
HM502	House Keeping – IV
HM503	Food and Beverage Service – IV
HM504	Food and Beverage Production - IV
HM505	Food Science

HM506	Basics of Computers – II
HM507	Sales and Marketing – I
HM508	Finance – I

BBA (HM) SEM – VI	
SUBID	SUBNAME
HM601	Front office – V
HM602	House Keeping – V
HM603	Food and Beverage Service – V
HM604	Food and Beverage Production – V
HM605	Hotel Law
HM606	Engineering and Maintenance
HM607	Sales and Marketing – II
HM608	Finance – II

BBA (HM) SEMESTER – I

SUBJECT: FRONT OFFICE – I

Teaching Scheme (Hours/week)				**Credits**	**Examination Scheme**				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3		2	5	4	40%	26.67%	--	33.33%	100%

A. COURSE OVERVIEW

To make students knowledgeable about all fundamentals & basics of Front Office as a separate entity within.

B. COURSE CONTENT

Sr.No	**Major Topics**	**Lecture + Practical**	**COs**
1	Introduction: the hospitality origin and growth, tourism industry, importance of tourism, industries related to tourism	4	CO1 AND CO5
2	Evolution and growth of the hotel industry in the world: Ancient era, Grand tour, Modern Era	4	CO1

3	Evolution and growth of the hotel industry in India: Ancient and Medieval Era, Colonial Era, Modern Era	3	CO1
4	Hotel : Definition and core areas with an overview	4	CO2
5	Classification of Hotels: Types of hotel on the basis of Location: Downtown, sub-urban, motel, resort, floatels, resort,	4	CO1 AND CO5
6	Types of hotel on the basis of Clientele: convention hotel, commercial hotel	3	CO1 AND CO5
7	Types of hotel on the basis of Theme: heritage, ecotels, spa, boutique	4	CO1 AND CO5
8	Types of hotel on the basis of target market : suite, B&B, timeshares, casino, condominiums, corporate lodging	4	CO1 AND CO5
9	Types of hotel on the basis of level of service: budget hotels, midscale hotels, luxury hotels	3	CO1 AND CO5
10	Types of hotel on the basis of length of stay: transient hotel, residential hotel, semi-residential hotel	3	CO1 AND CO5
11	Front office organisation: Function areas (department introduction and importance for any hotel)	4	CO2
12	Sections and layouts of various areas like; Reservation, Reception, Information Desk, Cash and Bills, Travel desk, Communication Section and Uniformed services	4	CO2
13	Organisation structure or hierarchy of front office staff	3	CO3
14	Duties and responsibilities of front office personnel like Front office manager, Reservation Assistant, Receptionist, Cashier, Telephone operator, Bell boy, and Door attendant	5	CO3
15	Qualities of front office personnel	4	CO4
16	Basic Front office terminologies	4	CO4

C. TEXT BOOKS

Hotel Front Office Operations and Management – Jatashankar Tiwari – Oxford Publication

D. REFERENCE BOOKS

Front Office Operations and Management – Sudhir Andrews – McGraw Hill Publication
Front Office Training Manual – Sudhir Andrews – McGraw Hill Publication
Front Office Procedures – Kasavana / Brooks

E. COURSE OUTCOMES

CO NUMBER	Skill	STATEMENT
CO1	Evaluate	Understand the evolution, meaning, categorization and classifications of hotel.
CO2	Comprehension	Understand the various sections and layouts of Front office in the hotel.
CO3	Application	Know the attributes and hierarchy of Front office staff.
CO4	Synthesis	Basic terminologies of FRONT OFFICE
CO5	Analysis	Role of Front office in enhancing guest experience

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	2	2	3	3	3	2	2	2	2	2	2	2	3	3	2	2	
CO2	3	1	1	2	2	3	3	3	2	2	3	2	2	2	3	3	
CO3	2	3	2	2	1	2	2	1	3	2	2	3	2	2	2	2	
CO4	1	2	3	3	3	2	2	2	1	1	2	2	1	3	2	2	
CO5	3	3	2	2	2	1	2	2	3	3	2	2	2	2	2	2	
Avg.	2.2	2.2	2.2	2.4	2.2	2	2.2	2	2.2	2	2.2	2.2	2	2.4	2.2	2.2	2.175

SUBJECT: HOUSE KEEPING – I

Teaching Scheme (Hours/week)				Credits	Examination Scheme				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3		2	5	4	40%	26.67%	--	33.33%	100%

A. COURSE OVERVIEW

To make students knowledgeable about all fundamentals & basics of Housekeeping department.

B. COURSE CONTENT

Sr.No	Major Topics	Lecture + Practical	COS
1	Introduction to House keeping department	1	CO1
2	Importance of Housekeeping	2	CO2
3	Responsibility of Housekeeping Department	3	CO1
4	Organizational Structure	2	CO2
5	Housekeeping Personnel	4	CO2
6	Personal Attributes of HK Staff	2	CO1
7	Layout of Department	2	CO2
8	Coordination with other departments	4	CO2
9	The Professional Housekeeper	3	CO3
10	Planning Housekeeping Operations and daily routines and systems including The Planning Process	6	CO3
11	House keeping Day	4	CO3
12	Standard Contents of a Furniture	4	CO4
13	Guest room Furniture and Accessories	3	CO4
14	Guest room Fixtures and Fittings	5	CO4
15	Placement of Guest Supplies	4	CO4
16	Importance of Guest Rooms to a Guest	4	CO5

17	Type of guest rooms	3	CO5
18	Guest Room Status	2	CO5
19	Guest Floor Rules	2	CO5

C. TEXT BOOKS

Hotel Housekeeping Operations and Management – G. Raghubalan, Smritee Raghubalan – Oxford Publication.

D. REFERENCE BOOKS

Textbook of Housekeeping Management and Operations – Sudhir Andrews – McGraw Hill Publication.

Training Manual of Housekeeping – Sudhir Andrews – McGraw Hill

E. COURSE OUTCOMES

CO NUMBER	Skill	STATEMENT
CO1	Evaluate	Basics of house keeping department
CO2	Comprehension	Importance and organization of House keeping
CO3	Application	Daily, routine and other activities on guest floor of house keeping
CO4	Synthesis	Understanding Standard contents of a guest room
CO5	Analysis	Know various Room types and their amenities

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	2	2	3	3	3	2	2	2	2	2	2	2	3	3	2	2	
CO2	3	1	1	2	2	3	3	3	2	2	3	2	2	2	3	3	
CO3	2	3	2	2	1	2	2	1	3	2	2	3	2	2	2	2	

CO4	1	2	3	3	3	2	2	2	1	1	2	2	1	3	2	2	
CO5	3	3	2	2	2	1	2	2	3	3	2	2	2	2	2	2	
Avg.	2.2	2.2	2.2	2.4	2.2	2	2.2	2	2.2	2	2.2	2.2	2	2.4	2.2	2.2	2.175

BBA (HM) SEMESTER – I

SUBJECT: FOOD AND BEVERAGE SERVICE – I

Teaching Scheme (Hours/week)				**Credits**	**Examination Scheme**				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3		2	5	4	40%	26.67%	--	33.33%	100%

A. COURSE OVERVIEW

The course designed is to educate the students with regards to the basics of the food and beverage service operations.

B. COURSE CONTENT

Sr.No	**Major Topics**	**Lecture + Practical**	**Cos**
1	Hotel and service Industry	2	CO1
2	Sectors of the Food Service Industry	2	CO1
3	Food and Beverage Areas	1	CO1
4	Coordination of Food and Beverage with other Departments	2	CO1
5	Duties and Responsibilities of food and beverage staff	2	CO1
6	Competencies of food and beverage personnel	3	CO2
7	Dos and Don'ts of a waiter	4	CO2
8	Ancillary Areas : Introduction	4	CO2

9	Still room	3	CO2
10	Silver room or plate room	3	CO2
11	Hotplate	4	CO2
12	Spare linen store	2	CO3
13	Wash up/ kitchen stewarding	3	CO3
14	Dispense bar	2	CO3
15	Automatic vending	4	CO3
16	Types of Menu	4	CO3
17	Menu Planning	2	CO3
18	New menu trends	1	CO4
19	Types of meal	2	CO4
20	Breakfast	1	CO4
21	Afternoon tea	1	CO4
22	High tea	1	CO4
23	French classical menu	3	CO5
24	Indian menu	2	CO5
25	Cover and Accompaniments	2	CO5

C. TEXT BOOKS

Food and Beverage – Dennis Lillicrap and Cousins (Orient Longman)
Food and Beverage Service – A Training Manual – Sudhir Andrews – Tata McGraw Hill

D. REFERENCE BOOKS

Textbook of Food and Beverage Service – SN Bagchi & Anita Sharma – Aman Publications
Food and Beverage: F&B Simplified – Vara Prasad & Gopi Krishna – Pearson

E. COURSE OUTCOMES

CO NUMBER	**Skill**	**STATEMENT**

CO1	Evaluate	Develop general knowledge on the origins and development of food service in hotels, restaurants and institutions
CO2	Comprehension	Identify trends likely to affect food service in coming years
CO3	Application	Identify a variety of managerial, production, and service positions that are typical of the food service industry and describe the rules these positions play in providing food service
CO4	Synthesis	Develop the knowledge about ancillary areas related with different outlets
CO5	Analysis	Describe managerial responsibilities as they relate to food service functions including menu planning, and preparation

F. COURSE MATRIX

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	
CO1	2	2	3	3	3	2	2	2	2	2	2	2	3	3	2	2	
CO2	3	1	1	2	2	3	3	3	2	2	3	2	2	2	3	3	
CO3	2	3	2	2	1	2	2	1	3	2	2	3	2	2	2	2	
CO4	1	2	3	3	3	2	2	2	1	1	2	2	1	3	2	2	
CO5	3	3	2	2	2	1	2	2	3	3	2	2	2	2	2	2	
Avg.	2.2	2.2	2.2	2.4	2.2	2	2.2	2	2.2	2	2.2	2.2	2	2.4	2.2	2.2	2.175

BBA (HM) SEMESTER – I

SUBJECT: FOOD AND BEVERAGE PRODUCTION – I

Teaching Scheme (Hours/week)				Credits	Examination Scheme				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3		3	6	5	40%	26.67%	--	33.33%	100%

A. COURSE OVERVIEW

The course designed is to educate the students with regards to the basics of the food and beverage kitchen operations.

B. COURSE CONTENT

Sr.No	Major Topics	Lecture + Practical	Cos
1	Introduction to professional cookery	3	CO1
2	Origin of Cookery	4	CO1
3	Development of attitude and professional behavior	3	CO1
4	Personal Hygiene	4	CO2
5	Classical Brigade	4	CO2
6	Kitchen organization and layout	3	CO2
7	Aims and objectives of cooking food	4	CO3
8	Methods of cooking	4	CO3
9	Equipment and fuel	3	CO3
10	Basic commodities : Vegetables, Fruits, Salads, Rice, Cereals and Pulses, Eggs, Stocks, Sauces	5	CO4
11	Basic commodities used in bakery and pastry : Introduction	4	CO4
12	A. Flour	2	CO4
13	B. Structure of wheat grain	1	CO4
14	C. Types of flours	2	CO5

15	D. Gluten free flour	1	CO5
16	E. Raising agents	1	CO5
17	F. Fats and oils	2	CO5
18	G. Usage of fats and oils in cooking and baking	3	CO5
19	H. Rendering the fat	2	CO1 & CO2
20	I. Clarifying butter	2	CO1 & CO2
21	J. Milk and dairy products	3	CO1 & CO2

C. TEXT BOOKS

Theory of Cookery – Krishna Arora – Frank Brothers

D. REFERENCE BOOKS

Modern Cookery (Vol. 1&2) – Thangam E Phillip – Orient Longman
Food Production Operations – Parvinder S. Bali – Oxford University Press

E. COURSE OUTCOMES

CO NUMBER	Skill	STATEMENT
CO1	Evaluate	Understand the basic operations of a hotel's kitchen with regard to safety procedures and hygiene followed by chefs also an idea about the basic hierarchy in the kitchen and their role in the brigade with regard to their skills and experiences
CO2	Comprehension	Identify different types of equipments and their uses in the kitchen
CO3	Application	Familiarize various cooking methods
CO4	Synthesis	Identify types of fruits and vegetables, their selection, storage and uses in cookery
CO5	Analysis	To learn various types of stocks and sauces

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	2	2	3	3	3	2	2	2	2	2	2	2	3	3	2	2	
CO2	3	1	1	2	2	3	3	3	2	2	3	2	2	2	3	3	
CO3	2	3	2	2	1	2	2	1	3	2	2	3	2	2	2	2	
CO4	1	2	3	3	3	2	2	2	1	1	2	2	1	3	2	2	
CO5	3	3	2	2	2	1	2	2	3	3	2	2	2	2	2	2	
Avg.	2.2	2.2	2.2	2.4	2.2	2	2.2	2	2.2	2	2.2	2.2	2	2.4	2.2	2.2	2.175

BBA (HM) SEMESTER – I

SUBJECT: COMMUNICATION SKILLS – I

Teaching Scheme (Hours/week)				Credits	Examination Scheme				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3			3		60%	40%	--	--	100%

A. COURSE OVERVIEW

This course will help to understand and explain importance of business communication.

B. COURSE CONTENT

Sr.No	Major Topics	Lecture + Practical	Cos
1	Need, purpose and nature of business communication	1	CO1

2	Barriers of communication	2	CO1
3	Overcoming a barriers	2	CO1
4	Essentials of grammar	3	CO1
5	Applied grammar and uses	2	CO1
6	Common errors and misappropriations	2	CO1
7	Jumbled sentences	1	CO2
8	Indianisms	1	CO2
9	Basics of Phonetics	1	CO2
10	Building advance vocabulary	2	CO2
11	Levels and types of listening skills	2	CO2
12	Listening barriers	2	CO3
13	Guidelines of effective listening	2	CO3
14	Definition, importance and inevitability of non-verbal communication	2	CO3
15	Body movements	2	CO3
16	Facial expression	1	CO3
16	Posture	2	CO4
17	Eye contact	1	CO4
18	Use of space	2	CO5
19	Importance of Vocal behaviour	1	CO5
20	Hepatics	2	CO5

C. TEXT BOOKS

Idli, Orchid and Will Power – Vitthal Kamath

Dare to Dream: The Life of M S Oberoi – Bachi J Karkaria – Peguin

D. REFERENCE BOOKS

English for the Hotel Industry – Aysha Vishwamohan Pearson Education

E. COURSE OUTCOMES

CO NUMBER	Skill	STATEMENT
CO1	Evaluate	To distinguish between various level of organizational communication and to surpass communication barriers while developing an understanding of communication as a process in an organization
CO2	Comprehension	To demonstrate his/her ability to error free expression while making an optimum use of correct business vocabulary and grammar
CO3	Application	To stimulate critical thinking by developing writing skills
CO4	Synthesis	To demonstrate the importance of good listening skills
CO5	Analysis	To demonstrate verbal and non-verbal communication ability through presentation

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	3	2	2	3	2	3	2	2	3	1	1	3	2	1	3	2	
CO2	2	2	1	3	2	2	3	2	2	3	3	2	3	2	2	3	
CO3	3	2	2	2	2	2	2	3	1	2	2	2	1	2	3	2	
CO4	2	3	2	3	3	2	3	2	2	2	3	2	3	2	2	2	
CO5	2	2	3	2	2	3	1	2	2	3	2	2	2	3	1	2	
Avg.	2.4	2.2	2	2.6	2.2	2.4	2.2	2.2	2	2.2	2.2	2.2	2.2	2.2	2	2.2	2.2

BBA (HM) SEMESTER – I

SUBJECT: FINANCIAL ACCOUNTING FOR MANAGERS

Teaching Scheme (Hours/week)				Credits	Examination Scheme				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3			3	4	60%	40%	--	--	100%

A. COURSE OVERVIEW

To make students knowledgeable about all fundamentals & basics of accounting.

B. COURSE CONTENT

Sr.No	Major Topics	Lecture + Practical	Cos
1	Introduction to Financial Accounting and its scope	4	CO5
2	Concepts of Financial accounting, Limitations of financial accounting.	3	CO2
3	Classification of Accounts and Mechanism of accounting	3	CO2
4	Various Subsidiary books	3	CO1
5	Bank Reconciliation	3	CO1
6	Trial Balance	4	CO3
7	Passing Adjustment Entry	3	CO3
8	Making Profit and Loss account and Balance sheet	4	CO4
9	Profit and loss account and balance sheet of Proprietary concern	3	CO3
10	Profit and loss account and balance sheet of partnership concern	3	CO3
11	Profit and loss account and balance sheet of Limited Company	3	CO4

C. TEXT BOOKS

Financial Accounting for managers - S. K. Bhattacharya, John Dearden - Vikash Publishing House Private Limited

D. REFERENCE BOOKS

Advanced Accounts - N C Shukla, TC Grewal and S C Gupta - S Chand and Co. Ltd.
Financial Accounting and Management - Prof. T J Rana - B S Shah Prakashan

E. COURSE OUTCOMES

CO NUMBER	Skill	STATEMENT
CO1	Evaluate	Demonstrate accounting concepts and conventions and their implications on the accounting system. Create financial statements of sole proprietorship.
CO2	Comprehension	Present financial statements according to the provisions of the Indian Companies Act. Analyse financial statements and apply comparative and common size techniques.
CO3	Application	Analyse financial statements and apply various ratios to and interpret the company's financial performance.
CO4	Synthesis	Differentiate between funds flow statements and cash flow statements. Analyse funds flow statement and cash flow statement according to accounting standard 3.
CO5	Analysis	Demonstrate various accounting standards and Explain the concept of IFRS

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	2	2	2	2	3	3	1	2	3	3	2	3	2	2	2	3	
CO2	3	3	3	1	3	2	3	2	2	1	3	2	2	3	2	2	
CO3	2	2	2	2	2	2	2	3	2	2	3	3	2	3	2	3	
CO4	2	1	3	3	3	2	3	2	2	3	2	2	2	2	3	2	
CO5	2	3	2	2	1	3	2	1	2	2	2	2	3	2	2	2	

Avg.	2.2	2.2	2.4	2	2.4	2.4	2.2	2	2.2	2.2	2.4	2.4	2.2	2.4	2.2	2.4	2.26

BBA (HM) SEMESTER – I

SUBJECT: PRINCIPLES OF MANAGEMENT

Teaching Scheme (Hours/week)				**Credits**	**Examination Scheme**				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3			3	4	60%	40%			100a5

A. COURSE OVERVIEW

This course focuses on the basic concept of Management.

B. COURSE CONTENT

Sr.No	**Major Topics**	**Lecture + Practical**	**Cos**
1	Introduction to Management	7	CO5
2	Planning and Decision making	7	CO2
3	Organizing	7	CO3
4	Leading	7	CO4
5	Management in 21st Century	8	CO1

C. TEXT BOOKS

Stoner James A F, Freeman R Edward & Gilbert Jr Daniel R "Management" New Delhi Prentice-Hall of India

D. REFERENCE BOOKS

Management Theory and Practice by C.B. Gupta. S. Chand Publication.
Principles and Practice of Management by V. S. P. Rao and P.S. Narayana. Konark publication

E. COURSE OUTCOMES

CO NUMBER	Skill	STATEMENT
CO1	Evaluate	Explain the various concepts and theories of management
CO2	Comprehension	Demonstrate different leadership styles and skills required for working in groups and teams
CO3	Application	Teach the basic functions of management like planning, organizing, leading and controlling
CO4	Synthesis	Explain the various culture and quality aspects related to business.
CO5	Analysis	Evaluating the practical approach for the real business situation.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	3	2	2	3	2	3	2	2	3	1	1	3	2	1	3	2	
CO2	2	2	1	3	2	2	3	2	2	3	3	2	3	2	2	3	
CO3	3	2	2	2	2	2	2	3	1	2	2	2	1	2	3	2	
CO4	2	3	2	3	3	2	3	2	2	2	3	2	3	2	2	2	
CO5	2	2	3	2	2	3	1	2	2	3	2	2	2	3	1	2	
Avg.	2.4	2.2	2	2.6	2.2	2.4	2.2	2.2	2	2.2	2.2	2.2	2.2	2.2	2	2.2	2.2

BBA (HM) SEMESTER – I

SUBJECT: TOURISM MANAGEMENT – I

Teaching Scheme (Hours/week)	Credits	Examination Scheme

Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3			3	4	60%	40%			100%

A. COURSE OVERVIEW

This course focuses on the basic concept of tourism industry.

B. COURSE CONTENT

Sr.No	Major Topics	Lecture + Practical	Cos
1	Meaning of tourism	1	CO1
2	Tourism industry	1	CO1
3	Significance of tourism	1	CO1
4	Tourism system	1	CO1
5	Five A's of tourism	1	CO2
6	Developments in the history of tourism	2	CO2
7	Tourism in India : Post independence	1	CO2
8	Modern tourism	2	CO2
9	Purpose of tourism	1	CO2
10	Travel motivators	2	CO3
11	Types of tourism	4	CO3
12	Definition and characteristics of tourism product	3	CO3
13	Nature of tourism product	2	CO3
14	Types of tourism product	2	CO4
15	Economic impacts of tourism	2	CO4
16	Environmental impacts of tourism	1	CO4
17	Socio cultural impacts of tourism	1	CO4
18	Cultural and political impacts of tourism	2	CO4
19	The Demonstration effect	2	CO5

20	Measures to regulate tourism impact	2	CO5
21	Tourism legislation	2	CO5

C. TEXT BOOKS

International Tourism Management – A. K. Bhatia – Sterling
Tourism: Operations and Management – Sunetra Roday, Archana Biwal and Vandana – Oxford Publication

D. REFERENCE BOOKS

Tourism: Principles and practices – Sampad Kumar Swain & Jitendra Mohan – Oxford Publication.

E. COURSE OUTCOMES

CO NUMBER	Skill	STATEMENT
CO1	Evaluate	Importance of tourism as an industry
CO2	Comprehension	Purpose of tourism
CO3	Application	Types of tourism
CO4	Synthesis	Impacts of tourism on various areas
CO5	Analysis	Laws related to tourism

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	2	2	2	2	3	3	1	2	3	3	2	3	2	2	2	3	
CO2	3	3	3	1	3	2	3	2	2	1	3	2	2	3	2	2	
CO3	2	2	2	2	2	2	2	3	2	2	3	3	2	3	2	3	
CO4	2	1	3	3	3	2	3	2	2	3	2	2	2	2	3	2	

CO5	2	3	2	2	1	3	2	1	2	2	2	2	3	2	2	2	
Avg.	2.2	2.2	2.4	2	2.4	2.4	2.2	2	2.2	2.2	2.4	2.4	2.2	2.4	2.2	2.4	2.26

BBA (HM) SEMESTER – II

SUBJECT: FRONT OFFICE – II

Teaching Scheme (Hours/week)				**Credits**	**Examination Scheme**				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3		2	5	4	40%	26.67%	--	33.33%	100%

A. COURSE OVERVIEW

To make students knowledgeable about all fundamentals & basics of Front Office
To introduce the Front Office Systems with the latest developments in the field of Hospitality trade which hold significance to the future managers.

B. COURSE CONTENT

Sr.No	**Major Topics**	**Lecture + Practical**	**COS**
1	Telecommunication: Introduction	4	CO1
2	Types of Exchanges	4	CO1 & CO2
3	Other communication Equipments	3	CO1 & CO2
4	Organization and Job Description of Telecommunication Department	4	CO2
5	Skills and Competencies of the Telephone Operator	4	CO2
6	General Duties of a Telephone Operator	3	CO2
7	Room Tariff : Introduction	4	CO3
8	Room Rate Designation	4	CO3
9	Types of Meal plans	3	CO3
10	Guest Relation Executives: Introduction	3	CO4

11	Organisation of GRE	4	CO4
12	Important Departments for GRE	4	CO4
13	General Duties and Responsibilities of GRE	3	CO4
14	The Guest Cycle : An Introduction	1	CO5
15	The Guest Cycle : Pre – arrival	4	CO5
16	The Guest Cycle : Arrival	4	CO5
17	The Guest Cycle: Stay	2	CO5
18	The Guest Cycle : Departure and Post departure	2	CO5

C. TEXT BOOKS

Front Office Operations and Management – Sudhir Andrews
Front Office Training Manual – Sudhir Andrews – McGraw Hill Publication
Hotel Front Office Operations and Management – Jatashankar Tiwari – Oxford Publication

D. REFERENCE BOOKS

E. COURSE OUTCOMES

CO NUMBER	Skill	STATEMENT
CO1	Evaluate	Identification of various equipments used in Front office
CO2	Comprehension	Professional Telephone etiquettes
CO3	Application	Importance of Tariff card and it's uses
CO4	Synthesis	Importance and duties of Guest Relation executives
CO5	Analysis	Importance and phases of guest cycle

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	2	2	2	2	3	3	1	2	3	3	2	3	2	2	2	3	
CO2	3	3	3	1	3	2	3	2	2	1	3	2	2	3	2	2	

CO3	2	2	2	2	2	2	2	3	2	2	3	3	2	3	2	3	
CO4	2	1	3	3	3	2	3	2	2	3	2	2	2	2	3	2	
CO5	2	3	2	2	1	3	2	1	2	2	2	2	3	2	2	2	
Avg.	2.2	2.2	2.4	2	2.4	2.4	2.2	2	2.2	2.2	2.4	2.4	2.2	2.4	2.2	2.4	2.26

BBA (HM) SEMESTER – II

SUBJECT: HOUSE KEEPING – II

Teaching Scheme (Hours/week)				**Credits**	**Examination Scheme**				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3		2	5	4	40%	26.67%	--	33.33%	100%

A. COURSE OVERVIEW

To make students knowledgeable about all fundamentals & basics of Housekeeping.
To introduce the Housekeeping systems with the latest developments in the field of Hospitality Industry which hold relevance to the future managers.

B. COURSE CONTENT

Sr.No	**Major Topics**	**Lecture + Practical**	**Cos**
1	Cleaning Guestrooms	4	CO1
2	Types and Nature of Soil	4	CO1
3	Standards of Cleaning	3	CO1
4	The Science of Cleaning	4	CO2
5	The Cleaning Process	4	CO2
6	Information on Housekeeping Inventories	3	CO2
7	House keeping inventories: Cleaning Equipments	4	CO2

8	Housekeeping Inventories: Cleaning Agents	4	CO3
9	Housekeeping Inventories: Guest Supplies	3	CO3
10	Housekeeping Inventories: Linen	3	CO3
11	Care and cleaning of Different surfaces (Metals, Glass, Ceramics, Wood, Stone)	4	CO3
12	Importance of house keeping control Desk	4	CO3
13	Forms, Formats, Records, and Registers maintained at control Desk	3	CO4
14	Handling Room transfers	5	CO4
15	Leave application Procedure	4	CO5
16	Gate pass procedure	4	CO5

C. TEXT BOOKS

Hotel Housekeeping Operations and Management – G. Raghubalan, Smritee Raghubalan – Oxford Publication.

D. REFERENCE BOOKS

Textbook of Housekeeping Management and Operations – Sudhir Andrews – McGraw Hill Publication.

Training Manual of Housekeeping – Sudhir Andrews – McGraw Hill

E. COURSE OUTCOMES

CO NUMBER	Skill	STATEMENT
CO1	Evaluate	Types and Routine of House keeping services
CO2	Comprehension	Methods of cleaning different surfaces
CO3	Application	To know about various house keeping cleaning equipments, agents and guest supplies
CO4	Synthesis	Leave application and gate pass procedure
CO5	Analysis	Various Forms, formats and registers maintained at housekeeping control desk

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	

CO1	2	2	3	3	3	2	2	2	2	2	2	2	3	3	2	2	
CO2	3	1	1	2	2	3	3	3	2	2	3	2	2	2	3	3	
CO3	2	3	2	2	1	2	2	1	3	2	2	3	2	2	2	2	
CO4	1	2	3	3	3	2	2	2	1	1	2	2	1	3	2	2	
CO5	3	3	2	2	2	1	2	2	3	3	2	2	2	2	2	2	
Avg.	2.2	2.2	2.2	2.4	2.2	2	2.2	2	2.2	2	2.2	2.2	2	2.4	2.2	2.2	2.175

BBA (HM) SEMESTER – II

SUBJECT: FOOD AND BEVERAGE SERVICE - II

Teaching Scheme (Hours/week)				**Credits**	**Examination Scheme**				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3		2	5	4	40%	26.67%	--	33.33%	100%

A. COURSE OVERVIEW

The course designed is to educate the students with regards to the basics of the food and beverage service operations.

B. COURSE CONTENT

Sr.No	**Major Topics**	**Lecture + Practical**	**Cos**
1	Types of Service	3	CO1
2	Factors Influencing the Type of Service	2	CO1
3	Room Service Organization	4	CO1
4	Types of room Service	2	CO1

5	Equipments Used in Room Service	2	CO1
6	Room Service Tray Layout	2	CO1
7	Procedure for Service	3	CO2
8	Room Service Errand Card & Doorknob Menu	2	CO2
9	Innovations/ Modern Changes	3	CO2
10	Functions of a Control System	2	CO2
11	Methods of a Control System	4	CO2
12	Methods of Recording Order of Sale	2	CO2
13	Kitchen Order Token/Ticket	2	CO3
14	Billing & Methods of Payment	2	CO3
15	Sales Summary Sheet	2	CO3
16	Computerized Pre-check	3	CO3
17	Cultivation of Tobacco	3	CO3
18	Cigarette	3	CO3
19	Cigar	3	CO4 & CO5
20	Other Tobacco Products	2	CO4 & CO5
21	History & Definition of Cheese	2	CO4 & CO5
22	Classification of Cheese	3	CO4 & CO5
23	Cheese Production	3	CO4 & CO5
24	Storage of Cheese & Portioning and Serving of Cheese	1	CO4 & CO5

C. TEXT BOOKS

Food and Beverage: F&B Simplified – Vara Prasad & Gopi Krishna – Pearson

D. REFERENCE BOOKS

Food and Beverage – Dennis Lillicrap and Cousins (Orient Longman)

Food and Beverage Service – A Training Manual – Sudhir Andrews – Tata McGraw Hill

Textbook of Food and Beverage Service – SN Bagchi & Anita Sharma – Aman Publications

E. COURSE OUTCOMES

CO NUMBER	Skill	STATEMENT
CO1	Evaluate	Understand the difference among various services like French Service, English service, American Service, Russian Service
CO2	Comprehension	Understand the food and beverage outlet's revenue control systems
CO3	Application	Identify the various room service management techniques that can be adapted in the hotel
CO4	Synthesis	Understand about the tobacco products like cigar and cigarettes
CO5	Analysis	Understand the various types of cheese used in kitchen and service areas

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	2	2	2	2	3	3	1	2	3	3	2	3	2	2	2	3	
CO2	3	3	3	1	3	2	3	2	2	1	3	2	2	3	2	2	
CO3	2	2	2	2	2	2	2	3	2	2	3	3	2	3	2	3	
CO4	2	1	3	3	3	2	3	2	2	3	2	2	2	2	3	2	

CO5	2	3	2	2	1	3	2	1	2	2	2	2	3	2	2	2	
Avg.	2.2	2.2	2.4	2	2.4	2.4	2.2	2	2.2	2.2	2.4	2.4	2.2	2.4	2.2	2.4	2.26

BBA (HM) SEMESTER – II

SUBJECT: FOOD AND BEVERAGE PRODUCTION - II

Teaching Scheme (Hours/week)				**Credits**	**Examination Scheme**				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3		3	6	5	40%	26.67%	--	33.33%	100%

A. COURSE OVERVIEW

This syllabus is intended towards training of students in the basics of the food and beverage Production.

B. COURSE CONTENT

Sr.No	**Major Topics**	**Lecture + Practical**	**Cos**
1	Classification Of Soups	2	CO1
2	Preparation Of Thin Soups	2	CO1
3	Preparation Of Thick Soups	2	CO1
4	Making Of Good Soup	1	CO1
5	Modern Trends Of Presenting Soups	2	CO1
6	Physical And Chemical Characteristics Of Meats	2	CO1
7	Selecting And Grading Meat	3	CO2
8	Processing Of A Whole Animal	3	CO2
9	Classification Of Meats	4	CO2
10	Cuts Of Lamb	2	CO2
11	Cuts Of Beef	2	CO2
12	Cuts Of Pork	2	CO2

13	Classification And Preparation Of Poultry	3	CO2
14	Game Cooking	1	CO3
15	Yield Tests	2	CO3
16	Classification Of Fish	3	CO3
17	Classification Of Shellfish	2	CO3
18	Cuts Of Fish	1	CO3
19	Classical Preparation Of Fish	1	CO4
20	Selection And Storage Of Seafood	2	CO4
21	Cooking Of Seafood	2	CO4
22	Philosophy Of Indian Food	3	CO4
23	Impact Of Ayurveda On Indian Cooking	3	CO4
24	Influence Of The Invaders And Travellers On Indian Cuisine	1	CO4
25	Regional And Religious Influences On Indian Cuisine	2	CO5
26	Equipment Use In Cooking	2	CO5
27	Techniques Employed In Indian Cooking	3	CO5
28	Concepts Of Slow Food And Organic Food	2	CO5

C. TEXT BOOKS

Food Production Operations – Parvinder S. Bali – Oxford University Press

D. REFERENCE BOOKS

Theory of Cookery – Krishna Arora – Frank Brothers
Modern Cookery (Vol. 1&2) – Thangam E Phillip – Orient Longman

E. COURSE OUTCOMES

CO NUMBER	Skill	STATEMENT

CO1	Evaluate	Identify different kitchen ingredients such as cereals, pulses, fats and oils etc
CO2	Comprehension	Plan and design various menus with an understanding of different types of menus
CO3	Application	Describe different meat with their characteristics, selection, storage, and uses
CO4	Synthesis	Describe different fish with their characteristics, selection, storage, and uses
CO5	Analysis	Create awareness about Indian cuisine

F. COURSE MATRIX

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	
CO1	2	2	3	3	3	2	2	2	2	2	2	2	3	3	2	2	
CO2	3	1	1	2	2	3	3	3	2	2	3	2	2	2	3	3	
CO3	2	3	2	2	1	2	2	1	3	2	2	3	2	2	2	2	
CO4	1	2	3	3	3	2	2	2	1	1	2	2	1	3	2	2	
CO5	3	3	2	2	2	1	2	2	3	3	2	2	2	2	2	2	
Avg.	2.2	2.2	2.2	2.4	2.2	2	2.2	2	2.2	2	2.2	2.2	2	2.4	2.2	2.2	2.175

BBA (HM) SEMESTER – II

SUBJECT: COMMUNICATION SKILLS – II

Teaching Scheme (Hours/week)	**Credits**	**Examination Scheme**

Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3			3	4	60%	40%			100%

A. COURSE OVERVIEW

This course will help students to understand how to present professional presentations and discussions.

B. COURSE CONTENT

Sr.No	Major Topics	Lecture + Practical	Cos
1	Dynamics of Professional Presentations : Introduction	2	CO1
2	Combating Stage Fright	2	CO1
3	Preparing PowerPoint Slides for Presentations	2	CO1
4	Describing Objects/Situations/People	1	CO1
5	Individual and Group Presentation	1	CO1
6	Delivering Just a Minute Sessions	2	CO1
7	Difference between GD and Debate	1	CO2
8	Number and Duration	2	CO2
9	Personality Traits to be evaluated	1	CO2
10	Dynamics of Group Behaviour/Group Etiquettes and Mannerisms	2	CO2
11	Types of GD	1	CO2
12	Opening an GD	2	CO2
13	Summarizing a Discussion	1	CO3
14	Art of Persuasion	2	CO3
15	Making speeches interesting	1	CO3
16	Delivering Different types of speeches.	2	CO3
	Purpose of General Conversations	1	CO3
	Features of a Good Conversation	2	CO3

	Short Conversations	1	CO4
	Telephonic Skills	2	CO4
	Debate	1	CO5
	Situational Dialogues and Role Plays	2	CO5

C. TEXT BOOKS

Idli, Orchid and Will Power – Vitthal Kamath
Dare to Dream: The Life of M S Oberoi – Bachi J Karkaria – Peguin
English for the Hotel Industry – Aysha Vishwamohan Pearson Education

D. REFERENCE BOOKS

The Functional Aspects of Communication Skills – Dr. D Prasad – Katson Books

E. COURSE OUTCOMES

CO NUMBER	Skill	STATEMENT
CO1	Evaluate	To demonstrate the dynamics of professional presentation
CO2	Comprehension	Develop the skills related to group discussions
CO3	Application	Demonstrate the different interview techniques and necessary qualities to clear the interview
CO4	Synthesis	To Develop the Public Speaking skills
CO5	Analysis	Identify and demonstrate the purpose and features of conversations, dialogues and debates

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	2	2	3	3	3	2	2	2	2	2	2	2	3	3	2	2	
CO2	3	1	1	2	2	3	3	3	2	2	3	2	2	2	3	3	

CO3	2	3	2	2	1	2	2	1	3	2	2	3	2	2	2	2	
CO4	1	2	3	3	3	2	2	2	1	1	2	2	1	3	2	2	
CO5	3	3	2	2	2	1	2	2	3	3	2	2	2	2	2	2	
Avg.	2.2	2.2	2.2	2.4	2.2	2	2.2	2	2.2	2	2.2	2.2	2	2.4	2.2	2.2	2.175

BBA (HM) SEMESTER – II

SUBJECT: PRINCIPLES OF ECONOMICS

Teaching Scheme (Hours/week)				**Credits**	**Examination Scheme**				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3			3	4	60%	40%			100%

A. COURSE OVERVIEW

This course focuses on the basic concept of Management.

B. COURSE CONTENT

Sr.No	**Major Topics**	**Lecture + Practical**	**COS**
1	Demand Analysis	8	CO5
2	Elasticity Of Demand	7	CO2
3	Cost Of Production	7	CO2
4	Supply	7	CO1
5	Market Structure	7	CO1

C. TEXT BOOKS

Economics for Hotel & Catering Students – By Howard & Hugle

D. REFERENCE BOOKS

Introduction to Economics – Caiseneross
Managerial Economics – Jean
Economics of Hotel Management – AM Sheela

E. COURSE OUTCOMES

CO NUMBER	Skill	STATEMENT
CO1	Evaluate	Define the basic concepts of Managerial Economics. This course will enable students to describe the situations of certainty, uncertainty and risk and the constraints therein in corporate situations.
CO2	Comprehension	Discover the reasons for success or failure of a product in the market by studying the various factors affecting demand for the product. Students will also be able to illustrate when an individual consumer or market attains a state of equilibrium. Students will be able to forecast demand using different methods. The course shall help students illustrate the concept of elasticity for pricing products, and for setting the budget for product promotions.
CO3	Application	Identify the least cost-output relationship and determine the relationship between the output and the cost in the short run and the long run period of operation. Students will be able to determine the level of output beyond which profits will be generated.
CO4	Synthesis	Estimate and optimizing the performance of the company in different market structures in terms of profits using the Concepts of marginal revenue and marginal cost, and equilibrium price and output. The course shall help students in formulating pricing and non- pricing strategies to deter competition.
CO5	Analysis	Describe the methods for measurement of national income and inflation and to enumerate the policies to counter trade cycles. Students will be able to inspect the causes of a trade cycle and suggest remedies.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	3	2	3	2	3	3	2	2	3	3	2	3	2	2	2	3	
CO2	2	3	3	2	3	2	3	2	2	1	3	2	2	3	2	2	
CO3	3	2	2	2	2	2	2	3	3	2	2	3	3	3	3	3	
CO4	2	2	3	3	3	2	3	2	2	2	2	2	2	1	3	1	
CO5	2	3	2	2	2	1	2	2	2	2	2	2	3	2	2	2	
Avg.	2.4	2.4	2.6	2.2	2.6	2	2.4	2.2	2.4	2	2.2	2.4	2.4	2.2	2.4	2.2	2.31

BBA (HM) SEMESTER – II

SUBJECT: HUMAN RESOURCE MANAGEMENT - I

Teaching Scheme (Hours/week)				Credits	Examination Scheme				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3			3	4	60%	40%			100%

A. COURSE OVERVIEW

This course aims to make students aware of the concepts of HRM, and their importance and relevance in the hospitality industry.

B. COURSE CONTENT

Sr.No	Major Topics	Lecture + Practical	COs
[1]	**Introduction to HRM:** In search of definition, Brief outline of Indian Labor Movement, Growth Drivers of the Indian Service Sector, Why Managing HRM is gaining is more importance, Hospitality Industry –	**7**	CO1

	characteristics and implications, HR Roles, Relationship between HR and Organizational Performance, HR Challenges, Functions of HR Managers, Competency of HR Managers		
[2]	**Manpower Planning:** Importance of Manpower planning, Factors, Manpower planning process, Managing workforce surplus and shortfall, What should manpower planning offer?, Human Resource Information System and manpower planning	**7**	CO1, CO3
[3]	**Recruitment:** Introduction, Sources, What to look for in prospective candidates, When to recruit, Recruitment Policy, Company Brand and Recruitment, How to Prepare for the Interview, Legality and Recruitment	**7**	CO4
[4]	**Training and Development:** Importance of Training, Training Function and the Size of the Hotel, Training Need Identification Process, Hospitality Industry and Relevant Training in India, Training Evaluation, Training Methods, Trainers' Qualification and Experience, Training – Cost or Investment, Organizational Culture and Training	**7**	CO5
[5]	**Performance Appraisal:** Purpose of Performance Appraisal System, Performance Appraisal System, Usage of Performance Appraisal, Difficulties Associated With Performance Process, The 360 Degree Feedback System and Its Content, Feedback Partners, Effective Performance Appraisal System	**8**	CO1, CO2

C. TEXT BOOKS

Biswas Malay (2012), *"Human Resource Management in Hospitality". Oxford University Press.*

D. REFERENCE BOOKS

Sudhir A. (2009). *Human Resource Management, A Textbook for the Hospitality Industry.* Tata McGraw-Hill Companies

David K. Hayes, Jack D. Ninemeier (2015). *Human Resources Management in the Hospitality Industry*, 2nd Edition. Wiley

E. COURSE OUTCOMES

CO NUMBER	Skill	STATEMENT
CO1	Evaluate	Develop an ability to see if the HR Processes are working well in a hotel or a hospitality firm
CO2	Comprehension	Develop Skill to be able to see interconnection between various processes of HRM
CO3	Application	Develop competency to be able develop various HR Processes
CO4	Synthesis	Develop skill so that two or more processes of HR can be clubbed to get better benefits
CO5	Analysis	Ability to see through the HR system and its implications on Business

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	2	2	3	3	3	2	2	2	2	2	2	2	3	3	2	2	
CO2	3	1	1	2	2	3	3	3	2	2	3	2	2	2	3	3	
CO3	2	3	2	2	1	2	2	1	3	2	2	3	2	2	2	2	
CO4	1	2	3	3	3	2	2	2	1	1	2	2	1	3	2	2	
CO5	3	3	2	2	2	1	2	2	3	3	2	2	2	2	2	2	
Avg.	2.2	2.2	2.2	2.4	2.2	2	2.2	2	2.2	2	2.2	2.2	2	2.4	2.2	2.2	2.175

BBA (HM) SEMESTER – II

SUBJECT: TOURISM MANAGEMENT - II

Teaching Scheme (Hours/week)				Credits	Examination Scheme				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3			3	4	60%	40%			100%

A. COURSE OVERVIEW

This course focuses on the basic concept of tourism industry

B. COURSE CONTENT

Sr.No	Major Topics	Lecture + Practical	COs
1	Air transport	1	CO1
2	Air transport in India	2	CO1
3	Security of aircraft and passengers	1	CO1
4	International air travel classes	1	CO1
5	Road transport	1	CO1
6	Rail transport	2	CO1
7	Water transport	1	CO1
8	Transport as an attraction	1	CO2
9	Need for tourism organisation	1	CO2
10	International tourism organisations	2	CO2
11	Government organisations in India	2	CO2
12	Private sector organisations in India	2	CO2
13	The travel agent	1	CO3
14	Types and functions of travel agencies	3	CO3
15	Setting-up a travel agency	2	CO3
16	Sources of income for travel agency	1	CO3
17	Types of tour operators	2	CO3
18	Types of package tours	2	CO4

19	Guides and escorts	1	CO4
20	Basic information Required for itinerary planning	2	CO5
21	Planning the itinerary	2	CO5
22	Resources for planning itineraries	1	CO5
23	Costing of a tour	2	CO5

C. TEXT BOOKS

Tourism: Operations and Management – Sunetra Roday, Archana Biwal and Vandana – Oxford Publication

D. REFERENCE BOOKS

International Tourism Management – A. K. Bhatia – Sterling

Tourism: Principles and practices – Sampad Kumar Swain & Jitendra Mohan – Oxford Publication.

E. COURSE OUTCOMES

CO NUMBER	**Skill**	**STATEMENT**
CO1	Evaluate	Various modes of transportation
CO2	Comprehension	Difference between Travel agent and Tour operator
CO3	Application	Types of tourism organizations
CO4	Synthesis	Understand the difference between Tour guide and escort
CO5	Analysis	How to make a itinerary

F. COURSE MATRIX

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	
CO1	2	2	2	2	3	3	1	2	3	3	2	3	2	2	2	3	
CO2	3	3	3	1	3	2	3	2	2	1	3	2	2	3	2	2	

CO3	2	2	2	2	2	2	2	3	2	2	3	3	2	3	2	3	
CO4	2	1	3	3	3	2	3	2	2	3	2	2	2	2	3	2	
CO5	2	3	2	2	1	3	2	1	2	2	2	2	3	2	2	2	
Avg.	2.2	2.2	2.4	2	2.4	2.4	2.2	2	2.2	2.2	2.4	2.4	2.2	2.4	2.2	2.4	2.26

BBA (HM) SEMESTER – III

SUBJECT: FRONT OFFICE – III

Teaching Scheme (Hours/week)				**Credits**	**Examination Scheme**				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3		2	5	4	40%	26.67%	--	33.33%	100%

A. COURSE OVERVIEW

To make students knowledgeable about all fundamentals & basics of Front Office
To introduce the Front Office Systems with the latest developments in the field of Hospitality trade which hold significance to the future managers.

B. COURSE CONTENT

Sr.No	**Major Topics**	**Lecture + Practical**	**Cos**
1	Co-ordination of front office with different departments	9	CO1
2	Convention and Tour group Businesses	8	CO2
3	Importance of reservations	7	CO3
4	Types of Reservations	5	CO3
5	Modes of Reservations	6	CO3
6	Sources of reservations	8	CO4
7	Reservation reports	8	CO3

8	Hotel and Guest Security	9	CO5

C. TEXT BOOKS

Front Office Training Manual – Sudhir Andrews – McGraw Hill Publication
Hotel Front Office Operations and Management – Jatashankar Tiwari – Oxford Publication

D. REFERENCE BOOKS

Front Office Procedures – Kasavana / Brooks
Check-in Check-out Managing Hotel Operations – Gary Vallen/Jerome J. Vallen - Pearson

E. COURSE OUTCOMES

CO NUMBER	Skill	STATEMENT
CO1	Evaluate	Understand the inter and intra departmental communication of the front office department
CO2	Comprehension	Importance, modes and tools of reservation
CO3	Application	Define the procedure, types and sources of reservation
CO4	Synthesis	Know the procedure of amending/revising a reservation
CO5	Analysis	Importance of Hotel and Guest security in recent times

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	2	2	2	2	3	3	1	2	3	3	2	3	2	2	2	3	
CO2	3	3	3	1	3	2	3	2	2	1	3	2	2	3	2	2	
CO3	2	2	2	2	2	2	2	3	2	2	3	3	2	3	2	3	
CO4	2	1	3	3	3	2	3	2	2	3	2	2	2	2	3	2	
CO5	2	3	2	2	1	3	2	1	2	2	2	2	3	2	2	2	

Avg.	2.2	2.2	2.4	2	2.4	2.4	2.2	2	2.2	2.2	2.4	2.4	2.2	2.4	2.2	2.4	2.26

BBA (HM) SEMESTER – III

SUBJECT: HOUSE KEEPING - III

Teaching Scheme (Hours/week)				**Credits**	**Examination Scheme**				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3		2	5	4	40%	26.67%	--	33.33%	100%

A. COURSE OVERVIEW

To make students knowledgeable about all fundamentals & basics of Housekeeping.
To introduce the Housekeeping systems with the latest developments in the field of Hospitality Industry which hold relevance to the future managers.

B. COURSE CONTENT

Sr.No	Major Topics	Lecture + Practical	Cos
1	Textile Terminology	2	CO1
2	Classification and Identification of Textile Fibres	4	CO1
3	Yarn	3	CO1
4	Fabric Construction	4	CO1
5	Blends and Unions	4	CO1
6	Textile Finishes	3	CO1
7	Use of textile in Hotels	4	CO1
8	Linen and Uniform Room	4	CO2
9	Storage of Linen	3	CO2
10	Linen Exchange	3	CO2
11	Par Stock	4	CO2
12	Linen Control	4	CO2
13	Linen quality and Life Span	3	CO2

14	Discards and Their Use	5	CO3
15	Laundry Equipments	4	CO4
16	Laundry Agents and Aids	4	CO4
	Stain Removal	2	CO5

C. TEXT BOOKS

Hotel Housekeeping Operations and Management – G. Raghubalan, Smritee Raghubalan – Oxford Publication

D. REFERENCE BOOKS

Textbook of Housekeeping Management and Operations – Sudhir Andrews – McGraw Hill Publication.

Training Manual of Housekeeping – Sudhir Andrews – McGraw Hill

E. COURSE OUTCOMES

CO NUMBER	Skill	STATEMENT
CO1	Evaluate	Knowledge on various Fabrics, fibers and Textiles
CO2	Comprehension	Process of laundry operations
CO3	Application	Knowledge on different types of stains and their removal methods
CO4	Synthesis	Operation of linen room, uniform room and sewing room
CO5	Analysis	Integrated pest management and waste disposal

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	3	2	3	3	2	3	3	3	3	3	2	3	1	2	1	3	
CO2	1	3	2	3	3	3	2	3	2	3	3	2	3	2	1	3	
CO3	3	2	3	3	2	3	2	3	2	1	2	2	2	3	2	1	

CO4	2	3	2	1	3	2	3	1	3	3	1	3	3	3	3	2	
CO5	2	3	2	1	2	2	2	3	2	2	3	2	3	2	3	2	
Avg.	2.2	2.6	2.4	2.2	2.4	2.6	2.4	2.6	2.4	2.4	2.2	2.4	2.4	2.4	2	2.2	2.3625

BBA (HM) SEMESTER – III

SUBJECT: FOOD AND BEVERAGE SERVICE- III

Teaching Scheme (Hours/week)				**Credits**	**Examination Scheme**				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3		2	5	4	40%	26.67%	--	33.33%	100%

A. COURSE OVERVIEW

The course designed is to educate the students with regards to the basics of the food and beverage service operations.

B. COURSE CONTENT

Sr.No	**Major Topics**	**Lecture + Practical**	**Cos**
1	Classification of Non Alcoholic Beverages	1	CO1
2	Tea	1	CO1
3	Coffee	2	CO1
4	Other Non-Alcoholic Beverages	1	CO1
5	Classification of Alcoholic Beverages	1	CO2
6	Fermented Alcoholic Beverages	2	CO2
7	Fermented and Distilled Alcoholic Beverages	3	CO2
8	How is Alcohol Obtained	1	CO3
9	Types of Distillation	2	CO3
10	Alcoholic Proof	1	CO3

11	Classification of Wines	1	CO3
12	Viticulture	1	CO4
13	Grapes & Principle Grape Varieties	3	CO4
14	Vine Pests and Diseases	2	CO4
15	Faults in Wines & Naming of Wines	1	CO4
16	Vinificaiton	1	CO4
17	Factors Affecting the Quality of Wine	3	CO5
18	Storage of Wines	1	CO5
19	Methods of making Champagne	1	CO5
20	Other methods of making sparkling wine	1	CO5
21	Sparkling wines of from other Regions/Countries	1	CO5
22	Storage of sparkling wine	1	CO5
23	Port	1	CO5
24	Sherry	1	CO4
25	Madeira, Marsala & Malaga	2	CO4
26	Guidelines of pairing wine and food	1	CO5

C. TEXT BOOKS

Food and Beverage Service – A Training Manual – Sudhir Andrews – Tata McGraw Hill
Food and Beverage: F&B Simplified – Vara Prasad & Gopi Krishna – Pearson

D. REFERENCE BOOKS

Food and Beverage – Dennis Lillicrap and Cousins (Orient Longman)
Textbook of Food and Beverage Service – SN Bagchi & Anita Sharma – Aman Publications

E. COURSE OUTCOMES

CO NUMBER	**Skill**	**STATEMENT**
CO1	Evaluate	Understand about the non-alcoholic beverage

CO2	Comprehension	Understand the classification of alcoholic beverage
CO3	Application	Explain the main steps involved in the production of wine and it's classification
CO4	Synthesis	To learn the different wine producing areas specifically with laws of wine production
CO5	Analysis	To demonstrate and understand the food and wine pairing technique

F. COURSE MATRIX

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	
CO1	2	2	2	2	3	3	1	2	3	3	2	3	2	2	2	3	
CO2	3	3	3	1	3	2	3	2	2	1	3	2	2	3	2	2	
CO3	2	2	2	2	2	2	2	3	2	2	3	3	2	3	2	3	
CO4	2	1	3	3	3	2	3	2	2	3	2	2	2	2	3	2	
CO5	2	3	2	2	1	3	2	1	2	2	2	2	3	2	2	2	
Avg.	2.2	2.2	2.4	2	2.4	2.4	2.2	2	2.2	2.2	2.4	2.4	2.2	2.4	2.2	2.4	2.26

BBA (HM) SEMESTER – III

SUBJECT: FOOD AND BEVERAGE PRODUCTION - III

Teaching Scheme (Hours/week)				**Credits**	**Examination Scheme**				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3		3	6	5	40%	26.67%	--	33.33%	100%

A. COURSE OVERVIEW

B. COURSE CONTENT

Sr.No	Major Topics	Lecture + Practical	Cos
1	Types Of Industrial And Institutional Establishments	1	CO1
2	Industrial Catering And Army Mess	1	CO1
3	Hospital Catering	1	CO1
4	Off Premise Catering	1	CO1
5	Central Processing Units	1	CO1
6	Transport Catering	1	CO1
7	Principles Of Indenting For Volume Feeding	1	CO2
8	Purchase Systems And Specifications	2	CO2
9	Storage For Bulk	1	CO2
10	Inventory Control In Stores	2	CO2
11	Control Procedures To Check Pilferage And Spoilage	1	CO2
12	Portion Sizes And Portion Control For Volume Feeding	2	CO2
13	Modifying Recipe For Volume Catering	1	CO2
14	Challenges Of Volume Catering	2	CO3
15	Souring Agents , Coloring Agents And Thickening Agents	1	CO3
16	Tenderizing Agents, Flavouring And Aromatic Agents And Spicing Agents	2	CO3
17	Hyderabadi Cuisine	3	CO3
18	Awadhi Cuisine	3	CO3

19	Bengali Cuisine	3	CO4
20	Goan Cuisine	3	CO4
21	Kashmiri Cuisine	3	CO4
22	Kerala Cuisine	3	CO4
23	Marathi Cuisine	3	CO4
24	Parsi Cuisine	3	CO4
25	Punjabi Cuisine	3	CO5
26	Rajasthani Cuisine	3	CO5
27	Tamil Nadu Cuisine	3	CO5
28	Origin And History Of Indian Sweets	3	CO5
29	Ingredients Used In Indian Sweets	3	CO5
30	Regional Influences On Indian Sweets	1	CO5
31	Equipments Used In Preparing Indian Sweets	1	CO5

C. TEXT BOOKS

Food Production Operations - Parvinder S. Bali - Oxford University Press

D. REFERENCE BOOKS

Quantity Food Production Operation - Parvinder S. Bali - Oxford University Press
Modern Cookery (Vol. 1&2) - Thangam E. Phillp - Orient Longman

E. COURSE OUTCOMES

CO NUMBER	**Skill**	**STATEMENT**
CO1	Evaluate	Describe volume cookery with it's planning, purchasing and indenting required for mass production
CO2	Comprehension	Enumerate and describe the factors that affect regional eating habits in various parts in India
CO3	Application	Describe regional cuisine of India

CO4	Synthesis	Understand festivals and regional delicacies of Indian sweets with their history and classification
CO5	Analysis	Explain various basic gravies used in preparation of Indian Dishes

F. COURSE MATRIX

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	
CO 1	2	2	2	2	3	3	1	2	3	3	2	3	2	2	2	3	
CO 2	3	3	3	1	3	2	3	2	2	1	3	2	2	3	2	2	
CO 3	2	2	2	2	2	2	2	3	2	2	3	3	2	3	2	3	
CO 4	2	1	3	3	3	2	3	2	2	3	2	2	2	2	3	2	
CO 5	2	3	2	2	1	3	2	1	2	2	2	2	3	2	2	2	
Avg.	2.2	2.2	2.4	2	2.4	2.4	2.2	2	2.2	2.2	2.4	2.4	2.2	2.4	2.2	2.4	2.26

BBA (HM) SEMESTER – III

SUBJECT: COMMUNICATION SKILLS - III

Teaching Scheme (Hours/week)				**Credits**	**Examination Scheme**				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3			3	4	60%	40%			100%

A. COURSE OVERVIEW

B. COURSE CONTENT

Sr.No	Major Topics	Lecture + Practical	Cos
1	Art of Negotiations	1	CO1
2	A. Definition	1	CO1
3	B. Different Styles of Negotiations	2	CO1
4	Tips of Win-win negotiations	1	CO1
5	Paragraph Writing	1	CO1
6	A. Structure of a paragraph	1	CO1
7	Construction of a paragraph	2	CO1
8	Business Letters and Resumes	1	CO2
9	A. Importance	1	CO2
10	B. Elements	1	CO2
11	C. Layout	1	CO2
12	D. Business letters-elements	2	CO2
13	E. Types of Business letter	2	CO2
14	Resume preparations	1	CO2
15	Email and Blog Writing	1	CO3
16	A. Reasons for popularity	1	CO3
17	B. Common pitfalls	2	CO3
18	C. Guiding principles for composition	1	CO3
19	D. Maintaining common etiquette	2	CO4
20	Blog writing	1	CO4
21	Other business writings	1	CO4
22	A. Itinerary Writing	2	CO4
23	B. Memo	1	CO5
24	C. Notice Agenda and Minutes	2	CO5

25	D. Menu Writing	2	CO5
26	Advertising	2	CO5

C. TEXT BOOKS

D. REFERENCE BOOKS

E. COURSE OUTCOMES

CO NUMBER	Skill	STATEMENT
CO1	Evaluate	To draft effective business letters and resumes
CO2	Comprehension	To stimulate critical thinking by developing the negotiation skills
CO3	Application	To participate in paragraph and essay writing activity
CO4	Synthesis	To learn the skills of E-mail writing
CO5	Analysis	To develop other business writing skills like memo, notices, agendas, minutes of meeting

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	3	2	3	3	2	3	3	3	3	3	2	3	1	2	1	3	
CO2	1	3	2	3	3	3	2	3	2	3	3	2	3	2	1	3	
CO3	3	2	3	3	2	3	2	3	2	1	2	2	2	3	2	1	
CO4	2	3	2	1	3	2	3	1	3	3	1	3	3	3	3	2	
CO5	2	3	2	1	2	2	2	3	2	2	3	2	3	2	3	2	

Avg.	2.2	2.6	2.4	2.2	2.4	2.6	2.4	2.6	2.4	2.4	2.2	2.4	2.4	2.4	2	2.2	2.3625

BBA (HM) SEMESTER – III

SUBJECT: COMPUTERS IN HOTEL - I

Teaching Scheme (Hours/week)				**Credits**	**Examination Scheme**				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3			3	4	60%	40%			100%

A. COURSE OVERVIEW

It gives basic introduction of uses and types of computer systems.

B. COURSE CONTENT

Sr.No	**Major Topics**	**Lecture + Practical**	**Cos**
1	Introduction to Computers	1	CO1
2	A. Evolution of Computers	1	CO1
3	B. Data and Information	1	CO1
4	C. Numbering system in a computer system	1	CO1
5	D. Components of a computer system	1	CO1
6	E. Basic Computer Organization	1	CO1
7	Classification of computers	1	CO1
8	Software concepts and operating systems	1	CO2
9	A. Classification of Software	1	CO2
10	B. Operating system	1	CO2
11	C. Classification	2	CO2
12	D. Major Operating system	1	CO2
13	Programming Language	1	CO2
14	Internet	1	CO2

15	A. History	1	CO3
16	B. Equipment needed to connect to internet	1	CO3
17	C. Basic internet services	1	CO3
18	D. Uses of Internet	1	CO3
19	E. Basic components of world wide web	1	CO3
20	F. Network and data communication	1	CO3
21	G. Terminology used in networks	1	CO4
22	H. Network topology	1	CO4
23	I. Classification of software	1	CO4
24	J. Wireless Technology	1	CO4
25	K. E-commerce	1	CO4
26	L. Internet security	1	CO4
27	Antivirus software	1	CO4
28	Introduction to DBMS	1	CO4
29	Database	1	CO4
30	Database Management	1	CO5
31	Database Management System	1	CO5
32	Database Types	1	CO5
33	Database Users	1	CO5
34	Main Components of DBMS	1	CO5
35	Microsoft Visual Foxpro 6.0	1	CO5

C. TEXT BOOKS

D. REFERENCE BOOKS

E. COURSE OUTCOMES

CO NUMBER	**Skill**	**STATEMENT**

CO1	Evaluate	Understand Classification of computers with their main components
CO2	Comprehension	Understand major operating systems
CO3	Application	Understand types of internet
CO4	Synthesis	Understand Database management systems
CO5	Analysis	Understand Microsoft Visual Foxpro

F. COURSE MATRIX

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	
CO1	2	2	3	3	3	2	2	2	2	2	2	2	3	3	2	2	
CO2	3	1	1	2	2	3	3	3	2	2	3	2	2	2	3	3	
CO3	2	3	2	2	1	2	2	1	3	2	2	3	2	2	2	2	
CO4	1	2	3	3	3	2	2	2	1	1	2	2	1	3	2	2	
CO5	3	3	2	2	2	1	2	2	3	3	2	2	2	2	2	2	
Avg.	2.2	2.2	2.2	2.4	2.2	2	2.2	2	2.2	2	2.2	2.2	2	2.4	2.2	2.2	2.175

BBA (HM) SEMESTER – III

SUBJECT: HUMAN RESOURCE MANAGEMENT - II

Teaching Scheme (Hours/week)				**Credits**	**Examination Scheme**				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3			3	4	60%	40%			100%

A. COURSE OVERVIEW

This course aims to make students aware of the concepts of Organizational Behaviour, and its importance and relevance in the hospitality industry. As the hospitality industry is totally dependent on behaviour of employees for providing service.

B. COURSE CONTENT

Sr.No	Major Topics	Lecture + Practical	Cos
[1]	**Introduction to Organizational Behaviour:** Meaning and Definition of OB, Key elements of OB, Scope of OB, Need for studying OB, Contributing disciplines to OB	**6**	CO1 CO5
[2]	**Personality:** Concept and determinants of Personality, Types of Personality, Theories of Personality, Type Theory, Trait Theory, The Big 5 Model, How Personality Develops?, How Personality influences OB?	**6**	CO4
[3]	**Perception:** Meaning and Definition of Perception, Perception v/s Sensation, Perceptual Process, Factors Affecting Perception, How to Improve Perception?	**6**	CO2
[4]	**Learning:** Meaning and Definition, Determinants of learning, Learning Theories, Classical Conditioning, Operant Learning, Cognitive Theory, Learning Principles, Reinforcement, Punishment	**6**	CO1, CO3
[5]	**The Group and Group Dynamics:** Definition and Characteristics of Group, Why do people form and join Groups?, Types of Groups, Stages of Group Development, Group Behavior, Group Norms, Group Cohesion**,** Group Role	**6**	CO4
[6]	**Organizational Conflicts:** Meaning & Definition of Conflict, Sources of Conflict, Types of Conflicts, Aspects of Conflicts, Conflict Process, Conflict Management	**6**	CO3

C. TEXT BOOKS

Robbins, S. P., Judge, T. A., & Vohra, N. *Organizational behaviour by Pearson 18e*. Pearson Education India.

D. REFERENCE BOOKS

Rao, P. S. (2010). *Organisational behaviour*. Himalaya Publishing House.

Sudhir A. (2009). *Human Resource Management, A Textbook for the Hospitality Industry.* Tata McGraw-Hill Companies

E. COURSE OUTCOMES

CO NUMBER	Skill	STATEMENT
CO1	Evaluate	Show how the OB works at individual, group and system level
CO2	Comprehension	Help students understand the fact that behaviour is an outcome of the total psychological system of a person including the interaction of emotions, moods, personality, groups, culture etc.
CO3	Application	Train them in using this knowledge to analyse the behaviour of employees and motivate the employees
CO4	Synthesis	Create an understanding so that they can see the behaviour as a whole and not sums as the parts
CO5	Analysis	Show how subtle messages in terms of body language and other behaviour etc. are important to understand behavior

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	2	1	1	3	1	2	2	2	3	2	2	2	2	1	1	1	
CO2	1	2	2	1	2	1	3	1	2	1	1	1	3	3	3	2	
CO3	3	3	3	2	2	3	2	3	2	3	2	3	1	2	3	3	

CO4	1	2	2	2	3	2	2	2	1	3	3	3	3	2	2	2	
CO5	3	2	3	3	3	2	2	3	2	1	2	2	2	2	2	2	
Avg.	2	2	2.2	2.2	2.2	2	2.2	2.2	2	2	2	2.2	2.2	2	2.2	2	2.1

BBA (HM) SEMESTER – III

SUBJECT: NUTRITION

Teaching Scheme (Hours/week)				**Credits**	**Examination Scheme**				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3			3	4	60%	40%			100%

A. COURSE OVERVIEW

B. COURSE CONTENT

Sr.No	**Major Topics**	**Lecture + Practical**	**Cos**
1	Introduction to Nutrition A. Relation of Food and Health B. Food and Its Functions C. Factors affecting Food D. Classification of Nutrients	4	CO1
2	Carbohydrates A. Classification B. Sources C. Functions D. Deficiency E. Excess F. Recommended Dietary Allowances	5	CO1
3	Proteins A. Classification B. Sources C. Functions D. Deficiency E. Excess F. Recommended Dietary Allowances	5	CO2

4	Lipids A. Classification B. Sources C. Functions D. Deficiency E. Excess F. Recommended Dietary Allowances	6	CO2
5	Water A. Classification B. Sources C. Functions D. Deficiency E. Excess F. Recommended Dietary Allowances	4	CO3
6	Vitamins A. Classification B. Sources C. Functions D. Deficiency E. Excess F. Recommended Dietary Allowances	5	CO4
7	Minerals A. Classification B. Sources C. Functions D. Deficiency E. Excess F. Recommended Dietary Allowances	5	CO5
8	Balanced Diet	2	CO5

C. TEXT BOOKS

Food Science and Nutrition - Sunetra Roday - Oxford University Press

D. REFERENCE BOOKS

E. COURSE OUTCOMES

CO NUMBER	**Skill**	**STATEMENT**
CO1	Evaluate	Importance of food for health and digestion in human body

CO2	Comprehension	Importance of major nutrients like carbohydrate and protein with their sources, functions and deficiency on human body
CO3	Application	Importance and role of major vitamins with their sources, functions and deficiency in human body
CO4	Synthesis	Importance and role of major minerals with their source , functions and deficiency in human body
CO5	Analysis	Importance of balance diet in preparing any meal

F. COURSE MATRIX

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	
CO1	3	2	3	3	2	3	3	3	3	3	2	3	1	2	1	3	
CO2	1	3	2	3	3	3	2	3	2	3	3	2	3	2	1	3	
CO3	3	2	3	3	2	3	2	3	2	1	2	2	2	3	2	1	
CO4	2	3	2	1	3	2	3	1	3	3	1	3	3	3	3	2	
CO5	2	3	2	1	2	2	2	3	2	2	3	2	3	2	3	2	
Avg.	2.2	2.6	2.4	2.2	2.4	2.6	2.4	2.6	2.4	2.4	2.2	2.4	2.4	2.4	2	2.2	2.3625

BBA (HM) SEMESTER – V

SUBJECT: FRONT OFFICE – IV

Teaching Scheme (Hours/week)				**Credits**	**Examination Scheme**				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3		2	5	4	40%	26.67%	--	33.33%	100%

A. COURSE OVERVIEW

To make students knowledgeable about all advance theories of Front Office
To introduce the Front Office Systems with the latest developments in the field of Hospitality trade which hold significance to the future managers.

B. COURSE CONTENT

Sr.No	Major Topics	Lecture + Practical	Cos
1	Handling Cash Transaction	5	CO1
2	The Cashier's Daily Report	6	CO1
3	Cash and Cash Equivalent	6	CO2
4	Departure Procedure	4	CO2
5	Mode of Settlement of Bills	7	CO2
6	Potential Check-out problems and solutions	5	CO3
7	Front Office Accounting	5	CO3
8	Front Office Accounting Cycle	5	CO4
9	Night Audit	6	CO4
10	Night Auditor	4	CO5
11	Night Audit Process	5	CO5

C. TEXT BOOKS

Front Office Training Manual – Suxzdhir Andrews – McGraw Hill Publication
Hotel Front Office Operations and Management – Jatashankar Tiwari – Oxford Publication
Front Office Procedures – Kasavana / Brooks

D. REFERENCE BOOKS

E. COURSE OUTCOMES

CO NUMBER	Skill	STATEMENT
CO1	Evaluate	Functions of property management system
CO2	Comprehension	Know various modules present in a PMS
CO3	Application	Analyses situation, identify guest problems, formulates solutions and implement corrective measures during the entire guest cycle

CO4	Synthesis	Explain and discuss front office accounting procedures, check-out and settlement procedures, night audit functions and verification
CO5	Analysis	Comprehend the scope of hospitality industry as an International Business

F. COURSE MATRIX

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	
CO1	3	2	3	3	2	3	3	3	3	3	2	3	1	2	1	3	
CO2	1	3	2	3	3	3	2	3	2	3	3	2	3	2	1	3	
CO3	3	2	3	3	2	3	2	3	2	1	2	2	2	3	2	1	
CO4	2	3	2	1	3	2	3	1	3	3	1	3	3	3	3	2	
CO5	2	3	2	1	2	2	2	3	2	2	3	2	3	2	3	2	
Avg.	2.2	2.6	2.4	2.2	2.4	2.6	2.4	2.6	2.4	2.4	2.2	2.4	2.4	2.4	2	2.2	2.3625

BBA (HM) SEMESTER – V

SUBJECT: HOUSE KEEPING - IV

Teaching Scheme (Hours/week)				**Credits**	**Examination Scheme**				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3		2	5	4	40%	26.67%	--	33.33%	100%

A. COURSE OVERVIEW

This course will help students to understand managerial aspects of housekeeping works.

B. COURSE CONTENT

Sr.No	Major Topics	Lecture + Practical	Cos
1	Principles of Ergonomics	2	CO1
2	Ergonomics in Hotel Housekeeping	2	CO1
3	Pest Control	2	CO1
4	Common Pest and Their Control	2	CO1
5	Integrated Pest Management	4	CO1
6	Waste Disposal	4	CO2
7	Internal Environment	4	CO2
8	Noise	2	CO2
9	Air-conditioning	3	CO2
10	Light	4	CO2
11	Objectives of Interior Designing	2	CO2
12	Basic Types of Design	2	CO2
13	Elements of Design	2	CO3
14	Principles of Design	4	CO3
15	Units of Design	2	CO3
16	Designing for physically challenged	3	CO3
	Planning trends in the hotel	2	CO3
	Colour	2	CO3
	Lighting	3	CO4
	Floor, Coverings, and Finishes	2	CO4
	Types, Characteristics, and Cleaning of Floor coverings	2	CO4
	Carpets	3	CO4
	Importance of Floor Maintenance	2	CO4
	Ceilings and Their Maintenance	3	CO4

	Wall Coverings	2	CO5
	Windows and Windows Treatments	2	CO5

C. TEXT BOOKS

Hotel Housekeeping Operations and Management – G. Raghubalan, Smritee Raghubalan – Oxford Publication.

D. REFERENCE BOOKS

Textbook of Housekeeping Management and Operations – Sudhir Andrews – McGraw Hill Publication.

Training Manual of Housekeeping – Sudhir Andrews – McGraw Hill

E. COURSE OUTCOMES

CO NUMBER	Skill	STATEMENT
CO1	Evaluate	Need and importance of Ergonomics in house keeping
CO2	Comprehension	Importance of internal environment like Noise, Air conditioning and light
CO3	Application	Outsourcing cleaning – Types and merits/demerits
CO4	Synthesis	Basics of interior designing like Types, elements, principles and units
CO5	Analysis	Basics of interior decoration like colour, carpets, windows, wall coverings

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	2	2	3	3	3	2	2	2	2	2	2	2	3	3	2	2	
CO2	3	1	1	2	2	3	3	3	2	2	3	2	2	2	3	3	
CO3	2	3	2	2	1	2	2	1	3	2	2	3	2	2	2	2	

CO4	1	2	3	3	3	2	2	2	1	1	2	2	1	3	2	2	
CO5	3	3	2	2	2	1	2	2	3	3	2	2	2	2	2	2	
Avg.	2.2	2.2	2.2	2.4	2.2	2	2.2	2	2.2	2	2.2	2.2	2	2.4	2.2	2.2	2.175

BBA (HM) SEMESTER – V

SUBJECT: FOOD AND BEVERAGE SERVICE - IV

Teaching Scheme (Hours/week)				**Credits**	**Examination Scheme**				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3		2	5	4	40%	26.67%	--	33.33%	100%

A. COURSE OVERVIEW

The course designed is to educate the students with regards to the Advance theories of the food and beverage service operations.

B. COURSE CONTENT

Sr.No	**Major Topics**	**Lecture + Practical**	**COS**
1	Ingredients of Beer	2	CO1
2	The Brewing Process	2	CO1
3	Types of Beer & Storage of Beer	1	CO1
4	Scotch Whisky Manufacturing Process	3	CO1
5	Irish Whisky Manufacturing Process	3	CO2
6	Canadian Whisky Manufacturing Process	2	CO2
7	American Whisky Manufacturing Process	2	CO2
8	Cognac Manufacturing Process	2	CO2
9	Armagnac Manufacturing Process	1	CO3
10	Manufacturing Process of Rum	2	CO3

11	Types of Rum	2	CO3
12	Manufacturing Process of Gin	2	CO3
13	Types of Gin	2	CO4
14	Manufacturing Process of Vodka	2	CO4
15	Types of Vodka	2	CO4
16	Manufacturing process of Tequila	2	CO4
17	Types of Tequila	2	CO4
18	Manufacturing process Absinthe, Aquavit & Arrack	2	CO4
19	Manufacturing process Calvados , Eau De Vie & Fenny	2	CO5
20	Manufacturing process Korn, Pastis & Pomace Brandy	2	CO5
21	More Local Spirits	4	CO5
22	Liqueur versus flavored liquor	4	CO5
23	Ingredients of Liqueur production	4	CO5
24	Manufacturing Process of Liqueurs	2	CO5
25	Classification of Liqueurs	3	CO5
26	Liqueurs – Flavour, base and country of origin	3	CO5

C. TEXT BOOKS

Food and Beverage – Dennis Lillicrap and Cousins (Orient Longman)
Food and Beverage Service – A Training Manual – Sudhir Andrews – Tata McGraw Hill

D. REFERENCE BOOKS

Textbook of Food and Beverage Service – SN Bagchi & Anita Sharma – Aman Publications
Food and Beverage: F&B Simplified – Vara Prasad & Gopi Krishna – Pearson

E. COURSE OUTCOMES

CO NUMBER	Skill	STATEMENT

CO1	Evaluate	Develop an understanding of the concepts of beer making
CO2	Comprehension	Develop the knowledge about fermented beverages like sake, cider, and Perry
CO3	Application	To learn the spirit making procedures
CO4	Synthesis	To understand the common indigenous spirit of the world
CO5	Analysis	To learn the manufacturing process and classification of liqueur

F. COURSE MATRIX

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	
CO1	3	2	3	3	2	3	3	3	3	3	2	3	1	2	1	3	
CO2	1	3	2	3	3	3	2	3	2	3	3	2	3	2	1	3	
CO3	3	2	3	3	2	3	2	3	2	1	2	2	2	3	2	1	
CO4	2	3	2	1	3	2	3	1	3	3	1	3	3	3	3	2	
CO5	2	3	2	1	2	2	2	3	2	2	3	2	3	2	3	2	
Avg.	2.2	2.6	2.4	2.2	2.4	2.6	2.4	2.6	2.4	2.4	2.2	2.4	2.4	2.4	2	2.2	2.3625

BBA (HM) SEMESTER – V

SUBJECT: FOOD AND BEVERAGE PRODUCTION - IV

Teaching Scheme (Hours/week)	**Credits**	**Examination Scheme**

Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3		3	6	5	40%	26.67%	--	33.33%	100%

A. COURSE OVERVIEW

This syllabus is intended towards training of students in the advance theory and techniques of the Food and Beverage Production.

B. COURSE CONTENT

Sr.No	Major Topics	Lecture + Practical	Cos
1	Larder Work	2	CO1
2	Section And Functions Of Garde Manger	4	CO1
3	Layout Of The Larder	3	CO1
4	Ktchen Larder Equipments	4	CO1
5	Hierarchy Of Larder Staff	4	CO2
6	Duties And Responsibilities Of Larder Chef	3	CO2
7	Parts Of Sandwich	4	CO2
8	Types Of Sandwich	4	CO2
9	Making Sandwich Storing Sandwich	3	CO3
10	Modern Approach To Sandwiches In Hotels	3	CO3
11	Popular Herbs Used In Cooking	4	CO3
12	Wines Used In Cooking	1	CO3
13	Italian Cuisine	3	CO3
14	Lebanese Cuisine	2	CO3
15	Greek Cuisine	4	CO4
16	Spanish Cuisine	4	CO4
17	Mexican Cuisine	3	CO4

18	French Cuisine	3	CO5
19	Cuisine Of UK	2	CO5

C. TEXT BOOKS

International Cuisine & Food Production Management - Parvinder S Bali - Oxford University Press

D. REFERENCE BOOKS

Food Production Operations – Parvinder S Bali - Oxford University Press
Quantity Food Production Operation – Parvinder S Bali - Oxford University Press
Modern Cookery (Vol. 1&2) - Thangam E Phillip - Orient Longman

E. COURSE OUTCOMES

CO NUMBER	Skill	STATEMENT
CO1	Evaluate	Impart knowledge on larder kitchen
CO2	Comprehension	Develop knowledge on various types of sandwiches
CO3	Application	Describe the use of herbs and wine in cooking with their uses
CO4	Synthesis	Develop knowledge on Western cuisine with their history, popular dishes and Cooking methods
CO5	Analysis	Develop knowledge on Continental cuisine with their history, popular dishes and Cooking methods

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	2	2	3	3	3	2	2	2	2	2	2	2	3	3	2	2	
CO2	3	1	1	2	2	3	3	3	2	2	3	2	2	2	3	3	

CO3	2	3	2	2	1	2	2	1	3	2	2	3	2	2	2	2	
CO4	1	2	3	3	3	2	2	2	1	1	2	2	1	3	2	2	
CO5	3	3	2	2	2	1	2	2	3	3	2	2	2	2	2	2	
Avg.	2.2	2.2	2.2	2.4	2.2	2	2.2	2	2.2	2	2.2	2.2	2	2.4	2.2	2.2	2.175

BBA (HM) SEMESTER – V

SUBJECT: FOOD SCIENCE

Teaching Scheme (Hours/week)				**Credits**	**Examination Scheme**				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3			3	4	60%	40%			100%

A. COURSE OVERVIEW

This Course Focuses On Importance Of Food And Science Related To Maintain And Preserve The Various Food Materials And Products. It is also helpful to identify various methods to evaluate any food with new recipe development.

B. COURSE CONTENT

Sr.No	**Major Topics**	**Lecture + Practical**	**COS**
1	Introduction and Concepts of Food Science	2	CO1
2	Need for Convenience Foods	1	CO1
3	Importance of Microorganisms in Food Microbiology	2	CO2
4	Factors Affecting the Growth of Microbes	2	CO2
5	Food Fermentations	2	CO2
6	Contamination of food	2	CO2
7	Food borne Illnesses	1	CO2

8	Causes of Food Spoilage	1	CO2
9	Objectives of Food Processing	1	CO3
10	Methods of Food Preservation	3	CO3
11	Effect of processing on Food Constituents	2	CO3
12	Food Additives	2	CO4
13	Methods of Evaluation	1	CO5
14	Objective Evaluation	1	CO5
15	Proximate Composition of Food Constituents	2	CO5
16	Proximate Analysis of Food Constituents	2	CO5
17	Soya Foods	1	CO5
18	Food Fads	1	CO5
19	Organic Foods	1	CO5
20	Health Foods	1	CO5
21	Natural Foods	1	CO5
22	Live Foods	1	CO5
23	New Trends in Packaging	2	CO5
24	Edible Films	1	CO5

C. TEXT BOOKS

Food Science and Nutrition - Sunetra Roday - Oxford University Press

D. REFERENCE BOOKS

E. COURSE OUTCOMES

CO NUMBER	**Skill**	**STATEMENT**
CO1	Evaluate	Importance and need for convenience food
CO2	Comprehension	Micro-organisms and their growth which affect food to spoil
CO3	Application	Various important food preservation techniques
CO4	Synthesis	Various important food additives

CO5	Analysis	Evaluation of any food and it's importance in developing new recipe

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	3	2	3	3	2	3	3	3	3	3	2	3	1	2	1	3	
CO2	1	3	2	3	3	3	2	3	2	3	3	2	3	2	1	3	
CO3	3	2	3	3	2	3	2	3	2	1	2	2	2	3	2	1	
CO4	2	3	2	1	3	2	3	1	3	3	1	3	3	3	3	2	
CO5	2	3	2	1	2	2	2	3	2	2	3	2	3	2	3	2	
Avg.	2.2	2.6	2.4	2.2	2.4	2.6	2.4	2.6	2.4	2.4	2.2	2.4	2.4	2.4	2	2.2	2.3625

BBA (HM) SEMESTER – V

SUBJECT: BASICS OF COMPUTERS - II

Teaching Scheme (Hours/week)				Credits	Examination Scheme				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3			3	4	60%	40%			100%

A. COURSE OVERVIEW

To make students knowledgeable about all fundamentals & basics of Computers.

B. **COURSE CONTENT**

Sr.No	Major Topics	Lecture + Practical	COS

1	Microsoft Word 2003	1	CO1
2	F. Major components of MS Word Window	1	CO1
3	G. Working	2	CO1
4	Operations performed	2	CO1
5	Microsoft Excel 2003	1	CO1
6	E. Applications	2	CO2
7	F. Structure	1	CO2
8	G. Starting MS Excel	2	CO2
9	H. Components	2	CO2
10	I. Operations performed	1	CO3
11	Features of spreadsheets	2	CO3
12	Microsoft PowerPoint 2003	1	CO3
13	M. Starting MS PowerPoint	1	CO3
14	N. Components	1	CO3
15	O. Operations performed	2	CO3
16	Features	1	CO4
17	Microsoft Access 2003	1	CO4
18	Starting MS Access	1	CO4
19	Components	2	CO4
20	Operations Performed	1	CO4
21	Working with Forms	1	CO4
22	Management Information System	1	CO5
23	MIS in Hotels	1	CO5
24	Usage	2	CO5
25	Design and Function	2	CO5
26	Software Development Life Cycle	2	CO5

27	MIS Evaluation	1	CO5
28	Managing Management Information Systems	2	CO5
29	Security Issues of Management	1	CO5
30	Information System	1	CO5

C. TEXT BOOKS

Computers in Hotels-Concepts and Application – Partho Pratim Seal – Oxford University Press

D. REFERENCE BOOKS

E. COURSE OUTCOMES

CO NUMBER	Skill	STATEMENT
CO1	Evaluate	Understand Microsoft word
CO2	Comprehension	Understand Microsoft Excel
CO3	Application	Understand Microsoft Office
CO4	Synthesis	Understand Microsoft Access
CO5	Analysis	Understand Management Information System

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	3	2	3	3	2	3	3	3	3	3	2	3	1	2	1	3	
CO2	1	3	2	3	3	3	2	3	2	3	3	2	3	2	1	3	
CO3	3	2	3	3	2	3	2	3	2	1	2	2	2	3	2	1	
CO4	2	3	2	1	3	2	3	1	3	3	1	3	3	3	3	2	

CO5	2	3	2	1	2	2	2	3	2	2	3	2	3	2	3	2	
Avg.	2.2	2.6	2.4	2.2	2.4	2.6	2.4	2.6	2.4	2.4	2.2	2.4	2.4	2.4	2	2.2	2.3625

BBA (HM) SEMESTER – V

SUBJECT: SALES AND MARKETING - I

Teaching Scheme (Hours/week)				**Credits**	**Examination Scheme**				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3			3	4	60%	40%			100%

A. COURSE OVERVIEW

- To acquaint the students with concepts and techniques in the application for developing and designing in sales and marketing program.
- To sensitize students to the various facets of advertising, public relation and promotion management, Sales promotion, and Publicity, digital Marketing.

B. COURSE CONTENT

Sr.No	**Major Topics**	**Lecture + Practical**	**COS**
1	Introduction to Marketing and Services A. What is marketing? B. What are Products and Services? C. General Marketing Management D. Marketing Mix E. Hospitality Marketing vs. Marketing of Manufactured Goods	6	CO1 AND CO5
2	Marketing Environment and Market Research A. Introduction B. Marketing Environment C. Marketing Research	6	CO2

3	Consumer Behavior in Services and the Future Guest A. Introduction B. Factors which influence Consumer Behavior C. Hospitality Market Segments D. Buying Decision-making Process E. During Marketing Tactics before and after Service F. Buying Decision-making Process of new products G. Customer's Expectations of Service H. Factors Influencing Expectations in Service I. Exceeding Customer Expectations J. Creating Excellent Service Mindsets K. The Future Guest	6	CO3
4	Hospitality Products and Services A. Introduction B. Hospitality Products C. Dimensions of Hospitality Products D. Marketing strategies for Products E. Product positioning and differentiation F. Branding G. Customer Benefit Strategy H. Hospitality Services I. Hospitality Service Dynamics J. Range of Services provided by hotels and restaurants K. Product Service Dimensions	6	CO4
5	Hospitality Pricing Strategies	6	CO4

	A. Introduction B. Pricing strategies of the Hospitality Industry C. Types of Pricing Plans and Room Rates D. Yield Management		
6	Hospitality "Place" Strategies and Distribution Channels A. Introduction B. Distribution Channels C. Guest Contact Options D. Functions of Distribution Channels E. Methods of Distribution Channels F. Methods of Distribution in Hospitality Sector G. Global Distribution Systems H. Online Hotel Reservations I. Central Reservation System J. Tour Operators and Travel Agents	6	CO4

C. TEXT BOOKS

Andrews S. Sales and Marketing. 1st ed., Tata McGraw- Hill. India, 2009.

D. REFERENCE BOOKS

Makens J, Bowen J T and Kotler P R. 6th ed., Pearson Education, 2010.

E. COURSE OUTCOMES

CO NUMBER	Skills	STATEMENT
CO1	Evaluate	Develop an understanding of marketing as a function and capable to observe the factors effecting marketing of organization's products or services.
CO2	Comprehension	Identify the Marketing Environment and Market Research and to be able to estimate the Market.
CO3	Application	Understanding the consumer behavior in services and the future guest.
CO4	Synthesis	Make familiar Hospitality Products, Services and Pricing Strategies and Policies.
CO5	Analysis	Summarize the efficiency of marketing function.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	2	3	3	3	3	3	2	2	2	2	3	3	3	2	2	2	
CO2	3	3	2	3	3	2	3	3	3	3	2	2	3	1	2	2	
CO3	3	1	3	2	1	3	3	2	3	2	1	3	2	3	3	3	
CO4	1	3	2	2	3	2	3	2	3	2	1	2	2	2	3	2	
CO5	2	2	1	3	3	1	2	3	3	2	3	2	3	1	2	3	
Avg.	2.2	2.2	2.4	2.2	2.4	2.4	2.2	2.2	2.4	2.2	2.4	2.4	2.6	2.4	2.4	2.5	2.3438

BBA (HM) SEMESTER – V

SUBJECT: FINANCE - I

Teaching Scheme (Hours/week)				Credits	Examination Scheme				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3			3	4	60%	40%			100%

A. COURSE OVERVIEW

This course focuses on the basic concept of Finance in Hotel Industry.

B. COURSE CONTENT

Sr.No	Major Topics	Lecture + Practical	COS
1	Finance Management in Hospitality Industry	4	CO5
2	Factors affecting the Hotel Industry	4	CO2

3	Time Value of Money	3	CO2
4	Financial Statements of Hospitality Business	3	CO1
5	Analysis and interpretation of Financial Statement	4	CO1
6	Funds analysis, Cash Flow Analysis	3	CO3
7	Working Capital of Hotel Companies	5	CO3
8	Management of Cash	5	CO4
9	Inventory and Receivables Management	5	CO3

C. TEXT BOOKS

Hotel Finance – Anand Iyengar – Oxford University Press

D. REFERENCE BOOKS

Van horne, *"Fundamentals of Financial Management",* Pearson Education, 11th ed.
Brigham, *"Financial Management"*, Cengage Publication
Kewown, J.Arthur, Martin, John, Petty, William, and Scott David, *"Financial Management: Principles and Applications"*,10th Ed. Pearson.
Chandra Prassanna, *"Financial Management"*, 10th Edition, TMH, New Delhi

E. COURSE OUTCOMES

CO NUMBER	**Skill**	**STATEMENT**
CO1	Evaluate	Demonstrate role of financial management in business corporations, Knowledge of the value of money overtime, its utility and trade-off between risk and return.
CO2	Comprehension	Construct and Compare the various capital budgeting techniques and risk in capital budgeting.
CO3	Application	Distinguish between equity, debt and preference capital. Determine capital structure using EBIT –EPS analysis. Calculate specific cost of capital and weighted average cost of capital.
CO4	Synthesis	Demonstrate the concept of working capital and sources of working capital finance. Determine working capital estimation and EOQ levels, Plan cash management, inventory management.

CO5	Analysis	Differentiate between relevance and irrelevance theory of dividends. Calculate value of the firm using Walter's Model, Gordon's Model and MM Hypothesis

F. COURSE MATRIX

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	
CO1	3	2	3	2	3	3	2	2	3	3	2	3	2	2	2	3	
CO2	2	3	3	2	3	2	3	2	2	1	3	2	2	3	2	2	
CO3	3	2	2	2	2	2	2	3	3	2	2	3	3	3	3	3	
CO4	2	2	3	3	3	2	3	2	2	2	2	2	2	1	3	1	
CO5	2	3	2	2	2	1	2	2	2	2	2	2	3	2	2	2	
Avg.	2.4	2.4	2.6	2.2	2.6	2	2.4	2.2	2.4	2	2.2	2.4	2.4	2.2	2.4	2.2	2.31

BBA (HM) SEMESTER – VI

SUBJECT: FRONT OFFICE – V

Teaching Scheme (Hours/week)				**Credits**	**Examination Scheme**				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3		2	5	4	40%	26.67%	--	33.33%	100%

A. COURSE OVERVIEW

- To make students knowledgeable about all advance theories of Front Office
- To introduce the Front Office Systems with the latest developments in the field of Hospitality trade which hold significance to the future managers.

B. COURSE CONTENT

Sr.No	Major Topics	Lecture + Practical	COS
1	Importance of Evaluating Hotel's Performance	4	CO1
2	A. Various methods to Evaluate Hotel's Performance like Occupancy Ratios, Avaerage Daily rate, Average Room Rate Per Guest and Revenue Per Available Room(Rev-Par)	7	CO1
3	B. Market Share Index	4	CO1
4	C. Evaluation of Hotel's By Guests	3	CO1
5	Yield Management in Hotel industry	5	CO2
6	Measuring Yield In the hotel Industry	4	CO2
7	Elements and Benefits of Yield management	5	CO2 and CO3
8	Challenges in Yield Management	5	CO2 and CO3
9	Benefits and data required for forecasting	4	CO4
10	Yield Management Prospects	4	CO2 and CO3
11	Preparing a Budget for front office department by focusing on various expenses and expected revenue basis	6	CO4
12	Basic tasks of Front office Heads (Attendance, Briefings, Managing Disciplines, Cost-reducing methods, Staff scheduling, Evaluating staff)	9	CO5

C. TEXT BOOKS

Hotel Front Office: Operations and Mangement – Jatashankar Tiwari – Oxford University Press

Textbook of Front Office Management and Operations – Sudhir Andrews – MC Graw Hill Education

D. REFERENCE BOOKS

Check-in Check-out: Managing Hotel Operations – Gary K Vallen, Jerome J Vallen – Pearson

E. COURSE OUTCOMES

CO NUMBER	Skill	STATEMENT
CO1	Evaluate	Learn and Understand Various Methods to Evaluate any Hotel's Performance and evaluation of any Property by Guests
CO2	Comprehension	Understand Yield management concept along with it's Benefits and Elements
CO3	Application	Understand what revenue management is, and why it is important and How effective yielding can improve a hotel's profit
CO4	Synthesis	Uses of various internal and external data of various planning aspects like Forecasting, Establishing room rates and Budgeting
CO5	Analysis	Understand the various tactics to apply and establish Discipline, staff schedule and evaluating an individuals

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	2	2	3	3	3	2	2	2	2	2	2	2	3	3	2	2	
CO2	3	1	1	2	2	3	3	3	2	2	3	2	2	2	3	3	
CO3	2	3	2	2	1	2	2	1	3	2	2	3	2	2	2	2	
CO4	1	2	3	3	3	2	2	2	1	1	2	2	1	3	2	2	
CO5	3	3	2	2	2	1	2	2	3	3	2	2	2	2	2	2	
Avg.	2.2	2.2	2.2	2.4	2.2	2	2.2	2	2.2	2	2.2	2.2	2	2.4	2.2	2.2	2.175

BBA (HM) SEMESTER – VI

SUBJECT: HOUSE KEEPING - V

Teaching Scheme (Hours/week)				Credits	Examination Scheme				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3		2	5	4	40%	26.67%	--	33.33%	100%

A. COURSE OVERVIEW

- To make students knowledgeable about all advance theories of Housekeeping.
- To introduce the Housekeeping systems with the latest developments in the field of Hospitality Industry which hold relevance to the future managers?

B. COURSE CONTENT

Sr.No	Major Topics	Lecture + Practical	COS
1	Hotel Renovation	1	CO1
2	A. Reasons to Renovate	1	CO1
3	B. Types of Renovation	3	CO1
4	C. Subsidiary Processes in Renovation	4	CO1
5	Budgeting for House Keeping Expenses	1	CO2
6	A. Types of Budget	2	CO2
7	B. House keeping Expenses	2	CO2
8	C. Budget-Planning Process	2	CO2
9	D. Controlling Expenses and Inventory	3	CO2
10	E. Types, Stages and Process of Purchasing	5	CO2
11	Flower Arrangement in Hotels	1	CO3
12	Flower Arrangement Basics	4	CO3
13	Designing Flower arrangments	4	CO3
14	Japanese / Oriental Flower Arrangement	2	CO3
15	Common Flowers and Foliage	3	CO3
16	Essential Components of Horticulture	4	CO4
17	Landscaping	2	CO4

18	Indoor Plants	2	CO4
19	Bonsai in Hotel Properties	1	CO4
20	Ecotel Certification	1	CO5
21	Choosing an eco-friendly site	1	CO5
22	Energy Conservation	2	CO5
23	Water Conservation	2	CO5
24	Environment Friendly House keeping	2	CO5

C. TEXT BOOKS

Hotel Housekeeping Operations and Management – G. Raghubalan, Smritee Raghubalan – Oxford Publication. 2nd Edition.

D. REFERENCE BOOKS

Textbook of Housekeeping Management and Operations – Sudhir Andrews – McGraw Hill Publication.

Training Manual of Housekeeping – Sudhir Andrews – McGraw Hill

E. COURSE OUTCOMES

CO NUMBER	Skill	STATEMENT
CO1	Evaluate	Need and process of renovation
CO2	Comprehension	Types of Budget and Budgetary control
CO3	Application	Principles and styles of Flower arrangements
CO4	Synthesis	Basics of Horticulture like Indoor plants, Bonsai
CO5	Analysis	Learn different energy and water conservation activities

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	3	2	3	3	2	3	3	3	3	3	2	3	1	2	1	3	

CO2	1	3	2	3	3	3	2	3	2	3	3	2	3	2	1	3	
CO3	3	2	3	3	2	3	2	3	2	1	2	2	2	3	2	1	
CO4	2	3	2	1	3	2	3	1	3	3	1	3	3	3	3	2	
CO5	2	3	2	1	2	2	2	3	2	2	3	2	3	2	3	2	
Avg.	2.2	2.6	2.4	2.2	2.4	2.6	2.4	2.6	2.4	2.4	2.2	2.4	2.4	2.4	2	2.2	2.3625

BBA (HM) SEMESTER – VI

SUBJECT: FOOD AND BEVERAGE SERVICE - V

Teaching Scheme (Hours/week)				Credits	Examination Scheme				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3		2	5	4	40%	26.67%	--	33.33%	100%

A. COURSE OVERVIEW

B. COURSE CONTENT

Sr.No	Major Topics	Lecture + Practical	COS
1	Steps Followed in Planning an Outlet	1	CO1
2	Space Calculation for Various F&B Outlets	3	CO1
3	The Staff Requirement Calculation	1	CO1
4	Seating Arrangement	1	CO1
5	Selection and Planning of Equipment	1	CO1
6	Planning the Interiors of an Outlet	3	CO2
7	Planning Menu for an Outlet	1	CO2
8	Constraints in Menu Planning	2	CO2
9	Categories of Staff & Organization Chart	1	CO2
10	Hierarchy	2	CO2
11	Job Descriptions & Job Specifications	1	CO3
12	Assignment of Duties & Duty Rota & Staff Schedule	2	CO3
13	Job of Supervisor & Task of Supervisor	2	CO3
14	Standard Operating Procedure & How to write a SOP	1	CO3
15	Types of Banquets	2	CO3
16	Staff Organization of Banquet Department	1	CO4

17	Banquet Booking Procedure	2	CO4
18	Banquet Menus	2	CO4
19	Banquet Space Requirements & Banquet Seating Plans and Set ups	1	CO4
20	Banquets Service Procedures & Toasting	2	CO4
21	Factors to be considered while planning buffet	1	CO4
22	Guidelines for Calculating the area required for Buffet	1	CO5
23	Planning Menu for Buffet	2	CO5
24	Types of Buffet	1	CO5
25	Equipments Required for a Buffet Set-up	2	CO5
26	Types of Bar	2	CO5
27	Bar Layout & Parts of Bar	1	CO5
28	Bar Stock & Bar Licensing	1	CO5
29	Bar Control & Bar Staffing	3	CO5
30	Definition & History of Cocktail	2	CO5
31	Classification & categories of Cocktail	2	CO5
32	Basic Bar equipments to make Cocktails	1	CO5
33	Basic Tips in making cocktails	2	CO5
34	Organization & Important Tasks of Kitchen Stewarding	1	CO5
35	Dishwashing Methods & Dish wash Machines	3	CO5
36	Inventory and Control & Par Levels	2	CO4 & CO5

C. TEXT BOOKS

Food and Beverage: F&B Simplified - Vara Prasad & Gopi Krishna – Pearson Publication

D. REFERENCE BOOKS

Food and Beverage - Dennis Lillicrap and Cousins - Orient Longman

Food and Beverage Service – A Training Manual - Sudhir Andrews - Tata McGraw Hill
Textbook of Food and Beverage Service - SN Bagchi & Anita Sharma - Aman Publications

E. COURSE OUTCOMES

CO NUMBER	Skill	STATEMENT
CO1	Evaluate	Understand the planning and managing Food and Beverage outlets considering the planning for staff requirement, space requirement and layout of different area
CO2	Comprehension	Discuss about the banquet and off-premises operations and management
CO3	Application	Understand the concept of buffet in hospitality industry
CO4	Synthesis	To understand Bar management process and procedures
CO5	Analysis	Develop an understanding about cocktail making

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	2	2	3	3	3	2	2	2	2	2	2	2	3	3	2	2	
CO2	3	1	1	2	2	3	3	3	2	2	3	2	2	2	3	3	
CO3	2	3	2	2	1	2	2	1	3	2	2	3	2	2	2	2	
CO4	1	2	3	3	3	2	2	2	1	1	2	2	1	3	2	2	
CO5	3	3	2	2	2	1	2	2	3	3	2	2	2	2	2	2	
Avg.	2.2	2.2	2.2	2.4	2.2	2	2.2	2	2.2	2	2.2	2.2	2	2.4	2.2	2.2	2.175

BBA (HM) SEMESTER – VI

SUBJECT: FOOD AND BEVERAGE PRODUCTION - V

Teaching Scheme (Hours/week)				Credits	Examination Scheme				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3		3	6	5	40%	26.67%	--	33.33%	100%

A. COURSE OVERVIEW

This syllabus is intended towards training of students in the advance theory and techniques of the Food and Beverage Production.

B. COURSE CONTENT

Sr.No	Major Topics	Lecture + Practical	COS
1	The Concepts Of Plate Presentations	2	CO1
2	Merging Of Flavours, Shapes, And Textures On The Plate	2	CO1
3	Emerging Trends In The Food Presentation	3	CO1
4	Types Of Nutrients	2	CO2
5	Balanced Diet And Nutritional Analysis	2	CO2
6	Principles Of Healthy Cooking	3	CO2
7	Chinese Cuisine	4	CO3
8	Japanese Cuisine	4	CO3
9	Thai Cuisine	3	CO3
10	Kitchen Organization	3	CO3
11	Allocation Of Work-Job Description, Duty Rosters	4	CO4
12	Production Planning And Scheduling	4	CO4
13	Production Quality And Quantity Control	3	CO4
14	Forecasting And Budgeting	2	CO5

15	Yield Management	4	CO5
16	Testing New Equipments	4	CO5
17	Developing New Recipes	3	CO5
18	Food Trials	2	CO5
19	Evaluating A Recipe	2	CO1 & CO5
20	Organoleptic Evaluation	2	CO4
21	Sensory Evaluation	2	CO5

C. TEXT BOOKS

International Cuisine & Food Production Management - Parvinder S. Bali - Oxford University Press

D. REFERENCE BOOKS

Food Production Operations – Parvinder S. Bali - Oxford University Press
Quantity Food Production Operation – Parvinder S. Bali - Oxford University Press
Modern Cookery (Vol. 1&2) - Thangam E Phillip - Orient Longman

E. COURSE OUTCOMES

CO NUMBER	Skill	STATEMENT
CO1	Evaluate	To develop concepts of Food presentations
CO2	Comprehension	Develop knowledge on the concept of Health Food
CO3	Application	Develop knowledge on Oriental cuisine with their history, popular dishes and Cooking methods
CO4	Synthesis	Impart knowledge on the aspect of production planning and management
CO5	Analysis	Describe the use of research in product development

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	

CO1	3	2	3	3	2	3	3	3	3	3	2	3	1	2	1	3	
CO2	1	3	2	3	3	3	2	3	2	3	3	2	3	2	1	3	
CO3	3	2	3	3	2	3	2	3	2	1	2	2	2	3	2	1	
CO4	2	3	2	1	3	2	3	1	3	3	1	3	3	3	3	2	
CO5	2	3	2	1	2	2	2	3	2	2	3	2	3	2	3	2	
Avg.	2.2	2.6	2.4	2.2	2.4	2.6	2.4	2.6	2.4	2.4	2.2	2.4	2.4	2.4	2	2.2	2.3625

BBA (HM) SEMESTER – VI

SUBJECT: HOTEL LAW

Teaching Scheme (Hours/week)				**Credits**	**Examination Scheme**				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3			3	4	60%	40%			100%

A. COURSE OVERVIEW

This course aims to make students aware of the concepts of Hotel Law, and their importance and relevance in the hospitality industry.

B. COURSE CONTENT

Sr.No	**Major Topics**	**Lecture + Practical**	**COS**
1	**Introduction to Hotel Law:** Introduction to Hotel Laws	**8**	CO1, CO4
2	**Laws Related to Hotel Operations:** Hotel Licenses and Regulations, Hotel Insurance	**10**	CO2

3	**Laws Related to Employees and Guests:** Hospitality Law	**8**	CO3
4	**Laws Related to Food and Beverages:** Food Legislation, Liquor Licensing	**10**	CO5

C. TEXT BOOKS

Devendra A (2010). *Hotel Law. Oxford University Press.*

D. REFERENCE BOOKS

E. COURSE OUTCOMES

CO NUMBER	**Skill**	**STATEMENT**
CO1	Evaluate	Introduce the basic need to study hotel law for the hotel management student
CO2	Comprehension	Develop a comprehension on various types of hotel laws in India
CO3	Application	Develop a basic understanding of implications of major Hotel Laws in India on the businesses of hospitality sector companies
CO4	Synthesis	Instil a mind set to see through combined effects of major hotel laws on the hotel industry in India
CO5	Analysis	Develop an analytical understanding of hotel laws

F. COURSE MATRIX

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	
CO1	1	3	2	2	3	3	3	3	3	3	3	1	2	1	2	2	
CO2	2	2	1	3	2	2	1	2	1	2	2	3	2	3	1	1	
CO3	3	2	3	2	1	3	2	1	2	3	1	3	3	2	3	3	

CO4	2	1	2	2	2	2	2	2	3	1	3	2	2	1	2	3	
CO5	2	2	3	2	3	1	2	3	2	2	2	2	2	3	2	2	
Avg.	2	2	2.2	2.2	2.2	2.2	2	2.2	2.2	2.2	2.2	2.2	2.2	2	2	2.2	2.1375

BBA (HM) SEMESTER – VI

SUBJECT: ENGINEERING AND MAINTENANCE

Teaching Scheme (Hours/week)				**Credits**	**Examination Scheme**				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3			3	4	60%	40%			100%

A. COURSE OVERVIEW

To give an overview of hotel facilities and operations in regards to engineering and maintenance perspective which helpful to understand the importance of supporting department to smooth functioning of the hotel's offerings.

B. COURSE CONTENT

Sr.No	Major Topics	Lecture + Practical	COS
1	Hospitality Industry and Engineering Systems	2	CO1
	A. Engineering Systems in Hospitality Industry	1	CO1
2	Water Distribution System	1	CO2
	A. Cold Water-Supply, Storage and Distribution	2	CO2
	B. Hot water generation and Distribution	1	CO2
	C. Piping material for conveying water	1	CO2
3	Fittings in water distribution line	2	CO2
4	Sanitation, Waste Disposal and Pollution	1	CO3
	A. Sanitation and Sanitary Systems	1	CO3

	B. Treatment and Disposal of Waste	2	CO3
	C. Solid Waste and its Disposal	1	CO3
	D. Regulations and Norms for Solid Waste Management	2	CO3
	E. Pollution and Hotel Industry	1	CO3
	F. Pollution Control Boards and Pollution Norms	1	CO3
5	Maintenance Management	1	CO4
	A. Role and importance of maintenance department	1	CO4
	B. Types of maintenance procedures in department	1	CO4
	C. Maintenance management policy	1	CO4
	D. Elements of maintenance programmes	1	CO4
	E. Contract maintenance	1	CO4
6	Tendering practice	2	CO4
7	Equipment Replacement Policy	1	CO4
	A. Causes for Equipment replacement	1	CO4
	B. Equipment Replacement policy	2	CO4
8	Safety and security	1	CO5
	A. Safety in hotels and its management	1	CO5
	B. Fire Safety	1	CO5
	C. A few Safety issues in hotel	1	CO5
	D. Security in Hotels and its management	1	CO5

C. TEXT BOOKS

Hotel Engineering - Sujit Ghosal - Oxford University Press

D. REFERENCE BOOKS

E. COURSE OUTCOMES

CO NUMBER	Skill	STATEMENT
CO1	Evaluate	Identify the need, importance and organization of engineering department
CO2	Comprehension	Gain depth knowledge about water distribution system along with various materials used for transportation of water
CO3	Application	Gain depth knowledge about waste disposal and sanitation systems and procedures
CO4	Synthesis	Well versed about maintenance management program and replacement policy
CO5	Analysis	Learn about fire safety measures used in hospitality industry

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	3	2	3	3	2	3	3	3	3	3	2	3	1	2	1	3	
CO2	1	3	2	3	3	3	2	3	2	3	3	2	3	2	1	3	
CO3	3	2	3	3	2	3	2	3	2	1	2	2	2	3	2	1	
CO4	2	3	2	1	3	2	3	1	3	3	1	3	3	3	3	2	
CO5	2	3	2	1	2	2	2	3	2	2	3	2	3	2	3	2	
Avg.	2.2	2.6	2.4	2.2	2.4	2.6	2.4	2.6	2.4	2.4	2.2	2.4	2.4	2.4	2	2.2	2.3625

BBA (HM) SEMESTER – VI

SUBJECT: SALES AND MARKETING - II

Teaching Scheme (Hours/week)	Credits	Examination Scheme

Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3			3	4	60%	40%			100%

A. COURSE OVERVIEW

- To acquaint the students regarding Hospitality promotion.
- To familiarize the students Marketing strategy.
- To make students know about supports or pillars of marketing.

B. COURSE CONTENT

Sr.No	Major Topics	Lecture + Practical	COS
1	Hospitality Sales A. Sales Objectives B. Sales Force Strategy C. Sales-Force Structure D. Selling Principles E. Steps to Effective Selling F. Managing the Sales Force G. In-House Selling	6	CO1
2	Hospitality Promotion, Advertising and Public Relations A. Introduction B. Hospitality Communication Channels C. Hospitality Marketing Communication System D. Promotional Objectives E. Buying Influences in Hospitality Services F. Promotion Products and Services G. Web Marketing	6	CO1
3	People as a Marketing Proposition	6	CO2

	A. Introduction B. Features of Service Personnel C. Maintaining Consistent Performance D. Delivering Service as Promised		
4	Physical Evidence as a Marketing Strategy E. Types of Physical Evidence F. Managing Physical Evidence G. Making Tangible the Intangible in Hospitality	6	CO3
5	Processes as a Marketing Support A. Operations Management in Services B. Process Management C. Processes within a Delivery System D. Process and People E. Process and Organizations	6	CO4
6	Strategic Marketing Planning and Control A. Benefits of Planning B. What is planning? C. Planning Process D. Phases of Planning E. What is Strategy? F. The Marketing Plan G. Essential Hospitality Marketing Strategies	6	CO5

C. TEXT BOOKS

Andrews S. Sales and Marketing. 1st ed., Tata McGraw- Hill. India, 2009.

D. REFERENCE BOOKS

Makens J, Bowen J T and Kotler P R. 6th ed., Pearson Education, 2010.

E. COURSE OUTCOMES

CO NUMBER	**Skill**	**STATEMENT**
CO1	Evaluate	Describe the marketing communication mix, IMC, Communication models, describe the methods for setting the advertising budget, and describe the functions of advertising Agencies.

CO2	Comprehension	Participation and importance of people as a Marketing proposition.
CO3	Application	Develop to making tangible the intangible in hospitality services.
CO4	Synthesis	Correlate and locate marketing support as a process.
CO5	Analysis	Analyze the behavior of target market and relate them to Organizational marketing strategies.

F. COURSE MATRIX

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	
CO1	3	2	3	3	2	3	3	3	3	3	2	3	1	2	1	3	
CO2	1	3	2	3	3	3	2	3	2	3	3	2	3	2	1	3	
CO3	3	2	3	3	2	3	2	3	2	1	2	2	2	3	2	1	
CO4	2	3	2	1	3	2	3	1	3	3	1	3	3	3	3	2	
CO5	2	3	2	1	2	2	2	3	2	2	3	2	3	2	3	2	
Avg.	2.2	2.6	2.4	2.2	2.4	2.6	2.4	2.6	2.4	2.4	2.2	2.4	2.4	2.4	2	2.2	2.3625

BBA (HM) SEMESTER – VI

SUBJECT: FINANCE - II

Teaching Scheme (Hours/week)				**Credits**	**Examination Scheme**				
Lecture	Tutorial	Practical	Total		External	Sessional	Term work	Practical	Total
3			3	4	60%	40%			100%

A. COURSE OVERVIEW

This course focuses on the basic concept of Finance in Hotel Industry.

B. COURSE CONTENT

Sr.No	Major Topics	Lecture + Practical	COS
1	Short Term Finance	4	CO5
2	Basics of Capital Budgeting and Estimating Cash Flows	5	CO2
3	Capital Budgeting Techniques	3	CO2
4	Valuation of Hotel Real Estate	3	CO1
5	Risk in Hospitality Industry	4	CO1
6	The Financial System	3	CO3
7	Source of Long Term Finance	5	CO3
8	Franchising	5	CO4
9	Leasing	4	CO3

C. TEXT BOOKS

Hotel Finance – Anand Iyengar – Oxford University Press

D. REFERENCE BOOKS

Van horne, *"Fundamentals of Financial Management",* Pearson Education, 11th ed.

Brigham, *"Financial Management"*, Cengage Publication

Kewown, J.Arthur, Martin, John, Petty, William, and Scott David, *"Financial Management: Principles and Applications"*,10th Ed. Pearson.

Chandra Prassanna, *"Financial Management"*, 10th Edition, TMH, New Delhi

E. COURSE OUTCOMES

CO NUMBER	Skill	STATEMENT
CO1	Evaluate	Demonstrate role of financial management in business corporations, Knowledge of the value of money overtime, its utility and trade-off between risk and return.

CO2	Comprehension	Construct and Compare the various capital budgeting techniques and risk in capital budgeting.
CO3	Application	Distinguish between equity, debt and preference capital. Determine capital structure using EBIT –EPS analysis. Calculate specific cost of capital and weighted average cost of capital.
CO4	Synthesis	Demonstrate the concept of working capital and sources of working capital finance. Determine working capital estimation and EOQ levels, Plan cash management, inventory management.
CO5	Analysis	Differentiate between relevance and irrelevance theory of dividends. Calculate value of the firm using Walter's Model, Gordon's Model and MM Hypothesis

F. COURSE MATRIX

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	
CO1	2	2	3	3	3	2	2	2	2	2	2	2	3	3	2	2	
CO2	3	1	1	2	2	3	3	3	2	2	3	2	2	2	3	3	
CO3	2	3	2	2	1	2	2	1	3	2	2	3	2	2	2	2	
CO4	1	2	3	3	3	2	2	2	1	1	2	2	1	3	2	2	
CO5	3	3	2	2	2	1	2	2	3	3	2	2	2	2	2	2	
Avg.	2.2	2.2	2.2	2.4	2.2	2	2.2	2	2.2	2	2.2	2.2	2	2.4	2.2	2.2	2.175

SYLLABI BOOK

BACHELOR OF TECHNOLOGY
ELECTRONICS & COMMUNICATION ENGINEERING

Department of Electronics & Communication Engineering
Faculty of Technology
Dharmsinh Desai University
Nadiad – 387 001, Gujarat, India.

http://www.ddu.ac.in
ec@ddu.ac.in

With effect from
2021 - 2022

TEACHING SCHEME FOR THE COURSE
B. TECH. ELECTRONICS & COMMUNICATION
(Admission Year 2021)

B.Tech. Semester-1 (2021-2022)

	Subject	Teaching Scheme (Hrs/Week)				Credit	Exam Scheme (Marks)				
		Lect	Tut	Prac	Total		Th.	Int.	TW	Prac.	Total
1	Mathematics-I	3	1	0	4	**4**	60	40	-	-	100
2	Basic Electrical Engineering	3	1	2	6	**5**	60	40	50	-	150
3	Programming for Problem Solving I	4	0	3	7	**5.5**	60	40	50	-	150
4	Engineering Graphics & Design	1	0	4	5	**3**	-	-	100	-	100
5	Software Workshop	0	0	2	2	**1**	-	-	50	-	50
						18.5					**550**

B.Tech. Semester-2 (2021-2022)

	Subject	Teaching Scheme (Hrs/Week)				Credit	Exam Scheme (Marks)				
		Lect	Tut	Prac	Total		Th.	Int.	TW	Prac.	Total
1	Mathematics-II	3	1	0	4	**4**	60	40	-	-	**100**
2	Programming for Problem Solving II	4	0	3	7	**5.5**	60	40	50	-	**150**
3	Physics	3	1	2	6	**5**	60	40	50	-	**150**
4	Hardware Workshop	0	0	4	4	**2**	-	-	100	-	**100**
5	English	2	0	2	4	**3**	40	-	50	-	**90**
6	Environmental Studies	2	0	0	2	**0**	40	-	-	-	**40**
						19.5					**630**

B.Tech. Semester-3 (2022-2023)

	Subject	Teaching Scheme (Hrs/Week)				Credit	Exam Scheme (Marks)				
		Lect	Tut	Prac	Total		Th.	Int.	TW	Prac.	Total
1	Applied Mathematics	3	1	0	4	**4**	60	40	-	-	**100**
2	Linear Electronics - I	4	0	2	6	**5**	60	40	25	25	**150**
3	Electronic Instrumentation	3	1	2	6	**5**	60	40	25	25	**150**
4	Network Analysis	3	1	2	6	**5**	60	40	25	25	**150**
5	Digital Electronics	3	1	2	6	**5**	60	40	25	25	**150**
6	Mathematical Computing Laboratory	0	0	2	2	**1**	-	-	**25**	**25**	**50**
						25					**750**

B.Tech. Semester-4 (2022-2023)

	Subject	Teaching Scheme (Hrs/Week)				Credit	Exam Scheme (Marks)				
		Lect	Tut	Prac	Total		Th.	Int.	TW	Prac.	Total
1	Signal & Systems	2	1	2	5	**4**	40	40	25	25	**130**
2	Linear Electronics - II	4	0	2	6	**5**	60	40	25	25	**150**
3	Control Theory	3	1	2	6	**5**	60	40	25	25	**150**
4	Electrical Machines & Power	3	0	2	5	**4**	60	40	25	25	**150**
5	Program Elective - 1	3	1	2	6	**5**	60	40	25	25	**150**
6	Universal Human Values	2	1	0	3	**3**	40	-	-	-	**40**
						26					**770**

B.Tech. Semester-5 (2023-2024)

	Subject	Teaching Scheme (Hrs/Week)				Credit	Exam Scheme (Marks)				
		Lect	Tut	Prac	Total		Th.	Int.	TW	Prac.	Total
1	Microcontroller Applications	4	0	2	6	**5**	60	40	25	25	**150**
2	Electronic Communication	3	0	2	5	**4**	60	40	25	25	**150**
3	Electromagnetic Fields	3	1	0	4	**4**	60	40	50	-	**150**
4	Program Elective - 2	4	0	2	6	**5**	60	40	25	25	**150**
5	Open Elective - 1	1	1	2	4	**3**	-	-	50	-	**50**
6	Electronic Circuits Project	0	0	2	2	**1**	-	-	50	-	**50**
7	Technical Communication	1	1	2	4	**3**	-	-	50	-	**50**
						25					**750**

B.Tech. Semester-6 (2023-2024)

	Subject	Teaching Scheme (Hrs/Week)				Credit	Exam Scheme (Marks)				
		Lect	Tut	Prac	Total		Th.	Int.	TW	Prac.	Total
1	Advanced Microprocessor	4	0	2	6	**5**	60	40	25	25	**150**
2	Communication Systems	3	1	2	6	**5**	60	40	25	25	**150**
3	Digital Signal Processing	3	1	2	6	**5**	60	40	25	25	**150**
4	Microcontroller and IoT Project	0	0	2	2	**1**	-	-	50	-	**50**
5	Program Elective - 3	3	1	2	6	**5**	60	40	25	25	**150**
6	Open Elective - 2	2	0	2	4	**3**	40	-	25	25	**90**
						24					**740**

B.Tech. Semester-7 (2024-2025)

Subject		Teaching Scheme (Hrs/Week)				Credit	Exam Scheme (Marks)				
		Lect	Tut	Prac	Total		Th.	Int.	TW	Prac.	Total
1	Data & Computer Communications	4	0	2	6	**5**	60	40	25	25	**150**
2	Software Project	0	0	2	2	**1**	-	-	50	-	**50**
3	Entrepreneurship and IP Strategy	2	0	0	2	**2**	40	-	-	-	**40**
4	Open Elective - 3	2	1	0	3	**3**	40	-	-	-	**40**
5	Program Elective - 4	3	1	0	4	**4**	60	40	-	-	**100**
6	Program Elective - 5	4	0	2	6	**5**	60	40	25	25	**150**
7	Program Elective - 6	4	0	2	6	**5**	60	40	25	25	**150**
						25					**680**

B.Tech. Semester-8 (2024-2025)

Subject		Teaching Scheme (Hrs/Week)				Credit	Exam Scheme (Marks)				
		Lect	Tut	Prac	Total		Th.	Int.	TW	Prac.	Total
1	Industrial Training Project	0	0	24	24	**12**	-	-	50	300	**350**
2	Seminar	0	6	0	6	**6**	-	-	50	100	**150**
						18					**500**

PROGRAM ELECTIVE OPTIONS

Program Elective – 1

CMOS VLSI Design
Introduction to MEMS
Nano Electronics

Program Elective - 2

Power Electronics
Scientific Computing
Bio-Medical Electronics

Program Elective – 3

Microwave & Antennas
Microwave Theory and Techniques
Satellite Communication

Program Elective - 4

Wireless Communication
High Speed Electronics
Fiber Optic Communication

Program Elective – 5

Image Processing
Wireless Sensor Networks
Digital Switching Systems

Program Elective - 6

Embedded Systems
RF Circuit Design
Adaptive Signal Processing

OPENELECTIVE OPTIONS

Open Elective – 1

Audio Video Engineering
Computer Organization & Architecture
Robotics Engineering

Open Elective – 2

Automated Electronics
Power Plant Automation
Smart Instruments

Open Elective – 3

Coding Theory & Compression Techniques
Error Correcting Codes
Radar and Navigation

B.TECH.SEMESTER–I(EC/CE/IT)

SUBJECT: MATHEMATICS - I

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
3	1	0	4	4	60	40	-	-	100

Reference Code BSC102

COURSE OBJECTIVES

The course is designed to provide the basic concepts and principles of mathematics such as improper integrals, matrices, and calculus. It offers a study to compute surface area and volume, express functions in terms of series, the concepts of matrix algebra, vector differential calculus, and to use it as a tool to solve and analyze the engineering problems.

DETAILED SYLLABUS

[1] CALCULUS

Evaluates and involutes, Evaluation of definite and improper integrals; Beta and Gamma functions and their properties, Applications of definite integrals to evaluate surface areas and volumes of revolutions. Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule, Maxima and minima.

[2] MATRICES

Matrices, Vectors: addition and scalar multiplication, matrix multiplication; Rank of a Matrix, Linear systems of equations, Determinants, Cramer's Rule, Inverse of a matrix, Gauss Elimination and Gauss Jordan method.

[3] VECTOR SPACES

Eigenvalues, Eigenvectors, Symmetric, Skew-symmetric, and Orthogonal Matrices, Linear Independence of vectors, Diagonalization.

[4] MULTIVARIABLE CALCULUS (DIFFERENTIATION)

Limit, Continuity and Partial derivatives, Directional derivatives, Total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Vector Differential Calculus; Gradient, curl and divergence.

TEXT / REFERENCE BOOKS

1) B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 40th Edition, 2007.
2) G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
3) Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4) D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
5) Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

6) Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
7) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
8) V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East–West press, Reprint 2005.

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. Understand the concepts of Beta Gamma function used in applications of engineering problems.
CO2. Describe concepts of vector differential calculus for analysing engineering problem.
CO3. Apply the concept of integral calculus for computing improper integrals, surface area and volumes.
CO4. Analyse system of linear equations of engineering problems and can be solved using concepts of matrices.
CO5. Evaluate the optimum value of function of several variables.
CO6. Evaluate solution of eigen values and Eigen vectors of different engineering problems.

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	2		2			1				
CO2	3	2				1	1					
CO3	2	3	2					1	1			
CO4	3	2	3		2			1	1	1		
CO5	2	3	2	2	2				1	1		
CO6	2	2	3	2								
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – I (EC/CE/IT)

SUBJECT: BASIC ELECTRICAL ENGINEERING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
3	1	2	6	5	60	40	50*	-	150

Reference Code ESC101

*TW Marks includes Viva based on TW

COURSE OBJECTIVES

The course impart an in-depth understanding of the fundamental concepts associated with AC and DC circuit analysis used in electrical and electronic devices using basic circuital laws and Theorems. The course also focuses on the analyse relationship between electric and magnetic circuit, importance of magnetic circuit and performance of electrical machines.

To expose the students to the concepts of various types ofelectrical, electronic and magnetic circuits and their applications.

DETAILED SYLLABUS

[1] DC CIRCUITS

Electrical circuit elements (R, L and C), impact of temperature, voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first order RL and RC circuits.

[2] AC CIRCUITS

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-phase balanced circuits, voltage and current relations in star and delta connections

[3] ELECTRO-MAGNETIC INDUCTION

Introduction, Magnetic effect of electric current, Current carrying conductor in magnetic field, Law of electromagnetic induction, Induced emf, Self-Inductance (L), Mutual Inductance (M), and Coupling coefficient between two magnetically coupled circuits (K), Inductances in series and parallel.

[4] MAGNETIC CIRCUITS

Introduction, Definition of Magnetic quantities, Magnetic circuit, Leakage flux, Fringing effect, Comparison between magnetic and electric circuits

[5] TRANSFORMERS

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections

[6] ELECTRICAL MACHINES

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited DC motor. Construction and working of synchronous generators, Construction, Principles and working theory and Types of DC Motors & Generators, 1-Ph & 3-Ph Induction Motor, AC Generator

TEXT/ REFERENCE BOOKS

1) Basic Electrical, Electronics and Computer Engineering, R. Muthu Subramanian, S. Salvahanan, K. A. Muraleedharan, 2nd Edition, Tata McGraw Hill

2) Electronics Principles, Albert Paul Malvino, 6th Edition, Tata McGraw Hill

3) Electrical Technology (Vol: II), B. L. Theraja , A. K. Theraja, 23rd Edition, R. Chand & Company

4) Basic Electrical Engineering, D.P. Kothari, I. J. Nagrath, 3rd Edition, Tata McGraw Hill

5) Introduction to VLSI Circuit & Systems, John P. Uyemura, 1st Edition, John Willey & Sons Inc.

6) Basic Electrical Engineering, D.C. Kulshreshtha, 1st Edition, Tata McGraw Hill

7) Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson

8) Electrical Engineering Fundamentals, V.D. Toro, 2nd Edition, Prentice Hall India

9) Fundamentals of Electrical Engineering, L.S. Bobrow, , Oxford University Press

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. To find DC Circuit parameters using KVL, KCL and Ohm's Laws in DC circuits.
CO2. Apply various Network Theorems to solve DC networks and Analyse RL and RC circuits in time domain.
CO3. Analyse single phase AC circuits consists of R, L and C.
CO4. Analyse various Magnetic Circuits to find Magnetic parameters.
CO5. Apply Electromagnetic Induction law to find various EMF in Magnetic Circuit.
CO6. Understand the characteristics of Magnetic materials and draw Equivalent Circuit of a Transformer.
CO7. Find Transformer parameters and Power measurement in 3-phase circuit.
CO8. Analyse the operation and applications of DC Machines.
CO9. Analyse the operation and applications of AC Machines.

COURSE MATRIX

Course Outcome (CO's)	Program Outcomes (PO's)											
	Domain Specific (PSO)					Domain Independent (PO)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3			1	1		1		1		
CO2	3	3		2						1		
CO3	2	2	1				1					
CO4	2	2			1			1				
CO5	2	2				1						
CO6	2	3		1								
CO7	2	2		2	1			1				
CO8	2	2										
CO9	2	2		2								
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B.TECH. SEMESTER – I (EC/CE/IT)

SUBJECT: PROGRAMMING FOR PROBLEM SOLVING - I

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
4	0	3	7	5.5	60	40	50*	-	150

Reference Code ESC201

*TW Marks includes Viva based on TW

COURSE OBJECTIVES

The objectives of teaching this course are

- To impart in-depth understanding of fundamental programming concepts to build C programs.
- To explain conditional branching, iteration/looping, code reusability and pointers using C Programming Language.
- To demonstrate and teach how to code, document, test, and implement a well-structured C program.

DETAILED SYLLABUS

[1] OVERVIEW OF C

Basic structure of C program, compiling and running C program

[2] CONSTANTS, VARIABLES AND DATA TYPES

Types of constants, basic data types, identifier, variable, enum, symbolic constant, typedef, keywords, overflow and underflow

[3] OPERATORS AND EXPRESSIONS

Arithmetic, relational, logical, assignment, bitwise, and sizeof() operators, operator precedence and associativity, expression evaluation

[4] MANAGING INPUT OUTPUT OPERATIONS

getchar() and putchar() functions, formatted I/O using printf() and scanf()

[5] DECISION MAKING AND BRANCHING

if and if...else statement, nested and ladder if...else, conditional operator, switch statement, goto statement with warning

[6] DECISION MAKING AND LOOPING

while, do...while, and for loops, nested loops, break and continue statements

[7] ARRAYS AND STRINGS

Introduction to arrays, declaration, initialization and access of one-dimensional and two-dimensional arrays, Introduction to multi-dimensional and variable length arrays, declaration and initialization of strings, printing and scanning strings to/from standard I/O, string handling functions, list of strings

[8] USER-DEFINED FUNCTIONS

Function prototype and function declaration, function definition, function call, actual and formal parameters/arguments, return type and return statement, Nested function call, recursion, scope, visibility, and lifetime of variables.

[9] STRUCTURES AND UNIONS

Defining structure, declaring and initializing structure variables, typedef, accessing structure members, copying and comparing structure variables, nested structures, arrays and structures, structures and functions, unions

[10] POINTERS

Introduction, accessing address of a variable, declaration and initialization of pointer variables, Accessing variable using pointer, chain of pointers, scale factor and pointer expressions, pointers and arrays, pointer to array Vs array of pointers, passing arrays and strings to the function, array of pointers, pointers and functions, pointers and structures, const pointer vs pointer to const

TEXT / REFERENCE BOOKS

1) Programming in ANSI C by Balagurusamy, 8th Ed., Tata McGraw Hil
2) Programming with C by Byron Gottfried, 3rd Ed., McGraw Hill Education
3) The C Programming Language by Kernighan and Ritchie, 2nd Ed., PHI Learning
4) Expert C Programming: Deep C Secrets by Peter Van Der Linden, Pearson Education
5) Let Us C by YashvantKanetkar, 12th Ed., BPB Publication
6) Programming in C by Ashok N. Kamthane, 2nd Ed., Pearson Education

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. Use and understand language syntax and concepts for C Programming.
CO2. Comprehend and use C Programming concepts to solve algorithmic and logical problems.
CO3. Analyse the given problem and to formulate appropriate C language solution based on definitive language concept(s).
CO4. Design a flowchart or a diagram for given problem and create C programs using decision making, branching, looping, user defined function, array, structure, pointers, etc.
CO5. Apply concepts to write, compile, debug, execute, and document C programs with different test cases using appropriate tool(s).

COURSE MATRIX

Course Outcome (CO's)	Program Outcomes (PO's)											
	Domain Specific (PSO)					Domain Independent (PO)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		1	2								
CO2		3			2	2			2		1	1
CO3			2	1	2			2		1	1	1
CO4				3	2	1			1	1		
CO5					3				2			
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B.TECH.SEMESTER–I (EC/CE/IT)

SUBJECT: ENGINEERING GRAPHICS AND DESIGN

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
1	0	4	5	3	-	-	100*	-	100

Reference Code ESC102

*TW Marks includes Viva based on TW

COURSE OBJECTIVES

The objectives of this course are:

- To Understand the drawing importance in Engineering.
- To Describe the 3-Dimensional object in a different 2-Dimensional view.
- To Develop skills in Reading and Interpretation of Engineering Drawings.
- To enhance drawing skills through hands-on training in a CAD lab using engineering software.

DETAILED SYLLABUS

[1] INTRODUCTION TO ENGINEERING DRAWING

Introduction to Engineering Drawing Covering, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales –Plain, Diagonal and Vernier Scales.

[2] ORTHOGRAPHIC PROJECTIONS

Orthographic Projections Covering, Principles of Orthographic Projections-Conventions Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes;

[3] PROJECTIONS OF REGULAR SOLIDS

Projections of Regular Solids Covering, those inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.

[4] SECTIONS AND SECTIONAL VIEWS OF RIGHT ANGULAR SOLIDS

Sections and Sectional Views of Right Angular Solids Covering, Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)

[5] ISOMETRIC PROJECTIONS

Isometric Projections Covering, Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions

[6] OVERVIEW OF COMPUTER GRAPHICS

Overview of Computer Graphics Covering, listing the computer technologies that impact on graphical communication, demonstrating knowledge of the theory of CAD software.

[7] CUSTOMIZATION & CAD DRAWING

Customization & CAD Drawing consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;

[8] ANNOTATIONS, LAYERING & OTHER FUNCTIONS

Annotations, layering & other Functions Covering applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wire frame models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multi view, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling;

TEXT / REFERENCE BOOKS

1) Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House

2) Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education

3) Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication

4) Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers

5) (Corresponding set of) CAD Software Theory and User Manuals

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. Understand and interpret engineering drawings so that concepts can be communicated graphically more effectively.

CO2. Demonstrate correct usage of methods, concept, and theories to illustrate and solve problems of conics, lines, planes, solids, surfaces, and many more.

CO3. Choose a suitable standard projection method, break down a complex 3D problem into various orthographic and sectional orthographic views, and highlight missing features.

CO4. Practical Exposure to computer-aided software to generate isometric projection and compose standard components of different streams

COURSE MATRIX

Course Outcome (CO's)	Program Outcomes (PO's)											
	Domain Specific (PSO)					Domain Independent (PO)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		1	2								
CO2		3			2	2			2		1	1
CO3			2	1	2			2		1	1	1
CO4				3	2	1			1	1		
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B.TECH.SEMESTER–I (EC/CE/IT)

SUBJECT: SOFTWARE WORKSHOP

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
0	0	2	2	1	-	-	50*	-	50

Reference Code ESC202

*TW Marks includes Viva based on TW

COURSE OBJECTIVES

Creating sound back ground for use of Linux operating system helps the students for their future endeavor in the study of programming subjects and Project work. By offering this course, the department encourages the student to use Open source software such as Linux OS, Scilab and Latex. The laboratory covers fundamentals and high-level architecture of Linux operating system. The laboratory offers hands-on experience for Linux Installation, various commands and driver installation. Hands on experience for writing pseudo code for given problem and writing shell scripts are inclusive in this study. The broad objective of this course is to understand the basic concepts of Linux OS and study the usages of Linux commands. Also to understand the basics of C programming language

DETAILED SYLLABUS

[1] OPERATINGSYSTEMBASICS

Introduction to Operating System and Linux Architecture

[2] SOFTWAREINSTALLATION

Installation of open source/freeware software using package manager for programming/simulation.

[3] SHELLCOMMANDS

Linux usage, commands & shell scripting. Command structure and general purpose utility

[4] FILE HANDLING

basic of file handling. The file system, Handling ordinary files, File attributes and permission, file system details

[5] SHELLSCRIPTING

Basic Shell commands, Looping and Branching,

[6] SHELLUTILITIES

Find command and shell, simple filters, advance filters.

[7] EDITORS

VI editor for basic text editing, LATEX for scientific documents and report writing.

TEXT / REFERENCE BOOKS

1) Unix : Concepts and Applications, Sumitabha Das, 4th Edition, Tata McGraw Hill

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. Store files, surf internet, carry out documentation work using Linux OS and Use Linux commands to perform file management and data security tasks.
CO2. Create articles and reports having multiple chapters and references using Latex typesetting.
CO3. Install open source software such as drivers of Hardware devices as well as other application like Scilab for mathematical computation.
CO4. Develop pseudo code for given problem statements.
CO5. Develop various shell scripts for any given problem statements along with use of filters.

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2				3			3		1		3
CO2	2	2			3					1		
CO3					3	3				3		
CO4	2				3			3		1		3
CO5	2	2			3					1		
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER II (EC/CE/IT)

SUBJECT: MATHEMATICS-II

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
3	1	0	4	4	60	40	0	0	100

Reference Code BSC301

COURSE OBJECTIVES

The course is designed to understand and apply the basic concepts of first order and higher order differential equations, numerical methods, Laplace transforms, multiple integrals, and vector integral calculus. It covers solving the initial value problems to address engineering applications.

DETAILED SYLLABUS

[1] FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS AND INTRODUCTION TO HIGHER ORDER DIFFERENTIAL EQUATIONS

Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type, second order linear differential equations with variable coefficients, Method of variation of parameters, Cauchy-Euler equation.

[2] NUMERICAL METHODS

Ordinary differential equations: Taylor's series, Euler and modified Euler's methods, Runge-Kutta method of fourth order for solving first order equations, Solution of algebraic and transcendental equations: Newton Raphson's Method, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.

[3] MULTIVARIABLE CALCULUS (INTEGRATION)

Multiple Integration: Double integrals (Cartesian), Change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Triple integrals (Cartesian), Scalar line integrals,Vector line integrals, Scalar surface integrals, Vector surface integrals, Theorems of Green, Gauss and Stoke's.

[4] LAPLACE TRANSFORM

Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions, Finding inverse Laplace transform by different methods, Convolution theorem. Evaluation of integrals by Laplace transform, Solving ODE by Laplace Transform method.

TEXT / REFERENCE BOOKS

1) B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 40th Edition, 2007.

2) G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Ed.,Pearson, 2002.

3) Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

4) W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edn., Wiley India, 2009.

5) S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
6) E. A. Coddington, An Intro. to Ordinary Differential Equations, Prentice Hall India, 1995.
7) J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc- Graw Hill, 2004.
8) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

COURSE OUTCOMES

At the end of the course,students should be able to

CO1. Understand effective mathematical tools for the solution of first order ordinary differential equations.
CO2. Extend their learning of differential calculus: Methods to solve and analyse higher order differential equations.
CO3. Analyse and evaluate the accuracy of common numerical methods such as Newton's Raphson's, False position and so on.
CO4. Derive numerical methods for integration and the solution of linear and nonlinear differential equations.
CO5. Evaluate and Differentiate multivariate functions in all directions such as differentiation, integration and solve applied problems involving vector-valued functions.
CO6. Investigate ordinary differential equations using Laplace transform.

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2				3			3		1		3
CO2	2	2			3					1		
CO3					3	3				3		
CO4	2				3			3		1		3
CO5	2	2			3					1		
CO6					3	3				3		
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – II (EC/CE/IT)

SUBJECT: PROGRAMMING FOR PROBLEM SOLVING - II

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
4	0	3	7	5.5	60	40	50*	-	150

Reference Code ESC201

*TW Marks includes Viva based on TW

COURSE OBJECTIVES

To make students familiar with the difference between object-oriented programming and procedural programming. In addition, the student should acquire skills for programming using advanced C++ features such as composition of objects, operator overloading, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling, etc.

DETAILED SYLLABUS

[1] BASICS OF C++

Overview, Program structure, keywords, identifiers, constants, data types, symbolic constants, declaration of variables, operators, namespaces, control structures, dynamic memory – C style – malloc(), calloc(), realloc() and free() Vs C++ style - new and delete keywords, reference and pointer

[2] FUNCTIONS IN C++

main function (variations in signature), function prototype, inline functions, call and return by reference, default parameters, function overloading

[3] INTRODUCTION TO OBJECT ORIENTED PROGRAMMING

Procedural Vs Object Oriented Programming, Principles of OOP, Benefits and applications of OOP

[4] CLASSES AND OBJECTS – ENCAPSULATION AND ABSTRACTION

Introduction, private and public members, Defining member functions, static members, Objects as function arguments and return type, friend functions, const member functions, Constructors and their types, Destructor, Operator overloading, type conversion

[5] INTRODUCTION TO C++ STRING CLASS

[6] INHERITANCE

Introduction, types of inheritance – single, multiple, multilevel, hierarchical, and hybrid inheritance, Protected members, overriding, virtual base class

[7] POLYMORPHISM

Introduction, Pointers and Objects, this pointer, pointer to derived classes, virtual and pure virtual functions, dynamic binding

[8] INPUT/OUTPUT

Introduction to streams, standard I/O stream objects, stream classes, unformatted and formatted I/O, manipulators

[9] EXCEPTION HANDLING

Basics of exception handling, try-catch-throw, rethrowing exceptions, user defined exceptions

[10] TEMPLATES

Basics of class templates and function templates

TEXT / REFERENCE BOOKS

1) Object-Oriented programming with C++, Seventh Ed., by E Balagurusamy, TMH publication
2) The C++ Programming Language, Fourth Ed., by Bjarne Stroustrup, Addison-Wesley publication
3) Object-Oriented Programming in C++, Fourth Edition, by Robert Lafore, SAMS publication
4) Accelerated C++: Practical Programming by Example, First Edition, by Andrew Koenig and Barbara E. Moo, Addison-Wesley publication
5) C++ Black Book, First edition, by Steven Holzner, Paraglyph Press
6) C++: The Complete Reference, Fourth Edition, by Herbert Schildt, McGraw Hill Education

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. Design and analyse the programming applications using object-oriented programming paradigm, focusing on the definition and use of classes along with the fundamentals of object-oriented design.
CO2. Define the solutions for real-time problems using Object Oriented concepts.
CO3. Apply advanced features of C++ specifically stream I/O, templates and operator overloading which influences the performance of programs.
CO4. Design object oriented software solutions for small systems involving multiple classes and objects. Implement solutions in C++.
CO5. Test and debug C++ implementations. Apply generic programming for real time applications
CO6. Explain the benefits of object oriented design and understand when it is an appropriate methodology to use.
CO7. Classify procedural, non-procedural and object oriented programming language.
CO8. Analyse the process of handling errors or exceptions.
CO9. Apply advanced features of C++ specifically Inheritance, and polymorphism which exhibit the opportunity to reuse the code functionality and fast execution time

COURSE MATRIX

Course Outcome (CO's)	Program Outcomes (PO's)											
	Domain Specific (PSO)					Domain Independent (PO)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	3			1			1	2
CO2	3	3	3	2	3			1			1	2
CO3	3	3	3	2	3			1			1	2
CO4	3	3	3	2	3	1		1			1	2
CO5	3	3	3	2	3			1			1	2
CO6	3	2	3	2	3		2	1			1	2
CO7	3	1	3	2	3			1			1	2
CO8	3	3	1	2	3			1			1	2
CO9	3	3	3	2	3			1			1	2
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER II (EC/CE/IT)
SUBJECT: PHYSICS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
3	1	2	6	5	60	40	50*	-	150

Reference Code BSC101

*TW Marks includes Viva based on TW

COURSE OBJECTIVES

The course provides the in-depth understanding of the concepts associated with Semiconductor, Optoelectronics, Communication, Oscillators and Basic Switching devices. It also serves the basic design ideas around rectification and amplification. The course focuses on modulation techniques and its components. The overall aspects of basic physics application in electronics with practical approach are covered in this subject. This course also includes the analog modulation & demodulation techniques (AM, FM and PM) and digital modulation (ASK, FSK and PSK).

DETAILED SYLLABUS

[1] SEMICONDUCTORS

Intrinsic and extrinsic semiconductors, Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction, Metal-semiconductor junction (Ohmic and Schottky), Semiconductor materials of interest for optoelectronic & other devices.

[2] DIODE

Introduction to P-N junction Diode and V-I characteristics, Half wave and Full-wave rectifiers, capacitor filter. Zener diode and its characteristics, Zener diode as voltage regulator, Special purpose diodes.

[3] LIGHT-SEMICONDUCTOR INTERACTION

Radiative transitions and optical absorption, LED and LASER, Photo detectors.

[4] ACTIVE COMPONENTS AND APPLICATIONS

BJT:Structure and input-output characteristics of a BJT, The Unbiased Transistor, Transistor Currents , Biased Transistor, a single stage voltage divider biasing, Emitter Bias, The CE Connections, The Base Curve, Collector curve, Transistor approximation Variation in current Gain, The Load Line, The Operating point, Recognizing Saturation, BJT as a switch & Amplifiers, LED Drivers.

[5] OSCILLATORS

General form of oscillator, Sinusoidal oscillator, phase shift oscillator, Crystal Oscillator.

[6] MOSFET

MOS physics and mode of operations, nFET current-voltage relationship, MOS pass characteristics and CMOS inverter, Dynamic RAM (DRAM) 1T bit-cell.

[7] FIBER OPTICS

Fiber Optics and Optoelectronics, Historical Developments, A Fiber-Optic Communication System, Advantages of Fiber-Optic Systems, Ray Propagation in Optical Fibers, Fundamental Laws of Optics, Ray Propagation in Step-Index Fibers, Ray Propagation in Graded-Index Fibers

[8] COMMUNICATION SYSTEMS

Communication system components, Analog modulation- AM, FM,PM. Digital modulation- ASK, FSK, PSK

TEXT / REFERENCE BOOKS

1) Electronics Principles, Albert Paul Malvino, 6thEdition, Tata McGraw Hill
2) David Griffiths, Introduction to Electrodynamics
3) S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley (2008).
4) R.P Khare, Fiber Optics and Optoelectronics, Oxford University Press
5) Sanjay Sharma, Communication Systems: Analog and Digital
6) Halliday and Resnick, Physics
7) W. Saslow, Electricity, magnetism and light
8) Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc. (1995).
9) B. E. A. Saleh and M. C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc., (2007).
10) Yariv and P. Yeh, Photonics: Optical Electronics in Modern Communications, Oxford University Press, New York (2007).
11) P. Bhattacharya, Semiconductor Optoelectronic Devices, Prentice Hall of India (1997)
12) Behrouz A. Forouzan, Data communication and networking.
13) B. P lathi, Modern Digital and Analog Communication Systems, Third edition.

COURSE OUTCOMES

At the end of the course,students should be able to

CO1. Illustrate intrinsic and extrinsic semiconductors and their applications. Demonstrate carrier generation and recombination.
CO2. Design half wave, full wave rectifier circuit and voltage regulator circuit using Zener diode, PN diode and NPN, PNP transistors.
CO3. Analyze Transistor input output characteristics, biasing circuits, Compute load line and calculate the operating point. Identify the working region of the transistor circuit. Implement a transistor as a switch.
CO4. Analyze structure of the oscillator. Discriminate Sinusoidal oscillator, Phase shift oscillator and Crystal oscillator.
CO5. Assess the performance & characteristics of Opto-electronic semiconductor devices like LED, LASER, Photo detectors
CO6. Devising the ray optics propagation in step index and graded index fiber. Synthesizing the use of optoelectronics in fiber optic communications.
CO7. Relating the requirement of modulation. Comparison of analog and digital modulation techniques with the needs of system components. Illustrating and relating AM, FM, PM, ASK, FSK, PSK modulation techniques with their diagrams.
CO8. Distinguish the behaviour of NMOS, PMOS, CMOS, DRAM, for their VI characteristics

and review those with effects of doping, temperature and regulation.

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	1	1	-							
CO2	3	3	3	-	1							
CO3	3	3	2	2	-							
CO4	2	3	2	-	1							
CO5	2	2	2	-	1							
CO6	2	2	3	2	-							
CO7	2	3	1	1	-							
CO8	2	2	2	2	-							
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER II (EC/CE/IT)
SUBJECT: HARDWAREWORKSHOP

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
0	0	4	4	2	-	-	100*	-	100

Reference Code ESC202

*TW Marks includes Viva based on TW

COURSE OBJECTIVES

Operating the test and measuring electronic instruments is essential in the entire study of electronics and communication branch. Study of circuit simulators, PCB design software, Raspberry pi and Arduino boards help student in creating foundation for development of successful projects in higher semesters. Course covers study and hands on test and measuring instruments, operation of Raspberry pi and Arduino boards, circuit implementation on bread boar and simulators, Linux operating system and website development.

DETAILED SYLLABUS

[1] ELECTRONIC COMPONENTS

Digital Multi-meter, Power Supply, Function Generator, Cathode Ray Oscilloscope, Digital Oscilloscope, Measurement of Phase Difference in single phase circuit, Various Electrical and Electronics component like LED, LDR, Photo-diode, MOSFET, MCB and Relay.

[2] COMPUTER HARDWARE

Introduction to a personal computer and its basic peripherals, installation of Operating System Software and the required device drivers. Students are suggested to perform similar tasks on the Laptop scenario wherever possible.

[3] PERIPHERALS

Programming of Computer Ports & Interfacing of Electronic Components, Cables and Connectors like RJ45, RS232 and CRO probe.

[4] INTERNET

Introduction to Internet & World Wide Web modules, Making a PC Internet ready: Introduction to Internet and TCP/IP, Ethernet Connection, WiFi connection, configure TCP/IP (IP, Gateway, DNS, and Proxy), and use of ping command, Information sharing and data transfer over Local Area Network and Internet.

[5] WEB INFRASTRUCTURE

Basic Components of Web Sites, Front end & back end tools and technology. HTML & CSS, Developing, Configuring and deploying a website.

[6] IOT BOARDS AND CIRCUIT SIMULATION

Introduction to IOT boards like Arduino, Raspberry Pie etc. Interfacing, Circuit designing and PCB designing.

[7] MINIPROJECT

Student will develop a mini project related to the topics listed above.

TEXT / REFERENCE BOOKS

1) Electronic Components and Materials Principles, Dr.MadhuriA Joshi, 2nd Edition, Shroff Publishers & Distributors PVT. LTD.

2) A Textbook of Computer Hardware and Networking, JyotikaDeshmukh, D J Publications

3) Learning Web Design, Jennifer Robbins, 4th edition, O'Reilly Media

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. Operate Power supplies, Function Generators, Cathode Ray Oscilloscope and Digital Storage Oscilloscope to provide dc bias and observe the circuit parameters. Confidently

CO2. Implement given circuit on NI-Multisim circuit simulator, on bread board and using Proteous PCB designing software prepare physical PCB for hardware project (fixed DC power supply , water level detector)

CO3. Understand the usage of BNC, USB, RS232, RJ45, VGA, and HDMI connectors and make CRO probe and LAN cable using necessary wires and connectors

CO4. Install Linux OS and the required drivers, and configure the network connection to transfer a file over LAN or Internet and Operate Arduino and Raspberry Pi IoT boards.

CO5. Understand the basic components of a websites and develop a website using HTML and CSS.

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3				3	1	1	1	1	1		2
CO2	2				3	1	1	1	1	1		1
CO3	3	2	3		3	1	1	1	1	1		2
CO4	2		3		3	1	1	1	1	1		1
CO5	3	2	3		3	1	1	1	1	1		2
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B.TECH. SEMESTER II (EC/CE/IT)

SUBJECT: ENGLISH

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
2	0	2	4	3	40	-	50*	-	90

Reference Code HSMC201

*TW Marks includes Viva based on TW

COURSE OBJECTIVES

This course will help students of engineering develop their Linguistic skills. Beginning with Vocabulary Building the course proceeds towards the Sentence Formation and Paragraph Formation which will help them to enhance their Writing skills and Communicative skills as well. Understanding the common errors, and nature and style of writing will mould students' Writing competency for their professional growth in the world of competition. Understanding Paralinguistic features like stress, intonation, rhythm and so on will improve their Speaking skills to be efficient and confident for academic and professional purposes.

DETAILED SYLLABUS

[1] VOCABULARY BUILDING

The concept of Word Formation, Root words from foreign languages and their use in English, Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives, Synonyms, antonyms, and standard abbreviations.

[2] BASIC WRITING SKILLS

Sentence Structures, Use of phrases and clauses in sentences, Importance of proper punctuation, Creating coherence, Organizing principles of paragraphs in documents, Techniques for writing precisely

[3] IDENTIFYING COMMON ERRORS IN WRITING

Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Clichés

[4] NATURE AND STYLE OF SENSIBLE WRITING

Describing, Defining, Classifying, Providing examples or evidence, Writing introduction and conclusion

[5] WRITING PRACTICES

Comprehension, Précis Writing, Essay Writing

[6] ORAL COMMUNICATION

(This unit involves interactive practice sessions in Language Lab) Listening Comprehension, Pronunciation, Intonation, Stress and Rhythm, Common, Everyday Situations: Conversations and Dialogues, Communication at Workplace, Interviews, Formal Presentations

TEXT / REFERENCE BOOKS

1) Practical English Usage. Michael Swan. OUP. 1995.
2) Remedial English Grammar. F.T. Wood. Macmillan.2007
3) On Writing Well. William Zinsser. Harper Resource Book. 2001
4) Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
5) Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
6) Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. Understand the vocabulary and their root forms to enhance vocabulary level
CO2. Enhance their Writing in effective way
CO3. Rectify common errors in their Speaking and Writing
CO4. Develop efficiency in writing
CO5. Be competent at Public Speaking and Interviews
CO6. Acquire Proficiency in all four skills of Language

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3				3	1	1	1	1	1		2
CO2	2				3	1	1	1	1	1		1
CO3	3	2	3		3	1	1	1	1	1		2
CO4	2		3		3	1	1	1	1	1		1
CO5	3	2	3		3	1	1	1	1	1		2
CO6	2		3		3	1	1	1	1	1		1
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – II (EC/CE/IT)
SUBJECT: ENVIRONMENTAL STUDIES

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
2	0	0	2	0	40	--	--	--	40

Reference Code MC-II

COURSE OBJECTIVES

Identify and analyze the current issues related to environment and propose appropriate economical solutions for sustainable developmental activities.

DETAILED SYLLABUS

[1] THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Definition, scope and importance & Need for public awareness

[2] NATURAL RESOURCES

Renewable and non-renewable resource: Natural resources and associated problems**,** Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams, and their effects on forests and tribal people ,Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams benefit and problems, Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies, Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies, Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies, Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification, Role of an individual in conservation of natural resources. Equitable use of resources of sustainable lifestyles

[3] ECOSYSTEMS

Concept of an ecosystem, Structure and function of an ecosystem, producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids, Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem and Aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries)

[4] BIODIVERSITY AND ITS CONSERVATION

Introduction definition: Genetic, species and ecosystem diversity,Bio-geographical classification of India, Value of biodiversity: Consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, national and local levels, India as a mega-diversity nation, Hot-spots of biodiversity, Threats to biodiversity, habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity

[5] ENVIRONMENTAL POLLUTION

Definition, Causes, effects and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste management, causes, effects and control measures of urban and industrial wastes, Role of an individual in prevention of pollution, Pollution case studies, Disaster management: floods, earthquake, cyclone and landslides

[6] SOCIAL ISSUES AND THE ENVIRONMENT

From unsustainable to sustainable development, Urban problems related to energy,Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people: its problems and concerns. Case studies, Environmental ethics: Issues and possible solutions, Climate change: Global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Case studies, Wasteland reclamation, Consumerism and waste products, Environment Protection Act: Air (Prevention and Control of Pollution) Act, Water (Prevention &Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, Public awareness

[7] HUMAN POPULATION AND THE ENVIRONMENT

Population growth, variation among nations, population explosion, Family Welfare Program, environment and human health, human rights, Value education, HIV/AIDS, Women and Child Welfare, Role of Information Technology in Environmental and human health, Case studies

[8] FIELD WORK

Visit to a local area to document environmental assets (river/forest/grassland/hill/mountain), Visit to a local polluted site - Urban/Rural/Industrial/Agricultural, Study of common plants, insects, birds, Study of simple ecosystems – pond, river, hill, slopes etc.

TEXT / REFERENCE BOOKS

1) ErachBharucha Textbook of Environmental Studies; Second Edition, Universities Press: Hyderabad, 2013.

2) Rajagopalan, R. Environmental Studies; Oxford University Press: India, 2015.

3) Varandani, N. S. Basics of Environmental studies; Lambert Academic Publishing: Germany, 2013.

4) Rao, C. S. Environmental Pollution Control Engineering; Wiley publishers: New Delhi, 2006.

5) Clark, R. S. Marine Pollution; Clanderson Press Oxford: Bath, 2001.

6) Cunningham, W.P.; Cooper; Gorhani, T. H. E.; Hepworth, M.T., Environmental Encyclopedia; Jaico Publ. House: Mumbai, 2001.

7) De, A. K. Environmental Chemistry; Wiley Eastern: New Delhi, 2006.

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

CO2. Identify, formulate, review research literature, and analyse complex engineering problems

reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

CO3. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

CO4. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions for complex problems

CO5. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

CO6. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

CO7. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3				3	1	1	1	1	1		2
CO2	2				3	1	1	1	1	1		1
CO3	3	2	3		3	1	1	1	1	1		2
CO4	2		3		3	1	1	1	1	1		1
CO5	3	2	3		3	1	1	1	1	1		2
CO6	2		3		3	1	1	1	1	1		1
CO7	2		3		3	1	1	1	1	1		1
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – III (EC)
SUBJECT: APPLIED MATHEMATICS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	0	4	4	60	40	-	-	100

COURSE OBJECTIVES

The course is designed to provide comprehensive knowledge of complex numbers, linear differential equations of higher order, and partial differential equations for solving the initial value problems. It focuses on in-depth understanding of concepts associated with probability, discrete and continuous probability distributions, and relationship between independent variable and dependent variable. This course is extensively useful in engineering and its applications.

DETAILED SYLLABUS

[1] PROBABILITY AND STATISTICAL METHODS

Probability, permutation, combination, total probability, conditional probability, Baye's theorem, binomial distribution, Poisson distribution, normal distribution, uniform distribution, calculation of errors: probable error and standard error, coefficient of correlation, rank correlation, lines of regression.

[2] COMPLEX NUMBERS

Definition, elementary operations, properties, Argand diagram, modulus, amplitude, De-Moivre's theorem, expand $\sin n\theta$, $\cos n\theta$ and $\tan n\theta$ in powers of $\sin\theta$, $\cos\theta$, and $\tan\theta$ respectively, expand $sin^m\theta$, $cos^m\theta$, $or sin^m\theta \cdot cos^m\theta$ in a series of sines or cosines of multiples of θ.

[3] LINEAR DIFFERENTIAL EQUATIONS & IT'S APPLICATION

Linear differential equations of higher order with constant coefficients, equations reducible to linear equations with constant coefficients, simultaneous linear equations with constant coefficients, application to engineering problems: electric circuits.

[4] PARTIAL DIFFERENTIAL EQUATIONS

Introduction, formation, equations solvable by direct integration, solution of linear equations of first order, and non-linear equations of first order, Charpit's method, homogenous linear equations with constant coefficient, rules to find the complementary function and the particular integral, non-homogenous linear equations with constant coefficients.

TEXT / REFERENCE BOOKS

1) B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 40th Edition,2007.
2) Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3) Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint,2010.
4) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint,2010.

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. Understand and represent the complex numbers in Argand diagram.
CO2. Analyse and understand the basic concepts and terminologies of probability and probability distribution functions.
CO3. Evaluate and examine the linear regression between two variables.
CO4. Extend their learning of differential calculus: methods to solve and analyse the higher order differential equations.
CO5. Model physical processes using ordinary and partial differential equations and characterize the solution of initial value problem.
CO6. Investigate and apply the ordinary differential equations in engineering problems.

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3				3	1	1	1	1	1		2
CO2	2				3	1	1	1	1	1		1
CO3	3	2	3		3	1	1	1	1	1		2
CO4	2		3		3	1	1	1	1	1		1
CO5	3	2	3		3	1	1	1	1	1		2
CO6	2		3		3	1	1	1	1	1		1
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – III(EC)

SUBJECT: LINEAR ELECTRONICS – I

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

COURSE OBJECTIVES

Devices such as diodes, transistors, FETs, MOSFETs are the building blocks of electronic circuits. Electronic devices have become an important part of our day-to-day life. Consumer electronics products such as refrigerators, washing machines, gadgets like mobile phones, laptops, calculators are based on these devices(either discrete or in a chip form). Similarly industrial electronics, industrial automation and motion control, medical applications etc. are not possible without these electronic devices. So clear understanding of these devices is necessary. In this subject the physics of these devices, characteristics of these devices and the basic applications are covered. The objective of this course is to offer a detail understanding of the basic physical structure, principles of operation, electrical characteristics and circuit models of semiconductor devices like, various diodes, BJT, FET and fabrication of integrated-circuits.

DETAILED SYLLABUS

[1] SEMICONDUCTOR DIODE

Mobility and conductivity, Mass-action law, Charge densities in a semiconductor, Generation and recombination of charges, Diffusion, The continuity equation, Injected minority carrier charge, Potential variation within graded semiconductor, The Temperature Dependence of the V/I Characteristics, Diode Resistance, Space- Charge, or Transition Capacitance CT, Charge controlled Description, Diffusion Capacitance, Junction Diode Switching Times, Breakdown Diodes, Tunnel Diodes, Sampling gate.

[2] BIPOLAR JUNCTION TRANSISTORS

Introduction to Transistor, Transistor Switching Times, ,Transistor Hybrid Model, The h Parameters, Analysis of Transistor Amplifier Circuit Using h Parameters, Conversion Formula For The Parameters of the Three Transistor Configurations, The Hybrid Pi Common Emitter Transistor Model at high Frequency, Hybrid Pi Conductance's, Hybrid Pi Capacitances, Step Response of an Amplifier, Bandpass of Cascaded Stages.

[3] TRANSISTOR BIASING & THERMAL STABILIZATON

The Operating Point of a BJT, Bias Stability, Self-Bias or Emitter Bias, Stabilization against Variations in Ico, VBE and β, Bias compensation, biasing technique for linear integrated circuits, Thermistor &Sensistor Compensation

[4] FIELD EFFECT TRANSISTOR

Construction & characteristics of JFETs, Transfer characteristics, Depletion type MOSFET, MOS Device structure, physical operation, VI characteristics, MOSFET circuits at DC, MOSFET as an Amplifier and switch, Biasing, Small signal operation and Models, Single stage MOS amplifiers Common Gate, Common Source, Common Drain

[5] FREQUENCY RESPONSE OF AMPLIFIERS

MOSFET internal capacitance and high frequency Model, Frequency Response of CS amplifier, MOSFET Current mirror circuits, Miller's theorem, CMOS Implementation of CS amplifier, Cascode amplifiers, CS with source degeneration

TEXT / REFERENCE BOOKS

1) Integrated Electronics, Jacob Millman& Christos C. Halkias, 1st Edition, Tata McGraw Hill

2) Electronic Devices &Circuit Theory, Robert L. Boylstead&LouisNashelsky, 8th Edition, Prentice Hall of India.

3) Integrated Circuits, K. R. Botkar, 9th Edition, Khanna Publications

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. Student can compute the maximum temperature; a reverse biased diode can tolerate for a given reverse bias voltage and wattage capacity of the diode

CO2. Student can design a voltage regulator circuit for a given output voltage and load current

CO3. Student can compute transistor amplifier's voltage gain, current gain, input impedance, and output impedance using h parameters values of a given transistor.

CO4. Student can design a self-bias circuit for a given spread in Ico, VBE and β of a transistor for a given maximum variation in operating point.

CO5. Student can design biasing circuits for FETs.

CO6. Student can calculate voltage gain, input resistance, and output resistance for a given MOS amplifier circuit.

CO7. Student can calculate higher cut off frequency and lower cut off frequency in order to obtain the bandwidth of amplifier.

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	1	-	-	-	-	1	-	1	-	-
CO2	3	1	3	-	-	-	-	1	-	1	-	-
CO3	3	3	-	-	-	-	-	1	-	1	-	-
CO4	3	2	3	-	-	-	-	1	-	1	-	-
CO5	3	2	3	-	-	-	-	1	-	1	-	-
CO6	3	2	3	1	-	-	-	1	-	1	-	-
CO7	3	2	3	-	-	-	-	1	-	1	-	-
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – III (EC)
SUBJECT: ELECTRONICS INSTRUMENTATION

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	2	5	5	60	40	25	25	150

COURSE OBJECTIVES

Troubleshooting of electronic circuits is an essential requirement of service sector industry. This course will develop skills for measurement of electrical parameters of various systems using measuring instruments. Students will analyse construction, operation & design of Voltmeters, Ohmmeters, Ammeters, Power factor meter, Energy meter, Instrument transformer, CRO, DSO, transducers for temperature, pressure, level and flow measurement, P, PI PD and PID controller. Moreover, they can design and analysis fundamental method for measurement of resistance, inductance, capacitance and frequency. The objective of this course is to offer profound understanding of operating principles, working and applications of various instruments for measurement of electrical parameters with reference to electrical & electronic systems.

DETAILED SYLLABUS

[1] DIRECT-CURRENT INDICATING INSTRUMENTS
Suspension Galvanometer, Torque and Deflection of the Galvanometer, Permanent-Magnet Moving Coil Mechanism, DC Ammeters, DC Voltmeters, Voltmeter Sensitivity, Voltmeter-Ammeter Method of Measuring Resistance, Series-Type Ohmmeter Shunt-Type Ohmmeter, Multimeter or VOM, Calibration of DC Instruments, Alternating-Current Indicating Instruments, Thermo Instruments, Electrodynamometers in Power Measurements Watt-hour Meter, Power-Factor Meter, Instrument Transformers.

[2] BRIDGES AND THEIR APPLICATION
Introduction, Wheatstone Bridge, Kelvin Bridge, Guarded Wheatstone Bridge, AC Bridges and their Application, Comparison Bridges, Maxwell Bridge, Hay Bridge, Schering Bridge, Unbalance Conditions, Wien Bridge, Wagner Ground Connection, Potentiometer.

[3] ELECTRONIC INSTRUMENTS FOR MEASURING BASIC PARAMETERS
Amplified DC Meter, AC Voltmeter using Rectifiers, True RMS- Responding Voltmeter, Electronic Multimeter, Considerations in Choosing an Analog Voltmeter, Differential Voltmeters, Digital Voltmeters, Component Measuring Instruments, Q Meter, Vector Impedance Meter, Vector Voltmeter, RF Power and Voltage Measurement.

[4] OSCILLOSCOPES
Introduction, Oscilloscope, Block Diagram, Cathode Ray Tube, CRT Circuits, Vertical Deflection System, Delay Line, Multiple Trace, Horizontal Deflection System, Oscilloscope Probes and Transducers, Oscilloscope Techniques, Special Oscilloscopes.

[5] CONTROL ACTIONS AND CONTROLLERS
Control Actions like P, PI, PD & PID, Electronic Controllers, Characteristics of Different types of Control Valves.

[6] INDUSTRIAL INSTRUMENTATION

Measurement Schemes for Temperature, Pressure, Level & Flow with their Industrial Applications, Distributed Control System (DCS), and Programmable Logic Controller.

TEXT / REFERENCE BOOKS

1) Electrical & Electronic Measurement & Measuring Instruments, A. K. Sawhney, 17th Edition, Dhanpat Rai & Co.

2) Electronic Instrumentation and Measurement Technique, Wlliam D. Cooper & Albert D. Helfrick, 5thEdition , Prentice Hall of India

3) Electronics Measurement & Instrumentation, R. K. Rajput, 1st Edition, Prentice Hall of India

4) Electronic Instrumentation, H. S. Kalsi, 2nd Edition, Tata McGraw Hill

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. Design & analyse DC Ammeter, DC Voltmeter, Series type ohmmeter and Shunt type ohmmeter for given specification.

CO2. Analyse construction & operation of instrument for measuring voltage, current, power factor and energy.

CO3. Design & analyse Wheatstone bridge and kelvin's double bridges for measurement of low & medium value of resistance.

CO4. Design & analyse AC bridges for measurement of primary and secondary parameters of components.

CO5. Compare and select amplified DC meter, AC voltmeter using rectifier, True rms responding voltmeter and electronic Multimeter for improving accuracy of measurement.

CO6. Illustrate the operation of various oscilloscope for measuring voltage, frequency and phase.

CO7. Describe the working principle, of level, flow pressure and temperature measurement transducer.

CO8. Compare P, PI, PD & PID, PLC & DCS and design ladder logic for PLC controller

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	2	3				3	1		1
CO2	3	1										1
CO3	3	3	3	2	3				3	1		1
CO4	3	3	3	2					3	1		1
CO5	3	1										1
CO6	3	3			3							1
CO7	3	1	1									1
CO8	3	2	3				1					1
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – III (EC/IC)
SUBJECT: NETWORK ANALYSIS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	2	5	5	60	40	25	25	150

COURSE OBJECTIVES

This course is designed to provide a complete overview of electric circuit analysis used in electronics engineering. The students can analyze electrical networks by understanding application of basic laws, theorems and transforms. The concept of this subject is useful to the students for understanding the concept of stability of the circuit and its frequency domain analysis. The students can inculcate capability to analyze electrical networks by understanding basic laws, theorems and transforms.

DETAILED SYLLABUS

[1] DEVELOPMENT OF THE CIRCUIT CONCEPT
Introduction, Charge and Energy, The Relationship of Field and Circuit Concepts, The Capacitance Parameter, The Inductance Parameter, The Resistance Parameter, Units and scaling, Approximation of a Physical System as a circuit.

[2] CONVENTIONS FOR DESCRIBING NETWORKS
Reference Directions for Current and Voltage, Active Element Conventions, the Dot Convention for Coupled Circuits, Topological Description of Networks.

[3] NETWORK EQUATIONS
Kirchhoff's Laws, The Number of Network Equations, Source Transformations, Examples of the Formulation of Network Equations Loop Variable Analysis, Node Variable Analysis, Determinants: Minors and the Gauss Method, Duality.

[4] FIRST ORDER DIFFERENTIAL EQUATIONS
General and particular solutions, Time constants, the integrating factor, More Complicated Networks.

[5] INITIAL CONDITIONS IN NETWORKS
Why Study Initial Conditions? Initial Conditions in Elements, Geometrical Interpretation of Derivatives, A Procedure for Evaluating Initial Conditions, Initial State of a Network.

[6] DIFFERENTIAL EQUATIONS
Second order equations, Internal Excitation, Higher order equations ;Internal Excitation, Networks Excited by External Energy Sources, Response as related to the s-Plane Location of Roots, General Solutions in terms of S,Q and ωn.

[7] THE LAPLACE TRANSFORMATION
Introduction, The Laplace Transformation, Some Basic Theorems for the Laplace Transformation, Examples of the solution of problems with the Laplace Transformation, Partial Fraction Expansion, Heaviside's Expansion Theorem, Examples of Solutions by the Laplace Transformation.

[8] TRANSFORMS OF SPECIAL SIGNAL WAVEFORMS

The Shifted Unit Step Function, The Ramp and impulse Functions, Waveform Synthesis, The Initial and Final Value of f (t) from F(s), The Convolution Integral, Convolution as Summation.

[9] IMPEDANCE FUNCTIONS AND NETWORK THEOREMS

The concept of Complex Frequency, Transform Impedance and Transform Circuits, Series and Parallel Combinations of Elements, Superposition and Reciprocity, Thevenin's Theorem and Norton's Theorem.

[10] NETWORK FUNCTIONS: POLES AND ZEROS

Terminal Pairs or Ports, Network Functions for One Port and Two port. The Calculation of Network Function (1) Ladder Networks (2) General Networks, Poles and Zeros of Network Functions, Restrictions on Pole and Zero Locations for Driving-Point Functions, Restrictions on Pole and Zero locations for Transfer Functions, Time-domain Behaviour from the Pole & zero plot, Introduction to band pass, low pass, high pass and band reject filters.

[11] TWO PORT NETWORKS

Relationship of two port variables, short circuit admittance parameters, the open circuit impedance parameters, transmission parameters, the hybrid parameters, relationship between parameter sets, parallel connection of two port networks.

TEXT / REFERENCE BOOKS

1) Network Analysis, M.E. Van Valkenburg, 3rd Edition, Prentice Hall of India Private Limited
2) Network Analysis and Synthesis, U. A. Patel, 3rd Edition, Mahajan Publication House.
3) Circuit Theory - Analysis & Synthesis, A. Chakraborty, 1st Edition, Dhanpatrai publication

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. Apply KVL, KCL and Ohm's Laws to complex RLC networks to find response in any part of the network in form of node voltages and loop currents for given excitation
CO2. Compute response of the network for given excitation using classical (solving differential equations) as well as transform methods
CO3. Understand behaviour of mutually coupled coils and determine direction of induced current using dot convention
CO4. Design RLC series network to generate response with specific frequency for given step input.
CO5. Use Laplace transform method to find out response of the network to given waveforms
CO6. Apply Thevenin's and Norton's theorem to complex RLC networks in order to simplify the network and determine load voltage / current.
CO7. Find out two port parameters for given passive network and determine existence of reciprocity and symmetry of the network and also find out over all parameters for series or cascade connected individual networks.
CO8. Design stable electrical network with the help of poles and zeros.

COURSE MATRIX

Course Outcome (CO's)	Program Outcomes (PO's)											
	Domain Specific (PSO)					Domain Independent (PO)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2					2					2
CO2	3	2								1		
CO3	1	3					1					2
CO4	3	2						2		1		
CO5	3	3										1
CO6	2	2	3	2			3					
CO7	1	3						1		3		
CO8	3	2	2		3							3
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – III (EC/IC)
SUBJECT: DIGITAL ELECTRONICS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	2	6	5	60	40	25	25	150

COURSE OBJECTIVES

The objective of this course is to provide the concepts associated with the digital logic and circuit design that are basic building blocks of a digital computer system. To apply the laws involved in the Boolean algebra for the simplification of logic functions and minimization of hardware requirements. To design and analyze of combinational and sequential circuits involved in the different digital circuits and systems.

DETAILED SYLLABUS

[1] INTRODUCTION TO LOGIC CIRCUITS
Logic Gates & Networks, Truth Tables, Boolean Algebra, Synthesis using AND, OR and NOT Gates, NAND – NOR Logic Networks, Sum of Products and Product of Sums Forms, Introduction to Verilog.

[2] IMPLEMETATION TECHNOLOGY
Transistor Switches, NMOS & CMOS Logic Gates, Negative Logic Systems, Introduction to PAL, PLA, CPLD & FPGAs, Voltage Levels in Logic Gates, Noise Margin, Dynamic Operation & Power Dissipation in Logic Gates, Fan-in and Fan-out, Transmission Gates, Transistor-Transistor Logic, Emitter - Coupled Logic.

[3] OPTIMIZED IMPLEMENTATION OF LOGIC FUNCTIONS
Karnaugh Map Strategy for Minimization, Minimization of POS Forms, Multiple Output Circuits, Multilevel Synthesis, Analysis of Multilevel Synthesis.

[4] COMBINATIONAL CIRCUITS
Multiplexers, Decoders, Encoders, Code Converters, Arithmetic Comparison Circuits

[5] SEQUENCIAL CIRCUITS
Basic Latch, Gated SR Latch, Gated D Latch, Master Slave & Edge Triggered D Flip-Flops, T & JK Flip Flops, Registers, Counters, Reset Synchronization, BCD- Ring –Johnson Counters.

[6] SYNCHRONOUS SEQUENCIAL CIRCUITS
Basic Design Steps, Mealy State Model, Design of Counter, FSM as an Arbiter Circuit, Analysis of Synchronous Sequential Circuits.

TEXT / REFERENCE BOOKS

1) Fundamentals of Digital Logic with Verilog Design, Stephen Brown &ZvonkoVrenesic, Tata McGraw Hill
2) Digital Logic and Computer Design, Morris Mano, Prentice Hall of India
3) Fundamental of Digital Circuits, Anand Kumar, Prentice Hall of India

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. Analyse and calculate parameters such as noise margin, input –output voltages, fan-out, and speed power product, power dissipation for ECL and TTL logic families. Implement the Boolean functions using CMOS gates.
CO2. Attempt SOP to POS conversion (& vice versa) for implementation of Boolean expressions using AND-OR-INVERT functions as well as universal gates. Also to optimize the Boolean expressions either by applying Boolean algebra or by using minimization techniques as K-Map method and Tabulation Method with "don't care" conditions up to 6 variables.
CO3. Implement various combinational circuits like Multiplexers, Decoders, Encoders, Code Converters, and Arithmetic Comparison Circuits using basic gates. Design and Implement basic combinational blocks of a digital computer using multiplexers, decoder, PLA, PAL and verify the circuit implementations with the help of simulation tool.
CO4. Implement a basic memory element using flip-flops and understand the characteristics of various flip-flop designs and compare them with respect to their timing relationship, hardware requirement and limitations.
CO5. Differentiate Combinational and Sequential circuits. Design and analyse FSMs using sequential circuits. Reduce hardware requirement of FSMs by minimizing state table. Analyse Mealy and Moore machine designs using timing waveforms.
CO6. Construct sequential circuits like asynchronous/ synchronous counters, shift registers and counters for timing signal generation.

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	3	2		1	1					
CO2	3	3	3	2		1	3				1	1
CO3	3	3	2	1		1	3				1	1
CO4	3	3	3	1		1	1				1	1
CO5	3	1	3	3	3	2	3		1		1	
CO6	3	3	3	2	3	1	3		1		2	
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – III (EC)

SUBJECT: MATHEMATICAL COMPUTING LABORATORY

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
0	0	2	2	1	-	-	25	25	50

COURSE OBJECTIVES

Availability of simulation tools help students to visualize mathematical concepts studied as part of in Mathematics subjects and understand its relevance to their core engineering. Considering wide spread use of Python as a programming language, students should have hands on practices on this language at early stage of engineering studies. The objective of the course is to fulfil the requirements by implementing the mathematical formulas and concepts through Python programming.

DETAILED SYLLABUS

[1] INTRODUCTION TO PYTHON
Introduction to syntax & programming environment, Functions, Looping and plotting.

[2] SIMULATIONS
AC analysis of circuit, Power factor calculations, Matrix operations, Linear equations solving using matrix operations, Fourier Series, Limit and Partial derivative solutions and KCL and KVL application on network circuits are included.

TEXT / REFERENCE BOOKS

1) Principles of Electronics, V. K. Mehta &Rohit Mehta, 11th Edition, S. Chand & Company.
2) Electrical & Electronic Measurement & Measuring Instruments, A.K. Sawhney, 17th Edition, Dhanpat Rai Publishing.
3) Digital logic and Computer Design, M. M. Mano, Pearson Education India.

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. Write python codes including necessary features such as looping and functions, run and troubleshoot the same.
CO2. Write python code to implement mathematical formulas and show the results with single and multiple graphs in single and / or multiple plots
CO3. Find circuit parameters and response in the Resistive network using KVL and KCL using python.
CO4. Write python code to execute mathematical formula for derivative and limit of a given function and synthesize the periodic waveform for given Fourier series representation of a signal.

COURSE MATRIX

Course Outcome (CO's)	Program Outcomes (PO's)											
	Domain Specific (PSO)					Domain Independent (PO)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2		1	1	3	1	1	1		1	2	
CO2	2		1	1	3	1	1	1		1	2	
CO3	2	2	1	1	3	1	1	1		1	2	2
CO4	2	2	1	1	3	1	1	1		1	2	2
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – IV (EC)
SUBJECT: SIGNAL& SYSTEMS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	1	2	5	4	40	40	25	25	130

COURSE OBJECTIVES

Signals and systems is a topic that forms an integral part of engineering systems in many diverse areas like communication, image processing, speech processing etc. This subject offer in depth understanding of time domain and frequency domain analysis of continuous time and discrete time signals and systems.

DETAILED SYLLABUS

[1] INTRODUCTION

Signals and systems as seen in everyday life, and in various branches of engineering and science. Energy and power signals, continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability

[2] LINEAR SHIFT- INVARIANT SYSTEMS

Linear shift-invariant (LSI) systems, impulse response and step response, convolution, input-output behaviour with aperiodic convergent inputs. Characterization of causality and stability of linear shift invariant systems, System representation through differential equations and difference equations, Periodic and semi-periodic inputs to an LSI system, the notion of a frequency response and its relation to the impulse response, Fourier series representation

[3] THE FOURIER TRANSFORM

The Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT), Parsvale's Theorem, The idea of signal space and orthogonal bases

[4] THE z – TRANSFORM

The z-Transform for discrete time signals and systems- Eigen functions, region of convergence, z-domain analysis. State-space analysis and multi-input, multi-output representation. The state-transition matrix and its role.

TEXT / REFERENCE BOOKS

1) B. P. Lathi, “Linear Systems and Signals”, Oxford University Press, 2009.
2) A. V. Oppenheim, A. S. Willsky and S. H. Nawab, “Signals and systems”, Prentice Hall India,1997.
3) J. G. Proakis and D. G. Manolakis, “Digital Signal Processing: Principles, Algorithms, and Applications”, Pearson, 2006.
4) H. P. Hsu, “Signals and systems”, Schaum’s series, McGraw Hill Education, 2010.

5) S. Haykin and B. V. Veen, "Signals and Systems", John Wiley and Sons, 2007.
6) A. V. Oppenheim and R. W. Schafer, "Discrete-Time Signal Processing", Prentice Hall, 2009.
7) M. J. Robert "Fundamentals of Signals and Systems", McGraw Hill Education, 2007.

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. Characterize and analyse the properties of continuous and discrete time signals and systems.
CO2. Explain input output relationship for linear shift invariant system and interpret the convolution operator for continuous and discrete time system
CO3. Analyze the continuous and discrete time system using differential equations using classical methods and transform methods in presence of different input signals
CO4. Apply Fourier series and Fourier Transform on continuous time signals and systems.
CO5. Compute response of the passive network for given excitation using classical as well as transform methods.
CO6. Demonstrate discrete time signal in frequency domain through discrete time Fourier Transform. Illustrate its efficient computation by FFT Algorithms.

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	1						1		
CO2	3	3	2	1								
CO3	3	3	2	1								
CO4	3	3	2	1								
CO5	3	3	2	1	1	1						
CO6	3	3	2	1								
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – IV (EC)
SUBJECT: LINEAR ELECTRONICS – II

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

COURSE OBJECTIVES

This course involves the in-depth understanding of the analog electronics circuits which can enable students to interpret, analyses, design, and apply electronics and communication-based circuits. This core subject understanding is useful to the students in the projects and in the field of Power Electronics, Electronics Communication, and audio-video engineering. The objective of this course is to offer in-depth understanding of the analysis, design, and applications for analog electronics circuits.

DETAILED SYLLABUS

[1] POWER CIRCUITS AND SYSTEMS
Amplifier Classification, Distortion in Amplifiers, Large-Signal Amplifiers, Harmonic Distortion, Efficiency of a Class A Amplifier, Push-Pull Amplifiers, Class B amplifiers, Class AB Operation, Regulated Power Supplies, Series Voltage Regulator.

[2] FEEDBACK AMPLIFIER CHARACTERISTIC
Classification of Amplifiers, The Feedback Concept, The Transfer Gain with Feedback, General Characteristics of Negative-Feedback Amplifiers, Input Resistance, Output Resistance, Method Analysis of a Feedback Amplifier, Voltage-Series Feedback, Current-Series Feedback, Current-Shunt Feedback, Voltage-Shunt Feedback.

[3] OSCILLATORS USING TRANSISTOR
Sinusoidal Oscillators, The Phase-Shift Oscillators, Resonant-Circuit Oscillators, A General Form of Oscillator Circuits, Colpitt's Oscillator, Hartley's Oscillator, Clapp's Oscillator, Crystal Oscillators.

[4] OPERATIONAL AMPLIFIER CHARACTERISTICS
Differential Amplifier, DC and AC Analysis of Bipolar Differential Amplifier, The ideal Operational Amplifier, Inverting and Non-Inverting Amplifiers, Op-Amp Parameters, Measurement of Op-Amp Parameters, General Description of Various Stages of Op-Amp, Open-Loop and Closed-Loop Frequency Response, Op-Amp Stability, Frequency Compensation.

[5] LINEAR APPLICATIONS OF OP-AMP
Summing and Difference Amplifiers, Integrator and Differentiator, Current-to-Voltage Converters, Voltage-to-Current Converters, Current Amplifiers, Voltmeters and Current Meters, Instrumentation Amplifiers, Transducer Bridge Amplifiers, Ideal and Realistic Frequency Response of Various Filters, Basic First-Order Low-Pass and High-Pass Filters, First Order Wideband Band Pass Filters (Phase-Shifter), Second-Order Low-Pass Filters, Second-Order High-Pass Filters, Second-Order Band-Pass Filters, Second-Order Band-Reject Filters.

[6] NON-LINEAR APPLICATIONS OF OP-AMP

Precision Half-Wave Rectifiers, Precision Full Wave Rectifiers, Log Amplifiers, Antilog Amplifiers, Zero Crossing Detector, Level Detectors, Voltage Magnitude Comparator and Window Detector, Basic Peak Detectors Using Op-Amps and Comparators, Basic Sample and Hold Circuits, Digital to Analog (D/A) Converters, Analog to Digital (A/D) Converters.

[7] WAVE SHAPING & WAVEFORM GENERATORS

The Op-Amp as Voltage Comparator, Some Applications of a Comparator using Op-Amp, Schmitt Trigger Circuit, Basic Triangular Wave Generator, Astable and MonostableMultivibrator Using Op-Amp, Introduction to 555 Timer, Timer 555 Used in Astable and Monostable Mode.

TEXT / REFERENCE BOOKS

1) Integrated Electronics, Millman&Halkians, Tata McGraw Hill

2) Op - Amp and Linear Integrated Circuits, RamakantA. Gayakwad, 4th Edition, Pearson Education

3) Integrated Circuits, K. R. Botkar, 9thEdition, Khanna Publications

COURSE OUTCOMES

At the end of the course,students should be able to

CO1. Analyse class A, Class B, Class AB and Push-Pull amplifier in terms of operating characteristics, harmonic distortion and power efficiency.

CO2. Design regulated power supply to provide constant voltage with specified minimum load current for the given specification.

CO3. Computation of transfer gain, input and output impedance of various types of negative feedback amplifiers.

CO4. Design analog circuits using OPAMPs for specific applications like comparator, DAC, volt and current meters

CO5. Develop OPAMP circuits to perform mathematical operations like addition, subtraction, multiplication, division, integration, differentiation, logarithm, antilogarithm

CO6. Design different types of waveform generators using discrete components and OPAMP and IC 555 like astable and Monostable Multivibrator

CO7. Design analog active filters using OPAMP and Sinusoidal Oscillator for given frequency and gain.

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3						1		1		
CO2	3	2	3					1		1		
CO3	3	2		2	2			1		1		
CO4	3	3	3					1		1		
CO5	3	2	3					1		1		
CO6	3	3	3					1		1		
CO7	3	2	3					1		1		
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – IV (EC)
SUBJECT: CONTROL THEORY

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	2	6	5	60	40	25	25	150

COURSE OBJECTIVES

The objective of this course is to introduce basics of control theory and establish the fundamentals of devices in control applications as required by electronics engineering students. To introduce different types of systems and model a complicated system into a more simplified form to interpret different physical and mechanical systems in terms equivalent electrical models for analysis. To employ time domain analysis to predict and analyze transient performance parameters of the system for various standard input test functions. Demonstrate system stability concept and learn methods for examining system stability in both time and frequency domains including determining the system stability margins.

DETAILED SYLLABUS

[1] INTRODUCTION
Open-loop and closed loop control system, Servomechanism, Historical development of control system, sampled data & digital control system, Multivariable control system, Application in non-engineering field.

[2] MATHEMATICAL MODELS OF PHYSICAL SYSTEMS
Introduction, Differential equation of physical systems, Transfer functions, Block diagram algebra, signal flow graph. (Note: Problems on electrical, mechanical & electromechanical systems only.)

[3] FEEDBACK CHARACTERISTICS OF CONTROL SYSTEMS
Feedback and non feedback systems, reduction of parameter variations by use of feedback, control over system dynamics by use of feedback, effects of disturbance signals by use of feedback, lineraizing effect of feedback, regenerative feedback, Basics of Feed forward Control System with example.

[4] TIME RESPONSE ANALYSIS AND CONCEPTS OF STABILITY
Introduction, standard test signals, time response of first order system, time response of second order system, steady state errors and error constants, effects of adding zero to a system, design specifications and constructions for second and higher order systems, performance indices, examples, concepts and conditions for stability, Huwitz's and Routh's stability criteria, relative stability criteria.

[5] THE ROOT LOCUS TECHNIQUE
Introduction, Rules of construction of root loci, sketching of root locus and applications

[6] FREQUENCY DOMAIN ANALYSIS & STABILITY
Freq. domain specifications, correlation bet time & frequency domain specifications, Bode plot, Polar plot, Nichols chart, Nyquist stability criterion, Constant M& N circles

TEXT / REFERENCE BOOKS

1) Feedback Control Systems, D. K. Theckedath , R. A. Barapate, Tech-Max Publication.
2) Control System Engineering, U. A. Patel, Mahajan Publication House.
3) Modern Control Engineering, K. Ogata, 4th Edition, Prentice Hall of India

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. To study and define the different configurations of control systems, i.e how subsystems are connected between the input and output. To evaluate the range of system gain to ensure the stability of the system.
CO2. To introduce different types of physical systems and identify a set of algebraic equations to represent and model a complicated system into a more simplified form to interpret different physical and mechanical systems in terms of electrical system to construct equivalent electrical models for analysis.
CO3. To analyze the system using Bode plot for the estimation of the relative stability of the system in terms of the gain margin and phase margin.
CO4. To employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions. Design the second order systems for the given performance indices of time domain.
CO5. To evaluate the closed loop stability of the control systems using Nyquist and polar plot.
CO6. To illustrate the impact of the variations in the system gain on the location of closed loop poles in the s-plane.
CO7. To demonstrate the effect of feedback in control systems such as gain, bandwidth, sensitivity of the system to parameter variations, speed of the response, and accurate control of the output.

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3						1		1		
CO2	3	2	3					1		1		
CO3	3	2		2	2			1		1		
CO4	3	3	3					1		1		
CO5	3	2	3					1		1		
CO6	3	3	3					1		1		
CO7	3	2	3		2			1		1		
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – IV (EC)

SUBJECT: ELECTRICAL MACHINES & POWER

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	0	2	5	4	60	40	25	25	150

COURSE OBJECTIVES

This course provides fundamental concepts associated with working and analysis of electrical machines. This also includes concepts to analyze the mechanism of electrical power generation, transmission and distribution. This course teaches on how to identify and troubleshoot electrical faults in switchgear. The objective of this course is to exposé the students to the concepts of various types of electrical machines and their applications. Besides to introduce them with the fundamental of generation, transmission and distribution of the electrical power and power system protection.

DETAILED SYLLABUS

[1] DC MACHINES

DC Generator & DC Motor

Operating Principle and Types of DC generator &motor, Losses in DC Generator, Power Stages in DC Generator, Maximum Efficiency and Power in DC Generator, Generator Characteristics, Speed control of DC motor

[2] AC MACHINES

Single Phase Transformer

Working Principle, Construction, Characteristics of an Ideal Transformer, EMF Equation, Transformer Load Analysis, Transformer Parameters, Equivalent Circuit, Open Circuit & Short Circuit Tests, Efficiency, Regulation, All day efficiency, Parallel Operation of transformer.

Three Phase Induction Motors

Working Principle, Construction, Relation between Torque & Rotor Power Factor, Starting Torque and Running Torque of Motor, Effect of Change in Supply Voltage on Starting Torque, Torque Slip Characteristics, Induction Motor as a Generator, Power Stages, Starting Methods of Induction Motor, Speed Control of Induction Motors

Single Phase Motors

Introduction and Broad Classifications, Self-Starting Mechanism, AC Series Motor and Universal Motors.

Alternators

Working Principle, Construction, Factors Affecting Alternator Size, Alternator on Load, Synchronous Reactance, Vector Diagrams, Voltage Regulation by EMF Method, Parallel Operation of Alternators.

[3] ELECTRICAL POWER GENERATION

Schematic Arrangement of Various Power Plants - Thermal, Hydro, Nuclear, Diesel and Gas Turbine Based Power Plant, Structure of Electric Power System, Load Curves, Important Terms and Factors, Load Duration Curves, Types of Loads, Wind energy: types, power in the wind, types of wind turbine generators, Solar Energy: types of solar cell, A generic photovoltaic cell, from cells to modules to array, physics of shading, Introduction to major types of PV system, Maximum Power point tracker, Concentrating Solar Power (CSP) Technologies, Introduction to smart grid

[4] POWER FACTOR IMPROVEMENT

Power Triangle, Disadvantages and Causes of Low Power Factor, KVAR Calculations, Importance of Power Factor Improvement, Most Economical Power Factor.

[5] TRANSMISSION LINE & UNDER GROUND CABLES

Classification of Transmission Line & Under Ground Cables, Main Components, Conductor Materials, Types of Insulators, String Efficiency and Its Improvement, Construction of underground Cables

[6] INTRODUCTION TO SWITCH GEAR

Essential Features of Switchgear, Switchgear Equipment - Circuit Breaker, Fuses, Relay, Principle and Methods of *arc* Quenching in Circuit Breaker, Desirable Characteristics of Fuse Element, Fuse Element Materials, Theory of Protective Relays, Fundamental Requirements of Protective Relay, Calculation of Relay Operating Time, The Bus Bar Arrangement, Faults in Power System.

TEXT / REFERENCE BOOKS

1) Electrical Technology (Vol: II), B. L. Theraja& A. K. Theraja, 23rd Edition, S. Chand & Company Ltd.
2) Principles of Power System, V. K. Mehta &Rohit Mehta, 4th Edition, S. Chand & Company Ltd.
3) Theory and Performance of Electrical Machine, V.B. Gupta, 13th Edition, Laxmi Publications
4) Electrical Engineering, R.K. Rajput, 1st Edition, Laxmi Publications
5) Course in Power System, J. B. Gupta, 10th Edition, S. K. Kataria& Sons.
6) Switchgear and Protection, J. B. Gupta, 2nd Edition, S. K. Kataria& Sons.

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. Analyse important parameters such as induced emf, equivalent circuit, losses, efficiency and regulation of transformer.
CO2. Evaluate synchronous reactance of an alternator and regulation of an alternator. Discriminate magnetic effects like magnetising, demagnetising and cross magnetising on operation of an alternator based on various loads. Evaluate important parameters such as induced emf, equivalent circuit, losses, and efficiency of DC generator.
CO3. Explain starter mechanism and importance in induction motor. Explain split phase mechanism to make single phase induction motor self-starting and classify types of single phase induction motors. Evaluate important parameters such as motor slip, torque, losses, and efficiency of induction motor.
CO4. Compare and conclude merits and demerits of conventional and non-conventional electrical energy generation power plants
CO5. Analyse effect of power factor improvement in AC electrical power system. Compute the most economical power factor and net saving after power factor correction. Analyse and compute diversity factor, load factor, demand factor and average load of load curve.
CO6. Illustrate relay and circuit breaker coordination to protect electrical system. Choose required protective devices like fuses, circuit breakers, relays or isolator switch to protect against electrical faults. Choose the best material considering conductivity, tensile strength, durability, cost, life, fault frequency and safety for underground and overhead transmission line. Calculate efficiency, string efficiency and regulation of transmission lines.

COURSE MATRIX

Course Outcome (CO's)	Program Outcomes (PO's)											
	Domain Specific (PSO)					Domain Independent (PO)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1						1	2		
CO2	3	2	2		1				2	1		
CO3	3	2							1	1		
CO4	3									1		
CO5	3						2					
CO6	2	2	2			1	1	1				1
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – IV (EC)
SUBJECT: CMOS VLSI DESIGN

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	2	6	5	60	40	25	25	150

COURSE OBJECTIVES

Very large scale integration (VLSI) is the process of creating an integrated circuit (IC) by combining millions of transistors together in a small silicon chip. In this subject, students learn to design, analyze and optimize the digital logic circuitry it in terms of PDA (Power, Delay and Area) and understand the architectural choices and performance trade-offs involved in designing and realizing the CMOS circuits. This course teaches the importance of testability and basic techniques for test vector generation. This course provides an overview of chip design techniques using programmable devices. This course offers a profound understanding of the design, simulations and functional verification of complex digital VLSI circuits (using EDA tools like ALTERA/XILINX).

DETAILED SYLLABUS

[1] LOGIC DESIGN WITH MOSFETS
Complexity and Design, Basic Concepts, Types of IC, VLSI Design Flow, MOSFET as a Switching Element, Basic and Complex Logic Gates in CMOS, Transmission Gate Circuits, Clocking and Dataflow Control.

[2] FABRICATION OF CMOS INTEGRATED CIRCUITS
Physical Structure of CMOS Integrated Circuits, CMOS Patterning – Silicon Layout and Stick Diagrams, Fabrication of CMOS Integrated Circuits – Process Flow and Design Rules, Layout of Basic Structures, FET Sizing.

[3] ELECTRICAL CHARACTERISTICS OF CMOS LOGIC
MOS Physics,FET RC Model, DC and Transient Characteristics of CMOS Gates, Power Dissipation, Analysis of Complex Logic Gates.

[4] DESIGNING HIGH SPEED CMOS LOGIC NETWORKS
Driving Large Capacitive Loads, Delays Estimate for Logic Cascade, Delay Optimization Using Logical Effort, Branching Effort, Advanced Techniques in CMOS Logic Circuits.

[5] ADVANCED CMOS CIRCUITS
BiCMOS Drivers, Mirror Circuits, Pseudo-nMOS, Tri-state Circuits, Clocked CMOS, Dynamic CMOS Logic Circuits, Domino Logic Cell Dual-Rail Logic Networks. (DCVSL, CPL)

[6] THE DESIGN OF VLSI SYSTEM
Memories and Programmable Logic, Interconnect Delay Modelling, Crosstalk, Interconnect Scaling, Floor Planning and Routing, Input and Output Circuits, Power Distribution and Consumption, Low Power Design Considerations, VLSI Clocking and System Design, Reliability and Testing of VLSI Circuits.

[7] INTRODUCTION TO HDL

Introduction to Verilog & System Verilog, Basic Building Blocks & Datatypes, Randomization.

TEXT / REFERENCE BOOKS

1) Introduction to VLSI Circuits& Systems, John P. Uyemura, John Wiley & Sons Inc.
2) CMOS logic Circuit Design, John P. Uyemura, Springer Private limited
3) Digital Integrated Circuits - A Design Perspective, J.M. Rambaey, A. Chandrakassan& B. Nikolic, 2nd Edition, Prentice Hall of India.
4) Principles of CMOS VLSI Design - A System Perspective, N. H. E. Weste& K. Eshraghian, 2nd Edition, Prentice Hall of India.
5) Modern VLSI design - System On Chip Design, W. Wolf, 3rd Edition, Pearson Asia
6) Introduction to System Verilog, Ashok D Mehta, Springer.
7) Introduction to Verilog HDL, Samir Palnitkar, PHI

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. Identify conduction state of given MOSFET and derive RC model by recognizing physical properties of MOSFET.
CO2. Prepare schematic and Si layout of CMOS digital logic circuitry and compare their physical design parameters with the reference Inverter design.
CO3. Describe pros & cons of various IC fabrications processes and also appraise requirements of various design rules. Assess switching performance & reliability of CMOS Digital Logic circuits.
CO4. Apply logical effort theory for improving the Speed of CMOS logic cascade and understand advanced techniques for logic implementation using FET & BJTs.
CO5. Designing of high density structure like memory array to enhance its performance. Understand system-level physical design of VLSI chip.
CO6. Test the CMOS based circuits using various testing methods to identify physical defects in a given chip.

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3		3		3	1						
CO2	3	2				1			1	2		
CO3	3		2		2					2		
CO4	2		3			1						
CO5	1		2									
CO6	3		2			1						
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – IV (EC)
SUBJECT: UNIVERSAL HUMAN VALUES

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	1	0	3	3	40	0	0	0	40

COURSE OBJECTIVES

This course is intended to provide a much needed orientation input in value education to the young enquiring minds. It presents a universal approach to value education by developing the right understanding of reality (i.e. a worldview of the reality "as it is") through the process of self-exploration. The whole course is presented in the form of a dialogue whereby a set of proposals about various aspects of the reality are presented and the students are encouraged to self-explore the proposals by verifying them on the basis of their natural acceptance within oneself and validate experientially in living. The prime focus throughout the course is toward affecting a qualitative transformation in the life of the student rather than just a transfer of information. While introducing the holistic worldview and its implications, a critical appraisal of the prevailing notions is also made to enable the students discern the difference on their own right.

DETAILED SYLLABUS

[1] INTRODUCTION TO VALUE EDUCATION
Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Right Understanding, Relationship and Physical Facility, Happiness and Prosperity – Current Scenario, Method to Fulfill the Basic Human Aspirations

[2] HARMONY IN THE HUMAN BEING
Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health

[3] HARMONY IN THE FAMILY AND SOCIETY
Harmony in the Family – the Basic Unit of Human Interaction, Values in Human-to-Human Relationship, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Understanding Harmony in the Society, Vision for the Universal Human Order

[4] HARMONY IN THE NATURE/EXISTENCE
Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence

[5] IMPLICATIONS OF THE HOLISTIC UNDERSTANDING – A LOOK AT PROFESSIONAL ETHICS
Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession

TEXT / REFERENCE BOOKS

1) Dr. Rajneesh Arora ,Dr.Shishir Gaur , Dr.Ruchir Gupta , Student Induction ProgramHandbook v2AICTE NCC-IP sub-committee. (e-version)

2) Dr. Rajneesh Arora , Dr.Shishir Gaur, Sh. BP Singh, Sh. Rajul Asthana and Sh. JitenderNarula, Universal Human Values-I (UHV-I) Mentors' Manual, Version 2.1, AICTENCC-IP sub-committee. (e-version), July 2020

3) UHV Handouts 1 to 5, AICTE NCC-IP sub-committee. (e-version).https://drive.google.com/drive/folders/1eZ6R-VrAFvHwlQ91iDaPkLhk9CPjCH_o?usp=sharing

4) RR Gaur, R Asthana and GP Bagaria, Class Notes on UNIVERSAL HUMAN VALUESAND ETHICS, Part 1 to Part 4, AICTE NCC-IP sub-committee. (e-version).

COURSE OUTCOMES

At the end of the course,students should be able to

CO1. Become familiar with the ethos and culture of the institution
CO2. Set a healthy daily routine, create bonding in batch as well as between faculty members and students
CO3. Get an exposure to a holistic vision of life, develop awareness, sensitivity and understanding of the Self---family---Society---Nation---International---Entire Nature
CO4. Facilitate them in creating new bonds with peers and seniors who accompany them through their college life and beyond
CO5. Overcome weaknesses in some essential professional skills
CO6. Practice professional ethics and holistic strategies for Transition towards Value-based Life and Profession

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3		3		3	1					3	
CO2	3	2		3		1			1	2		
CO3	3	3	2		2					2		
CO4	2		3			1					3	
CO5	3		2	3				3			2	
CO6	3		2			1						
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

Provisional Syllabus

(Semester V – VIII)

B. TECH. SEMESTER – V (EC)

SUBJECT: (EC511) MICROCONTROLLER APPLICATIONS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

COURSE OBJECTIVES

The objective of this course is to provide details of the 8051 microcontroller architecture, interfacing techniques and to be able to develop simple applications real-world applications microcontrollers. To familiarize students with the assembly language programming, access peripherals using low level language and optimization to meet system requirements.

DETAILED SYLLABUS

NO TOPIC

[1] MICROPROCESSORSAND MICROCONTROLLERS
Introduction, Microprocessors and Microcontrollers, The Z80 and the 8085, A Microcontroller survey, Development systems for Microcontrollers.

[2] THE 8051 ARCHITECTURE
Introduction, 8051 Microcontroller Hardware, Input/Output pins, ports and circuits, External memory, Counter and timers, Serial data input/output, Interrupts.

[3] MOVING DATA
Introduction, Addressing Modes, External data moves, Code memory read only data moves, Push and Pop, Data exchanges.

[4] LOGICAL OPERATIONS
Introduction, Byte-level logical operations, Bit-level logical operations, Rotate and Swap operations.

[5] ARITHMETIC OPERATIONS
Introduction, Flags, Incrementing and Decrementing, Addition, Subtraction, Multiplication and Division, Decimal arithmetic.

[6] JUMP AND CALL INSTRUCTIONS
Introduction, The jump and call program range, Jump types, Call and Subroutines, Interrupts and Returns, Enabling, Disabling & Priority in interrupts.

[7] AN 8051 MICROCONTROLLER DESIGN
Introduction, A Microcontroller specification, A Microcontroller Design, Testing the design, Subroutines, Lookup tables for the 8051, Serial data transmission.

[8] APPLICATIONS
Introduction, Keyboards, Displays, Pulse Measurement, D/A and A/D conversions, Case Study.

[9] SERIAL DATA COMMUNICATION
Serial I/O Modes of Operation, serial data input output programming.

[10] 8006/97 OVERVIEW
8096/97 (16-bit Microcontroller) Architecture overview and additional features.

RECOMMENDED TEXT / REFERENCE BOOKS

1) The 8051 Microcontroller based Embedded Systems, Manish K. Patel, McGraw Hill Education.
2) The 8051 Microcontroller Architecture, Programming & Applications, Kenneth J Ayala,2nd Edition, Penram International Publication.

3) The 8051 Microcontroller & Embedded Systems, Muhammad A. Mazidi& Janice G. Mazidi, 2nd Edition, Pearson Education

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. Analyse assembly language instruction behaviour and execution with reference to the architecture of the 8051 microcontroller, peripheral support and the timing divisions

CO2. Develop assembly language programs to implement common algorithms and attempt optimization of the code

CO3. Utilize serial section of the 8051 to establish the communication between 8051 microcontroller external systems.

CO4. Demonstrate multitasking environment using interrupt programming.

CO5. Determine requirement of hardware components and to design memory subsystem as per given specifications.

CO6. Design applications related to real life needs using support of I/O ports and timers particularly in case of timing constraints

CO7. Design and implement the simple applications involving input devices like switches, keyboards, sensors, ADC and output devices like LED, 7-segment display, LCD, DAC.

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	2								
CO2	3	3	3	3								
CO3	3	3	3	3								
CO4	3	3	2	3								
CO5	3	2	3	2								
CO6	3	3	2	3	3							
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – V (EC)

SUBJECT: (EC512) ELECTRONIC COMMUNICATION

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

COURSE OBJECTIVES

Electronic communication is inevitable part of our day to day life. The objective of this course is to make aware the students about fundamental concepts of communication technologies and its applications. To fulfil the objective, course covers detailed concepts of the circuits used for basic communications. It also covers various types of noise affecting to electronic communication. Further, it emphasis on the techniques of transmitting and receiving information signals using analog modulation techniques (AM, FM, PM). This course also includes in-depth understanding of different applications of Analog Communication systems such as Satellite Communication and Optical Communication.

DETAILED SYLLABUS

NO TOPIC

[1] Resonant Circuits
Series and Parallel Equivalence, Series RLC Circuit, Parallel Tuned Circuit, Skin Effect, Mutual Inductance, Coupling Circuits..

[2] Waveform Spectra
Introduction, Complex Repetitive Waves, Effect of Filtering on Complex Signals.

[3] Noise
Introduction, Thermal Noise, Shot Noise, Partition Noise, Low- Frequency or Flicker Noise, High frequency or Transmit Time Noise, Generation Recombination Noise, Equivalent Noise Resistance, Signal to Noise Ratio, Noise Factor, Noise Temperature.

[4] RF Amplifier
Tuned RF Amplifiers, Neutralization, Special RF Amplifiers, Frequency Conversion andMixers.

[5] Receivers
Introduction, Super heterodyne Receivers, Choice of Intermediate and OscillatorFrequencies, Image Rejection, Adjacent Channel Selectivity, Spurious Responses, Tracking Automatic Gain Control, Double Conversion Receivers, HF CommunicationsReceivers.

[6] Amplitude Modulation
Introduction, Amplitude Modulation, Amplitude Modulated Transmitters, AM Receivers

[7] Single Sideband Modulation
Introduction, Single Sideband Principles, The Balanced Modulator SSB Generation, SSBReception, Modified SSB Systems.

[8] Angle Modulation
Introduction, Frequency Modulation, Phase Modulation, Equivalence between FM andPM, Angle Modulator Circuits, Angle Modulation Detectors.

[9] Satellite Communication
Introduction, Orbits, Station Keeping, Satellite Attitude, Transmission Path, Path Loss, Noise Considerations, The Satellite System, Saturation Flux Density, Effective Isotropic Radiated Power, Antenna Look Angles, Elevation and azimuth angle calculations, Uplink and down link power budget calculations, Multiple Access Methods. The following removals are recommended in view of additions.

[10] Fiber Optic Communication

Introduction, principles of Light Transmission in Fiber, Losses in Fiber, Dispersion, LightSources for Fiber Optics Photo Detectors, Connectors and Splices, Fiber Optic Communication Systems

RECOMMENDED TEXT / REFERENCE BOOKS

1) Electronic Communication, Dennis Roddy & John Coolen, 3rd Edition, Prentice Hall of India.
2) Electronic Communications, George Kennedy, 4th Edition, Tata McGraw Hill

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. Analyze Amplitude modulated signal in terms of frequency spectrum, average power, effective voltage and current as well as amplitude modulator, demodulator circuit and receiver.

CO2. Do detailed analysis of AM receiver, SSB transmission and reception.

CO3. Analyze Angle Modulation, demodulation and transmission.

CO4. Analyze LC tank circuit as well as RF amplifier in terms of resonant frequency, dynamic impedance and -3 dB bandwidth

CO5. Determine the overall noise factor and noise temperature of the systems connected in tandem and choose the one which offers minimum noise factor.

CO6. Analyze signal transmission and reception in satellite and Fiber optic communication system.

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3										
CO2	3	2										
CO3	2	3										
CO4	3	3	3									
CO5	2	2		3	2							
CO6	2	3						2				
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – V (EC)

SUBJECT: (EC507) POWER ELECTRONICS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

COURSE OBJECTIVES

This course involves understanding of the power electronics circuits which can enable students to interpret, analyze, design, and apply power electronics based circuits. The subject understanding is useful to the students for different power applications by offering deep insight into characteristics and functioning of various power semiconductor devices.

To prepare students for analysis and designing power converter circuits for different power applications by offering deep insight into characteristics and functioning of various power semiconductor devices.

DETAILED SYLLABUS

NO TOPIC

[1] Introduction to Power Electronics:
Overview of Power Electronics, Power Semiconductor Devices, Control Characteristics of Power Devices, Characteristic & Specifications of Switches, Types of Power Circuits, Reverse Recovery Characteristics, Types of Power Diodes, Freewheeling Diodes, Structure and Volt-Current Characteristics of Power MOSFETS, COOLMOS, SITs, Structure and Volt-Current Characteristics of IGBTs, SiC – MOSFET, SiC – IGBT.

[2] Thyristors:
Thyristor Characteristics, Two Transistor Model of Thyristor, Thyristor Turn-on, Thyristor Turn-off, Types of Thyristors, Series & Parallel Connection of Thyristors, di/dt& dv/dt Protection, Gate Drive Circuits.

[3] Uncontrolled and Controlled Rectifiers:
Multiphase Star Rectifiers, Three-Phase Bridge Rectifiers, Three-Phase Bridge Rectifier With RL Load, 3-Phase Rectifier Design, Principal of Phase Controlled Converter, Single Phase Semi Converter, Single Phase Full Converter, Three Phase Half Wave Converters, Three Phase Semi Converter, Three Phase Full Converter. (Without Analysis for RL Load), Power Factor Improvement, Pulse Width Modulation using IGBT, Single Phase Sinusoidal PWM using IGBT, Three Phase PWM Control using IGBT.

[4] Inverters:
Principal of Operation of Pulse Width Modulated Inverters, Performance Parameters, Single-Phase Bridge Inverters, Voltage Control of Single-Phase Inverters, Current Source Inverter, Multilevel Concept, Applications & Features of Multilevel Inverter.

[5] DC-DC Converters:
Principal of Step Down Converter, Principal of Step Up Converter, Performance Parameters, Converter Classification, Switch Mode Buck, Boost, Buck-Boost &Cuk.

[6] AC Controllers:
Principal of On-Off Control, Principal of Phase Control, Cycloconverters, PWM Controlled AC Voltage Controllers.

[7] Protection of Devices & Circuits:
Cooling and Heat Sinks, Snubber Circuits, Reverse Recovery Transients, Supply & Load Side Transients, Current & Voltage Protection, Magnetic Interference, Protection of IGBT.

[8] Dc Drives:
Characteristics of DC Motor, Operating Modes, Single-Phase DC Drives, Breaking Schemes of DC-DC Converter Drives, Closed-Loop Control of DC Drives.

[9] Ac Drives:
Induction Motor Drives, Close-Loop Control of Induction Motors, Synchronous Motor Drives, Stepper Motor Control, Basics of DC Drives and Comparison with AC Drives.

[10] Power Supplies:
Switched-Mode Power Supplies, UPS, CVT.

RECOMMENDED TEXT / REFERENCE BOOKS

1) Power Electronics circuits, Devices and Applications, Muhammad H. Rashid, 3rd Edition, Pearson Education and PHI.
2) Power Electronics, M. D. Singh and K. B. Khanchandani, 2nd Edition, TheMcGrow Hill.
3) Power Electronics, Dr.P.S.Bhimbhara, 4th Edition, Khanna Publication.
4) Power Electronics, B. R. Gupta & V. Singhal, 2nd Edition, S. K. Kataria& Sons

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. Illustrate the construction, operation, working, and characteristics of various power semiconductor devices like MOSFET and IGBT

CO2. Evaluate performance of single phase and three phase controlled rectifier circuits, three phase uncontrolled rectifier circuits

CO3. Analyse the performance of PWM inverters, analyse and design protection circuits

CO4. Fundamental and applications of SCR, DIAC, and TRIAC, operation and design of triggering circuits

CO5. Evaluate thyristor series and parallel network, design of PUT triggering circuit, Evaluate AC voltage controller circuits

CO6. Design DC - DC regulators and chopper circuits, apply basic power electronics converter understanding to realize power electronics applications, evaluate uninterrupted power supply

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	3					1		1		
CO2	3	2	2					1		1		
CO3	3	2	2					1		1		
CO4	3	3	3					1		1		
CO5	3	3	3					1		1		
CO6	3	3	2					1		1		
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – V (EC)

SUBJECT: (EC517) ELECTROMAGNETIC FIELDS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	1	0	5	5	60	40	50	-	150

COURSE OBJECTIVES

The objective of this subject is to provide a platform for students to combine their knowledge in mathematics and relates in an electromagnetic engineering.

This subject built a strong foundation of the static as well as time varying electromagnetic fields, to help the students identify, formulate and solve the problems related to electromagnetic fields and wave propagation. The concept of this subject is useful to the students for understanding the electromagnetic radiation in wireless communication.

DETAILED SYLLABUS

NO TOPIC

[1] Vector Analysis
Scalars and Vectors, Vector Algebra, The Cartesian coordinate system, Vector Components and Unit Vectors, The Vector Field, The Dot Product, The Cross Product, Other Coordinate Systems; Circular Cylindrical Coordinates, The Spherical Coordinate System.

[2] Coulomb's Law and Electric Field Intensity
The Experimental Law of Coulomb, Electric Field Intensity, Field Due to a Continuous Volume Charge Distribution, Field of a Sheet of Charge, Streamlines and Sketches of Fields.

[3] Electric Flux Density, Gauss's Law, And Divergence
Electric Flux Density, Gauss's Law, Application of Gauss's Law Some Symmetrical Charge, Distributions, Application of Gauss's Law, Differential Volume Element, Divergence, Maxwell's First Equation (Electrostatics), The Vector Operator V and the Divergence Theorem.

[4] Energy and Potential
Energy Expended in Moving a Point Charge in an Electric Field, The Line Integral, Definition of Potential Difference and Potential, The Potential Field of a Point Charge, The Potential Field of a System of Charges, Conservative Property, Potential Gradient, The Dipole, Energy Density in the Electrostatic Field.

[5] Conductors, Dielectrics and Capacitance
Current and Current Density, Continuity of Current, Metallic Conductors, Conductor Properties and Boundary Conditions, The Method of Images, Semiconductors, The Nature of Dielectric Materials, Boundary Conditions for Perfect Dielectric Materials, Capacitance, Several Capacitance Examples, Capacitance of a Two-Wire Line.

[6] Poisson’s and Laplace's Equations
Poisson's and Laplace's Equations, Uniqueness Theorem, Examples of the Solution of Laplace's Equation, Example of the Solution of Poisson's Equation, Product Solution of Laplace's Equation.

[7] The Steady Magnetic Field
Biot-Savart Law, Ampere's Circuital Law, Curl, Stokes' Theorem, Magnetic Flux and Magnetic Flux Density, The Scalar and Vector Magnetic potential, Derivation of Steady-Magnetic.

[8] Magnetic Forces, Materials and Inductance

Force on a Moving Charge, Force on a Differential Current Element, Force between Differential Current Elements, Force and Torque on a closed Circuit, The Nature of Magnetic Materials, Magnetization and Permeability, Magnetic Boundary Conditions, The Magnetic Circuit, Potential Energy and Forces on Magnetic Materials, Inductance and Mutual Inductance.

[9] Time-Varying Fields and Maxwell's Equations

Faraday's Law, Displacement Current, Maxwell's Equations in Point Form, Maxwell's Equations in Integral Form, The Retarded Potentials.

[10] The Uniform Plane Wave

Wave Motion in Free Space, Wave Motion in Perfect Dielectrics, Plane Waves in Lossy Dielectrics, The Poynting Vector and Power Considerations, Propagation in Good Conductors: Skin Effect, Reflection of Uniform Plane Waves, Standing-Wave Ratio.

[11] Transmission Lines

Basic Principles, Reflection co-efficient, Transmission co-efficient, Equation of the impedance on the transmission line.

RECOMMENDED TEXT / REFERENCE BOOKS

1) Engineering Electromagnetics, William H. Hayt, 7th Edition, Tata McGraw Hill
2) Electronic Communication Systems, George Kenedy, 3rd Edition, Tata McGraw Hill
3) Theory and Problems in Electromagnetics, Joseph Edminister, Tata McGraw Hill
4) Principles of Electromagnetics, Mathew N.O. Sadiku, 3rd Edition, Oxford University Press
5) Electromagnetics, John D. Kraus, 3rd Edition, Tata McGraw Hill

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. Compute vector functions, operators and use different methods of solving line, surface and volume integrals.
CO2. Apply vector calculus to solve static electric field problems for different engineering applications.
CO3. Compute the electric and magnetic field for different charge distribution using Cartesian, Cylindrical and Spherical coordinate system.
CO4. Deduce EM wave propagation in free space and dielectric medium.
CO5. Initiate the design of a range of field theory applications such as transmission line, antennas, wave propagation so on.
CO6. Apply uniform plane wave and Maxwell’s equation for free space model in wireless communication.

COURSE MATRIX

Course Outcome (CO's)	Program Outcomes (PO's)											
	Domain Specific (PSO)					Domain Independent (PO)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										
CO2	3	2										
CO3	2	3										
CO4	3	3	3									
CO5	2	2		3	2							
CO6	2	3						2				
CO7	2	2	3	3	3	3	3	2				
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – V (EC)

SUBJECT: (EC518) CONTROL THEORY

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

COURSE OBJECTIVES

The objective of this course is to introduce basics of control theory and establish the fundamentals of devices in control applications as required by electronics engineering students. To introduce different types of systems and model a complicated system into a more simplified form to interpret different physical and mechanical systems in terms equivalent electrical models for analysis. To employ time domain analysis to predict and analyze transient performance parameters of the system for various standard input test functions. Demonstrate system stability concept and learn methods for examining system stability in both time and frequency domains including determining the system stability margins.

DETAILED SYLLABUS

NO TOPIC

[1] INTRODUCTION

Open-loop and closed loop control system, Historical development of control system, sampled data & digital control system, Multivariable control system, Application in non-engineering field.

[2] MATHEMATICAL MODELS OF PHYSICAL SYSTEMS

Introduction, Differential equation of physical systems, Transfer functions, Block diagram algebra, signal flow graph. (Note: Problems on electrical, mechanical & electromechanical systems only.)

[3] FEEDBACK CHARACTERISTICS OF CONTROL SYSTEMS

Feedback and non feedback systems, reduction of parameter variations by use of feedback, control over system dynamics by use of feedback, effects of disturbance signals by use of feedback, lineraizing effect of feedback, regenerative feedback, Basics of Feed forward Control System with example.

[4] TIME RESPONSE ALALYSIS AND CONCEPTS OF STABILITY

Introduction, standard test signals, time response of first order system, time response of second order system, steady state errors and error constants, effects of adding zero to a system, design specifications and constructions for second and higher order systems, performance indices, examples, concepts and conditions for stability, Huwitz's and Routh's stability criteria, relative stability criteria.

[5] THE ROOT LOCUS TECHNIQUE

Introduction, Rules of construction of root loci, sketching of root locus and applications

[6] FREQUENCY DOMAIN ANALYSIS & STABILITY

Freq. domain specifications, correlation between time & frequency domain specifications, Bode plot, Polar plot, Nichols chart, Nyquist stability criterion, Constant M& N circles

RECOMMENDED TEXT / REFERENCE BOOKS

1) Feedback Control Systems, D. K. Theckedath , R. A. Barapate, Tech-Max Publication.

2) Control System Engineering, U. A. Patel, Mahajan Publication House.

3) Modern Control Engineering, K. Ogata, 4th Edition, Prentice Hall of India

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. To study and define the different configurations of control systems, i.e how subsystems are connected between the input and output. To evaluate the range of system gain to ensure the stability of the system.

CO2. To introduce different types of physical systems and identify a set of algebraic equations to represent and model a complicated system into a more simplified form to interpret different physical and mechanical systems in terms of electrical system to construct equivalent electrical models for analysis.

CO3. To analyze the system using Bode plot for the estimation of the relative stability of the system in terms of the gain margin and phase margin.

CO4. To employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions. Design the second order systems for the given performance indices of time domain.

CO5. To evaluate the closed loop stability of the control systems using Nyquist and polar plot.

CO6. To illustrate the impact of the variations in the system gain on the location of closed loop poles in the s-plane.

CO7. To demonstrate the effect of feedback in control systems such as gain, bandwidth, sensitivity of the system to parameter variations, speed of the response, and accurate control of the output.

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1	1	1	1							
CO2	3	3	1	1								
CO3	3	1	1									
CO4	3	3	2	1								
CO5	3	1	2	1								
CO6	3	3	2	1								
CO7	3	2	3		2			1				
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – V (EC)

SUBJECT: (EC519) TERM PROJECT (ELECTRONIC CIRCUITS)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
0	0	2	2	1	-	-	25	25	50

COURSE OBJECTIVES

Students will select hardware based pure electronics project and be a self learner through analysis and design of project's circuit. Weekly presentation of project progress work improves Communication skill and overcome stage fear. Implementation of project on bread-board and ensure working of it through measurement and testing. Once it is tested okay, it will be implemented on Printed Circuit Board.

DETAILED SYLLABUS

NO TOPIC

[1] Plan, design and implement hardware projects.
[2] Analyze and interpret output.
[3] Presentation Skill
[4] Designing of PCB and implement hardware on PCB.

RECOMMENDED TEXT / REFERENCE BOOKS

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. Identify the problem statement that solve societal, health and safety issues, through literature survey for project work and Arrive at conceptual project design through brainstorming.
CO2. Develop design strategy for the project work.
CO3. Develop presentation and interpersonal communication skills through project work
CO4. Evaluate outcome and application of project work with appropriate societal, health and safety consideration.

COURSE MATRIX

Course Outcome (CO's)	Program Outcomes (PO's)											
	Domain Specific (PSO)					Domain Independent (PO)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1			3			3	2	1	
CO2	3	2	3	3					3			
CO3	3	2	3	3	2					3		
CO4	3	2	3	2	2	3	2	2	3	3	3	3
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – VI (EC)

SUBJECT: (EC615) ADVANCED MICROPROCESSORS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

COURSE OBJECTIVES

The objective of this course is to introduce performance enhancement techniques for advanced processor architechres, interfacing techniques and real-world applications design using 8086 and ARM7 based microprocessors. To familiarize students with the assembly language and high level programming to optimize machine language code with reference to timing and resource constraints of the system.

DETAILED SYLLABUS

NO TOPIC

[1] THE MICROPROCESSOR AND ITS ARCHITECTURE
Internal Architecture, Real mode memory addressing, protected mode memory addressing, memory paging.

[2] ADDRESSING MODES
Data addressing mode, program memory addressing mode, stack memory addressing mode

[3] 8086/8088 HARDWARE SPECIFICATIONS
Pin-outs, pin functions, clock generator, bus buffering and latching, bus timing, ready and the wait state, minimum mode versus maximum mode.

[4] MEMORY INTERFACE
Memory devices, address decoding, 8086 and 8088 memory interface

[5] INTERRUPTS
Basic interrupt processing, Hardware interrupts, Expanding the interrupt structure

[6] THE PENTIUM MICROPROCESSOR
Protected mode, paging mode, virtual 8086 mode, memory management mode with Pentium.

[7] INTRODUCTION TO ARM
Overview of ARM Processor, Fundamental of RISC & CISC, Evolution of RISC, Comparison of RISC & CISC, Design for LPC.

[8] ARM ARCHITECTURE
Architectural inheritance, Programmer's model, ARM development tools, Software Assembler (ARM), 'C' Language Complier, Simulator, Hardware Board, Board organization, Communication with external world. 3-stage pipeline ARM organization, ARM instruction execution, ARM implementation

[9] ARM ASSEMBLY LANGUAGE PROGRAMMING
Data processing instructions, Data transfer instructions, Control flow instructions, Programs based on assembly language. Introduction, Exceptions, Conditional execution, Branch and Branch with Link (B, BL), Branch, Branch with Link and eXchange (BX, BLX), Software Interrupt (SWI), Data processing instructions, Multiply instructions, Count leading zeros (CLZ), Single word and unsigned byte data transfer instructions, Half-word and signed byte data transfer instructions, Multiple register transfer instructions, Swap memory and register instructions (SWP), Status register to general register transfer instructions, General register to status register transfer instructions, Coprocessor instructions.

[10] THE THUMB INSTRUCTION SET

The Thumb bit in the Current Program Status Register (CPSR), The Thumb programmer's model, Thumb branch instructions, Thumb software interrupt instruction, Thumb data processing instructions, Thumb single register data transfer instructions, Thumb multiple register data transfer instructions, Thumb breakpoint instruction, Thumb implementation, Thumb applications.

[11] INTRODUCTION TO VECTORED INTERRUPT CONTROLLER

IRQ and FIQ using Vectored interrupt controller of LPC23xx

RECOMMENDED TEXT / REFERENCE BOOKS

1) The Intel Microprocessors 8086, 8088, 80186, 80188, 80286, 80386, 80486, Pentium, Pentium Pro Processors, Berry B Brey, 6th Edition, Prentice Hall of India.

2) ARM - System-On- Chip Architecture, Steve Furber, 2nd Edition, Prentice Hall of India.

3) Microprocessors and Interfacing-Programming & Hardware, Douglas V. Hall, 2nd Edition, Tata McGraw Hill.

4) IBM PC Assembly Language Programming, Peter Abel, 2nd Edition, Prentice Hall of India.

5) ARM System Developer Guide, AntrewSloss, Dominic Symes, Chris Wright, Morgan Kaufmann.

6) Technical Ref. Manual, ARM7TDMI (3) UM10211 LPC 2364/66/68/78 User Manual, NXP Ltd.

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. Being familiar and analyse the architectural aspects of 8086 like specifications, programming model, pipeline, prefetch queue, pin configuration and role of this features to build microprocessor based systems

CO2. Develop assembly language to satisfy executional requirements as per given problem statement with reference to programming model of 8086, instruction set and programming tools
Simulate and analyse the assembly language and C programs simulation tools

CO3. Determine requirement of hardware components and Design 16-bit memory subsystem with the 8086 as per system specifications

CO4. Demonstrate multitasking environment using interrupt programming and vectored interrupt controller
Use protected mode memory addressing, memory paging to extend addressing capacity of the system.

CO5. Introduce architecture and programming model of ARM7 architecture and compare it with 8086 architecture..

CO6. Develop ARM7 based assembly language and C programs to implement common algorithms and attempt optimization of the code
Use the machine language code templates to generate machine codes for different types of instructions.

CO7. Being familiar and analyse the architectural aspects of 8086 like specifications, programming model, pipeline, prefetch queue, pin configuration and role of this features to build microprocessor based systems

CO8. Develop assembly language to satisfy executional requirements as per given problem statement with reference to programming model of 8086, instruction set and programming tools
Simulate and analyse the assembly language and C programs simulation tools

CO9. Determine requirement of hardware components and Design 16-bit memory subsystem with the 8086 as per system specifications

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	2								
CO2	3	3	3	3								
CO3	3	3	3	3								
CO4	3	3	2	3								
CO5	3	3	3	2								
CO6	3	3	2	3	3							
CO7	3	3	3	3								
CO8	3	3	3	2								
CO9	3	3	2	3	3							
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – VI (EC)

SUBJECT: (EC611) DIGITAL SIGNAL PROCESSING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

COURSE OBJECTIVES

The field of Digital Signal Processing (DSP) continues to evolve and play a central role in modern electronics. In fact, DSP is so ubiquitous that the field is somewhat disappearing as a discrete entity. Many systems developed today related to wireless communication, speech processing, image and video processing, which are now integral part of everyday life of virtually everyone in this world, use powerful DSP concepts as their foundations.

The objective of the course is to offer in depth understanding of time domain and frequency domain analysis of discrete time signals and systems and design of IIR and FIR digital filters with the overview of DSP architectures.

DETAILED SYLLABUS

NO TOPIC

[1] DISCRETE SIGNALS
Introduction, Signal and Signal Classification (Analog, Digital), Types of Signal Processing, Advantages and Disadvantages of DSP.
Operations on Discrete Signals, Decimation and Interpolation.

[2] DISCRETE TIME SYSTEMS
System Classification, Digital Filters-Difference Equation, Impulse Response, Stability, Connections.

[3] DISCRETE CONVOLUTION
Discrete Convolution, Convolution of Finite Sequences, Stability of LTI Systems, System Response to Periodic Inputs, Periodic Convolution, Discrete Correlation.

[4] THE Z-TRANSFORM
Definition, Properties, Z-Plane Representation, The Transfer Function, Inverse-Z Transform, System Analysis, Frequency Response.

[5] APPLICATIONS OF Z-TRANSFORM
Time Domain Analysis, Frequency Response - Graphical Interpretation, Application-Oriented Examples: Digital Audio Effects.

[6] IIR FILTER DESIGN
Introduction, IIR Filter Design, Response Matching, Matched-Z Transforms, Mappings, Bilinear Transformation.

[7] FIR FILTERS DESIGN
Linear Phase Requirement and Symmetric Sequences, FIR Design By Fourier Series & Windowing Method.

[8] THE DFT AND FFT
Fourier Series, Fourier Transform, DTFT, DFT - Definitions, Properties, Spectral Smoothing by Time Windows, The FFT, DIT- FFT, DIF-FFT, IDFT, Applications of Overlap-Add Method & Overlap - Save Method.

[9] ADVANCE DSP CONCEPTS
Multirate Signal Processing, Adaptive Signal Processing, Finite Word Length Effect.

[10] APPLICATIONS OF DSP

Speech Processing: Speech Analysis, Speech Synthesis, Speech Recognition, Speaker Recognition, Image Processing: Extracting The Edges, Blurring The Images, Biomedical Signal Processing: ECG Analysis, Noise Detection And Diagnosis.

[11] DSP PROCESSOR ARCHITECTURE

Introduction to Digital Signal Processors: Characteristics of DSP Algorithms and Hardware Requirements, Von Neumann Architecture, Harvard Architecture, Parallelism And Hardware

Units of Typical Digital Signal Processor. Architectural Details of TMS320C6x.

RECOMMENDED TEXT / REFERENCE BOOKS

1) Analog and Digital Signal Processing, Ashok Ambardar, 2nd Edition, Thomson Brooks-Cole.
2) Digital Signal Processing, G. Proakis&Dimitris G. Manolakis, 3rd Edition, Prentice Hall of India
3) Digital Filters- Analysis, Design and Applications, Andreas Antonion, 2nd Edition, Tata McGraw Hill.
4) Digital Signal Processing - A Computer Based Approach, Sanjit K Mitra, 3rd Edition, Tata McGraw Hill.

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. Classify and perform operations on discrete time signals and compare representation of analog and discrete signals

CO2. Classify digital filters and find out their response through difference equations and analyse as well as realize them using z transform

CO3. Find Response of Discrete time LTI Systems using different methods of discrete convolution and check similarity between two functions using correlation between them.

CO4. Design analog filter for Butterworth response for given specifications, and convert it into digital filter using different methods of IIR Filter design.

CO5. Design linear phase FIR Filters using windowing method for given order and desired frequency response.

CO6. Distinguish between FT, DTFT and DFT and obtain spectrum of the given signal using definition of DFT as well as by radix 2 FFT Algorithms.

CO7. Understand special features of DSP processors, fundamentals of adaptive filters and compute truncation error due to finite word length limitations.

COURSE MATRIX

Course Outcome (CO's)	Program Outcomes (PO's)											
	Domain Specific (PSO)					Domain Independent (PO)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3		1	2	2		1		1		1
CO2	3	3		1	2	2	2	1		1		1
CO3	3	3		1	2	2		1		1		1
CO4	3	3	3	1	2	2	2	1		1		1
CO5	3	3	3	1	2	2	2	1		1		1
CO6	2	1	1	1	2	2		1		1		1
CO7	2	1	1	1	2	2		1		1		1
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – VI (EC)

SUBJECT: (EC610) MICROWAVE & ANTENNAS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

COURSE OBJECTIVES

The subject aims to provide the student with:

- An understanding of the fundamentals of antennas & the radio frequency networks.
- An ability to design microwave matching networks.
- An understanding of microwave waveguides, passive - active devices, and microwave tubes.
- Design and analysis of radiation parameters of antenna array.

DETAILED SYLLABUS

NO TOPIC

[1] TRAMSMISSSION LINE
The Smith Chart & its Applications, Transmission Line Components.

[2] WAVEGUIDES, RESONATOR & COMPONENTS
Rectangular Waveguides, Circular and other Waveguides, Waveguide Coupling, Matching & Attenuation, Cavity Resonator, Auxiliary Components.

[3] MICROWAVE TUBES & CIRCUITS
Microwave Triodes, Multi-Cavity Klystron, Reflex Klystron, Magnetron, Travelling Wave Tube and other Microwave Tubes.

[4] SEMICONDUCTOR MICROWAVE DEVICES & CIRCUITS
Passive Microwave Circuits, Transistor & Integrated Circuits, Varactor and Step Recovery, Diodes and Multipliers, Parametric Amplifiers, Tunnel Diodes and Negative Resistance Amplifiers, Gunn Effect Diodes, Avalanche Effect and Diodes, other Microwave Diodes, Micro-strip Line.

[5] ANTENNAS
Basic Considerations, Radiation from the Hertz Dipole, Near and Far Field Analysis, Radiation Parameters of Antenna, Thin Linear Antenna, Effect of Ground on Antennas, Basic Antenna Parameters, Side Lobe Level of Antenna.Directional High Frequency Antennas, Helical Antennas, Rhombic Antenna, Microwave Frequency Antennas, Horn Antennas, Parabolic Reflector Antenna.

[6] ANTENNA ARRAYS
Array of Point Sources, Broad side & End Fire Array, Array Synthesis, Schelkunoff Zero Placement Method, Binomial Array, Folded dipole, Yagi-Uda Array, Log Periodic Dipole Array Antenna.

[7] SPECIAL ANTENNA
Directional High Frequency Antennas, Helical Antennas, Rhombic Antenna, Microwave Frequency Antennas, Horn Antennas, Parabolic Reflector Antenna.

[8] WAVE PROPAGATION
Electromagnetic Radiation, Propagation of Waves, Ground, Space and Sky Wave Propagation, Scatter propagation, Duct propagation, Multi hop propagation, Fading and Diversity.

RECOMMENDED TEXT / REFERENCE BOOKS

1) Electromagnetic Waves, R. K. Shevgaonkar, Tata McGraw Hill.

2) Microwave Devices and Circuits, S. Y. Liao, 3rd Edition, Prentice Hall of India.
3) Electronic Communication systems, George Kennedy, 3rd Edition, Tata McGraw Hill.
4) Antennas, C. A. Balani, 3rd Edition, Tata McGraw Hill.
5) Antennas & Wave Propagation, K. D. Prasad, 2nd Edition, Khanna Publication.

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. Design microwave matching networks using single-double stub and quarter wave transformer.
CO2. Explain different types of metallic waveguides and their respective modes of propagation.
CO3. Demonstrate the structural and operational characteristics of microwave tubes and components to identify their applications and demonstrate their characteristics.
CO4. Illustrate the basic philosophy of radiation parameters of antenna and the concept of magnetic vector potential is introduced.
CO5. Design of dipole antenna, antenna array, and other special antennas used in radar and mobile communication.
CO6. Examine communication link for different wave propagation like ground waves, space waves and sky waves.

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	3	1			2		2			
CO2	3	2	1	1				1				
CO3	2	1	1									
CO4	2	1	1				2				2	
CO5	3	3	2	3	3				2			
CO6	3	3	2	3	3				2			
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – VI (EC)

SUBJECT: (EC604) COMMUNICATION SYSTEMS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

COURSE OBJECTIVES

The main objective of this course is to provide fundamental knowledge of communication system which is necessary to understand recent communication technologies. This course helps student to analyze signal in time domain as well as frequency domain. It also develop understanding of sampling theorem, digital baseband and passband signal transmission and reception. This course also includes performance analysis of linear and non-linear modulation and demodulation techniques.

DETAILED SYLLABUS

NO TOPIC

[1] INTRODUCTION

Overview of Communication System, Analog and Digital messages, Signal-to-Noise Ratio (SNR), Channel Bandwidth, Rate of Communication, Modulation, Randomness, Redundancy, and Coding.

[2] ANALYSIS AND TRANSMISSION OF SIGNALS

Signal Analysis

Periodic signal representation by Fourier Series, Exponential representation of non-periodic signals, Fourier Transforms and its properties, Sampling theorem.

Signal Transmission

Distortion less transmission through a linear system, Signal distortion over a channel, Bandwidth and the rate of pulse transmission, Energy Spectral Density(ESD) of a signal, Power Spectral Density(PSD) of a signal.

[3] DIGITAL COMMUNICATION SYSTEMS

Conversion of analog signal to digital form: Pulse code and Delta modulation, Digital multiplexing, Line coding, Pulse shaping, Scrambling of data, The regenerative repeater, Detection error probability, M-ary communication, Digital carrier systems.

[4] DIGITAL MODULATION TECHNIQUES

Coherent Binary Phase Shift Keying, Coherent Binary Frequency Shift Keying, Coherent Qudra-Phase Shift Keying, Coherent Minimum Shift Keying, Non-Coherent Orthogonal Modulation, Non-Coherent Binary Frequency Shift Keying, Differential Phase Shift Keying, Comparison of Binary and Quaternary modulation schemes, M-ary modulation techniques.

[5] MODULATION

Amplitude (Linear) Modulation

Amplitude Modulation: Single Side Band (SSB) signal equation, Hilbert's Transform of a signal, Effects of frequency and phase errors in synchronous demodulation, Digital carrier systems, Interference and noise in AM systems, Frequency-Division Multiplexing.

Angle (Exponential) Modulation

Interference and Noise in Angle-Modulated systems, Stereo FM receiver.

RECOMMENDED TEXT / REFERENCE BOOKS

1) Modern Digital and AnalogCommunication System, B. P. Lathi, 2nd Edition, Oxford Publication
2) Communication Systems, Simon Haykin, 3rd Edition, John wiley&sons.
3) Electronic Communication System-Fundamental through Advance, Tomas W., 3rd Edition, Wisley.
4) Communication System Analog&Digital, R. P. Singh, TataMcGrawHill.

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. Analyze of digital pulse modulation techniques in terms of SNR and Bandwidth
CO2. Analyze digital baseband binary data transmission.
CO3. Analyze constellation diagrams and BER for digital passband transmission and reception.
CO4. Analyze signal in frequency domain and examine the effect of different operations like addition, scaling, time shifting, frequency shifting, convolution
CO5. Calculate the essential bandwidth required for transmitting the binary pulse signal.
CO6. Analyze and compare DSBSC,SSBSC, AM and FM techniques in presence of noise, interference, phase error and frequency error.

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2										
CO2	3	3	1									
CO3	2	3	1									
CO4	2	3		2								
CO5	3	3	3	2								
CO6	2	3		2								
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – VI (EC)

SUBJECT: (EC617) AUTOMATED ELECTRONICS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

COURSE OBJECTIVES

Automation is playing a key role in Industries. Industries rely heavily on automation for economic viability and mass production. It is important for the students to learn basic of automation, how system works and importance of PLC, SCADA and robotics in automation. This course will provide opportunity to learn industrial automation techniques to understand basic components of automation in Industries, to learn various industry automation techniques, to apply knowledge of automation components for practical application, and to study different systems based on PLC, SCADA and robots in automation.

DETAILED SYLLABUS

NO TOPIC

[1] INTRODUCTION

Automation overview, Architecture of Industrial Automation system, Introduction of PLC and supervisory control and data acquisition (SCADA), Industrial bus systems: Modbus &Profibus

[2] AUTOMATION COMPONENTS

Sensors for temperature, pressure, force, displacement, speed, flow, level, humidity and pH measurement. Actuators, process control valves, introduction of DC and AC servo drives for motion control.

[3] COMPUTER AIDED MEASUREMENT AND CONTROL SYSTEMS

Elements of computer aided measurement and control, man-machine interface, computer aided process control hardware, process related interfaces, Industrial communication systems, Data transfer techniques, Computer aided process control software, Computer based data acquisition system, Internet of things (IoT).

[4] PROGRAMMABLE LOGIC CONTROLLERS

Programmable controllers, Programmable logic controllers, Analog digital input and output modules, PLC programming, Ladder diagram, Sequential flowchart, PLC Communication and networking, PLC selection, PLC Installation, Application of PLC.

[5] DISTRIBUTED CONTROL SYSTEM

Overview of DCS, DCS software configuration, DCS communication, DCS Supervisory Computer Tasks, DCS integration with PLC and Computers.

[6] OVERVIEW OF INDUSTRIAL AUTOMATION USING ROBOTS

Basic construction and configuration of robot**,**Pick and place robot, Welding robot.

RECOMMENDED TEXT / REFERENCE BOOKS

1) Industrial Instrumentation and Control, S. K. Singh, 3rd Edition, Tata McGraw Hill Companies.

2) PC based Instrumentation –Concepts and practice, N. Mathivanan, 3rd Edition, PHI Publications.

3) Programming Logic Controllers -Principles and applications, John W. Webb & Ronald Reis, 5th Edition, PHI Publications.

4) Process Control Instrumentation Technology, C. D. Johnson, 8th Edition, PHI Publications.
5) Programmable logic controller, Dunning & Delmar, 3rd Edition, Thomas Dilmar Publications.
6) Industrial control handbook, Parr & Newman, 3rd Edition, Industry Press.

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. To interpret the importance of automation techniques and relate to various control techniques employed in industry process automation working on Industrial bus systems: Modbus &Profibus

CO2. Introduce various elements of programmable logic controllers (PLC) and implement basic digital logic operations

CO3. To acquire different sensor input, signal condition the inputs, analyze the data, make decisions and take action or control

CO4. Design of PLC ladder diagram using timers, counters, comparison instructions, math operations, data handling and control flow instructions, shift and sequencer operations, and file instructions for various real life applications for plant automation

CO5. To understand the elements of computer aided measurement, control hardware, interfaces, Internet of things (IoT) for plant automation

CO6. Illustrate Basic construction and configuration of robots, applications of robots as pick and place robot and welding robot, demonstrate various building blocks of distributed control systems, and compare different modes of control

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2					1		1		
CO2	3	3	3					1		1		
CO3	3	2	1					1		1		
CO4	3	3						1		1		
CO5	3	2	1					1		1		
CO6	3	3	2					1		1		
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – VI (EC)

SUBJECT: (EC616) TERM PROJECT (MICROCONTROLLER)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
0	0	2	2	1	-	-	25	25	50

COURSE OBJECTIVES

To offer a profound understanding and implementation of Microcontroller based embedded systems in an elementary and integrated manner. At the completion of the course, students will be able to

- Identify, plan, design and implement a small-scale Microcontroller based embedded system.
- Interface Microcontroller(s) with input output peripherals.
- Develop an Integrated system to fulfill the requirements of hardware implementation with the necessary simulation (design, troubleshoot and optimization).
- Design PCB and develop hardware prototype.

DETAILED SYLLABUS

NO	TOPIC
[1]	Identify the project definition
[2]	Design and implement hardware and software/ algorithm
[3]	Analyze, troubleshoot and interpret output
[4]	Presentation Skill
[5]	Designing of PCB and implement hardware prototype

RECOMMENDED TEXT / REFERENCE BOOKS

Not applicable

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. Identify the problem statement that solve societal issues real life problems, through literature survey for project work and arrive at conceptual project statement.

CO2. Decide design specifications and plan for the project work. Develop presentation and interpersonal communication skills through project work

CO3. Develop presentation and interpersonal communication skills through project work

CO4. Evaluate outcome and application of project work with appropriate societal, health and safety consideration.

CO5. Analyse, test and troubleshoot designed circuits and codes for desired outcome.

COURSE MATRIX

Course Outcome (CO's)	Program Outcomes (PO's)											
	Domain Specific (PSO)					Domain Independent (PO)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2					1		1		
CO2	3	3	3					1		1		
CO3	3	2	1					1		1		
CO4	3	3						1		1		
CO5	3	2	1					1		1		
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – VII (EC)

SUBJECT: (EC720) IMAGE PROCESSING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

COURSE OBJECTIVES

This course offers a solid foundation to understand advanced applications such as Computer Vision, Medical image analysis, Surveillance and multimedia image processing. This subject covers the fundamental concepts & key stages of digital image processing including representation, sampling and quantization, image acquisition, image transforms, image enhancement, image filtering and image restoration. Students will also learn advance topics like Image Segmentation & Morphological Operations. They will implement all the techniques using Python language & OpenCV libraries.

DETAILED SYLLABUS

NO TOPIC

[1] INTRODUCTION

Digital Image Processing, The Origins of Digital Image Processing, Examples of Fields thatUse Digital Image Processing, Fundamental Steps in Digital Image Processing, Components ofan Image Processing System.

[2] DIGITAL IMAGE FUNDAMENTALS

Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing andAcquisition, Image Sampling and Quantization, Some Basic Relationships between Pixels,Linear and Nonlinear Operations

[3] IMAGE ENHANCEMENT IN THE SPATIAL DOMAIN

Background, Some Basic Gray-Level Transformations, Histogram Processing, Enhancementusing Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters,Sharpening Spatial Filters, Combining Spatial Enhancement Methods.

[4] IMAGE ENHANCEMENT IN THE FREQUENCY DOMAIN

Background, Introduction to the Fourier Transform and the Frequency Domain, SmoothingFrequency-Domain Filters, Sharpening Frequency Domain Filters, Holomorphic Filtering,Implementation.

[5] IMAGE RESTORATION

A Model of the Image Degradation/Restoration Process, Noise Models, Restoration in the Presence of Noise Only-Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering, Geometric Mean Filter, Geometric Transformations.

[6] COLOR IMAGE PROCESSING

Color Fundamentals, Color Models, Pseudocolor Image Processing, Basics of Full-ColorImageProcessing.

[7] MORPHOLOGICAL IMAGE PROCESSING

Preliminaries. Dilation and Erosion. Opening and Closing. The Hit-or-Miss Transformation.Some Basic Morphological Algorithms. Extensions to Gray-Scale Images

[8] IMAGE SEGMENTATION

Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, RegionBased Segmentation, Segmentation by Morphological Watersheds, The Use of Motion inSegmentation.

[9] REPRESENTATION AND DESCRIPTION

Representation, Boundary Descriptors, Regional Descriptors, Use of Principal Components forDescription, Relational Descriptors.

RECOMMENDED TEXT / REFERENCE BOOKS

1) Digital Image Processing, Rafael C. Gonzalez& Woods, 3rd Edition, Wesley Publishing Co.
2) Image Processing, Don Pearson, Tata McGraw Hill
3) Digital Picture Processing, AzrielResenfeld, Avinash C. Kak, Academic Press, New York
4) Digital Image Processing, Kenneth R. Castleman, Pearson Education
5) Fundamental of Digital Image Processing, Anil K. Jain, Pearson Education

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. Compare different methods for image acquisition, storage, processing and representation in digital devices having different color formats

CO2. Analyse an image in spatial domain and apply spatial enhancement techniques like point processing methods & Image Filtering.

CO3. Interpret & compare the mathematical principles of 2D transform methods for image analysis in frequency domain and apply them for image enhancement.

CO4. Discriminate various segmentation techniques for an image and separating image components for further analysis.

CO5. Compare various noise models for an image, evaluate restoration techniques to remove noise and degradation, and processing image using representation & description techniques.

CO6. Compare morphological image processing methods for various applications

COURSE MATRIX

Course Outcome (CO's)	Program Outcomes (PO's)											
	Domain Specific (PSO)					Domain Independent (PO)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2				3						
CO2	3	3	3	3	3	2		1	2	1		
CO3	3	3	3	2	3	2		1	2	1		
CO4	3	3	3	2	3	2		1	2	1		
CO5	3	3	3	2	3	2		1	2	1		
CO6	3	3	3	2	3	2		1	2	1		
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – VII (EC)

SUBJECT: (EC702) DATA & COMPUTER COMMUNICATIONS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

COURSE OVERVIEW

Computer networks and data communications plays a major role in every aspect of day to day life. The course is designed to impart fundamental knowledge of computer network architecture and major communication protocols. On completion of this course, students are familiarise with the Transmission Media, Flow Control and Error Detection & Correction, understand fundamental concepts in Routing, Addressing & working of Transport Protocols, Administer and maintain a computer network and also gain the knowledge of application layer protocols.

DETAILED SYLLABUS

NO TOPIC

[1] INTRODUCTION
The uses of Computer Networks, Network Structure, Network Architecture, OSI Reference Model, Classification of Computer Networks, TCP/IP Protocol Suite, Connectionless Vs Connection Oriented Services, Services & Interface.

[2] THE MEDIUM ACCESS SUBLAYER
The Channel Allocation Problem, Multiple Access Protocols, Collision Free Protocols, IEEE Standard 802.x for LAN and MANs, Bridges.

[3] THE DATA LINK LAYER
Data Link Layer Design Issues, Elementary Data Link Protocols, Sliding Window Protocols.

[4] THE NETWORK LAYER
IPv4 Addressing, Special Addresses, Network Layer Design Issues, Routing Algorithms, Congestion Control Algorithms, Internetworking, Internetworking Devices, The Network Layer in Internet - ARP, IP and ICMP Network Layer Protocols.

[5] THE TRANSPORT LAYER
The Transport Services, Elements of Transport Protocols, The Internet Transport Protocols (TCP and UDP).

[6] THE APPLICATION LAYER
Network Security

RECOMMENDED TEXT / REFERENCE BOOKS

1) Computer Networks, Andrew S. Tanenbaum, 3rd Edition, Prentice Hall of India
2) Data and Computer Communications, William Stallings, 3rd Edition, Prentice Hall of India
3) Data Communications and Networking, BehrouzA.Forouzan, 3rd Edition, Tata McGraw Hill

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. Understand the fundamental underlying principles of computer networking and discuss the functionality along with design issues of OSI and TCP-IP layered network architecture.

CO2. Develop various protocols of data link layer for wired communication and also discuss merits and demerits of several data link layer protocols.

CO3. Understand the fundamentals of various MAC layer protocols and examine the performance of MAC protocols using examples.

CO4. Study the working of routing algorithms to calculate the shortest path towards the destination based on different criteria like hope count, delay etc. And also analyse various network layer protocols such as RIP, OSPF.

CO5. Study the functionality the Internet protocol (IP) and also analyse IP header using packet capturing tool.

CO6. Assess the performance evaluation of transmission control protocol, its header and congestion control algorithms using network simulator (NS2).

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1		2				3						
CO2	3	3	3	3	3	2						
CO3	3	3	3	2	3	2						
CO4	3	3	3	2	3	2						
CO5	3	3	3	2	3	2						
CO6	3	3	3	2	3	2						
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – VII (EC)

SUBJECT: (EC722) EMBEDDEDSYSTEMS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

COURSE OBJECTIVES

Embedded Systems have become ubiquitous with their important role in various domains ranging from small handheld/portable devices to automobile and other complex time critical systems including IoTs. The design and performance of embedded systems are challenged by resource constraints besides size restriction. Therefore, understanding of suitable processor/microcontroller architecture, means of data transfer along with the basic concepts of responsibilities of Operating Systems is essential in order to address the common design issues.

The offered subject covers ARM Cortex processor with its feature for efficient firmware development as a suitable candidate for the design of embedded systems and very commonly used data transfer protocols like I2C and SPI. Since the operating system is an unavoidable part of any sophisticated embedded system, the subject also includes the topics related to the core responsibilities of operating systems like, process management, scheduling and I/O management.

To offer in-depth understanding of the ARM Cortex-M processors and software interface standard, the interface protocols like SPI and I2C, and the fundamentals of operating system

DETAILED SYLLABUS

NO TOPIC

[1] INTRODUCTION TO ARM CORTEX-M PROCESSORS
ARM Cortex-M processors, Advantages of the Cortex-M processors, Applications of the ARM Cortex-M processors, ARM ecosystem

[2] CORTEX-M ARCHITECTURE
Introduction to the architecture, Programmer's model, Behavior of the application program status register

MEMORY SYSTEM
Overview, Memory endianness, Bit-band operations, Memory access attributes

[3] EXCEPTIONS AND INTERRUPTS
Overview, Exception types, Interrupt management

[4] OS SUPPORT FEATURES
Overview of OS support features, Shadowed stack pointer, SVC exception, PendSV exception

[5] I2C PROTOCOL
Overview, I2C bus features, I2C bus hardware configurations, I2C Protocol, Driving I2C bus

[6] SPI PROTOCOL
Overview, SPI operation, Clock polarity and phase in SPI devices, SPI bus configurations

[7] SOFTWARE INTERFACE STANDARD
Overview, Areas of standardization in CMSIS-Core, Organization of CMSIS-Core, using CMSIS-Core Benefits of CMSIS-Core, Various versions of CMSIS

[8] INTRODUCTION TO OPERATING SYSTEMS
Operating System Concepts, System Calls

[9] PROCESSES

The Process Model, Threads, Interprocess Communication, Classical IPC Problems, Process Scheduling

[10] INPUT/OUTPUT

Principles of I/O Hardware & Software, Device Drivers, Device-Independent I/O Software, User-Space I/O Software, Deadlocks, RAM Disks, Disk Hardware and Software, Clock Hardware and Software, Terminal Hardware and Software.

RECOMMENDED TEXT / REFERENCE BOOKS

1) The Definitive Guide to ARM Cortex -M3 and Cortex-M4 Processors, Joseph Yiu, : 3rd Edition, Newness Press
2) Operating Systems: Design and Implementation, A. S. Tanenbaum, A. S. Woodhull, 3rd Edition, Prentice Hall of India
3) Operating Systems, William Stallings, Edition 6th, Pearson Education
4) The Designers guide to the Cortex-M processor family, Trevor Martin Edition 2nd, Newnes Press

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. Understand roles and responsibilities of operating systems and select a suitable structure/model of the operating system as per the system requirement.

CO2. Identify an appropriate approach for solving the problem of accessing shared resources based on the understanding of the process model of time-sharing multiprogramming environment.

CO3. Also examine situations/conditions leading to deadlocks while acquiring physical devices and design algorithms to prevent or avoid them.

CO4. Compare different scheduling algorithms with reference to scheduling criteria. Also identify the characteristics and time critical requirements of real time tasks and relate with a right real time scheduling algorithm.

CO5. Classify the devices and understand uniform naming and device independent features of the I/O software to effectively utilize the Operating system support.

CO6. Structure the I/O software in different layers to accommodate error handling, interrupt handlers and drivers for various devices.

CO7. Understand the difference in block devices and compare disk arm scheduling algorithms for reducing transfer time.

CO8. Also choose appropriate clock hardware and software approach for implementation of functions related to clock.

CO9. Understand, compare and implement industry standard widely used serial bus protocols like I2C and SPI for application-level use with the help of EDA tool Keil5. Understand features and applications of various profiles of Cortex processors.

CO10. Understand the internal architecture, features and Programmer's model of ARM Cortex-M processor and implement its unique features using assembly language programming.

CO11. Understand memory system in terms of memory endianness and attributes for efficient interfacing with Cortex-M processor. Write optimized code for implementation of atomic operation using bit-band feature of ARM Cortex M processor for boolean operations and multitasking systems.

CO12. Apply the fault and exception handling mechanisms of ARM Cortex-M processor to provide a well-defined response to unexpected situations for a robust embedded system. Also implement specific exceptions useful for real time systems. Use

software interface standards CMSIS for writing firmware in user friendly environment for easier development and debugging

COURSE MATRIX

Course Outcome (CO's)	Program Outcomes (PO's)											
	Domain Specific (PSO)					Domain Independent (PO)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1										
CO2	2	2	1				1	1		1		
CO3		3	2	1		1		1		1		
CO4	2				1							
CO5		2	2	1				1		1		
CO6		2	1				1					
CO7	2	1			3			1		1		
CO8	2				1							
CO9	2	1	3		2							
CO10	2	1	2		3	1		1		1		
CO11	2	1	3		2							
CO12	2	1	2		3	1		1				
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – VII (EC)

SUBJECT: (EC717) CODING THEORY & COMPRESSION TECHNIQUES

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	0	4	4	60	40	-	-	100

COURSE OBJECTIVES

To present insightful understanding of the basic concepts of probability theory followed by information theory, source coding, channel model, channel capacity, channel coding, and their applications, specifically with respect to a communication system.

Moreover, the students are also exposed to a variety of topics of compression techniques, ranging from basic dictionary techniques to the advanced video compression techniques, and their applications.

DETAILED SYLLABUS

NO TOPIC

[1] PROBABILITY THEORY AND RANDOM PROCESS
Introduction to the theory of probability, Random variables, Statistical averages, The centrallimit theorem, correlation, binary case.

[2] AN INTRODUCTION TO INFORMATION THEORY
Measure of information, Source encoding, Error-free communication over a noisy channel, The channel capacity of a discrete memory less channel, channel capacity of a continuous channel, Practical communication systems in the light of Shannon's equation.

[3] ERROR-CORRECTING CODES
Introduction, Linear block codes, Cyclic codes, Burst-error- detecting and correcting codes,Interlaced codes for burst and random error correction, Convolution codes, comparison of coded and uncoded systems.

[4] Data compression Techniques
Introduction, Huffman coding, static Dictionary, diagram coding, Adaptive Dictionary, The LZ77 approach, The LZ78 approach, File compression, Image compression (GIF), Compression over modems

[5] TRANSFORM CODING
Introduction, The transform, Transforms of interest, Discrete cosine transform, Discrete sine transform Quantization and coding of transform coefficients, Application to image compression-JPEG: The transform, quantization, coding.

[6] VIDEO COMPRESSION STANDARDS
Introduction, MPEG, H.261, H-263, H-264, Packet Video

RECOMMENDED TEXT / REFERENCE BOOKS

1) Modern Digital and Analog Communication Systems, B. P. Lathi, 3rdEdition, Hold Saunders International
2) Introduction to Data Compression, Khalid Sayood, 2nd Edition, Elsevier
3) Data Compression, David Salomon, 3rdEdition, Springer
4) Information Theory, Coding &Cryptograph, Ranjan Bose, 2nd Edition, Tata McGraw Hill

COURSE OUTCOMES

At the end of the course,students should be able to

- CO1. Apply concept of probability to analyse probability distributions for various cases.
- CO2. Compute entropy and channel capacity of various memoryless channels for different scenarios.
- CO3. Analyze different error detection and correction coders and decoders
- CO4. Generate binary codes using Huffman coding Algorithms as well as static and adaptive dictionary for loss less data compression.
- CO5. Calculate and compare different Transformation Techniques for data compression.
- CO6. Apply DCT for image compression and video compression.Illustrate Algorithms and standards developed for different video communication applications.

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	1	2	-	-	-	2	-	2	-	2
CO2	3	3	3	3	-	-	-	2	-	3	-	2
CO3	3	3	2	3	-	-	-	2	-	3	-	3
CO4	3	3	2	3	-	-	-	2	-	3	-	3
CO5	3	3	3	3	-	-	-	2	-	3	-	3
CO6	3	3	3	2	-	-	-	2	-	3	-	2
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – VII (EC)

SUBJECT: (EC724) WIRELESS COMMUNICATION

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	0	6	5	60	40	-	-	100

COURSE OBJECTIVES

In view of fast development in a range of applications depending on cellular systems as well as wireless technology in general, it is essential to understand the fundamentals of cellular concept with in-depth study of the characteristic of hostile wireless channels and design of various techniques to compensate the demerits of the channels.

The offered subject has to include the advance topics like cellular concepts, digital modulation techniques, spread spectrum techniques, speech coders, Adaptive equalizer, diversity, GSM architecture as the attempt of upgrading the quality of wireless communication.

To offer fundamental understanding of various aspects of wireless communication including cellular structure, interference and fading issues with different minimization techniques. The subject makes students aware of various mobile telephony standards like GSM-2G, 2.5G, 3G (WCDMA) and 4GLong Term Evolution (LTE).

DETAILED SYLLABUS

NO TOPIC

[1] INTRODUCTION TO WIRELESS COMMUNICATION SYSTEM

Evolution of mobile radio communications, Cellular Telephone System.

MODERNWIRELESS COMMUNICATION SYSTEMS

Second generation (2G) cellular networks, Third generation (3G) wireless networks, Bluetoothand personal area network.

[2] THE CELLULAR CONCEPT-SYSTEM DESIGN FUNDAMENTALS

Introduction, Frequency reuse, Channel assignment strategies, Handoff strategies, Interference and system capacity, Trunking and grade of service, Improving coverage & capacity in cellular systems.

[3] MOBILE RADIO PROPAGATION

Large scale path loss, Small scale path loss fading and multi path Doppler shift, Fading offset, Level crossing rate, Fade duration.

[4] MODULATION TECHNIQUES FOR MOBILE RADIO

Digital modulation - an overview, Pulse shaping Techniques, Linear modulation techniques, Constant envelope modulation, combined linear and constant envelope modulation (QAM), Multiple Access Techniques, Spread spectrum modulation techniques.

[5] EQUALIZATION, DIVERSITY, AND CHANNEL CODING

Introduction, Fundamentals of equalization, Training , A generic adaptive equalizer, Equalizers in a communications receiver, Survey of equalization techniques, Linear equalizers, Nonlinear equalization, Diversity techniques, RAKE receiver, Interleaving, Fundamentals of channel coding.

[6] SPEECH CODING

Introduction, Characteristics of speech signals, Quantization techniques, Adaptive differential pulse code modulation (ADPCM), Vocoders, Linear predictive coders, choosing speech codec for mobile communications, The GSM codec

[7] MULTIPLE- ACCESS TECHNIQUES FOR WIRELESS COMMUNICATION

Introduction, Frequency division multiple access (FDMA), Time division multiple access,Spread spectrum multiple access, Frequency hopped multiple access (FHMA), Code-

divisionmultiple access (CDMA), Hybrid spread spectrum techniques, Space division multiple access(SDMA), Packet radio, Capacity of cellular systems.

[8] GSM SYSTEM

RF specifications, Time slot data structure, Speech frame, Control channels System structure.HLR VLR AUC EIR MSC BSC BTS MS Equalization, Diversity, Channel Coding, SpeechCoding.

[9] OVERVIEW OF 3G & 4G

An overview of wireless systems, Techniques for high data rate in 3G, Brief about WCDMA,3GPP Long Term Evolution (LTE)- Goals, System overview, Network structure, MainFeatures

RECOMMENDED TEXT / REFERENCE BOOKS

1) Wireless communication, Theodore Rappaport, 2nd Edition, Prentice Hall of India.
2) Wireless Communication, W. C. Y. Lee, 3rd Edition, Tata McGraw Hill.
3) Wireless Communications, Andreas F. Molisch, 2nd Edition, A John Wiley and Sons, Ltd.
4) Wireless Communications and Networking, Vijay Garg, M.K. Publishers

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. Compute path-loss and received signal strength with given transmit power, antenna gain and distance for largescale fading channel condition and determine small scale multipath fading parameters for given operating frequency, speed of mobile and delay spread.

CO2. Compare the features of 1G, 2G & 3G mobile techniques and analyse 2G techniques in terms of interference and capacity

CO3. Understand Linear and nonlinear equalizers and Select suitable DSP chip for implementation of the LMS algorithm for adaptive equalization for given order of filter to achieve specified mean square error criterion.

CO4. Analyse cellular system to improve coverage and capacity

CO5. Understand all types of diversity and Determine average SNR for given number of receive antenna for selection diversity and MRC diversity.

CO6. Compare modulation techniques in terms of bandwidth efficiency and power efficiency.

CO7. Find out output bit rate for LPC, SBC and CELP source coders for given block of speech duration, sampling frequency and determine the bandwidth requirement for given type of FEC and modulation technique.

CO8. Compare multiple Access Techniques and compute efficiency of FDMA, TDMA and CDMA

CO9. Understand GSM architecture and overview of 4G features and illustrate the call establishment process in GSM showing the usage of control channels at every step of data exchange between Mobile station and switching centre.

COURSE MATRIX

Course Outcome (CO's)	Program Outcomes (PO's)											
	Domain Specific (PSO)					Domain Independent (PO)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1		1	1					
CO2	3	2	1	1		1	1	1				
CO3	3	3	1	1		1	1	1				
CO4	3	3	1	1		2	1	1				
CO5	3	3	3	3		2	1	1				
CO6	3	3	2	2		2	1	1				
CO7	3	3	2	2		2	1	1				
CO8	3	3	1	1		2	1	1				
CO9	3	3	2									
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – VII (EC)

SUBJECT: (EC723) TERM PROJECT (SOFTWARE)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
0	0	2	2	1	-	-	25	25	50

COURSE OBJECTIVES

To offer a profound understanding and implementation of any system or concept using any programming language or software tool.

DETAILED SYLLABUS

NO TOPIC

[1] Plan, design and implement Software projects.
[2] Analyze and interpret output.
[3] Presentation Skill
[4] Designing of Flowchart

RECOMMENDED TEXT / REFERENCE BOOKS

Not applicable

COURSE OUTCOMES

At the end of the course,students should be able to

CO1. Identify the problem statement that solve societal, health and safety issues, through literature survey for project work and Arrive at conceptual project design through brainstorming.
CO2. Develop design strategy for the project work.
CO3. Develop presentation and interpersonal communication skills through project work
CO4. Evaluate outcome and application of project work with appropriate societal, health and safety consideration.

COURSE MATRIX

Course Outcome (CO's)	Program Outcomes (PO's)											
	Domain Specific (PSO)					Domain Independent (PO)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1								
CO2	3	2	1	1								
CO3	3	3	1	1								
CO4	3	3	1	1								
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

B. TECH. SEMESTER – VIII (EC)

SUBJECT: (AF802) SEMINAR

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
0	0	2	2	2	-	-	50	100	150

COURSE OBJECTIVES

Assist the student's development of employer-valued skills such as teamwork communication and attention to detail. Students should design/develop & fabricate the hardware and/or software system. They may also undertake project involving study and analysis of existing electronics systems in the industry and suggesting modifications for revamping the system.

DETAILED SYLLABUS

Not applicable

RECOMMENDED TEXT / REFERENCE BOOKS

Not applicable

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. Enhance capability to acquire and apply fundamental principles of engineering.
CO2. Aware the development in technologies in recent trends in respective fields.
CO3. Correlate theoretical knowledge in practical to integrate any system.
CO4. Provide an opportunity to implement their ideas for the designing of various system.
CO5. Enhance presentation skills of work done.
CO6. Capability and enthusiasm for self-improvement through continuous professional development and life-long learning
CO7. Enhance teamwork and communication skills in professional fields.
CO8. Communicate efficiently.
CO9. Identify, formulate and model problems and find engineering solution based on a systems approach.
CO10. Awareness of the social, cultural, global and environmental responsibility as an engineer.

COURSE MATRIX

Course Outcome (CO's)	Program Outcomes (PO's)											
	Domain Specific (PSO)					Domain Independent (PO)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1		1	1					
CO2	3	2	1	1		1	1	1				
CO3	3	3	1	1		1	1	1				
CO4	3	3	1	1		2	1	1				
CO5	3	3	3	3		2	1	1				
CO6	3	3	2	2		2	1	1				
CO7	3	3	2	2		2	1	1				
CO8	3	3	1	1		2	1	1				
CO9	3	3	2									
CO10	3	3	2	2		2						
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

SYLLABI BOOK

MASTER OF TECHNOLOGY
ELECTRONICS & COMMUNICATION SYSTEMS

Department of Electronics & Communication Engineering
Faculty of Technology
Dharmsinh Desai University
Nadiad – 387 001, Gujarat, India.

http://www.ddu.ac.in
ec@ddu.ac.in

2021-2022

TEACHING SCHEME FOR THE COURSE
M. TECH. ELECTRONICS & COMMUNICATION SYSTEMS
(Admission Year 2021)

SEMESTER I (2021-22)

	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
1	Wireless and Mobile Communication	3	0	2	60	40	-	25	125	4
2	Advanced Digital Signal Processing	3	0	2	60	40	-	25	125	4
3	Research Methodology and IPR	2	0	0	40	-	-	-	40	2
4	Software Project	0	0	2	-	-	50	-	50	1
Elective - I										
5	Voice and Data Networks	3	0	2	60	40	-	25	125	4
5	Remote Sensing	3	0	2	60	40	-	25	125	4
5	Markov Chain and Queuing System	3	0	2	60	40	-	25	125	4
Elective - II										
6	Analog and Digital CMOS VLSI Design	3	0	2	60	40	-	25	125	4
6	Digital Design and Verification	3	0	2	60	40	-	25	125	4
6	FiberOptic Communication & Sensor Systems	3	0	2	60	40	-	25	125	4
									590	19

SEMESTER II (2021-22)

	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
1	Statistical Signal Analysis	3	0	2	60	40	-	25	125	4
2	Advanced Communication Networks	3	0	2	60	40	-	25	125	4
3	System Modelling & Simulation Project	0	0	2	-	-	50	-	50	1
Elective - III										
4	RF and Microwave Circuit Design	3	0	2	60	40	-	25	125	4
4	Cognitive Radio	3	0	2	60	40	-	25	125	4
4	DSP Architecture	3	0	2	60	40	-	25	125	4
Elective - IV										
5	Pattern Recognition and Machine Learning	3	0	2	60	40	-	25	125	4
5	Digital Image and Video Processing	3	0	2	60	40	-	25	125	4
5	Optical Networks	3	0	2	60	40	-	25	125	4
Elective - V										
6	Advance Wireless Communication Systems	3	0	2	60	40	-	25	125	4
6	Satellite Communication	3	0	2	60	40	-	25	125	4
6	Multispectral Signal Analysis	3	0	2	60	40	-	25	125	4
									675	21

SEMESTER III (2022-23)

	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
1	Dissertation - I	0	**0**	**30**	-	-	125	225	350	16
2	Pedagogy Studies	2	0	0	-	-	50	-	50	0
									400	16

SEMESTER IV (2022-23)

	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
1	Dissertation - II	0	**0**	**30**	-	-	150	300	450	16
2	English for Research Paper Writing	2	0	0	-	-	50	-	**50**	0
									400	16

M. TECH. SEMESTER – I (ECS)
SUBJECT: WIRELESS AND MOBILE COMMUNICATION
SYLLABUS & SCHEME (W.E.F. 2021)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme			
Lect	Tut	Prac	Total		Ext	Sess.	Prac	Total
3	0	2	5	4	60	40	25	125

COURSE OBJECTIVES

This course offers an insight into the concepts of mobile and wireless data communication technologies. The objective of this course is to enable the student to understand the technologies of wireless and mobile communications.

The offered subject includes the advance topics like cellular concepts, digital modulation techniques, spread spectrum techniques, speech coders, Adaptive equalizer, diversity, GSM architecture as the attempt of upgrading the quality of wireless communication.

To offer fundamental understanding of various aspects of wireless communication including cellular structure, interference and fading issues with different minimization techniques. The subject makes students aware of various mobile telephony standards like GSM-2G, 2.5G, 3G (WCDMA) and 4GLong Term Evolution (LTE).

DETAILED SYLLABUS

1. Cellular Communication Fundamentals: Cellular system design, Frequency reuse, cell splitting, handover concepts, Co channel and adjacent channel interference, interference reduction techniques and methods to improve cell coverage, Frequency management and channel assignment. GSM architecture and interfaces, GSM architecture details, GSM subsystems, GSM Logical Channels, Data Encryption in GSM, Mobility Management, Call Flows in GSM. 2.5G Standards: High speed Circuit Switched Data (HSCSD), General Packet Radio Service (GPRS), 2.75 G Standards: EDGE

2. Overview of digital modulation techniques: BPSK, QPSK, 8PSK, QAM, FSK and MSK, Spectral efficiency analysis based on calculations for Multiple access technologies: TDMA, FDMA and CDMA,Comparison of these technologies based on their signal separation techniques, advantages, disadvantages and application areas. Wireless network planning (Link budget and power spectrum calculations)

3. Code Division Multiple Access: Introduction to CDMA technology, IS 95 and CDMA 2000 system

4. Mobile Radio Propagation: Large Scale Path Loss, Free Space Propagation Model, Reflection, Ground Reflection (Two-Ray) Model, Diffraction, Scattering, Practical Link Budget Design using Path Loss Models, Outdoor Propagation Models, Indoor Propagation Models, Signal Penetration into Buildings. Small Scale Fading and Multipath Propagation, Impulse Response Model, Multipath Measurements, Parameters of Multipath channels, Types of Small Scale Fading: Time Delay Spread; Flat, Frequency selective, Doppler Spread; Fast and Slow fading.

5. Equalization, Diversity, Equalizers in a communications receiver, Algorithms for adaptive equalization, diversity techniques, space, polarization, frequency

diversity, Interleaving. Channel Coding & Speech Coding

6. Higher Generation Cellular Standards: 3G Standards: evolved EDGE, enhancements in 4G standard, Architecture and representative protocols, call flow for LTE, VoLTE, UMTS, introduction to 5G (eMBB, uRLLC, mMMTC-5G IoT)

RECOMMENDED TEXT / REFERENCE BOOKS

1. Andreas F. Molisch, Wireless Communications, Second Edition, John Wiley & Sons Ltd. 2011
2. T.S.Rappaport, "Wireless Communications Principles and Practice", 2nd Edition, PHI,2002.
3. V.K.Garg, J.E.Wilkes, "Principle and Application of GSM", Pearson Education, 5th Edition, 2008.
4. V.K.Garg, "IS-95 CDMA & CDMA 2000", Pearson Education, 4th Edition, 2009.
5. William C.Y.Lee, "Mobile Cellular Telecommunications Analog and Digital Systems", 2nd Edition, TMH, 1995.
6. Asha Mehrotra, "A GSM system Engineering" Artech House Publishers Bosten, London,1997.
7. Multiple Access Techniques for 5G Wireless Networks and Beyond, aezi, Mojtaba, Ding, Zhiguo, Poor, H. Vincent, Springer International Publishing, 2020.

COURSE OUTCOMES

At the end of the course, students should be able to

CO1 Understand the concept of cellular networks, GSM architecture, 2.5G, 2.75G standards
CO2 Understanding Wireless communication Channels for signal propagation in fading environment
CO3 Understand and analyze different types of digital modulation techniques and multiplexing techniques used for wireless communications.
CO4 Understand CDMA technology standards (IS-95 and CDMA 2000)
CO5 Understand and analyze Equalization, Diversity, channel coding & speech coding for wireless receivers.
CO6 Understand Higher Generation Cellular Standards with its architectures (3G, 4G and Introduction to 5G)

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	2	-	-							
CO2	3	3	2	2	1							
CO3	3	2	1	2	1							
CO4	3	2	2	2	-							
CO5	3	2	2	2	1							
CO6	1	1	-	-	-							
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

M. TECH. SEMESTER – I (ECS)
SUBJECT: VOICE AND DATA NETWORKS
SYLLABUS & SCHEME (W.E.F. 2021)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme			
Lect	Tut	Prac	Total		Ext	Sess.	Prac	Total
3	0	2	5	4	60	40	25	125

COURSE OBJECTIVES

Voice and Data networks plays a major role in every aspect of day to day life. The course is designed to impart fundamental knowledge of computer network architecture and major communication protocols. On completion of this course, students are familiarise with the Flow Control and Error Detection & Correction, understand fundamental concepts in Routing, Addressing & working of Transport Protocols, also gain the knowledge of queuing models and concurrent process.

DETAILED SYLLABUS

1. Network Design Issues, Network Performance Issues, Network Terminology, centralized and distributed approaches for networks design, Issues in design of data networks, Layered and Layer less Communication, Cross layer design of Networks.

2. Data Communication Networks and their Design, Link layer design- Link adaptation, Link Layer Protocols, Retransmission. Mechanisms (ARQ), Hybrid ARQ (HARQ), Go Back N, Selective Repeat protocols and their analysis.

3. Unit 3: Queuing Models of Networks, Traffic Models, Little's Theorem, Markov chains, M/M/1 and other Markov systems, Multiple Access Protocols for Local Area Networks.

4. Inter-networking, Bridging, Global Internet, IP protocol and addressing, Sub netting, Classless Inter domain Routing (CIDR), IP address lookup, Dynamic IP Address Configuration, Routing in Internet, Internet Routing Protocols – OSPF and BGP, Mobile IP, Translating IP addresses to domain names.

5. Unit 5: End to End Protocols, TCP and UDP. TCP Congestion Control - Additive Increase/Multiplicative Decrease , Slow Start, Fast Retransmit/ Fast Recovery, Congestion avoidance, RED TCP Throughput Analysis, Quality of Service in Packet Networks. Network Calculus, Packet Scheduling Algorithms.

6. Socket Interface - Concept of Process, Process Creation (Forking) and Process Identification, Concurrent and Iterative mode of services, Socket Introduction Socket System calls.

RECOMMENDED TEXT / REFERENCE BOOKS

1. Computer Networks, Andrew S. Tanenbaum, 3rd Edition, Prentice Hall of India
2. D. Bertsekas and R. Gallager, “Data Networks”, 2nd Edition, Prentice Hall, 1992.

3. L. Peterson and B. S. Davie, "Computer Networks: A Systems Approach", 5th Edition, Morgan Kaufman, 2011.
4. Kumar, D. Manjunath and J. Kuri, "Communication Networking: An analytical approach", 1stEdition, Morgan Kaufman, 2004.
5. Walrand,"Communications Network: A First Course", 2nd Edition, McGraw Hill, 2002.
6. Leonard Kleinrock, "Queueing Systems, Volume I: Theory", 1stEdition, John Wiley and Sons, 1975.
7. Aaron Kershenbaum, "Telecommunication Network Design Algorithms", McGraw Hill, 1993.
8. Vijay Ahuja, "Design and Analysis of Computer Communication Networks", McGraw Hill, 1987
9. TCP/IP Protocol Suite, 7th Edition By: Behrouz A. Forouzan Publisher: Tata McGraw Hill
10. Internetworking with TCP/IP Vol.1, 2, 3, 2nd Edition By: Douglas Comer Publisher: Prentice Hall of India
11. Unix Network Programming, 1stEdition By: W. R. Stevens Publisher: Prentice Hall of India
12. TCP/IP Illustrated Vol. I, 1stEdition By: W. R. Stevens Publisher: Pearson Education

COURSE OUTCOMES

At the end of the course, students should be able to

CO1	Describe the fundamental underlying principles of computer networking.
CO2	Discuss the functionality of layered network architecture.
CO3	Develop various protocols of data link layer for wired communication.
CO4	Analyze the different queuing model of networks.
CO5	Analyse the packet formation in *wireshark* packet capturing tool.
CO6	Assess the performance evaluation of transmission control protocol.
CO7	Develop the code to generate concurrent process using fork programming.

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3					1				3		
CO2	2					1						
CO3	3		3									
CO4	2		2									
CO5		2		3	3							
CO6	3	2	2	1								
CO7	3	2	2	3	3							
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

M. TECH. SEMESTER – I (ECS)
SUBJECT: ADVANCE DIGITAL SIGNAL PROCESSING
SYLLABUS & SCHEME (W.E.F. 2021)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme			
Lect	Tut	Prac	Total		Ext	Sess.	Prac	Total
3	0	2	5	4	60	40	25	125

COURSE OBJECTIVES

To offer in depth understanding of time domain and frequency domain analysis of discrete time signals and systems along with the design process of IIR and FIR digital filters and detailed study of advance topics in digital signal processing such as adaptive filter, multirate signal processing etc.

DETAILED SYLLABUS

1. Overview of DSP, Overview of discrete time signal and systems, Convolution and correlations and their application, Characterization in time and frequency, overview of Z-transform and its applications, overview of DFT, FFT Algorithms, Digital filter design and structures: Basic FIR/IIR filter design & structures, design techniques of linear phase FIR filters, IIR filters by impulse invariance, bilinear transformation, FIR/IIR Cascaded lattice structures, and Parallel all pass realization of IIR.

2. Multi rate DSP, Decimators and Interpolators, Sampling rate conversion, multistage decimator & interpolator, poly phase filters, QMF, digital filter banks, Applications in sub-band coding.

3. Minimum mean square error and linear minimum mean square error criteria, FIR Wiener filter and linear prediction, steepest descent algorithm and LMS algorithm, Recursive Least Square algorithm. Applications: Adaptive Modelling and System Identification, Inverse Adaptive Modelling, Deconvolution, Adaptive Inverse Control, Adaptive Interference Cancelling.

4. Estimation of Spectra from Finite-Duration Observations of Signals. Nonparametric Methods for Power Spectrum Estimation, Parametric Methods for Power Spectrum Estimation.

5. Fixed and floating point representation of numbers, quantization noise in signal representations, finite word-length effects in coefficient representation, limit cycle oscillations, scaling to prevent overflow

6. Characteristics of DSP algorithms and hardware requirements, von Neumann architecture, Harvard architecture, parallelism and hardware units of typical digital signal processor. Architectural details of TMS320C6x. Introduction to wavelets, Wavelet transform applications.

RECOMMENDED TEXT / REFERENCE BOOKS

1. J. G. Proakis and D. G. Manolakis, “Digital signal processing: Principles, Algorithm and Applications”, 4thEdition, Prentice Hall, 2007.

2. N. J. Fliege, "Multirate Digital Signal Processing: Multirate Systems -Filter Banks – Wavelets", 1st Edition, John Wiley and Sons Ltd, 1999.
3. Bruce W. Suter, "Multirate and Wavelet Signal Processing",1st Edition, Academic Press, 1997.
4. Digital Signal Processing: A computerBased Approach, 2nd Edition By: S. K. Mitra Publisher: Tata McGraw Hill
5. Analog and Digital Signal Processing, 2nd Edition By: Ashok Ambardar Publisher: THOMSON Brooks
6. Digital Signal Processing: A Practical Approach, 2nd Edition, By - Emmanuel Ifeachor , Barrie Jervis Publisher: Pearson.
7. M. H. Hayes, "Statistical Digital Signal Processing and Modeling", John Wiley & Sons Inc., 2002.
8. S. Haykin, "Adaptive Filter Theory", 4th Edition, Prentice Hall, 2001.
9. D. G. Manolakis, V.K. Ingle and S. M. Kogon, "Statistical and Adaptive Signal Processing", McGraw Hill, 2000.

COURSE OUTCOMES

At the end of the course, students should be able to

CO1 Classify discrete time systems, Analyze and realize the DT system using z transform.

CO2 Represent analog and discrete signals, Find LTI-DT system's response using convolution and correlation.

CO3 Distinguish between FT, DTFT and DFT, Obtain spectrum of the given signal using DFT and FFT Algorithms.

CO4 Design of IIR and FIR filters

CO5 Select an appropriate DSP chip for implementation of adaptive filter using LMS algorithm, Determine truncation error due to finite word length effects, Understand the requirement of DSP algorithm and special features of DSP processors

CO6 Apply concepts of Multirate signal processing to poly phase filters, QMF, digital filter banks, and sub-band coding. Distinguishing Parametric & Nonparametric Methods for Power Spectrum Estimation.

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	1	1	1	2	1	1	2	2		1
CO2	3	2	1	1	2	2	1		2	2		1
CO3	3	3	3	2	2	2	1		2	2		1
CO4	3	3	3	2	2	2	1		2	2		1
CO5	3	3	3	2	2	2	1	1	2	2		1
CO6	3	3	2	1	2	2	1		2	2		1
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

M. TECH. SEMESTER – I (ECS)

SUBJECT: ANALOG AND DIGITAL CMOS VLSI DESIGN

SYLLABUS & SCHEME (W.E.F. 2021)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme			
Lect	Tut	Prac	Total		Ext	Sess.	Prac	Total
3	0	2	5	4	60	40	25	125

COURSE OBJECTIVES

Very large scale integration (VLSI) is the process of creating an integrated circuit (IC) by combining millions of transistors together in a small silicon chip. In this subject, students will be able to design CMOS based digital and analog circuits, perform functional/timing simulations and synthesis operation using EDA tool like Quartz-II. Students can able to analyse and optimize the circuitry in terms of PPA (Power, Performance and Area) with the help of SPICE simulations. Students can also able to learn testing of CMOS circuits and aware with physical design flow of VLSI system. Students will be also aware about FPGA chip family like Altera, Xilinx and Actel ACT in view of logic cells, delay, IO cells and interconnect.

DETAILED SYLLABUS

1. **Technology Scaling and Road map:**
   Scaling issues., Types of ASICs , ASIC Design Flow
   Digital CMOS Design:
2. **Review:** Basic MOS structure and its static behavior, CMOS Transistor RC model, Inverter: Static CMOS inverter, Switching threshold AC & DC analysis of CMOS logic and their evaluation, Dynamic behavior, Power consumption.
3. **Combinational logic:** Static CMOS design, Logic effort, Dynamic logic, Speed and power dissipation in dynamic logic, Cascading dynamic gates, CMOS transmission gate logic.
4. **Physical design flow:**
   Floor planning, Placement, CTS
5. **Advanced technologies:** Short channel effects, High–k, Metal Gate Technology, FinFET, TFET etc.
6. **ASIC TEST:** Boundary Scan Test, Fault modeling and simulation, ATPG & PODEM, Built in self test.
7. Programmable ASIC Logic Cells, IO cells, Interconnect
8. Routing
   Analog CMOS VLSI Design
9. **Single Stage Amplifier:** CS stage with resistance load, Divide connected load, Current source load, Triode load, CS stage with source degeneration, Source follower, Common gate stage, Cascade stage, Choice of device models. Differential Amplifiers: Basic difference pair, Common mode response, Differential pair with MOS loads, Gilbert cell.
10. **Passive and active current mirrors:** Basic current mirrors, Cascade mirrors, Active current mirrors. Frequency response of CS stage: Source follower, Common gate stage, Cascade stage and difference pair, Noise
11. **Operational amplifiers:** One stage OPAMP, Two stage OPAMP, Gain boosting, Common mode feedback, Slew rate, PSRR, Compensation of 2 stage OPAMP, Other compensation techniques.

RECOMMENDED TEXT / REFERENCE BOOKS

1. J P Rabaey, A P Chandrakasan, B Nikolic, "Digital Integrated circuits: A design perspective", Prentice Hall electronics and VLSI series, 2nd Edition.
2. BehzadRazavi , "Design of Analog CMOS Integrated Circuits", TMH, 2007.
3. Phillip E. Allen and Douglas R. Holberg, "CMOS Analog Circuit Design", Oxford, 3rd Edition
4. Michael John Sebastian Smith, Application Specific Integrated Circuits, 6th Indian Edition, Pearson Education
5. John P. Uyemura, Introduction to VLSI Circuits and Systems, 1st Edition, Wiley publisher
6. Baker, Li, Boyce, "CMOS Circuit Design, Layout, and Simulation", Wiley, 2nd Edition.

COURSE OUTCOMES

At the end of the course, students should be able to

CO1 Understand and compare different programmable ASICs in terms of Logic Cells, IO cells, interconnect and routing.

CO2 Analyse and evaluation of different configuration of analog circuits using MOSFET device.

CO3 Understand MOSFET device to estimate the switching delay of given digital logic which is useful to estimate maximum frequency of inputs. Also using inverter as a reference simple and subsequently complex digital circuitry are designed using, which are modeled using VHDL and subsequently simulate in terms of functionality and timing using Altera Quartus-II.

CO4 Fastest digital logic cascades is designed by using guidelines of Logical Effort theory specifically in terms of scaling of logical cascades. Also speed and power performance of CMOS circuitry is optimized with the help of advanced CMOS technology.

CO5 Test the CMOS based circuits using various testing methods to identify physical defects in a given chip.

CO6 Understand system-level physical design of VLSI chip and VLSI clocking. Understand technology scaling issues in ASIC and learn advanced process techniques to overcome to these issues.

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	1			2	1	1	2	2		1
CO2	3	3	3	1	2	2	1		2	2		1
CO3	3	3	3	2	2	2	1		2	2		1
CO4	3	3	3	2		2	1		2	2		1
CO5	3	3	3	2	2	2	1	1	2	2		1
CO6	3	3	2			2	1		2	2		1
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

M. TECH. SEMESTER – I (ECS)
SUBJECT: RESEARCH METHODOLOGY AND IPR
SYLLABUS & SCHEME (W.E.F. 2021)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme			
Lect	Tut	Prac	Total		Ext	Sess.	Prac	Total
2	0	0	2	2	40	0	0	40

COURSE OBJECTIVES

The course should enable the students to:

- Identify an appropriate research problem in their interesting domain.
- Understand the effective drafting of a research work.
- Understand the adequate knowledge on IPR (Intellectual Property Right).
- Study the law of patent and copyrights.

DETAILED SYLLABUS

1. Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

2. Effective literature studies approaches, analysis Plagiarism , Research ethics,

3. Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

4. Nature of Intellectual Property - Patents, Designs, Trademark and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

5. Patent Rights - Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

6. New Developments in IPR - Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

RECOMMENDED TEXT / REFERENCE BOOKS

1. Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science & engineering students’”
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”
3. Ranjit Kumar, 2nd Edition , “Research Methodology: A Step by Step Guide for beginners”
4. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd ,2007.

5. Mayall, “Industrial Design”, McGraw Hill, 1992.
6. Niebel , “Product Design”, McGraw Hill, 1974.
7. Asimov , “Introduction to Design”, Prentice Hall, 1962.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “ Intellectual Property in New Technological Age”, 2016.
9. T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008

COURSE OUTCOMES

At the end of the course, students should be able to

CO1 Illustrate research problem formulation and analyse research related information.
CO2 Realize the principles of ethics and ethical issues in science and engineering.
CO3 Write effective technical writing and developing a research proposal.
CO4 Explain how IPR would take such important place in growth of individuals & nation and realize the need of information about IPR to be promoted among student community in general & engineering in particular.
CO5 Relate that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about economic growth and social benefits.

COURSE MATRIX

Course Outcome (CO’s)	**Program Outcomes (PO’s)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	2	2							
CO2	1	1	1	1				3				
CO3	2	2	1							3		2
CO4	2	1	1									
CO5	2	1	1	1								
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

M. TECH. SEMESTER – I (ECS)

SUBJECT: SOFTWARE PROJECT

SYLLABUS & SCHEME (W.E.F. 2021)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme			
Lect	Tut	Prac	Total		Ext	Sess.	Prac	Total
0	0	2	2	1	-	-	50	50

Each student will take up a software project based on Object Oriented Design.

M. TECH. SEMESTER – II (ECS)

SUBJECT: RF AND MICROWAVE CIRCUIT DESIGN

SYLLABUS & SCHEME (W.E.F. 2021)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme			
Lect	Tut	Prac	Total		Ext	Sess.	Prac	Total
3	0	2	5	4	60	40	25	125

COURSE OBJECTIVES

The subject aims to provide the student with:

- Ability to design and analysis of microwave matching networks in RF communication used in spacecraft and radar communication.
- An understanding of microwave waveguides, passive - active devices, and microwave tubes.
- Design of antenna array beamforming used in 5G mobile communication.

DETAILED SYLLABUS

1. TRANSMISSION LINE THEORY

Lumped element circuit model for transmission line, field analysis, Smith chart, quarter wave transformer, generator and load mismatch, impedance matching and tuning.

2. MICROWAVE NETWORK ANALYSIS

Impedance and equivalent voltage and current, Impedance and admittance matrix, The scattering matrix, transmission matrix, Signal flow graph.

3. MICROWAVE COMPONENTS

Microwave resonators, Microwave filters, power dividers and directional couplers, Ferromagnetic devices and components

4. MICROSTRIP ANTENNA ARRAY

Fundamentals of Array Antenna, Linear & Planar Arrays, Array Synthesis, Adaptive Array, Microstrip Array

5. MICROWAVE SEMICONDUCTOR DEVICES AND MODELING

PIN diode, Tunnel diodes, Varactor diode, Schottky diode, IMPATT and TRAPATT devices, transferred electron devices, Microwave BJTs, GaAs FETs, low noise and power GaAs FET, MESFET, MOSFET, HEMT.

6. AMPLIFIERS DESIGN

Power gain equations, stability, impedance matching, constant gain and noise figure circles, small signal, low noise, high power and broadband amplifier, oscillators, Mixers design

RECOMMENDED TEXT/ REFERENCE BOOKS

1. Matthew M. Radmanesh, "Advanced RF & Microwave Circuit Design: The Ultimate Guide to Superior Design", Author House, 2009.
2. D. M. Pozar, " Microwave engineering" ,Wiley, 4th edition, 2011.
3. R. Ludwig and P. Bretchko, "R. F. Circuit Design", Pearson Education Inc, 2009.
4. G.D. Vendelin, A.M. Pavoi, U. L. Rohde, "Microwave Circuit Design Using Linear AndNon Linear Techniques", John Wiley 1990.
5. S.Y. Liao, "Microwave circuit Analysis and Amplifier Design", Prentice Hall 1987.
6. Radmanesh, "RF and Microwave Electronics Illustrated", Pearson Education, 2004.
7. C. A. Balanis, "Antenna Theory", Wiley, 3rd Edition, 2005.

COURSE OUTCOMES

At the end of the course, students should be able to

CO1 Design and analysis of Mixer, Amplifier and RF Filter used in RF communication.

CO2 Design microwave matching networks using single-double stub and quarter wave transformer.

CO3 Design different types of metallic waveguides and analysis of different modes of propagation.

CO4 Demonstrate the structural and operational characteristics of microwave tubes and components to identify their applications and demonstrate their characteristics.

CO5 Design of antenna array and beam forming used in radar and mobile communication.

CO6 Syntesis of smart array antenna using Adaptive algorithm.

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	3	1			2		2			
CO2	3	2	1	1				1				
CO3	2	1	1									
CO4	2	1	1				2				2	
CO5	3	3	2	3	3				2			
CO6	3	3	2	3	3				2			
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

M. TECH. SEMESTER – II (ECS)

SUBJECT: PATTERN RECOGNITION AND MACHINE LEARNING

SYLLABUS & SCHEME (W.E.F. 2021)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme			
Lect	Tut	Prac	Total		Ext	Sess.	Prac	Total
3	0	2	5	4	60	40	25	125

COURSE OBJECTIVES

The main objective of this course is to introduce students with fundamental concepts, theories, and algorithms for pattern recognition and machine learning which are used in computer vision, speech recognition, data mining, statistics, information retrieval, and bioinformatics. This course involves understanding of image processing, its role in pattern recognition, basics of pattern recognition, fundamentals of supervised and unsupervised learning, concepts of deep learning, and basics of support vector machine which can enable students to understand, apply, model, and evaluate artificial intelligence based systems.

DETAILED SYLLABUS

1. Revisiting concepts of Image Processing

2. Introduction to Pattern Recognition: Problems, applications, design cycle, learning and adaptation, examples, Probability Distributions, Parametric Learning - Maximum likelihood and Bayesian Decision Theory- Bayes' rule, discriminant functions, loss functions and Bayesian error analysis

3. Linear Models: Linear Models for Regression, linear regression, logistic regression Linear Models for Classification

4. Neural Network: perceptron, multi-layer perceptron, back-propagation algorithm, error surfaces, practical techniques for improving back-propagation, additional networks and training methods, Adaboost, Deep Learning

5. Linear Discriminant Functions: decision surfaces, two-category, multi-category, minimum squared error procedures, the Ho-Kashyap procedures, linear programming algorithms, Support vector machine

6. Algorithm independent machine learning: lack of inherent superiority of any classifier, bias and variance, re-sampling for classifier design, combining classifiers

7. Unsupervised learning and clustering: k-means clustering, fuzzy k-means clustering, hierarchical clustering

RECOMMENDED TEXT / REFERENCE BOOKS

1. Tom Mitchell, Machine Learning. McGraw-Hill, 1997.
2. Richard O. Duda, Peter E. Hart, David G. Stork, "Pattern Classification", 2nd Edition John Wiley & Sons, 2001.

3. Trevor Hastie, Robert Tibshirani, Jerome H. Friedman, "The Elements of Statistical Learning", 2nd Edition, Springer, 2009.
4. Christopher Bishop, Pattern recognition and machine learning, SpringerVerlag, 2006.
5. Peter Harrington, Machine Learning in Action, Manning Shelter Island
6. Simon Haykin, Neural Networks and Learning Machines, 3rd edition, Pearson, PHI.

COURSE OUTCOMES

At the end of the course, students should be able to

CO1 Fundamentals of Image Processing and its role in pattern recognition. Evaluating Pattern recognition problems & challenges in various applications
CO2 Pattern Recognition: Understanding role of design cycle, learning and adaptation, Probability Distributions. Evaluation of Parametric Learning methods - Maximum likelihood and Bayesian Decision Theory- Bayes' rule, discriminant functions, loss functions and Bayesian error analysis
CO3 Fundamentals of machine learning and understanding of artificial neural networks using algorithms like perceptron and gradient descent
CO4 Evaluation of supervised learning using perceptron and back-propagation algorithm
CO5 Evaluation of Deep learning algorithms, understanding of algorithm independent machine learning and support vector machine
CO6 Evaluation of Unsupervised learning algorithm, clustering, and linear discriminant functions

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	1	1		2	1	1	2	2		1
CO2	3	3	3	1	2	2	1		2	2		1
CO3	3	3	3	2	2	2	1		2	2		1
CO4	3	3	3	2	2	2	1		2	2		1
CO5	3	3	3	2	2	2	1	1	2	2		1
CO6	3	3	2			2	1		2	2		1
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

M. TECH. SEMESTER – II (ECS)

SUBJECT: STATISTICAL SIGNAL ANALYSIS

SYLLABUS & SCHEME (W.E.F. 2021)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme			
Lect	Tut	Prac	Total		Ext	Sess.	Prac	Total
3	0	2	5	4	60	40	25	125

COURSE OBJECTIVES

This course provides a unified mathematical framework which is the basis for describing random events and signals, and how to describe key characteristics of random processes. The course covers probability theory, considers the notion of random variables and vectors, how they can be manipulated, and cover techniques for statistical signal processing, detection and parameter estimation. The notion of statistical quantities such as autocorrelation and auto-covariance are extended from random vectors to random processes, and a frequency-domain analysis framework is developed.

DETAILED SYLLABUS

1. **Random Variables:** Probability Concepts, distribution and density functions, moments, independent, uncorrelated andorthogonal random variables; Vector-space representation of Random variables, Vector quantization, Tchebyshev inequality theorem, Central Limit theorem, Discrete & Continuous Random Variables.

2. **Random Process** - Expectations, Moments, Ergodicity, Discrete-Time Random Processes Stationary Process, autocorrelation and auto covariance functions, Spectral representation of random signals, Properties of power spectral density, Gaussian Process and White noise process, Poisson process, Markov Process

3. **Random Signal Modelling** - MA(q), AR(p), ARMA(p,q) models, Hidden Markov Model & its applications, Linear System with random input, Forward and Backward Predictions, Levinson Durbin Algorithm.

4. **Statistical Decision Theory** - Bayes' Criterion, Binary Hypothesis Testing, M-ary Hypothesis Testing, Minimax Criterion, Neyman-Pearson Criterion, Composite Hypothesis Testing.

5. **Parameter Estimation Theory** - Maximum Likelihood Estimation, Generalized Likelihood Ratio Test, Some Criteria for Good Estimators, Bayes' Estimation Minimum Mean-Square Error Estimate, Minimum, Mean Absolute Value of Error Estimate Maximum A Posteriori Estimate, Multiple Parameter Estimation, Best Linear Unbiased Estimator, Least-Square Estimation, Recursive Least-Square Estimator.

6. **Spectral Analysis** - Estimated autocorrelation function. Periodogram, Averaging the Periodogram (Barlett Method), Welch Modification, Parametric method. AR(p) spectral estimation and detection of Harmonic signals

RECOMMENDED TEXT / REFERENCE BOOKS

1. Papoulis and S.U. Pillai. "Probability, Random Variables and Stochastic Process" 4thEdition. McGraw-Hill. 2002.
2. D.G. Manolakis. V.K. Ingle and S.M. Kogon. “Statistical and Adaptive Signal Processing”, McGraw Hill, 2000.
3. Detection, Estimation, and Modulation Theory, Part 1 Harry L. Van Tree, JohnWiley & Sons.
4. MouradBarkat, “Signal Detection and Estimation”, Artech House, 2nd Edition, 2005

COURSE OUTCOMES

At the end of the course, students should be able to

CO1 Manipulate scalar and multiple random variables, using the theory of probability using the tools of probability transformations and characteristic functions.

CO2 Characterise random processes in terms of its statistical properties, including the notion of stationarity and ergodicity; analyse and manipulate power spectral densitiesof stationary random process.

CO3 Apply hypothesis testing to signal and event detection problem; and evaluate the detector performance using ROC curves, sensitivity/specificity.

CO4 Apply estimation techniques such as maximum-likelihood, least squares, and Bayesian estimation; and choose among MLE,MAP and MMSE estimators for a given parameter estimation tasks.

CO5 Characterise the uncertainty in an estimator, as well as characterise the performance of an estimator (bias, variance, and so forth); understand the Cramer-Rao lower-bound (CRLB) and minimum variance unbiased estimator (MVUE) estimators.

CO6 Outline various parametric estimation methods to accomplish thesignal modelling even at higher order statistics.

COURSE MATRIX

Course Outcome (CO’s)	**Program Outcomes (PO’s)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3			2							
CO2	3	3			2							
CO3	3	3	3			3						
CO4	3	3	2			2						
CO5	3	2		3								
CO6	2	2										
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

M. TECH. SEMESTER – II (ECS)
SUBJECT: ADVANCED COMMUNICATION NETWORK
SYLLABUS & SCHEME (W.E.F. 2021)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme			
Lect	Tut	Prac	Total		Ext	Sess.	Prac	Total
3	0	2	5	4	60	40	25	125

COURSE OBJECTIVES

Advance Communication Networks contribute very crucial role in every aspect of day to day life. The course is designed to impart fundamental knowledge of Real time communication protocols. On completion of this course, students are familiarise with the Packet Scheduling Algorithms, Admission control techniques, also gain the knowledge of differentiate services. Students also enhance the understanding of protocols of wireless networks.

DETAILED SYLLABUS

1. Overview of Internet-Concepts, challenges and history. TCP/IP Congestion and Flow Control in Internet-Throughput analysis of TCP congestion control. TCP for high bandwidth delay networks, Fairness issues in TCP.

2. Real Time Communications over Internet. Adaptive applications. Latency and throughput issues. Integrated Services Model (intServ). Resource reservation in Internet. RSVP. Characterization of Traffic by Linearly Bounded Arrival Processes (LBAP). Leaky bucket algorithm and its properties.

3. Packet Scheduling Algorithms-requirements and choices. Scheduling guaranteed service connections. GPS, WFQ and Rate proportional algorithms. High speed scheduler design. Latency Rate servers and delay bounds in packet switched networks for LBAP traffic. Active Queue Management - RED. IP switching and MPLS.

4. IP address lookup-challenges. Packet classification algorithms and Flow Identification Grid of Tries, Cross producing and controlled prefix expansion algorithms.

5. Admission control in Internet. Concept of Effective bandwidth. Measurement based admission control. Differentiated Services in Internet (DiffServ). DiffServ architecture and framework.

6. Protocols for Advanced Wireless Networks - Issues in Designing a Transport Layer Protocol for Wireless Networks, Classification of Transport Layer Solutions, TCP proposals over wireless networks, Transport Protocols for Interplanetary Communication & Issues.

7. Wireless Sensor Networks - Architecture, Data Dissemination, Data Gathering, Location Discovery, Need for energy management

RECOMMENDED TEXT / REFERENCE BOOKS

1. Jean Wairand and Pravin Varaiya, "High Performance Communications Networks", 2nd Edition, 2000.
2. Jean Le Boudec and Patrick Thiran, "Network Calculus A Theory of Deterministic Queueing Systems for the Internet", Springer Veriag, 2001.
3. Zhang Wang, "Internet QoS", Morgan Kaufman, 2001.
4. Anurag Kumar, D. Manjunath and Joy Kuri, "Communication Networking: An Analytical Approach" , Morgan Kaufman Publishers, 2004.
5. George Kesidis, "ATM Network Performance", Kluwer Academic, Research Papers, 2005.

COURSE OUTCOMES

At the end of the course, students should be able to

CO1 Describe the fundamental underlying principles of wireless networks.
CO2 Discuss the functionality of Integrated Serivces.
CO3 Analyse the performance of various wireless networks prtocols in ns-2.
CO4 Analyse the performance of various wireless sensor networks prtocols in ns-2.
CO5 Assess the performance evaluation of transmission control protocol.
CO6 Analyse the performance of various sechduling algorithms in ns-2.

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3					1				3		
CO2	2					1						
CO3	3		3									
CO4	2		2									
CO5		2		3	3							
CO6	3	2	2	1								
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

M. TECH. SEMESTER – II (ECS)

SUBJECT: ADVANCED WIRELESS COMMUNICATION SYSTEMS

SYLLABUS & SCHEME (W.E.F. 2021)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme			
Lect	Tut	Prac	Total		Ext	Sess.	Prac	Total
3	0	2	5	4	60	40	25	125

COURSE OBJECTIVES

In view of fast development in a range of applications depending on cellular systems as well as wireless technology in general, it is essential to explore advance topics in wireless communication with in-depth study of the techniques included in it.

The offered subject has to include the advance topics like OFDM and MIMO along with their use in LTE. Cognitive radio and Cooperative communication are also the part of the course.

DETAILED SYLLABUS

1. Multicarrier techniques, Orthogonal Frequency Division Multiplexing (OFDM), Cyclic prefix, OFDMA, AMC, bit and power allocation, PAPR, Synchronization issues. Introduction to NOMA.

2. Introduction to Multi-antenna Systems, Motivation, Types of multi-antenna systems, MIMO vs. multi-antenna systems, Exploiting multipath diversity, Transmit diversity, Space-time codes, The Alamouti scheme, Delay diversity, Cyclic delay diversity, Space-frequency codes, Spatial Multiplexing, Spectral efficiency and capacity, Transmitting independent streams in parallel, Mathematical notation

3. MIMO precoding, MIMO Beam forming channel state information (CSI) and channel estimation techniques

4. Case study - MIMO in LTE, Codewords to layers mapping, Pre-coding for spatial multiplexing, Pre-coding for transmit diversity, Beamforming in LTE, Cyclic delay diversity based pre-coding, Pre-coding codebooks, Propagation Channels, Time & frequency channel dispersion, AWGN and multipath propagation channels, Delay spread values and time variations, Fast and slow fading environments, Complex baseband multipath channels, Narrowband and wideband channels, MIMO channel models.

5. Introduction to Cognitive Radios: Digital dividend, cognitive radio (CR) architecture, functions of cognitive radio, dynamic spectrum access (DSA), components of cognitive radio, spectrum sensing, spectrum analysis and decision, Spectrum Management, Spectrum Sharing, Spectrum Overlay cognitive Radio, potential applications of cognitive radio.

6. Relaying, Multi-Hop, and Cooperative Communications - Introduction and Motivation, Fundamentals of Relaying, Relaying with Multiple, Parallel Relays, Routing and Resource Allocation in Multi-Hop Networks, Routing and Resource Allocation in Collaborative Networks, Relay Network Coding, Applications.

RECOMMENDED TEXT / REFERENCE BOOKS

1. Claude Oestges, Bruno Clerckx, "MIMO Wireless Communications : From Real-world
2. Propagation to Space-time Code Design",Academic Press, 1st Edition, 2010.
3. MohinderJanakiraman, “Space - Time Codes and MIMO Systems”, Artech House Publishers, 2004.
4. Andreas F. Molisch, Wireless Communications, Second Edition, John Wiley & Sons Ltd. 2011
5. Ekram Hossain, DusitNiyato, Zhu Han, “Dynamic Spectrum Access and Management in Cognitive Radio Networks”, Cambridge University Press, 2009.
6. Kwang-Cheng Chen, Ramjee Prasad, “Cognitive radio networks”, John Wiley & Sons Ltd., 2009.
7. Bruce Fette, “Cognitive radio technology”, Elsevier, 2nd Edition, 2009.
8. HuseyinArslan, “Cognitive Radio, Software Defined Radio, and Adaptive Wireless Systems”, Springer, 2007.
9. Francisco Rodrigo Porto Cavalcanti, Soren Andersson, “Optimizing Wireless Communication Systems” Springer, 2009.
10. Linda Doyle, “Essentials of Cognitive Radio”, Cambridge University Press, 2009.
11. Multiple Access Techniques for 5G Wireless Networks and Beyond, aezi, Mojtaba, Ding, Zhiguo, Poor, H. Vincent, Springer International Publishing, 2020.

COURSE OUTCOMES

At the end of the course, students should be able to

CO1	Understand the advantage of OFDM/OFDMA over conventional modulation techniques and find base band OFDM modulated signal.
CO2	Differentiate among MIMO diversity, spatial multiplexing and beam forming.
CO3	Understand the use of MIMO in LTE
CO4	Understand and Analyze concept of Cognitive radio for Increasing Spectrum Efficiency
CO5	Analyze wireless relay network system for extension of range.
CO6	Understand and analyze various routing techniques, relay network coding and applications for wireless networks.

COURSE MATRIX

Course Outcome (CO’s)	**Program Outcomes (PO’s)**											
	Domain Specific (PSO)					**Domain Independent (PO)**						
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	1	1	1	1	1	1	1	2	1		1
CO2	3	2	1	1	2	2	1		2	2		1
CO3	1	1	1	1	1	1	1		1	1		1
CO4	3	3	3	2	2	2	1		2	2		1
CO5	3	3	3	2	2	2	1	1	2	2		1
CO6	2	1	2	1	2	2	1		2	2		1
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)												

M. TECH. SEMESTER – II (ECS)

SUBJECT: SYSTEM MODELLING & SIMULATION PROJECT

SYLLABUS & SCHEME (W.E.F. 2021)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme			
Lect	Tut	Prac	Total		Ext	Sess.	Prac	Total
0	0	2	2	1	-	-	50	50

Each student will take up a project on System modelling using a simulation platform as a prelude to the M.Tech.

Dissertation activities to be carried out during Semester III & Semester IV.

M. TECH. SEMESTER – III (ECS)
SUBJECT: DISSERTATION PHASE – I
SYLLABUS & SCHEME (W.E.F. 2021)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme		
Lect	Tut	Prac	Total		Prac	TW	Total
0	0	30	30	16	225	125	350

Each student will take up a project involving analysis, design, and implementation and testing of substantial hardware, software or any combination of them related to live problems in the fields of study.

A dissertation report will be prepared and submitted for a viva-voce examination.

M. TECH. SEMESTER – III (ECS)
SUBJECT: PEDAGOGY STUDIES
SYLLABUS & SCHEME (W.E.F. 2021)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme		
Lect	Tut	Prac	Total		Prac	TW	Total
2	0	0	2	0	-	50	50

DETAILED SYLLABUS

1. Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology, Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions. Overview of methodology and Searching.

2. Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

3. Evidence on the effectiveness of pedagogical practices, Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

4. Professional development: alignment with classroom practices and follow-up support, Peer support, Support from the head teacher and the community. Curriculum and assessment, Barriers to learning: limited resources and large class sizes

5. Research gaps and future directions, Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

RECOMMENDED TEXT / REFERENCE BOOKS

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

M. TECH. SEMESTER – IV (ECS)
SUBJECT: DISSERTATION PHASE – II
SYLLABUS & SCHEME (W.E.F. 2021)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme		
Lect	Tut	Prac	Total		Prac	TW	Total
0	0	30	30	16	300	150	450

Each student will take up a project involving analysis, design, and implementations and testing of substantial hardware, software or any combination of them related to live problems in the fields of study.

A dissertation report will be prepared and submitted for a viva-voce examination.

M. TECH. SEMESTER – IV (ECS)

SUBJECT: ENGLISH FOR RESEARCH PAPER WRITING

SYLLABUS & SCHEME (W.E.F. 2021)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme		
Lect	Tut	Prac	Total		Prac	TW	Total
2	0	0	2	0	-	50	50

DETAILED SYLLABUS

1. Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

2. Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

3. Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

4. key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature

5. skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

6. useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

RECOMMENDED TEXT / REFERENCE BOOKS

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

Syllabus

Elective Subjects

M. TECH. SEMESTER – I (ECS)
SUBJECT: REMOTE SENSING
SYLLABUS & SCHEME (W.E.F. 2021)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme			
Lect	Tut	Prac	Total		Ext	Sess.	Prac	Total
3	0	2	5	4	60	40	25	125

DETAILED SYLLABUS

1. Physics Of Remote Sensing: Electro Magnetic Spectrum, Physics of Remote Sensing Effects of Atmosphere-Scattering–Different types–Absorption-Atmospheric window-Energy interaction with surface features –Spectral reflectance of vegetation, soil and water atmospheric influence on spectral response patterns-multi concept in Remote sensing.

2. Data Acquisition: Types of Platforms–different types of aircrafts-Manned and Unmanned spacecrafts–sun synchronous and geo synchronous satellites –Types and characteristicsofdifferent platforms – LANDSAT,SPOT,IRS,INSAT,IKONOS,QUICKBIRD etc

3. Photographic products, B/W, color, color IR film and their characteristics – resolving power of lens and film -Opto mechanical electro optical sensors –across track and along track scanners-multispectral scanners and thermal scanners–geometric characteristics of scanner imagery -calibration of thermal scanners.

4. Scattering System: Microwave scatterometry, types of RADAR –SLAR – resolution – range and azimuth –real aperture and synthetic aperture RADAR. Characteristics of Microwave images topographic effect-different types of Remote Sensing platforms –airborne and space borne sensors -ERS, JERS, RADARSAT, RISAT -Scatterometer, Altimeter-LiDAR remote sensing, principles, applications.

5. Thermal And Hyper Spectral Remote Sensing: Sensors characteristics-principle of spectroscopy-imaging spectroscopy–field conditions, compound spectral curve, Spectral library, radiative models, processing procedures, derivative spectrometry, thermal remote sensing – thermal sensors, principles, thermal data processing, applications.

6. Data Analysis: Resolution–Spatial, Spectral, Radiometric and temporal resolution-signal to noise ratio-data products and their characteristics-visual and digital interpretation–Basic principles of data processing –Radiometric correction–Image enhancement–Image classification– Principles of LiDAR, Aerial Laser Terrain Mapping.

RECOMMENDED TEXT / REFERENCE BOOKS

1. Lillesand T.M., and Kiefer,R.W. Remote Sensing and Image interpretation, John Wiley & Sons-2000, 6thEdition

2. John R. Jensen, Introductory Digital Image Processing: A Remote Sensing Perspective, 2nd Edition, 1995.
3. John A.Richards, Springer –Verlag, Remote Sensing Digital Image Analysis,1999.
4. Paul Curran P.J. Principles of Remote Sensing, ELBS; 1995.
5. Charles Elachi and Jakob J. van Zyl , Introduction To The Physics and Techniques of Remote Sensing , Wiley Series in Remote Sensing and Image Processing, 2006.
6. Sabins, F.F.Jr, Remote Sensing Principles and Image interpretation, W.H.Freeman& Co, 1978

M. TECH. SEMESTER – I (ECS)
SUBJECT: DIGITAL DESIGN AND VERIFICATION
SYLLABUS & SCHEME (W.E.F. 2021)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme			
Lect	Tut	Prac	Total		Ext	Sess.	Prac	Total
3	0	2	5	4	60	40	25	125

DETAILED SYLLABUS

1. Revision of basic Digital systems: Combinational Circuits, Sequential Circuits, Logic families. Synchronous FSM and asynchronous design, Metastability, Clock distribution and issues, basic building blocks like PWM module, pre-fetch unit, programmable counter, FIFO, Booth's multiplier, ALU, Barrel shifter etc.
2. Verilog/VHDL Comparisons and Guidelines, Verilog: HDL fundamentals, simulation, and test bench design, Examples of Verilog codes for combinational and sequential logic, Verilog AMS
3. System Verilog and Verification: Verification guidelines, Data types, procedural statements androutines, connecting the test bench and design, Assertions, Basic OOP concepts, Randomization,Introduction to basic scripting language: Perl, Tcl/Tk
4. Current challenges in physical design: Roots of challenges, Delays: Wire load models Generic PD flow, Challenges in PD flow at different steps, SI Challenge - Noise & Crosstalk, IR Drop, Process effects: Process Antenna Effect & Electro migration
5. Programmable Logic Devices: Introduction, Evolution: PROM, PLA, PAL, Architecture of PAL's, Applications, Programming PLD's, FPGA with technology: Antifuse, SRAM, EPROM, MUX, FPGA structures, and ASIC Design Flows, Programmable Interconnections, Coarse grained reconfigurable devices
6. IP and Prototyping: IP in various forms: RTL Source code, Encrypted Source code, Soft IP, Netlist, Physical IP, and Use of external hard IP during prototyping, Case studies, and Speed issues. Testing of logic circuits: Fault models, BIST, JTAG interface

RECOMMENDED TEXT / REFERENCE BOOKS

1. Douglas Smith, “HDL Chip Design: A Practical Guide for Designing, Synthesizing & Simulating ASICs & FPGAs Using VHDL or Verilog”, Doone publications, 1998.
2. Samir Palnitkar, “Verilog HDL: A guide to Digital Design and Synthesis”, Prentice Hall, 2nd Edition, 2003.
3. Doug Amos, Austin Lesea, Rene Richter, “FPGA based Prototyping Methodology Manual”, Synopsys Press, 2011.
4. Christophe Bobda, “Introduction to Reconfigurable Computing, Architectures, Algorithms and Applications”, Springer, 2007.
5. Janick Bergeron, “Writing Testbenches: Functional Verification of HDL Models”, Second Edition, Springer, 2003.

M. TECH. SEMESTER – I (ECS)

SUBJECT: FIBER OPTIC COMMUNICATION & SENSOR SYSTEMS

SYLLABUS & SCHEME (W.E.F. 2021)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme			
Lect	Tut	Prac	Total		Ext	Sess.	Prac	Total
3	0	2	5	4	60	40	25	125

DETAILED SYLLABUS

1. INTRODUCTION TO FIBER - Fiber structures and wave guiding fundamentals, optical source, power launching and coupling, photo detectors, optical receiver's transmission link analysis.

2. MULTICHANNEL SYSTEMS - WDM Lightwave systems, WDM Components, System performance issues, TDM, CDM and sub carrier multiplexing.

3. SOLITON SYSTEM - Fiber Solitons, Soliton-based communication, Loss Managed Soliton.

4. OPTICAL SWITCHING AND NETWORKS - Introduction, applications, technologies, SONET, wavelength routed network.

5. ALL-OPTICAL TIME-DIVISION MULTIPLEXING TECHNOLOGY - Role of All-optical TDN technology, Key Technologies for its systems.

6. OPTICAL FIBER SENSOR TECHNOLOGY - Multimode optical fiber sensors, distributed fiber optic sensors.

7. FIBER OPTICS APPLICATIONS - LANs, Broadband networks, sensing systems, system measurements

RECOMMENDED TEXT / REFERENCE BOOKS

1. Fiber Optics Communications, 4th Edition By: Gerd Keiser Publisher: Tata McGraw Hill
2. Optical Fibers and Fiber Optic Communication Systems, 2nd Edition By: Subir Kumar Sarkar Publisher: S. Chand
3. Optical Fiber Communication: Principles and Systems, 1st Edition By: A. Selvarajan, S Kar, T Srinivas Publisher: Tata McGraw Hill
4. Optical Fiber Communication: Principles and Practice, 2nd Edition By: John M. Senior Publisher: Prentice Hall of India
5. WDM Optical Networks, 1st Edition By: C. Siva Ram Murthy and Mohan Gurusamy Publisher: Prentice Hall of India

M. TECH. SEMESTER – II (ECS)
SUBJECT: COGNITIVE RADIO
SYLLABUS & SCHEME (W.E.F. 2021)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme			
Lect	Tut	Prac	Total		Ext	Sess.	Prac	Total
3	0	2	5	4	60	40	25	125

DETAILED SYLLABUS

1. Introduction to Cognitive Radios: Digital dividend, cognitive radio (CR) architecture, functions of cognitive radio, dynamic spectrum access (DSA), components of cognitive radio, spectrum sensing, spectrum analysis and decision, potential applications of cognitive radio.
2. Spectrum Sensing: Spectrum sensing, detection of spectrum holes (TVWS), collaborative sensing, geo-location database and spectrum sharing business models (spectrum of commons, real time secondary spectrum market).
3. Optimization Techniques of Dynamic Spectrum Allocation: Linear programming, convex programming, non-linear programming, integer programming, dynamic programming, stochastic programming.
4. Dynamic Spectrum Access and Management: Spectrum broker, cognitive radio architectures, centralized dynamic spectrum access, distributed dynamic spectrum access, learning algorithms and protocols.
5. Spectrum Trading: Introduction to spectrum trading, classification to spectrum trading, radio resource pricing, brief discussion on economics theories in DSA (utility, auction theory), classification of auctions (single auctions, double auctions, concurrent, sequential).
6. Research Challenges in Cognitive Radio: Network layer and transport layer issues, cross-layer design for cognitive radio networks.

RECOMMENDED TEXT / REFERENCE BOOKS

1. Ekram Hossain, DusitNiyato, Zhu Han, “Dynamic Spectrum Access and Management in Cognitive Radio Networks”, Cambridge University Press, 2009.
2. Kwang-Cheng Chen, Ramjee Prasad, “Cognitive radio networks”, John Wiley & Sons Ltd., 2009.
3. Bruce Fette, “Cognitive radio technology”, Elsevier, 2nd edition, 2009.
4. HuseyinArslan, “Cognitive Radio, Software Defined Radio, and Adaptive Wireless Systems”, Springer, 2007.
5. Francisco Rodrigo Porto Cavalcanti, Soren Andersson, “Optimizing Wireless Communication Systems” Springer, 2009.

M. TECH. SEMESTER – II (ECS)
SUBJECT: DSP ARCHITECTURE
SYLLABUS & SCHEME (W.E.F. 2021)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme			
Lect	Tut	Prac	Total		Ext	Sess.	Prac	Total
3	0	2	5	4	60	40	25	125

DETAILED SYLLABUS

1. Programmable DSP Hardware: Processing Architectures (von Neumann, Harvard), DSP core algorithms (FIR, IIR, Convolution, Correlation, FFT), IEEE standard for Fixed and Floating Point Computations, Special Architectures Modules used in Digital Signal Processors (like MAC unit, Barrel shifters), On-Chip peripherals, DSP benchmarking.

2. Structural and Architectural Considerations: Parallelism in DSP processing, Texas Instruments TMS320 Digital Signal Processor Families, Fixed Point TI DSP Processors: TMS320C1X and TMS320C2X Family,TMS320C25 –Internal Architecture, Arithmetic and Logic Unit, Auxiliary Registers, Addressing Modes (Immediate, Direct and Indirect, Bit-reverse Addressing), Basics of TMS320C54x and C55x Families in respect of Architecture improvements and new applications fields, TMS320C5416 DSP Architecture, Memory Map, Interrupt System, Peripheral Devices, Illustrative Examples for assembly coding.

3. VLIW Architecture: Current DSP Architectures, GPUs as an alternative to DSP Processors, TMS320C6X Family, Addressing Modes, Replacement of MAC unit by ILP, Detailed study of ISA, Assembly Language Programming, Code Composer Studio, Mixed Cand Assembly Language programming, On-chip peripherals, Simple applications developments as an embedded environment.

4. Multi-core DSPs: Introduction to Multi-core computing and applicability for DSP hardware, Concept of threads, introduction to P-thread, mutex and similar concepts, heterogeneous and homogenous multi-core systems, Shared Memory parallel programming –OpenMP approach of parallel programming, PRAGMA directives, OpenMP Constructs for work sharing like for loop, sections, TI TMS320C6678 (Eight Core subsystem).

5. FPGA based DSP Systems: Limitations of P-DSPs, Requirements of Signal processing for Cognitive Radio (SDR), FPGA based signal processing design-case study of a complete design of DSP processor.

6. High Performance Computing using P-DSP: Preliminaries of HPC, MPI, OpenMP, multicore DSP as HPC infrastructure.

RECOMMENDED TEXT / REFERENCE BOOKS

1. M. Sasikumar, D. Shikhare, Ravi Prakash, “Introduction to Parallel Processing”, 1st Edition, PHI, 2006.
2. Fayez Gebali, “Algorithms and Parallel Computing”,1st Edition, John Wiley & Sons, 2011.

3. Rohit Chandra, Ramesh Menon, Leo Dagum, David Kohr, DrorMaydan, Jeff McDonald,"Parallel Programming in OpenMP", 1st Edition, Morgan Kaufman,2000.
4. Ann Melnichuk,Long Talk, "Multicore Embedded systems", 1st Edition, CRC Press,2010.
5. Wayne Wolf, "High Performance Embedded Computing: Architectures, Applications and Methodologies", 1st Edition, Morgan Kaufman, 2006.
6. E.S.Gopi, "Algorithmic Collections for Digital Signal Processing Applications Using MATLAB", 1st Edition, Springer Netherlands, 2007.

M. TECH. SEMESTER – II (ECS)

SUBJECT: DIGITAL IMAGE AND VIDEO PROCESSING

SYLLABUS & SCHEME (W.E.F. 2021)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme			
Lect	Tut	Prac	Total		Ext	Sess.	Prac	Total
3	0	2	5	4	60	40	25	125

DETAILED SYLLABUS

1. **Digital Image and Video Fundamentals -** Digital image and video fundamentals and formats, 2-D and 3-D sampling and aliasing, 2-D/3-Dfiltering, imagedecimation/interpolation, video sampling and interpolation, Basic image processing operations, Image Transforms. Need for image transforms, DFT, DCT, Walsh, Hadamard transform, Haar transform, Wavelet transform

2. **Image and Video Enhancement and Restoration -** Histogram, Point processing, filtering, image restoration, algorithms for 2-D motion estimation, change detection, motion-compensated filtering, frame rate conversion, deinterlacing, video resolution enhancement, Image and Video restoration (recovery).

3. **Image and Video Segmentation -** Discontinuity based segmentation- Line detection, edge detection, thresholding, Region based segmentation, Scene Change Detection, Spatiotemporal Change Detection, Motion Segmentation, Simultaneous Motion Estimation and Segmentation Semantic Video Object Segmentation, Morphological image processing.

4. **Colour image Processing -** Colour fundamentals, Colour models, Conversion of colour models, Pseudo colour image processing, Full colour processing

5. **Image and Video Compression -** Lossless image compression including entropy coding, lossy image compression, video compression techniques, and international standards for image and video compression (JPEG, JPEG 2000, MPEG-2/4, H.264, SVC), Video Quality Assessment

6. **Object recognition -** Image Feature representation and description-boundary representation, boundary descriptors, regional descriptors, feature selection techniques, introduction to classification, supervised and unsupervised learning, Template matching, Bayes classifier

RECOMMENDED TEXT / REFERENCE BOOKS

1. Ed. Al Bovik ,"Handbook of Image and Video Processing", 2nd Edition, Academic Press, 2000.
2. J. W. Woods, "Multidimensional Signal, Image and Video Processing and Coding",2nd Edition, Academic Press, 2011.
3. Rafael C. Gonzalez and Richard E. Woods," Digital Image Processing", 3rd Edition, Prentice Hall, 2008.
4. A. M. Tekalp, "Digital Video Processing", 2nd Edition, Prentice Hall, 2015.
5. S. Shridhar, "Digital Image Processing", 2nd Edition, Oxford University Press, 2016.

M. TECH. SEMESTER – II (ECS)
SUBJECT: OPTICAL NETWORKS
SYLLABUS & SCHEME (W.E.F. 2021)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme			
Lect	Tut	Prac	Total		Ext	Sess.	Prac	Total
3	0	2	5	4	60	40	25	125

DETAILED SYLLABUS

1. SONET/SDH: optical transport network, IP, routing and forwarding, multiprotocol label switching.

2. WDM network elements: optical line terminals and amplifiers, optical add/drop multiplexers, OADM architectures, reconfigurable OADM, optical cross connects.

3. Control and management: network management functions, optical layer services and interfacing, performance and fault management, configuration management, optical safety.

4. Network Survivability: protection in SONET/SDH & client layer, optical layer protection schemes

5. WDM network design: LTD and RWA problems, dimensioning wavelength routing networks, statistical dimensioning models.

6. Access networks: Optical time division multiplexing, synchronization, header processing, buffering, burst switching, test beds, Introduction to PON, GPON, AON.

RECOMMENDED TEXT / REFERENCE BOOKS

1. Rajiv Ramaswami, Sivarajan, Sasaki, “Optical Networks: A Practical Perspective”, MK, Elsevier, 3 rd edition, 2010.
2. C. Siva Ram Murthy and Mohan Gurusamy, “WDM Optical Networks: Concepts Design and Algorithms”, PHI, EEE, 2001.

M. TECH. SEMESTER – II (ECS)

SUBJECT: SATELLITE COMMUNICATION

SYLLABUS & SCHEME (W.E.F. 2021)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme			
Lect	Tut	Prac	Total		Ext	Sess.	Prac	Total
3	0	2	5	4	60	40	25	125

DETAILED SYLLABUS

1. Architecture of Satellite Communication System: Principles and architecture of satellite Communication, Brief history of Satellite systems, advantages, disadvantages, applications, and frequency bands used for satellite communication and their advantages/drawbacks.

2. Orbital Analysis: Orbital equations, Kepler's laws of planetary motion, Apogee and Perigee fo an elliptical orbit, evaluation of velocity, orbital period, angular velocity etc of a satellite, concepts of Solar day and Sidereal day.

3. Satellite sub-systems: Architecture and Roles of various sub-systems of a satellite system such as Telemetry, tracking, command and monitoring (TTC & M), Attitude and orbit control system (AOCS), Communication sub-system, power sub-systems, antenna sub-system.

4. Typical Phenomena in Satellite Communication: Solar Eclipse on satellite, its effects, remedies for Eclipse, Sun Transit Outage phenomena, its effects and remedies, Doppler frequency shift phenomena and expression for Doppler shift.

5. Satellite link budget: Flux density and received signal power equations, Calculation of System noise temperature for satellite receiver, noise power calculation, Drafting of satellite link budget and C/N ratio calculations in clear air and rainy conditions, Case study of Personal Communication system (satellite telephony) using LEO.

6. Modulation and Multiple Access Schemes used in satellite communication. Typical case studies of VSAT, DBS-TV satellites and few recent communication satellites launched by NASA/ ISRO. GPS.

RECOMMENDED TEXT / REFERENCE BOOKS

1. Timothy Pratt and Others, "Satellite Communications", Wiley India, 2nd edition, 2010.
2. S. K. Raman, "Fundamentals of Satellite Communication", PearsonEducation India, 2011.
3. Tri T. Ha, "Digital Satellite Communications", Tata McGraw Hill, 2009.
4. Dennis Roddy, "Satellite Communication", McGraw Hill, 4th Edition, 2008.

M. TECH. SEMESTER – II (ECS)

SUBJECT: MULTISPECTRAL SIGNAL ANALYSIS

SYLLABUS & SCHEME (W.E.F. 2021)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme			
Lect	Tut	Prac	Total		Ext	Sess.	Prac	Total
3	0	2	5	4	60	40	25	125

DETAILED SYLLABUS

1. Hyperspectral Sensors and Applications: Introduction, Multi-spectral Scanning Systems (MSS), Hyperspectral Systems, Airborne sensors, Space borne sensors, Ground Spectroscopy, Software for Hyperspectral Processing, Applications, Atmosphere and Hydrosphere, Vegetation, Soils and Geology, Environmental Hazards and Anthropogenic Activity

2. Overview of Image Processing: Introduction, Image File Formats, Image Distortion and Rectification, Radiometric Distortion, Geometric Distortion and Rectification, Image Registration, Image Enhancement, Point Operations, Geometric Operation, Image Classification, Supervised Classification, Unsupervised Classification, Crisp Classification Algorithms, Fuzzy Classification Algorithms, Classification Accuracy Assessment, Image Change Detection, Image Fusion, Automatic Target Recognition

3. Mutual Information: A Similarity Measure for Intensity Based Image Registration: Introduction, Mutual Information Similarity Measure, Joint Histogram Estimation Methods, Two-Step Joint Histogram Estimation, One-Step Joint Histogram Estimation, Interpolation Induced Artifacts, Generalized Partial Volume Estimation of Joint Histograms, Optimization Issues in the Maximization of MI

4. Independent Component Analysis: Introduction, Concept of ICA, ICA Algorithms, Preprocessing using PCA, Information Minimization Solution for ICA, ICA Solution through Non-Gaussianity Maximization, Application of ICA to Hyperspectral Imagery, Feature Extraction Based Model, Linear Mixture Model Based Model, An ICA algorithm for Hyperspectral Image Processing, Applications using ICA.

5. Support Vector Machines : Introduction, Statistical Learning Theory, Empirical Risk Minimization, Structural Risk Minimization, Design of Support Vector Machines, Linearly Separable Case, Linearly Non-Separable Case, Non-Linear Support Vector Machines, SVMs for Multiclass Classification, One Against the Rest Classification, Pair wise Classification, Classification based on Decision Directed Acyclic Graph and Decision Tree Structure, Multiclass Objective Function, optimization Methods , Applications using SVM.

6. Markov Random Field Models: Introduction, MRF and Gibbs Distribution, Random Field and Neighborhood ,Cliques, Potential and Gibbs Distributions, MRF Modeling in Remote Sensing Applications, Optimization Algorithms, Simulated Annealing, Metropolis Algorithm, Iterated Conditional Modes Algorithm

RECOMMENDED TEXT / REFERENCE BOOKS

1. Pramod K. Varshney, Manoj K. Arora, "Advanced Image Processing Techniques for Remotely Sensed Hyperspectral Data", Springer, 2013.
2. S. Svanberg, "Multi-spectral Imaging– from Astronomy to Microscopy – from Radio waves to Gamma rays", Springer Verlag, 2009.

	MBA SEM-I
SUBID	**SUBNAME**
MB101	INTRODUCTION TO MANAGEMENT
MB102	ORGANIZATIONAL BEHAVIOUR
MB103	MANAGERIAL ECONOMICS
MB104	MANAGERIAL COMMUNICATION
MB105	QUANTITATIVE TECHNIQUES
MB106	TECHNOLOGY IN MANAGEMENT
MB107	FINANCIAL ACCOUNTING FOR MANAGERS

	MBA SEM-II
SUBID	**SUBNAME**
MB201	INDIAN BUSINESS ENVIRONMENT
MB202	COST and MANAGEMENT ACCOUNTING
MB203	MARKETING MANAGEMENT
MB204	FINANCIAL MANAGEMENT
MB205	PRODUCTION and OPERATIONS MGT.
MB206	HUMAN RESOURCE MANAGEMENT
MB207	BUSINESS RESEARCH METHODOLOGY

MBA SEM III	
SUBID	**SUBNAME**
MB301	SUMMER INTERNSHIP PROJECT
MB302	STRATEGIC MANAGEMENT
MB303	ETHICS, VALUES and STRESS MGT.
MB304	LEGAL ASPECTS OF BUSINESS
MB305	NEW ENTERPRISE MANAGEMENT
MB306	ADVT. And SALES PROMOTION MGT.
MB307	CONSUMER BEHAVIOR
MB308	STRATEGIC BRAND MANAGEMENT
MB326	MERGERS, ACQUISITIONS and RISK MGT.
MB327	INDIAN FINANCIAL SYSTEM
MB328	SECURITY ANALYSIS and PORTFOLIO MGT.

MBA SEM-IV	
SUBID	**SUBNAME**
MB401	MANAGEMENT CONTROL SYSTEM
MB402	MANAGEMENT RESEARCH PROJECT
MB403	CONTEMPORARY ISSUES IN MGT.
MB404	SALES & DISTRIBUTION MGT.
MB405	INDUSTRIAL & SERVICES MKT.
MB406	INTERNATIONAL MARKETING
MB424	CORPORATE TAX PLANNING
MB425	INTERNATIONAL FINANCIAL MGT.
MB426	STRATEGIC FINANCIAL MANAGEMENT

MBA Semester I

SUBJECT: INTRODUCTION TO MANAGEMENT

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4.5	0	0	4.5	4	50%	20%	30%	-	100%

A. COURSE OVERVIEW

To make students aware of the fundamentals concepts of management, evolution of management and contemporary management theories and practices globally as well as in the Indian context.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Management and Manager: organization and the need for management, the management process, types of managers, management levels and skills, the challenges of management	3	CO1
[2]	The Evolution of Management Theory: why study management theory? the scientific management school, classical organization theory school, behavioural school, the system approach, contingency approach	3	CO5
[3]	Organizational and Natural Environment: organizational environment, direct-action environment, indirect-action environment, natural environment	2	CO1
[4]	Social Responsibility and Ethic: the changing concepts of social responsibility, the shift to ethics, the tools of ethics	2	CO3
[5]	Globalization and Management: globalization and competitiveness, the changing international scene, global business practice	2	CO4
[6]	Inventing and Reinventing Organization: the meaning of entrepreneurship, the importance of entrepreneurship, reinventing organization	2	CO2
[7]	Culture and Multiculturalism: defining culture and performance, corporate culture and performance, multiculturalism and organizational success	2	CO4
[8]	Quality: Deming's fourteen points, TQM-the main ideas, history quality, defining quality	3	CO5
[9]	Decision Making: time and human relationship in decision making, the nature of managerial decision making, the rational model of decision making, the rational model in perspective	3	CO5

[10]	Planning and Strategic Management: the importance of planning at organization, the evolution of the concept of strategy, the content of a corporate strategy.	3	CO3
[11]	Strategy Implementation: matching structure and strategy, institutional strategy, operational strategy	3	CO1
[12]	Organizational Design and Organizational Structure: four building blocks, organizational design, downsizing, functional organization	2	CO2
[13]	Power and The Distribution of Authority: power, culture aspects of power, authority, line and staff authority, delegation.	2	CO5
[14]	Human Resource Management: human resources planning, recruitment, selection, training and development, promotion transfer demotion and separation	2	CO1
[15]	Managing Organizational Change and Innovation: modal of change process, types of planned change, organizational development.	2	CO3
[16]	Motivation: the challenge of motivation, theories of motivation, contemporary views of motivation	3	CO1
[17]	Leadership: the trait approach to leadership, the behavioural approach, contingency approach	3	CO2
[18]	Teams and Teamwork: types of team, characters of team, making team effective	2	CO2
[19]	Communication and Negotiation: the importance of effective communication, communication process, communication in organization, stability of negotiation outcomes.	1	CO2
[20]	Effective Control: meaning of control, designing control system, financial controls, types of budgets, auditing	2	CO3
[21]	Operation Management: the operational system, designing operation systems, operational planning and control decisions	2	CO1
[22]	Information System: information and control, management information systems, implementation and security, end-user computing	1	CO3

C. TEXT BOOKS

(It is necessary that at least 85% of course content is covered in prescribed textbooks. The format should be as per ACS referencing format)

1. Stoner James A F, Freeman R Edward & Gilbert Jr Daniel R "Management" New Delhi Prentice-Hall of India

D. REFERENCE BOOKS

(The format should be as per ACS referencing format)

1. Koontz Harold & Weihrich Heinz "Essential of Management" New Delhi Tata McGraw Hill
2. Burton Gene & Manab Thakur "Management Today" New Delhi Tata McGraw Hill

3. Robbins Stephen P & Coulter Mary "Management "New Delhi Prentice-Hall of India

E. COURSE OUTCOMES

(Minimum 5 COs are required)

CO Number	Skill	Statement
CO1	Evaluate	Explain the various concepts and theories of management
CO2	Comprehension	Demonstrate different leadership styles and skills required for working in groups and teams
CO3	Application	Teach the basic functions of management like planning, organizing, leading and controlling
CO4	Synthesis	Explain the various culture and quality aspects related to business.
CO5	Analysis	Evaluating the practical approach for the real business situation.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	3	2	2	3	2	3	2	2	3	1	1	3	2	1	3	2	
CO2	2	2	1	3	2	2	3	2	2	3	3	2	3	2	2	3	
CO3	3	2	2	2	2	2	2	3	1	2	2	2	1	2	3	2	
CO4	2	3	2	3	3	2	3	2	2	2	3	2	3	2	2	2	
CO5	2	2	3	2	2	3	1	2	2	3	2	2	2	3	1	2	
..																	
Avg	2.4	2.2	2	2.6	2.2	2.4	2.2	2.2	2	2.2	2.2	2.2	2.2	2.2	2	2.2	2.2

MBA SEMESTER – I
SUBJECT: ORGANIZATIONAL BEHAVIOUR

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4.5	0	0	4.5	4	50%	20%	30%	-	100%

A. COURSE OVERVIEW

This course aims to make students aware of the concepts of behavioural sciences and their applications in the field of management. It encompasses skills on leadership, emotional intelligence, communication, negotiations, perceptions, diversity, stress management etc. which are required to be a successful professional in any field (and not only management).

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	**What is Organizational Behavior?** What Managers Do, Enter Organizational Behavior, Disciplines That Contribute to the OB Field, There are Few Absolutes in OB, Challenges and Opportunities for OB, Coming Attractions: Developing an OB Model, Global Implications	**3**	CO1
[2]	**Diversity in Organizations:** Diversity, Biographical Characteristics, Ability, Implementing Diversity Management Strategies, Global Implications, Summary and Implications for Managers.	**3**	CO1, CO3
[3]	**Attitude and Job Satisfaction:** Attitudes, Job Satisfaction, Global Implications, Summary and Implications for Managers	**3**	CO1, CO3
[4]	**Emotions and Moods:** What are Emotions and Moods?, Emotional Labor, Emotional Intelligence, OB Applications of Emotions and Moods, Global Implications, Summary and Implications for Managers	**3**	CO1, CO5
[5]	**Personality and Values:** Personality, Values, Linking an individual's personality to workplace, Global Implications, Summary and Implications for Managers	**3**	CO2
[6]	**Perception and Individual Decision Making:** What is Perception?, Perception: Making Judgments about others, The Link between perception and individual decision making, Decision Making in organizations, Influences on decision making: individual differences and organizational constraints, Global Implications, Summary and Implications for Managers	**3**	CO5
[7]	**Motivation Concepts:** Defining Motivation, Early Theories, Contemporary Theories, Integrating Contemporary Theories of Motivation, Global Implications, Summary and Implications for Managers	**3**	CO1
[8]	**Motivation:** From Concepts to Applications: Motivating by Job Design: The Job Characteristics Model, Employee Involvement, Using Rewards to motivate employees, Global Implications, Summary and Implications for Managers	**3**	CO

[9]	**Foundations of Group Behaviour:** Defining and Classifying Groups, Stages of Group Development, Group Properties: Roles, Norms, Status, Size and Cohesiveness, Group Decision Making, Global Implications, Summary and Implications for Managers	**3**	CO3, CO4
[10]	**Understanding Work Teams:** Why Have Teams Become so popular?, Differences Between Groups and Teams, Types of Teams, Creating Effective Teams, Turning Individuals into Team Players, Beware! Teams Aren't Always the Answer, Global Implications, Summary and Implications for Managers	**3**	CO3, CO4
[11]	**Communication:** Functions of Communication, The Communication Process, Direction of Communication, Interpersonal Communication, Organizational Communication, Choice of Communication Channel, Barriers to Effective Communication, Global Implications, Summary and Implications for Managers	**3**	CO1, CO4
[12]	**Leadership:** What is Leadership? Trait Theories, Behavioral Theories, Contingency Theories, LMX, Charismatic Leadership and Transformational Leadership, Authentic Leadership, Mentoring, Challenges to the leadership construct, Finding and creating effective leaders, Global Implications, Summary and Implications for Managers	**3**	CO4
[13]	**Power and Politics:** A Definition of Power, Contrasting Leadership and Power, Bases of Power, Dependency, Power Tactics, Sexual Harassment, Politics, Causes and Consequences of Political Behavior, The Ethics of Behaving politically, Global Implications, Summary and Implications for Managers	**3**	CO1
[14]	**Conflict and Negotiation:** A Definition of conflict, Transitions in conflict thought, The conflict process, negotiations, Global Implications, Summary and Implications for Managers	**3**	CO5
[15]	**Foundations of Organization Structure:** What is Organizational Structure? Common Organizational Design, New Design Options, Why Do Structures Differ?, Organizational Designs and Employee Behavior, Global Implications, Summary and Implications for Managers	**3**	CO4
[16]	**Organizational Culture:** Why is Organizational Culture?, What Do Cultures Do?, Creating and sustaining culture, How Employees Learn Culture, Creating an Ethical Organizational Culture, Creating a Positive Organizational Culture, Spirituality and Organizational Culture, Global Implications, Summary and Implications for Managers	**3**	CO5
[17]	**Organizational Change and Stress Management:** Forces of Change, Planned Change, Resistance to Change, Approaches to Managing Organizational Change, Creating a Culture of Change, Work Stress and Its Management, Global Implications, Summary and Implications for Managers	**2**	CO5

C. TEXT BOOKS

(It is necessary that at least 85% of course content is covered in prescribed textbooks. The format should be as per APA referencing format)

1. Robbins, S. P., Judge, T. A., & Vohra, N. *Organizational behaviour by Pearson 18e*. Pearson

Education India.

D. REFERENCE BOOKS

(The format should be as per APA referencing format)

1. Luthans, F. (1981). *Organizational behavior*. McGraw-Hill Book Company.
2. Newstrom John W, & Keith, D. (1998). Organizational Behavior: human behavior at work.
3. Pareek, U. (2012). Udai Pareek's Understanding organizational Behaviour, 3e. *OUP Catalogue*.
4. Rao, P. S. (2010). *Organisational behaviour*. Himalaya Publishing House.

E. COURSE OUTCOMES

(Minimum 5 Cos are required)

CO Number	Skill	Statement
CO1	Evaluate	Categorise the various levels of OB like individual, team and system.
CO2	Comprehension	Explain the various concepts and theories of behavioural sciences.
CO3	Application	Demonstrate different leadership styles and skills required for working in groups and teams
CO4	Synthesis	Demonstrate the concepts of organisational behaviour and personality types.
CO5	Analysis	Develop ability to solve the problems creatively and innovatively in the various managerial capabilities or roles.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	2	1	1	2	3	3	2	2	3	2	1	2	3	2	3	1	
CO2	3	3	2	1	2	3	2	1	2	2	3	2	2	2	1	2	
CO3	3	2	2	2	3	3	2	2	3	2	2	2	1	2	2	2	
CO4	2	2	3	3	2	2	1	3	2	3	2	3	2	2	2	2	
CO5	2	2	2	2	2	1	3	2	1	2	2	2	3	2	2	3	
Avg	2.4	2	2.2	2	2.4	2.4	2	2	2.2	2.2	2	2.2	2.2	2	2	2	

MBA SEMESTER – I
SUBJECT: MANAGERIAL ECONOMICS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4.5	0	0	4.5	4	50%	20%	30%	-	100%

A. COURSE OVERVIEW

The course helps the students to apply economic concepts, principles and ideas to decision making in business organizations. It provides basic theories and tools of analysis and develop an understanding of the behaviour of various economic agents to help decision-making.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Introduction: Ten Principles of Economics, The Economist as Scientist and as Policy Adviser , Economic Models – The Circular Flow Diagram, The Production Possibilities Frontier	3	CO1
[2]	The Market forces of demand and Supply: Demand, Shift in demand curve, Supply, Shift in supply curve, Equilibrium, Analysing changes in Equilibrium	2	CO2
[3]	Elasticity and Its Application :The Price Elasticity of Demand and its determinants, Income and Cross Price Elasticity of Demand, The Price Elasticity of Supply and its determinants, Applications of Supply, Demand and Elasticity	2	CO2
[4]	Consumers, Producers and the Efficiency of Markets: Consumer surplus; Producer surplus; Market efficiency – the benevolent social planner, evaluating the market equilibrium	2	CO2 CO3
[5]	The Cost of Production : Costs – total revenue, total cost and profit, cost of capital as an opportunity cost, Cost in the short run, Cost in the Long Run, economic profit versus accounting profit; Production and costs – the production function, from production function to the total cost curve; The various measures of cost – FC, VC, AC, MC, cost curves and their shapes (rising MC, U-shaped ATC, the relation between MC and ATC), typical cost curves; Costs in the short run and long run – relationship between SR and LR, ATC, economies and diseconomies of scale	3	CO3 CO4
[6]	Firms in Competitive Markets : Perfect Competition – Revenue, Profit Maximization, The Firm's Short run decision to Shut down and Long run decision to exit or enter the market, The Short run and Long run Market Supply	3	CO2 CO4
[7]	Monopoly: Concepts of Monopoly, Sources of Monopoly Power, Production, Pricing and Profit Maximization Decisions of Monopolies, The Welfare Costs of Monopoly, Public Policy towards Monopolies	2	CO4 CO4
[8]	Oligopoly: Competition, Monopolies and Cartels, The Equilibrium for an oligopoly, Game theory – Prisoners' Dilemma and oligopoly, Public policies toward oligopolies	2	CO2 CO4
[9]	Monopolistic Competition : The Monopolistically Competitive firm in the short run and long run, monopolistic vs perfect competition,	3	CO2 CO4

	Monopolistic competition and the welfare of society, The debate over advertising		
[10]	The Data of Macroeconomics :_Measuring the cost of living: The consumer price index; Correcting economic variables for the effects of inflation, Production and growth: Economic growth around the world; The role and determinants of productivity; Economic growth and public policy; The importance of long-run growth	3	CO1 CO5
[11]	The Real Economy in the Long Run: Saving, investment and the financial system ; Financial institutions in the US economy; Saving and investment in the National Income Accounts; The market for loan able funds	3	CO5
[12]	The monetary system; The meaning of money; The Federal Reserve System; Banks and the money supply ; Money growth and inflation ; The classical theory of inflation; Money and Prices in the Long Run : The costs of inflation	3	CO1 CO5
[13]	Open-economy macroeconomics – Basic concepts ; The international flow of goods and capital – the flow of goods (exports, imports, net exports), the flow of capital (net foreign investment), the equality of net exports and net foreign investment; savings, investment and their relationship to the international flows; The prices for international transactions (real and nominal exchange rates); A first theory of exchange-rate determination (purchasing power parity)	4	CO5
[14]	Aggregate demand and aggregate supply ; Three key facts about economic fluctuations; Explaining short-run economic fluctuations; The aggregate demand curve; The aggregate supply curve; Two causes of economic fluctuations (the effects of shifts in aggregate demand and supply)	3	CO5
[15]	The Macroeconomics of Open Economies: The influence of monetary and fiscal policy on aggregate demand; How monetary policy influences aggregate demand – the theory of liquidity preference, the downward slope of the aggregate demand curve, changes in the money supply, the role of interest-rate targets in Fed policy; How fiscal policy influences aggregate demand – changes in government purchases, the multiplier effect, a formula for the spending multiplier, other applications of the multiplier effect, the crowding-out effect, changes in taxes; Using policy to stabilize the economy – the cases for and against active stabilization policy	4	CO5
[16]	Short-run Economic Fluctuations : The short-run tradeoff between inflation and unemployment; The Phillips Curve – origins, aggregate demand, aggregate supply and the Phillips Curve; Shifts in the Phillips Curve – the role of expectations; Shifts in the Phillips Curve – the role of supply shocks; The cost of reducing inflation – the sacrifice ration, rational expectations and the possibility of costless disinflation, the Volcker disinflation, the Greenspan era ;	4	CO5
[17]	Five debates about macroeconomic policy (pros and cons): Should monetary and fiscal policymakers try to stabilize the economy; Should monetary policy be made by rule rather than by discretion; Should the Central Bank aim for zero inflation; Should fiscal policymakers reduce the government debt; Should the tax laws be reformed to encourage saving	4	CO4 CO5

C. TEXT BOOKS

1. Gregory, Mankiw; "Economics: Principles and Application" India Edition, Cengage Publication, Latest edition

D. REFERENCE BOOKS

1. Managerial Economics in a Global Economy, D Salvatore (Thomson SouthWestern)
2. Managerial Economics – 4th ed., 1999, H Craig Petersen and W Cris Lewis; Pearson / PHI
3. Economics, Samuelson and Nordhaus (McGraw Hill)
4. Managerial Economics, Atmanand (Excel Books)
5. Essentials of Managerial Economics, I C Dhingra (SCS)

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Comprehension	Define the basic concepts of Managerial Economics. This course will enable students to describe the situations of certainty, uncertainty and risk and the constraints therein in corporate situations.
CO2	Application	Discover the reasons for success or failure of a product in the market by studying the various factors affecting demand for the product. Students will also be able to illustrate when an individual consumer or market attains a state of equilibrium. Students will be able to forecast demand using different methods. The course shall help students illustrate the concept of elasticity for pricing products, and for setting the budget for product promotions.
CO3	Analysis	Identify the least cost-output relationship and determine the relationship between the output and the cost in the short run and the long run period of operation. Students will be able to determine the level of output beyond which profits will be generated.
CO4	Synthesis	Estimate and optimizing the performance of the company in different market structures in terms of profits using the concepts of marginal revenue and marginal cost, and equilibrium price and output. The course shall help students in formulating pricing and non- pricing strategies to deter competition.
CO5	Evaluation	Describe the methods for measurement of national income and inflation and to enumerate the policies to counter trade cycles. Students will be able to inspect the causes of a trade cycle and suggest remedies.

F. COURSE MATRIX

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3	PS O4	.
CO1	2	2	1	3	3	3	2	2	1	2	2	2	3	3	3	2	
CO2	3	3	3	1	2	2	2	3	3	3	3	3	3	3	3	2	
CO3	3	3	3	2	2	2	3	3	3	3	3	1	2	2	2	2	
CO4	3	3	3	3	2	2	2	2	2	2	2	3	2	2	2	3	
CO5	2	2	2	2	2	2	2	2	2	1	1	2	3	3	3	2	

Avg	2.6	2.6	2.4	2.2	2.2	2.2	2.2	2.4	2.2	2.2	2.2	2.2	2.6	2.6	2.6	2.2	

MBA SEMESTER – I
SUBJECT : MANAGERIAL COMMUNICATION

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4.5	0	0	4.5	4	50%	20%	30%	-	100%

A. COURSE OVERVIEW

This section may include motivation, objectives, scope etc. of the subject. It is preferred to describe all in less than 7 lines.

- To introduce the students with the communication process and its importance.
- To help students to understand difference between Verbal and Non Verbal Communication.
- To help students with Oral and Written Communication.
- To introduce the students with case pedagogy of Management with real life Situations.
- It is quite relevant to industry and corporates.
- It even helps to build one's career in international countries also.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	**The Innards of Communication:** The Innards of Communication asks how we communicate. It presents a novel explanation on why we misunderstand one another and what role verbal and non-verbal symbols play in communication.	**3**	CO1
[2]	**Seven Communication Roadblocks**: Seven Communication Roadblocks describes seven barriers that communication less effective than it could be. It also gives a few general tips on bringing them down and improving our communication skills.	**3**	CO2
[3]	**Communicating across cultures:** Communication across cultures deals with cultural values that quietly shape our communication. It alerts us to certain basic that we need to keep in mind if we want to communicate well with people of other culture.	**3**	CO2
[4]	**Listening: The Mother of all Speaking:** The mother of all speaking deals with the mother of all speaking - listening. Our listening is mostly partial and passive. In order to make our communication effective both as communicators and as communicates we need to make our listening active. The chapter describes the anatomy of poor listening and of poor speaking and goes on the features of a good listener.	**3**	CO1
[5]	**Telephoning and Teleconferencing:** Telephoning and Teleconferencing focuses on spoken communication over the phone. The server reduction in the number and quality of non-verbal symbols when one uses this channel of communication poses challengers to whoever uses it. The chapter shows how to cope with this challenges and what etiquette to follow.	**3**	CO1
[6]	**Effective Business Presentation:**	**3**	CO3

	Effective Business Presentation is on making oral presentations. It offers suggestions on how to plan presentation systematically, how to deliver them forcefully, how to develop and display visual aids, and how to handle questions from the audience. There are also some tips on how to cope with nervousness which nearly all speakers feel when they stand up to make presentation.		
[7]	**Meeting without Yawns:** Meeting without Yawns is devoted to meeting. Meetings are a fact of corporate life. No one can do without them. They are also a major source of terrible waste of time and resources. This chapter analyses the reasons for wastefulness and suggests ways of making meeting work	**3**	CO2
[8]	**The Body Language of Business Letters:** The Body Language of Business letters deals with the body language of business writing, especially letters, and the impression in creates on the reader.	**3**	CO4
[9]	**Business Letters – The Winning Tone:** Business letters – The wining tone discuss the tone of writing, an aspect of written communication that is underestimated by many managers.	**3**	CO4
[10]	**Smart E-mail:** Smart E-mail takes a close look at e-mail – the modern miracle. It shows how to make your mail smart so that it stands out from the crowd and gets read.	**3**	CO4
[11]	**Reports that command respect:** Reports that command respect focuses on reports. It shows how to write brief reports that command the reader's and get their acceptance.	**3**	CO5
[12]	**Persuasive Proposals:** Persuasive Proposals is devoted to proposals. Executive have to make them persuasive for them to be read an accepted. This chapter shows how.	**3**	CO5
[13]	***Written Analysis of Cases***	**9**	CO1, CO2, CO3, CO4, CO5
[14]	**Oral Presentation**	**5**	CO3

C. TEXT BOOKS

(It is necessary that at least 85% of course content is covered in prescribed textbooks. The format should be as per APA referencing format)

Monippally M M. Business Communication Strategies, 1st ed.; Tata McGraw-Hill. India, 2009.

D. REFERENCE BOOKS

(The format should be as per APA referencing format)

Kaul A. Effective Business Communication, 2nd ed.; Prentice Hall of India. India, 2015.

E. COURSE OUTCOMES

(Minimum 5 Cos are required)

CO Number	Skill	Statement
CO1	Evaluate	Determine the appropriate communication and listening skills.
CO2	Comprehension	Demonstrate the non-verbal and negotiation skills in various business situations.
CO3	Application	Demonstrative effective presentation skills in various occasions.
CO4	Synthesis	Formulate effective business reports and letters in different scenarios.
CO5	Analysis	Develop relations with media, investors, government and effective communication in crisis situations.

F. COURSE MATRIX

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3	PS O4	
CO1	2	1	3	2	1	3	2	1	2	1	3	2	1	3	2	1	
CO2	3	2	2	2	1	3	2	3	1	2	2	3	3	2	2	1	
CO3	3	2	2	1	2	2	3	2	3	2	2	1	3	2	1	1	
CO4	2	1	3	2	1	3	2	1	2	1	3	2	1	3	2	1	
CO5	2	2	3	-	-	3	3	2	2	1	1	2	1	2	2	1	
Avg	2.4	2.2	2.6	2.4	2.4	2.8	2.4	2.4	2.2	2.2	2.2	2	2.2	2.4	2.2	2.2	2.3

MBA SEMESTER – I
SUBJECT: QUANTITATIVE TECHNIQUES

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4.5	0	0	4.5	4	50%	20%	30%	-	100%

A. COURSE OVERVIEW

This section may include motivation, objectives, scope etc. of the subject. It is preferred to describe all in less than 7 lines.

- To make students knowledgeable about business statistics, that is, understanding how the methods of statistics can be applied successfully to decision-making processes

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Organizing and Summarizing data: Statistics in business, Why and who uses statistics, How to arrange data, Raw data, Data array, the frequency distribution, constructing a frequency distribution, Charts & Graphs Descriptive statistics, Inferential statistics	3	CO1
[2]	Measure of Central tendency, Measure of dispersion:Discrete & Continuous distribution, Arithmetic mean, Weighted mean, Geometric mean, median, mode, Dispersion, ranges, average deviation measures, relative dispersion, EDA	3	CO1
[3]	Basic Probability: The study of odds and ends, basic terminology in probability, three types of probability, Probabilities under conditions of statistical independence, probabilities under conditions of statistical dependence, revising prior estimates of probabilities: Bayes' theorem	3	CO2
[4]	Probability distributions, Random variable Expected Values Binomial Distribution, Poisson distribution, Normal distribution, Exponential distribution, uniform distribution, Hyper-geometric distribution	3	CO2
[5]	Sampling and Sampling distribution: Introduction to sampling, random sampling, design of experiments, introduction to sampling distribution, sampling distributions in more detail, an operation consideration in sampling: the relationship between sample size and standard error	3	CO3
[6]	Confidence Interval Estimation: Point estimates, Interval estimates and confidence intervals, calculating interval estimates of the mean from large samples, calculating interval estimates of the proportion from large samples, interval estimates using the t distribution, determining the sample size in estimation.	3	CO3
[7]	Analysis of Variance (ANOVA)	3	CO4
[8]	Testing of Hypothesis, One sample Test:Concepts basic to the hypothesis-Testing procedure, Hypothesis testing of means when the population standard deviation is known, Hypothesis testing of proportions: large samples	3.5	CO4
[9]	Testing of Hypothesis, Two sample Test:Hypothesis testing for differences between means and proportions, Tests for differences between means: large sample sizes, small sample sizes, with dependent sample	3.5	CO4

[10]	Chi-Square Test: Introduction, Chi-Square as a test of independence, Chi-Square as a Test of Goodness of Fit: Testing the appropriateness of a distribution	**3.5**	CO4
[11]	Regression analysis: Estimation Using the Regression Line, Correlation Analysis, Making Inferences about population parameters, Using regression and correlation analysis, multiple regression analysis, Cases	**3.5**	CO5
[12]	Non parametric Methods: Sign Test for paired data, Rank sum test: The Mann-Whitney U test and the Kruskal-Wallis Test, Run Test, Rank Correlation, The Kolmogorov-Smirnov Test	**3**	CO5
[13]	LP Model formulation	**3**	CO5
[14]	LP: Graphical Solution Method	**3**	CO5
[15]	LP: Sensitivity Analysis	**3**	CO5
[16]	Transportation Problem, Assignment Problem	**3**	CO5

C. TEXT BOOKS

(It is necessary that at least 85% of course content is covered in prescribed textbooks. The format should be as per APA referencing format)

- Levin Richard, Rubin David S., Statistics for Management, Seventh Edition, Pearson Education
- Sharma J.K., Quantitative Techniques for Managerial Decision, Macmillan

D. REFERENCE BOOKS

(The format should be as per APA referencing format)

- Black Ken, Business Statistics for Contemporary Decision Making, Wiley StudentEdition, Sixth or later edition
- Huda R.P., Statistics for Business Economics, Third Edition, Macmillan

E. COURSE OUTCOMES

(Minimum 5 Cos are required)

CO Number	Skill	Statement
CO1	Evaluate	Interpret appropriate numerical data used in everyday life in numerical, use measures of location, measures of dispersion for grouped and ungrouped data.
CO2	Comprehension	Determining probabilities for various events.
CO3	Application	Summarize discrete and continuous probability distributions to various business problems.
CO4	Synthesis	Learn about a variety of sampling methods including random and non-random sampling. Perform Test of Hypothesis as well as calculate confidence interval for a population parameter for single sample and two sample cases.
CO5	Analysis	Compute and interpret the results of Regression and Correlation Analysis, transportation and assignment problems, linear programming problems

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	1	2	2	2	2	3	2	2	2	2
CO2	3	3	3	3	3	2	2	2	3	3	3	3	3	3
CO3	2	2	3	3	2	3	2	3	3	2	2	3	3	3
CO4	3	1	2	2	1	2	2	1	2	3	1	2	1	2
CO5	1	3	2	1	3	3	2	2	2	2	3	1	3	2
Avg	2.4	2.4	2.4	2.2	2	2.4	2	2	2.4	2.6	2.2	2.2	2.4	2.4

MBA SEMESTER – I
SUBJECT: TECHNOLOGY IN MANAGEMENT

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4.5	0	0	4.5	4	50%	20%	30%	-	100%

A. COURSE OVERVIEW

This section may include motivation, objectives, scope etc. of the subject. It is preferred to describe all in less than 7 lines.

- To make students knowledgeable of different information systems of organization.

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B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Basic of Computers	**3.5**	CO1
[2]	Microsoft Word: Introduction to Word, editing a Document, Move and Copy Text and Help System, Formatting Text and Paragraph, Finding & Replacing Text and Spell Check, Using Tabs, enhancing a Document, Columns, Tables and Other features, Using Graphics, Templates and Wizards, Using Mail Merge, Some Miscellaneous Features of MS-Word	**3.5**	CO3
[3]	**Overview of PowerPoint:** What is PowerPoint? Creating a Presentation, PowerPoint Views, running a Slide Show, Printing a Presentation	**4**	CO3
[4]	**MS Excel:** Simple features of spreadsheet: Formula, Copying, data table etc. Financial analysis with spreadsheet: (NPV, Data Table, Goal seek, Scenario)	**4**	CO3
[5]	**Lookup function** (VLOOKUP, HLOOKUP, INDEX, MATCH) **Database features in spreadsheet** (Advanced data, Filter, DCOUNT, DSUM, DMAX) **Date arithmetic in spreadsheet** (YEAR, MONTH, WEEKDAY, DATE, TODAY) **Regression analysis and Matrix** Operation in spreadsheet Required statistical tests through spreadsheet	**4**	CO3
[6]	Review	**3**	CO3
[7]	Information Systems in Global Business Today **Role of Information System in Business Today, Perspectives on Information Systems, Contemporary Approaches to Information Systems**	**4**	CO1
[8]	E-Business: How Businesses Use Information Systems Business Processes and Information Systems, Types of Information Systems, Enterprise Resource Planning (ERP) / Enterprise Applications, The Information Systems Functions in a Business	**3**	CO4
[9]	Information Systems, Organizations and Strategy **Organizations and Information Systems, How Information Systems Impact Organizations and Business Firms, Using Information Systems to Achieve Competitive Advantage**	**3**	CO4
[10]	Ethical and Social Issues in Information Systems Understanding Ethical and Social Issues Related to Systems, Ethics in an Information Society, The Moral Dimensions of Information Technology	**3**	CO5
[11]	IT Infrastructure and Emerging Technologies	**3**	CO4

	IT Infrastructure Infrastructure Components Contemporary Hardware Platform Trends **Contemporary Software Platform Trends**		
[12]	Telecommunications, the Internet, and Wireless Technology Telecommunication and Networking in Today's Business World Communications Networks The Global Internet The Wireless Revolution	**3**	CO4
[13]	Securing Information Systems System Vulnerability and Abuse Business Value of Security and Control Establishing a Framework for Security and Control Technologies and Tools for Protecting Information Resources	**3**	CO4
[14]	Achieving Operational Excellence and Customer Intimacy: Enterprise Application Enterprises systems Supply chain Management Systems Customer Relationship Management Systems Enterprises Application: New Opportunities and Challenges	**3**	CO4
[15]	E-Commerce: Digital Markets, Digital Goods E – Commerce and the Internet	**3**	CO4

C. TEXT BOOKS

(It is necessary that at least 85% of course content is covered in prescribed textbooks. The format should be as per APA referencing format)

- Laudon Kenneth, Laudon Jane, Management Information Systems, Latest Edition, Pearson Educatioin

D. REFERENCE BOOKS

(The format should be as per APA referencing format)

- Jawadekar W S, Management Information Systems, 2nd Edition, TMH
- Gupta Uma, Management Information Systems – A Managerial Perspective, Galgotia Publications
- O'Brien J., Management Information Systems - Managing Information Technology in Business Entreprise, Tata McGraw Hill, Latest Edition

E. COURSE OUTCOMES

(Minimum 5 Cos are required)

CO Number	Skill	Statement
CO1	Evaluate	Students are familiar with different business functions and Information Systems.
CO2	Comprehension	Familiarize with network topologies and network types.
CO3	Application	Students are taught about spreadsheet, word

		processing and presentation preparations
CO4	Synthesis	Students are familiarized with e-commerce, electronic data exchange and e-governance environments.
CO5	Analysis	Students are familiarized with the impact of information systems on organizations, challenges posed by information systems and how they should be addressed.

F. COURSE MATRIX

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	
CO1	3	3	2	3	1	2	2	2	2	3	2	2	2	2	2	3	
CO2	3	2	3	3	3	2	3	2	3	3	3	3	3	3	3	2	
CO3	2	2	3	2	2	3	3	3	3	2	2	3	3	3	3	3	
CO4	2	1	2	3	1	2	1	1	2	3	1	2	1	1	2	2	
CO5	1	2	1	1	3	3	2	2	2	2	3	1	3	2	1	2	
Avg	2.2	2	2.2	2.4	2	2.4	2.2	2	2.4	2.6	2.2	2.2	2.4	2.2	2.2	2.4	2.25

MBA SEMESTER – I
SUBJECT: FINANCIAL ACCOUNTING FOR MANAGERS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4.5	0	0	4.5	4	50%	20%	30%	-	100%

A. COURSE OVERVIEW

To enable students to understand, interpret & analyse Accounting System, Accounting books / records Financial Statements & also understand & decide relevance of accounting information to Managerial Decisions.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Introduction to Accounting, Concepts 'introduction: Fixed/ current Assets, investment, Current / long term liability, Income, Expenditure, Profit, loss, Etc	4	CO1
[2]	Balance sheet & related concepts	4	CO1 CO2 CO3
[3]	Profit & loss account & related concept	4	CO1 CO2 CO3
[4]	Smokey Valley café case – Information from main financial statement – Interested parties – Their area of interest Various accounting books & entries made in them		CO1 CO4
[5]	Accounting Mechanics: - Passing of accounting entries	4	CO1 CO4
[6]	Preparation of trial Balance, Adjustment & closing entries, Making of Manufacturing, Trading profit & loss account & Profit & loss appropriation account, Limitations of the financial statements. Preparation of a limited company's balance sheet & profit & loss account	4	CO1 CO2 CO3 CO4
[7]	Case studies for final accounts etc. of Proprietary, Partnership & limited company accounts from Text book & reference books	4	CO1 CO2 CO3 CO4 CO5
[8]	Bank Reconciliation, Fixed assets, Depreciation methods, Disposing / revaluation of fixed assets, writing of Fixed assets, Deferred revenue expenditure, Capitalization of expenditure	4	CO5
[9]	Accounting for transactions involving Foreign currency. Incorporating foreign br. Working results & balance sheet in head office final accounts	4	CO1 CO2 CO5
[10]	Overview Business purchase & Merger Accounting	4	CO1 CO2
[11]	Case study – Understanding , Analysing and interpreting financial statements	5	CO2 CO3
[12]	Consolidated Financial Statement	5	CO1 CO3

C. TEXT BOOKS

- Tulsian, D. P. (2021). *Financial Accounting* (Latest Edition ed.). S Chand.

D. REFERENCE BOOKS

- Gupta, A. (n.d.). *Financial Accounting for Management* (Latest Edition ed.). Pearson.
- Lalitha, V. R. (n.d.). *Financial Accounting* (Latest Edition ed.). Pearson.
- Shah, P. (n.d.). *Financial Accounting for Management* (Latest Edition ed.). Oxford.
- Swami, R. N. (n.d.). *Financial Accounting- A Managerial Perspective* (Latest ed.). PHI.

E. COURSE OUTCOMES

CO No.	Skills	Statement
CO1	Evaluate	Demonstrate accounting concepts and conventions and their implications on the accounting system. Create financial statements of sole proprietorship including Consolidated and standalone.
CO2	Comprehension	Present financial statements according to the provisions of the Indian Companies Act. Analyse financial statements and apply comparative and common size techniques.
CO3	Application	Analyse financial statements and apply various ratios to and interpret the company's financial performance.
CO4	Synthesis	Demonstrate various accounting standards and Explain the concept of IFRS
CO5	Analysis	Differentiate between funds flow statements and cash flow statements. Analyse funds flow statement and cash flow statement according to accounting standard 3 along with Bank Reconciliation, Fixed assets, Depreciation methods, Disposing / revaluation of fixed assets, writing of Fixed assets, Deferred revenue expenditure, Capitalization of expenditure

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	3	2	2	3	3	3	2	2	3	2	2	3	2	2
CO2	3	3	3	2	2	3	3	0	2	2	2	3	3	2	2	3
CO3	3	2	2	3	2	3	3	2	3	2	2	2	3	2	3	3
CO4	2	2	3	2	2	3	2	3	2	3	3	2	3	3	2	0
CO5	2	2	3	2	3	0	0	3	2	3	2	2	0	3	3	3
Avg	2.4	2.4	2.8	2.2	2.2	2.4	2.2	2.2	2.2	2.4	2.4	2.2	2.2	2.6	2.4	2.2

MBA SEMESTER – II
SUBJECT: INDIAN BUSINESS ENVIRONMENT

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4.5	0	0	4.5	4	50%	20%	30%	-	100%

A. COURSE OVERVIEW

This course intends to create an understanding of the Political, Economical, Social, Technological, Cultural, Legal, Governmental, Global environments and their implications on the businesses at Macro as well at Micro Levels. After studying this course, the students will be able to develop a strategic thinking and how these forces affect the strategy making into the business in real life.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	**An over view of Business Environment:** Types of environment; Internal environment, External environment; Micro environment; Macro environment; Competitive structure of industries; Competitor analysis; Environmental analysis and strategic management	2	CO2 CO3 CO5
[2]	**Environmental Analysis and Forecasting:** Techniques for environmental analysis; Steps in environmental analysis; Types of environmental forecasting; Techniques for environmental forecasting; Benefits / importance of environmental analysis; Limitations of environmental Forecasting	2	CO2 CO3 CO5
[3]	**Economic Environment Nature of the economy:** Structure of the economy; Economic policies; Economic conditions	2	CO4
[4]	**Political and Government Environment:** Functions of State; Economic roles of government; Government and legal environment; Economic Roles of Government in India; The Constitutional Environment	2	CO4
[5]	**Natural and Technological Environment**: Natural environment; Tech environment; Innovation; Technological leadership and follower ship; Technology and competitive advantage; Sources of Technological Dynamics; Time lags in technology. Introduction/Absorption; Appropriate Tech and Tech Adaptation; impact of tech on globalization; IT and Marketing; Transfer of Technology	2	CO4
[6]	**Demographic Environment:** Population size; Falling birth rate and changing age structure; Migration and ethnic aspects	2	CO4
[7]	**Societal Environment**: Business and society; Objectives and importance of business; Professionalization; Business ethics; Business and Culture; Religion; Language; Culture and OB; Other Social / cultural factors; Technological development and social change	2	CO4
[8]	**Social Responsibility of Business Classical and contemporary views:** Social orientation of business; Factors affecting social orientation; Responsibilities to different sections; The Indian situation; Arguments for and against social involvement; Social audit.	2	CO4
[9]	**Industrial Policy:** Industrial policy up to 1991; The new industrial policy; An evaluation of the new policy	2	CO4

[10]	**IDRA and Industrial Licensing Industries (Development and Regulation) Act:** Industrial licensing; The new policy	**2**	CO1
[11]	**Public, Private, Joint and Co-operative Sectors Public sector:** Growth and performance of public sector; The new public sector policy; Organization of public enterprises	**2**	CO1
[12]	**Government Environment Government and parliamentary control over public enterprises:** Pricing policy in public enterprises; Department of Public Enterprises; Nationalization; Private sector; Joint sector; The concept of national sector; Cooperative sector	**2**	CO4
[13]	**Privatization and Disinvestments:** Expansion of public sector and its defects; Privatization reaction; Ways of privatization; Obstacles; Conditions for success of privatization; Benefits of Privatization; Arguments against privatization; sins and pitfalls of privatization; Rangarajan Committee and Disinvestments; Privatization in India	**2**	CO1
[14]	**Village and Small Industries**: The VSI sector; Definitions; SMEs in other countries; Importance; Development of VSI under the Plans; Promotional measures; Institutional support structure; State industrial policies; Khadi and village industries; Ancillary industries; Drawbacks and problems	**2**	CO4
[15]	**Industrial Sickness Definition:** Magnitude; Causes of sickness; Preventive and curative measures; Sick Industrial Companies Act	**1**	CO4
[16]	**Price and Distribution Controls:** Objectives of price and distribution controls; Price policy in India; Price controls; Indirect controls; Direct controls; Administered prices; Dual pricing; Subsidization; (The gist of) Essential Commodities Act; Other laws to control production, distribution and prices (list only); The public distribution system	**2**	CO2
[17]	**Competition Policy and Law Competition policy and law:** Nature and Scope; Government policies and distortions to competition; Interface of FDI and competition law; Pre-requisites for a competition policy; Contours of competition law; Annexure to chapter on MRTP Act	**2**	CO2
[18]	**Stock Exchange and its Regulations Meaning:** Importance and functions; Dealings on stock exchange; Speculation on stock exchange; Organization of stock exchanges in India; OTCEI; National Stock Exchange of India; Stock Holding Corporation of India; Regulation of stock exchanges – Securities Contracts (Regulation) Act; SEBI; Capital market reforms and developments	**2**	CO1
[19]	**Industrial Finance Short-term finance:** Medium term finance; Long term finance; Ownership securities; Creditorship securities; New issues – marketing of securities; Underwriting of securities; Internal financing (ploughing back of profits); Public deposits; Commercial banks	**2**	CO1
[20]	**Industrial Financial Institutions:** Types of institutions; Types of assistance; IDBI; IFCI; ICICI; Industrial Investment Bank of India; Discount and Finance House of India; State Financial Corporations; State Industrial Development / Investment Corporations; Investment Institutions; Institutions for small industry; Commercial banks	**2**	CO1
[21]	**Planning in India**: The Planning Commission; The NDC; State plans; Formulation of the Plan; Performance Industrial Development Strategy Salient features of industrial planning and development; Capital goods vs. consumer goods; Roles of public and private sectors; Village and small	**2**	CO1

	industries; Comparative cost dynamics; Import substitution and export contribution; Capacity utilization; Regional disparities; An evaluation Planning and Development of Agriculture Phases of development; Expansion and development of inputs and services; Agricultural marketing; Agricultural price policy; Commodity exchange		
[22]	**GATT/WTO and Global Liberalization** Objectives; An evaluation of GATT; The Uruguay Round Agreement; GATT and WTO; Functions of WTO; Salient features of UR agreement; GATS; TRIMS; TRIPS; Evaluation of the Uruguay Round; UR agreement and developing countries; Implementation issues; UR agreement and India; Annexure to the chapter on the Doha Declaration	**2**	CO4
[23]	**International Investments Significance of foreign investment:** Trade and investment; Types of foreign investment; Factors affecting international investment; Growth of foreign investment; Dispersion of FDI; Portfolio investments; Cross-border M&As; Foreign investment in India; Foreign investment by Indian companies	**2**	CO1
[24]	**Multinational Corporations:** Definition and meaning; Organizational models; Dominance of MNCs; MNCs and international trade; Merits of MNCs; Demerits; Perspectives; Codes of conduct; Multinationals in India	**2**	CO4
[25]	**Globalization:** Globalization of world economy; Globalization of business; Meaning and dimensions; Features of current globalization; Globalization stages; Essential conditions for globalization; Foreign market entry strategies; Pros and cons of globalization; Policy options; Globalization of Indian business	**1**	CO4
[26]	**Development and Regulation of Foreign Trade:** Regulation of foreign trade; Foreign Trade (Development and Regulation) Act; Export Import policy; Export promotion; Organizational setup; Production assistance; Marketing assistance; EPZs, EOUs, TPs and SEZs; Export houses and trading houses; An evaluation	**2**	CO1

C. TEXT BOOKS

(It is necessary that at least 85% of course content is covered in prescribed textbooks. The format should be as per APA referencing format)

1. Cherunilam, F. (2022). *Business environment: Text and cases*. Himalaya Publishing House.

D. REFERENCE BOOKS

(The format should be as per APA referencing format)

1. Paul, J. (2010). *Buss. Environment*. Tata McGraw-Hill Education.
2. Fernando, A. C. (2011). *Business environment*. Pearson Education India.
3. Worthington, I., & Britton, C. (2009). *The business environment*. Pearson education.
4. Ahmed, F., & Alam, M. A. (2021). *Business Environment: Indian and Global Perspective*. PHI Learning Pvt. Ltd..

E. COURSE OUTCOMES

(Minimum 5 Cos are required)

CO Number	Skill	Statement
CO1	Evaluate	Make them aware of basics of the financial system of India
CO2	Comprehension	To make the students aware about fundamentals of Business Environment
CO3	Application	Teach them the ways of planning the scenarios
CO4	Synthesis	Help them understand effects of constitutional environment, technological environment, cultural environment, economic environment on business
CO5	Analysis	Help them comprehend the effects of SWOT on organization's strategy

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	2	2	2	3	1	3	1	2	2	2	2	3	2	2	3	2	
CO2	2	3	3	2	3	2	2	2	3	3	2	2	3	3	2	1	
CO3	3	2	1	2	3	2	3	3	2	3	1	2	1	2	2	3	
CO4	2	2	3	2	3	1	2	1	2	2	3	3	2	1	3	2	
CO5	2	3	2	2	2	2	2	3	3	2	2	2	3	3	2	2	
Avg	2.2	2.4	2.2	2.2	2.4	2	2	2.2	2.4	2.4	2	2.4	2.2	2.2	2.4	2	2.225

MBA. SEMESTER – II
SUBJECT: COST AND MANAGEMENT ACCOUNTING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4.5	0	0	4.5	4	50%	20%	30%	-	100%

A. COURSE OVERVIEW

- To make students aware of various techniques and methods ascertaining cost of various products and also to enable them to study & evaluate measures of controlling cost.
- To enable students to evaluate performance of various business concerns by use of technique of ratio analysis.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	**Concept of cost from various angles:** Definition of Cost Accounting – Its Basic- Methods and Techniques of costing, Advantage and Limitation of Cost Accounting – Comparison with Financial Accounting – Analyses and Classification of cost	4	CO1
[2]	**Elements of Cost** Procedures of linking cost to cost centers and cost units, Overheads: Nature and classification, Procedure of linking overheads to cost units, classification and collection of overheads, Allocation and apportionment of overheads – Examples, Overhead absorption and absorption rate. Actual and predetermined overheads	4	CO1
[3]	**Valuations** Joint Product, By product and stock valuation. Job batch and contract costing – examples	4	CO3
[4]	**Processing Costing** Process costing with examples, nature and problem in processes costing, normal and abnormal losses and their valuation – operation and services costing	4	CO3
[5]	**Marginal Costing** Nature and problem of Marginal costing, Break even analysis, CVP relationship with examples	4	CO2
[6]	**Budgetary and Budgetary control** Nature and problem, various types of budget, preparation of budget, examples and preparing of budget, responsibility accounting, learning curves, standard cost and standard costing, calculation and analysis of variances	4	CO4
[7]	**Cost control Accounts** Types of Accounting records, Integral accounting & non-Integral Accounting and Reconciliation of cost and financial accounts	4	CO3
[8]	**Activity based costing** Implementation and continuation of costing system, cost reduction, value analysis, value addition and review	4	CO3
[9]	**Cash flow statement and Fund flow statement** Preparation and analyses, examples	4	CO5
[10]	**Ratio analysis**	4	CO5

	Calculation of ratio and grouping of ratios, analysis of changes in ratios		
[11]	**Analysis of financial position and performance of business concern** Possible reason for variance in performance/ financial position	**4**	CO5
[12]	**Project Preparation**	**6**	CO5

C. TEXT BOOKS

- Bhar, B. K. (n.d.). *Cost Accounting* (Latest Edition ed.). Academic Publisher.
- Tulsian, P.C. (n.d.). *Cost Accounting* (Latest Edition ed.). S.Chand Publication.

D. REFERENCE BOOKS

- Charles, Srikant and George (n.d.). *Cost Accounting* (Latest Edition ed.). PHI Publication.
- Arora, M. N. (n.d.). *Cost and Management Accounting* (Latest Edition ed.). HPH Publication.
- Kishor, R. M. (n.d.). *Cost and Management Accounting* (Latest Edition ed.). Taxmann Publication.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Evaluate	Classify and identify the cost and its elements including Methods and techniques of cost ascertainment and control along with Allocation and apportionment of overheads.
CO2	Synthesis	Analyse business decisions using cost-volume- profit analysis
CO3	Application	To apply and analyse Methods and techniques of Costing along with various valuation techniques
CO4	Comprehension	Develop and apply standards and budgets for planning and controlling purposes.
CO5	Analysis	Analyse cash flow and fund flow, Variance analysis, Ratio analysis and Project planning to evaluation.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	.
CO1	3	3	2	2	2	2	3	2	2	3	2	1	3	2	3	2	
CO2	2	2	3	2	3	2	2	2	3	3	3	2	2	2	3	3	
CO3	3	3	3	3	2	3	3	3	2	2	2	3	3	3	2	2	
CO4	3	3	2	2	2	2	3	2	2	3	2	3	3	2	3	2	
CO5	3	3	3	2	2	2	3	2	2	3	2	2	3	2	3	2	
..																	
Avg	2.8	2.8	2.6	2.2	2.2	2.2	2.8	2.2	2.2	2.8	2.2	2.2	2.8	2.2	2.8	2.2	

SUBJECT: MARKETING MANAGEMENT

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	0	4	4	50%	20%	30%	-	100%

A. COURSE OVERVIEW

The course focuses on formulating and implementing marketing management strategies and policies, a task undertaken in most companies at the strategic business unit level. The marketing management process is important at all levels of the organization, regardless of the title applied to the activity. Typically, it is called corporate marketing, strategic marketing, or marketing management. For our purposes they all involve essentially the same process, even though the actors and activities may differ. The course will provide you with a systematic framework for understanding marketing management and strategy.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
1	• Defining Marketing for the New Realities • Developing Marketing Strategies and Plans Case:1	3	CO1 CO2
2	• Creating Long-term Loyalty Relationships • Collecting Information and Forecasting Demand	3	CO1
3	• Conducting Marketing Research Case:2	2	CO3 CO5
4	• Analyzing Consumer Markets • Analyzing Business Markets Case: 3	4	CO5
5	• Tapping into Global Markets • Identifying Market Segments and Targets	3	CO1 CO3
6	• Crafting the Brand Positioning • Creating Brand Equity	2	CO2
7	• Addressing Competition and Driving Growth • Setting Product Strategy • Designing and Managing Services Case: 4	4	CO2 CO5
8	• Introducing New Market Offerings • Developing Pricing Strategies and Programs	3	CO1 CO3
9	• Designing and Managing Integrated Marketing Communications • Managing Mass Communications: Advertising, Sales Promotions, Events and Experiences, and Public Relations Case: 5	3	CO1 CO5
10	• Managing Digital Communications: Online, Social Media and Mobile Marketing	4	CO1 CO3 CO5

	• Managing Personal Communications: Direct Marketing, Word of Mouth, and Personal Selling Case6		
11	• Designing and Managing Integrated Marketing Channels • Managing Retailing, Wholesaling, and Logistics Case: 7	3	CO3 CO4
12	• Managing a Holistic Marketing Organization for the Long Run	1	CO1 CO3 CO4
13	• Contemporary issues and presentation	1	CO3 CO4 CO5

C. TEXT BOOKS

(It is necessary that at least 85% of course content is covered in prescribed textbooks. The format should be as per APA referencing format)

1. 'Marketing Management', Philip Kotler, Kelvin Keller, 15th Edition, Perspective, Pearson Education, New Delhi.

D. REFERENCE BOOKS

(The format should be as per APA referencing format)

2. Marketing Management – Planning, Implementation and context, - Ramaswamy and Namakunsari, 3rd Edn, Macmillan India Ltd., New Delhi.
3. 'Marketing' – Michael J. Etzel, Bruce J. Walker William J. Stanton, Tata McGraw-Hill, 13th Edition, Delhi.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Evaluate	Develop an understanding of marketing as a function and capable to observe the factors effecting marketing of organization's products or services.
CO2	Comprehension	Identify the criteria to segment, target and positioning of products or services of organizations and to be able to estimate the.
CO3	Application	Design and develop marketing programmes and strategies for organizations.
CO4	Synthesis	Summarize the efficiency of marketing function by applying the marketing audit and control procedures
CO5	Analysis	Analyse the behaviour of target market and relate them to organizational marketing strategies.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	3	2	3	2	2	3	2	2	3	2	2	2	3	2	3	2	
CO2	3	2	2	3	2	1	2	2	1	2	3	3	2	2	1	2	
CO3	2	3	2	2	1	2	3	2	2	3	2	2	2	3	2	2	
CO4	2	3	1	2	3	2	2	2	2	2	2	2	2	1	2	2	
CO5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
Avg	2.4	2.4	2	2.2	2	2	2.2	2	2	2.2	2.2	2.2	2.2	2	2	2	2.13

SUBJECT: FINANCEIAL MANAGEMENT

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4.5	0	0	4.5	4	50%	20%	30%		100%

A. COURSE OVERVIEW

To familiarize students with the basic elements of the Financial Management. To develop familiarity with the analytical techniques helpful in financial decision making

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Introduction to Financial Management: This chapter lays down the conceptual framework for financial decision making in a "for-profit" business setting. The goals of business organization, the decision areas in financial management, the issues of multiplicity of stakeholders and related conflicts of interest in a typical corporate set up, etc., issues will be discussed	3	CO2
[2]	Time Value of Money: The application of time value of money is an invaluable tool in financial analysis. The applications range from personal finance areas to corporate finance such as capital budgeting, valuation and risk management'	3	CO1
[3]	Valuation of Bonds and Stocks: It is divided in to five sections and deals with Bond Valuation and Bond Yields, Equity and Preference Share Valuation and E/P Ratio, Growth etc.	3	CO1
[4]	Risk and Return: It is organized in to two sections discussing Risk and return of a single assets and portfolio, measurement of market risk and relationship between risk and return	3	CO5
[5]	Risk and Return- Extension (portfolio management of two securities: Portfolio Risk and return, beta, alpha, diversification	3	CO2
[6]	Cost of Capital: It focuses on cost of different sources of financing and eventually the overall cost of capital that acts as a hurdle rate or discount rate in the investment appraisal models. WACC, MACC	3	CO2
[7]	Capital Budgeting: This Chapter deals with the conceptual framework and decisions criteria for the long-term investment decisions. The basic issues in capital budgeting like cash flow estimation and appraisal techniques for investment decisions will be discussed. NPV, IRR, PBP, BCR, MIRR, DPBP	2	CO1
[8]	Leverage: This chapter is aimed at providing insights in to Operating leverage, financial leverage and combined leverage	3	CO5
[9]	Capital Structure Theory: This chapter lays down the theoretical foundations of the capital structure that find their application in designing of capital structure. The crucial issue of determining the optimal capital structure will be addressed. NI, NOI, Traditional, M&M Approach	2	CO3

[10]	Sources of Long term funds: It discusses the long term sources of finance like equity, bonds, debenture, preference share, internal accruals, term loans etc.	2	CO3
[11]	Raising Long Term Funds: It is divided in to eight sections like venture capital, initial public offer, rights issues, private placements, preferential allotment, dilution etc.	2	CO2
[12]	Dividend Policy and Dividend Decision: Gordon model, Walter Model, M&M Model	3	C05
[13]	Introduction to Working Capital Management: This chapter introduces working capital management and concerns with decisions relating to current assets and current liabilities., Operating Cycle and cash cycle, Cash requirement for working capital	3	C04
[14]	Working Capital Financing: It deals with the sources of finance that are used to support current assets like Accruals, Trade Credit, commercial papers etc., Tandon Committee, Chore Committee, MPBF	3	C04
[15]	Cash Management: Cash Budgeting, Long term cash forecasting, optimal cash balance etc. Cash Budgeting, Optimal Cash Balance, Miller and Ore Model, Baumol Model, Cash Collection and Disbursement	3	C04
[16]	Credit Management: Terms of Payment, Credit Policy Variables, Credit Evaluation, and Credit Granting decision.	3	CO3
[17]	Inventory Management: Order Point, Need for inventories, EOQ model, criteria for judging inventory system, Safety Stock. Lead time	3	C04
[18]	Cases (5 to 6) on time value of money, leverage, cash flow and others	3	CO2

C. TEXT BOOKS

(It is necessary that at least 85% of course content is covered in prescribed textbooks. The format should be as per ACS referencing format)

1. Pandey I M, "*Financial Management*", 10th edition, Vikas Publication, New Delhi

D. REFERENCE BOOKS

(The format should be as per ACS referencing format)

1. Van horne, *"Fundamentals of Financial Management",* Pearson Education, 11th ed.
2. Brigham, *"Financial Management"*, Cengage Publication
3. Kewown, J.Arthur, Martin, John, Petty, William, and Scott David, *"Financial Management: Principles and Applications"*,10th Ed. Pearson.
4. Chandra Prassanna, *"Financial Management"*, 10th Edition, TMH, New Delhi

E. COURSE OUTCOMES

(Minimum 5 Cos are required)

CO Number	Skill	Statement
CO1	Evaluate	Demonstrate role of financial management in business corporations, Knowledge of the value of money overtime, its utility and trade off between risk and return.
CO2	Comprehension	Construct and Compare the various capital budgeting techniques and risk in capital budgeting.
CO3	Application	Distinguish between equity, debt and preference capital. Determine capital structure using EBIT –EPS analysis. Calculate specific cost of capital and weighted average cost of capital.
CO4	Synthesis	Demonstrate the concept of working capital and sources of working capital finance. Determine working capital estimation and EOQ levels, Plan cash management, inventory management.
CO5	Analysis	Differentiate between relevance and irrelevance theory of dividends. Calculate value of the firm using Walter's Model, Gordon's Model and MM Hypothesis

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	.
CO1	3	2	2	2	1	3	2	2	3	2	2	2	1	2	3	3	
CO2	3	2	3	2	3	2	3	2	3	3	3	2	2	3	2	2	
CO3	2	2	2	2	2	2	2	2	2	2	3	3	3	3	2	1	
CO4	2	2	3	3	3	2	3	2	2	3	2	2	3	2	3	2	
CO5	2	3	2	3	2	3	2	3	1	2	2	2	2	2	2	2	
..																	
Avg	2.4	2.2	2.4	2.4	2.2	2.4	2.4	2.2	2.2	2.4	2.4	2.2	2.2	2.4	2.4	2	2.3

MBA SEMESTER – II
SUBJECT: PRODUCTION AND OPERATIONS MANAGEMENT

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4.5	0	0	4.5	4	50%	20%	30%	-	100%

A. COURSE OVERVIEW

This section may include motivation, objectives, scope etc. of the subject. It is preferred to describe all in less than 7 lines.

- To develop an understanding of the strategic importance of operations and how they provide a competitive advantage in the marketplace
- To understand the relationship between operations and other business functions, such as Marketing, Finance, Accounting, and Human Resources.
- To develop knowledge of the issues related to designing and managing operations and the techniques to do so.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Introduction to the Field: The field of operations management, Operation as service, Historical development of OM, Review and discussion	2	CO1
[2]	Operations Strategy and Competitiveness: What is operations strategy? Operations priorities, The notion of Trade-offs, Order winners and Qualifiers, Operation strategy in services, meeting the competitive challenge	2	CO1
[3]	Linear Programming using the Excel Solver:	2	CO2
[4]	Project Management: Definition of Project management, project control, organization structure, Critical path scheduling, time-oriented techniques, time-cost models, managing resources, PERT	2	CO5
[5]	Product Design: Product design process, design for the customer, quality function development, Value analysis, Value engineering	2	CO3
[6]	Learning Curves: Applications & Case, Organizational learning	2	CO3
[7]	Process Analysis: Types of process, Product-Process matrix	2	CO3
[8]	Job Design and Work Measurement: Job design decisions, behavioral considerations in job design, work methods, work measurements and standard	2	CO3
[9]	Manufacturing Process Selection and Design:	2	CO3
[10]	Facility Layout: Basic production Layout formats, Process layout, product layout, Group technology layout, fixed-position layout, Retail service layout	2	CO2
[11]	Service Process Selection and Design: Nature of services, operational classification of services, designing service organization	2	CO3

[12]	Waiting Line Management: The queuing system, customers arrivals, waiting line models	**2**	CO5
[13]	Quality Management: Focus on Six Sigma: Quality management and the Malcolm baldrige national quality awards, cost of quality, The singho system, fail safe design	**2**	CO5
[14]	Process Capability and Statistical Quality Control: Acceptance sampling, process control procedures, P Charts, X bar and R chart, Capability index	**2**	CO4
[15]	Operations Consulting and Reengineering	**2**	CO4
[16]	Supply Chain Strategy: Supply chain management: Make or buy, outsourcing, Value density ,Electronic information flow	**2**	CO4
[17]	Strategic Capacity Management:	**2**	CO4
[18]	Facility Location: Issues in facility location, plant location methods, center of gravity method, Ardlan Huristic method	**2**	CO2
[19]	Lean Production: Concept and application in lean production	**2**	CO5
[20]	Forecasting: Demand management, types of forecasting, qualitative techniques in forecasting, time series analysis: simple moving average, weighted moving average, exponential smoothing method	**2**	CO3
[21]	Aggregate sales and Operations Planning: Overview of operations planning activities, Hierarchical production planning, Aggregate production planning	**2**	CO2
[22]	Inventory Control: Definition of Inventory, Purpose of inventory, fixed-order quantity model, fixed-time period model, three simple inventory systems, ABC inventory planning	**2**	CO4
[23]	Material Resource Planning: MRP, MRP II, JIT in MRP, Lot sizing in MRP systems: Lot-for-Lot, Economic Order Quantity, Least total cost, least unit cost, lot size choice	**2**	CO4
[24]	Operation Scheduling: The nature and importance of work centers, priority rules and techniques	**2**	CO4
[25]	Simulation:	**2**	CO4

C. TEXT BOOKS

(It is necessary that at least 85% of course content is covered in prescribed textbooks. The format should be as per APA referencing format)

- Richard B Chase, F Robert Jacobs, Nicholas J Aquilano, Nitin K Agarw al, Operations Management for Competitive Advantage, Eleventh Edition,McGraw-Hill Education (India) Ltd, ISBN 0-07-060448-7

D. REFERENCE BOOKS

(The format should be as per APA referencing format)

- Roberta S Russell and Bernard W Taylor III, Operations Management, Fourth (or later) Edition, Pearson Education, ISBN 81-297-0006-9
- B Mahadevan, Operations Management – Theory and Practice, Pearson Education, ISBN 81-7758-564-9
- Kachru Upendra, Production and Operations Management, Excel Books, Latest Edition

E. COURSE OUTCOMES

(Minimum 5 Cos are required)

CO Number	Skill	Statement
CO1	Evaluate	To understand the basic concepts and strategies in operations and production activities.
CO2	Comprehension	To identify factors influencing plant location and plant layout
CO3	Application	To understand production process & services and execute the customer order timely
CO4	Synthesis	To know how to manage the materials, manpower efficiently and effectively by using appropriate inventory management methods, scheduling and material requirement planning
CO5	Analysis	Summarize different queuing situations, Project and quality management tools & techniques

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	3	3	2	3	1	2	2	2	2	3	2	2	2	2	2	3	
CO2	3	2	3	3	3	2	3	3	3	3	3	3	3	3	3	2	
CO3	2	2	3	2	2	3	3	3	3	2	2	3	3	3	3	3	
CO4	2	1	2	3	1	2	1	1	2	3	1	2	1	1	2	2	
CO5	1	2	1	1	3	3	2	2	2	2	3	1	3	2	1	2	
Avg	2.2	2	2.2	2.4	2	2.4	2.2	2.2	2.4	2.6	2.2	2.2	2.4	2.2	2.2	2.4	2.2625

MBA SEMESTER – II
SUBJECT: HUMAN RESOURCE MANAGEMENT

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4.5	0	0	4.5	4	50%	20%	30%	-	100%

A. COURSE OVERVIEW

To acquaint students to the various facts of managing people and to create an understanding of the various practices and policies of Human Resource Management. The course also aims to help the students to understand and learn the concepts required for utilization and development of Human Resources.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	**Introduction to HRM:** What is HRM and why is it important? The Trends Shaping Human Resource Management	3	CO1
[2]	**Employment Law in India and United States:** Labor Legislations in India Equal Employment Opportunity in the United States 1964-1991 Equal Employment Opportunity 1990-91 Present Equal Employment Opportunity in the United States 1964-1991 Equal Employment Opportunity 1990-91-Present Defenses Against Discrimination Allegations Illustrative Discriminatory Employment Practices EEOC Enforcement Process Diversity Management and Affirmative Action Programmes	3	CO1 CO5
[3]	**The Manager's Role in Strategic HRM:** Why Strategic Management Planning is Important to All Managers Fundamentals of Management Planning the Strategic Management Process Strategic Human Resource management HRD Scorecard Developed by TVRLS, India Building Your Own High Performance Work Systems	2	CO1
[4]	**Job Analysis**: The Basics of Job Analysis Methods for Collecting Job Analysis Information Writing Job Descriptions Writing Job Specifications Job Analysis in a Worker-Empowered World	3	CO1
[5]	**Human Resource Planning and Recruiting:** Planning and Forecasting the Need for Effective Recruiting a More Diverse Workforce Developing and Using Application Forms	3	CO2
[6]	**Employee Testing and Selection:** Basic Testing Concepts Types of Tests Work Samples and Simulations Background Investigations and Other Selection Methods	3	CO2
[7]	**Interviewing Candidates:** Basic Types of Interviews,What errors can undermine an interview's usefulness, How to design and conduct interviews	3	CO2
[8]	**Training and Developing Employees:** Introduction to Orientation and Training Programmes Analyzing Training Needs and Designing the Programmes Implementing the Training Programme Implementing Management Development Programmes Managing the Organizational 3Change Programme Evaluating the Training Report	3	CO4

[9]	**Performance Management and Appraisal:** Basic Concepts in Performance Management and Appraisal Dealing with Performance Appraisal Problems the Appraisal Interview Performance Management	**3**	CO2
[10]	**Coaching, Careers, and Talent Management:** Improving your Coaching Skills Career Management Basics Career Management Methods Employee Life-Cycle Career Management Talent Management	**3**	CO4
[11]	**Establishing Strategic Pay Plans:** Basic Factors in Determining Pay Rates Establishing Pay Rates Pricing Managerial and Professional Jobs Competency-Based Pay Special Topics in Compensation.	**3**	CO4
[12]	**Pay Performance and Financial Incentives:** Money and Motivation Individual Employee Incentive and Recognition Programs Incentives for Sales People Incentives for Managers and Executives Team and Organization Wide Incentive Plans Designing the Effective Incentive Programs	**3**	CO4
[13]	**Benefits and Services:** The Benefits Picture Today Pay for Time Not Worked Insurance Benefits Retirement Benefits Personal Services and Family-Friendly Benefits Flexible Benefits Programmes.	**3**	CO4
[14]	**Ethics, Justice, and Fair Treatment in HR Management:** Ethics and Fair Treatment at Work What Determines Ethical Behaviour at Work? How Managers Use Personnel Methods to Promote Ethics and Fair Treatment Managing Employee Discipline and Privacy Managing Dismissals	**3**	CO5
[15]	**Labor Relations and Collective Bargaining**: The Labor Movement Unions and The Law, The Collective Bargaining Process Grievances, The Union Movement Today and Tomorrow	**3**	CO2
[16]	**Managing Global Human Resources:** HR and The Internationalization of Business Staffing the Global Organizations Training and Maintenance Expatriate Employees How to Implement Global HR Systems	**3**	CO2, CO3
[17]	**Managing Human Resource in Entrepreneurial Firm:** The Small Business: Using Internet and Government Tools to Support the HR Effort Leveraging Small Size: Familiarity, Flexibility, Informality and HRM Using Professional Employee Organizations Managing HR Systems, Procedures and Paperwork	**3**	CO1

C. TEXT BOOKS

(It is necessary that at least 85% of course content is covered in prescribed textbooks. The format should be as per APA referencing format)

1. Garry Dessler, "Fundamentals of Human Resources Management", (Edinburgh: Pearson, 3rd Edition, 2014)

D. REFERENCE BOOKS

(The format should be as per APA referencing format)

1. Sinha, P. R. N., Sinha, I. B., & Shekhar, S. P. (2017). *Industrial Relations, Trade Unions and Labour Legislation*. Pearson Education India.
2. Srivastava, S. C. (2012). *Industrial Relations and Labour Laws*. Vikas Publishing House.
3. Armstrong, M. (2003). A Handbook of Human Resource Management Practices, Kogan Page Limited.
4. Mello, J. A. (2014). *Strategic human resource management*. Cengage Learning.

5. Bailey, C., Mankin, D., Kelliher, C., & Garavan, T. (2018). *Strategic human resource management*. Oxford University Press.

E. COURSE OUTCOMES

(Minimum 5 Cos are required)

CO Number	Skill	Statement
CO1	Evaluate	Explain various concepts, theories and issues needing attention in Human Resources Management.
CO2	Comprehension	Demonstrate, interpret, predict and organise the process of procurement of Human Resources.
CO3	Application	Define, outline, and determine key elements of Human Resource Development and Assessment.
CO4	Synthesis	To distinguish methods for designing relative worth of jobs through better reward management.
CO5	Analysis	To display the importance of Ethics in Business and how HRM plays a critical role in it.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	1	2	2	1	2	3	2	3	2	3	3	2	1	3	2	2	
CO2	2	2	3	2	3	2	3	2	3	2	2	2	3	2	3	2	
CO3	3	1	2	2	2	2	2	1	1	1	3	3	2	2	2	3	
CO4	2	3	3	3	2	1	1	2	2	2	2	2	2	3	2	2	
CO5	3	2	1	3	3	3	2	2	2	3	2	2	3	2	2	2	
Avg	2.2	2	2.2	2.2	2.4	2.2	2	2	2	2.2	2.4	2.2	2.2	2.4	2.2	2.2	2.1875

MBA SEMESTER – II
SUBJECT: BUSINESS RESEARCH METHODOLOGY

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4.5	0	0	4.5	4	50%	20%	30%	-	100%

A. COURSE OVERVIEW

This section may include motivation, objectives, scope etc. of the subject. It is preferred to describe all in less than 7 lines.

- To learn the basic skills to conduct research.
- To understand the quality of research studies and literature review.
- To design and produce a research proposal & research project.
- To analysis the research finding.
- To interpret the research result.
- To develop the research report.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Research in Business: Why study business research? How research industry works, what is good research?	2.5	CO1
[2]	Thinking Like a Researcher: Research and scientific method, concepts, constructs, definitions, variables, propositions, hypothesis.	2.5	CO1
[3]	Ethics in Business Research: What are research ethics? Ethical treatment of participants.	2.5	CO1
[4]	Research Methodology: Details and applications.	2.5	CO4
[5]	Defining the Research Problem: Types of research questions.	2.5	CO4
[6]	Research Design: What is research design, exploratory studies, descriptive studies, causal studies.	2.5	CO4
[7]	Secondary Data Searches: The exploratory phase search strategy, level of information, types of information sources, analysis.	2.5	CO2
[8]	Qualitative Research: Definition, Qualitative versus quantitative research, qualitative research methodology.	2.5	CO2
[9]	Observation Studies: Uses of observation, evaluation of observation method.	2.5	CO2
[10]	Surveys: Self-administered surveys.	2.5	CO2
[11]	Questionnaires and Instruments: Revisiting the research question hierarchy	2.5	CO2
[12]	Samplings: Nature & types of sampling, steps in sampling design.	2.5	CO2
[13]	Measurements / Measurements Scales: Nature of measurement, types of scales, selecting a measurement scales.	2.5	CO3
[14]	Data Preparation and Description: Simple tabulation and cross-tabulation and Hypothesis Testing, Coding, Data entry, data analysis.	2.5	CO3
[15]	Analysis of variance and the Design of Experiments: Usage of SPSS	2.5	CO3
[16]	Correlation and Regression: Explaining Association and Causation Simple and multiple regression.	2.5	CO3

[17]	Discriminant Analysis: classification and Prediction Applications & SPSS usage.	**2.5**	CO3
[18]	Factor Analysis for Data Reduction: Applications and SPSS Usage	**2.5**	CO3
[19]	Cluster Analysis for Market Segmentation: Applications and SPSS Usage	**2.5**	CO3
[20]	Written and Oral Report: Short reports, long reports, Research report components, writing the report, presentation of statistics.	**2.5**	CO5

C. TEXT BOOKS

(It is necessary that at least 85% of course content is covered in prescribed textbooks. The format should be as per APA referencing format)

Cooper R D & Schindler S P. Business Research Method, 9th ed., Tata McGraw-Hill. India, 2006

D. REFERENCE BOOKS

(The format should be as per APA referencing format)

- Malhotra N K. Marketing Research, 4th ed., Pearson Education. India, 2012.
- Kothari C. R. Research Methodology, 2nd ed., New Age Publishers. India, 2006.
- Nargundkar R. Marketing Research Text and Cases, 2nd ed., Tata MacGraw Hill, India, 2009.
- Sachdeva J K. Business Research Methodology, 2nd ed., Himalaya Publishing Ltd, 2015.

E. COURSE OUTCOMES

(Minimum 5 Cos are required)

CO Number	Skill	Statement
CO1	Evaluate	Define the basic concepts of research and research designs and in describing the various steps in the research process.
CO2	Comprehension	Enumerate the various data collection methods and design questionnaires. Through the course students would be able to describe and differentiate between the various sampling and scaling techniques.
CO3	Application	Select and apply the relevant parametric and non-parametric tests to test a hypothesis. The tests will be useful in identifying relationships between variables, determining and rating the performance of brands and training methods or for comparing a before-after phenomenon.
CO4	Synthesis	Segment markets. The course shall help students in estimating the performance of the company's products in different market segments, and in evaluating trends in the demand patterns for a company's products. The course shall help students in discovering the cause-effect relationships related to product or market problems. The course shall help students analyses and draw conclusions about the impact of multiple variables on a dependent variable.

CO5	Analysis	Choose the right type of report required in different situations, enumerating the different steps in writing a research report and the mechanics of writing a good research report.

F. COURSE MATRIX

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4	
CO 1	2	3	3	3	3	3	2	2	2	2	3	3	3	2	2	2	
CO 2	3	3	2	3	3	2	3	3	3	3	2	2	3	1	2	2	
CO 3	3	1	3	2	1	3	3	2	3	2	1	3	2	3	3	3	
CO 4	1	3	2	2	3	2	3	2	3	2	1	2	2	2	3	2	
CO 5	2	2	1	3	3	1	2	3	3	2	3	2	3	3	2	3	
									3								
Avg	2.2	2.4	2.2	2.6	2.6	2.2	2.6	2.4	2.8	2.2	2	2.4	2.6	2.2	2.4	2.4	2.3875

MBA SEMESTER – III
SUBJECT: STRATEGIC MANAGEMENT

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4.5	0	0	4.5	4	50%	20%	30%	-	100%

A. COURSE OVERVIEW

- To introduce the students to the competitive strategy and the competitive advantage
- To make students knowledgeable about all concepts of strategy formulation, development and implementation
- To develop an understanding about how is strategy is cross-functional in nature – i.e. it cuts across marketing, finance, HR and other functional areas

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	**Introduction to Strategy:** What is Strategy? Strategic Management, Strategy as a Subject of Study, Strategic Management in Different Contexts, The Challenges of Strategic Management	4	CO1
[2]	**The Environment:** Introduction, The Macro Environment, Industries and Sectors, Competitors and Markets, Opportunities and Threats	4	CO1
[3]	**Strategic Capability:** Introduction, Foundation of Strategic Capability, Cost Efficiency, Capabilities for Sustainable Competitive Advantage, Organizational Knowledge, Diagnosing Strategic Capability, Managing Strategic Capability	4	CO1
[4]	**Expectations and Purpose:** Introduction, Corporate Governance, Stakeholder Expectations, Business Ethics and Social Responsibility, The Cultural Context, Communicating Organizational Purposes	5	CO3
[5]	**Business-Level Strategy:** Introduction; Identifying Strategic Business Units; Sustaining Competitive Advantage; Competitive Strategy in Hypercompetitive Conditions; Competition and Collaboration; Game Theory	4	CO3
[6]	**Corporate-Level and International Strategy:** Introduction; Product/market Diversity; International Diversity and International Strategy; Value Creation and the Corporate Parent; Managing the Corporate Portfolio	4	CO3
[7]	**Directions and Methods of Development:** Introduction, Directions for Strategy Development, Methods of Strategy Development, Success Criteria	5	CO4
[8]	**Organizing for Success:** Introduction; Structural types: functional, multidivisional, holding company, matrix, transnational, team-based, project-based, choice of structure; Processes: direct supervision, Planning processes, Self-control and personal motivation, Cultural processes, Performance targeting processes, Market processes; Relationships: Relating internally, relating externally; Configurations: Stereotypical configurations, Reinforcing cycles, Configuration dilemmas	5	CO4
[9]	**Enabling Success: Managing people:** People as a resource, People and behaviour, organizing people, Implications for managers; Managing information: Information and Strategic Capability, Information and	5	CO4

	changing business models, Information and structuring, Implications for Managers **Technology**: Technology and the competitive situation, Diffusion of innovation, Technology and strategic capability, organizing technology development; Integrating resources; **Managing Finance:** Managing for value, Funding strategy development, Financial expectations of shareholders; Managing; **Technology:** Technology and the competitive situation, Diffusion of innovation, Technology and strategic capability, organizing technology development; Integrating Resources		
[10]	**Managing Strategic Change:** Diagnosing the Change Situation: The characteristics of strategic decisions, Types of Strategic Change, The Importance of Context, Organizational Structure as Context, Forcefield Analysis Styles of Managing Change, Roles in Managing Change; Levers for Managing Strategic Change: Turnaround, Managing rapid strategy reconstruction, Challenging the taken-for-granted, Changing organizational routines, Symbolic processes, Power and political processes, Communicating and monitoring change, Change tactics; Potential Pitfalls of Change Programmes	**5**	CO2 CO5
[11]	**Understanding Strategy Development:** Intended and Emergent Strategies; Intended Strategy Development: Strategy planning systems, Strategy workshops and project groups, Strategy consultants, externally imposed strategy; Emergent Strategy Development: Logical incrementalism, Resource allocation routines, Cultural processes, Organizational politics Multiple Processes of Strategy Development; Challenges and Implications for Strategy Development: Challenge of strategy drift, Learning organization, Strategy development in uncertain and complex conditions, Managing strategy development processes	**5**	CO2 CO5

C. TEXT BOOKS

(It is necessary that at least 85% of course content is covered in prescribed textbooks. The format should be as per APA referencing format)

1. Johnson, G., Scholes, K., & Whittington, R. (2008). *Exploring corporate strategy: Text and cases*. Pearson education.

D. REFERENCE BOOKS

(The format should be as per APA referencing format)

1. Milliken, J. (1997). Strategic Management: Concepts and Cases-Arthur A. Thompson JR, Irwin (1996), TMH.

2. Porter, M. E. (1985). Competitive Advantage: Creating and Sustaining Superior Performance, (Free Press; New York, NY).

3. Hill, C. W., Jones, G. R., & Schilling, M. A. (2014). *Strategic management: theory: an integrated approach*. Cengage Learning.

4. Hitt, M. A., Freeman, R. E. & Harrison, J. S. (Latest Edition) Handbook of Strategic Management,

E. COURSE OUTCOMES

(Minimum 5 Cos are required)

CO Number	Skill	Statement
CO1	Evaluate	To learn how to analyse the environmental strategic positioning of the organisation.
CO2	Comprehension	To develop an understanding of strategic management as important concept for business organizations functioning.
CO3	Application	To know the basic concepts of strategy formulation.
CO4	Synthesis	To learn the alternatives available in strategic functioning of organizations.
CO5	Analysis	To know the bases for implementation and execution of strategies.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	2	2	3	2	2	1	2	2	2	3	2	2	2	2	2	2	
CO2	1	2	1	3	2	2	2	2	2	2	3	2	3	1	3	2	
CO3	3	2	3	2	3	3	2	2	2	1	2	2	2	3	2	3	
CO4	3	2	2	2	2	2	3	3	1	2	3	2	2	2	2	2	
CO5	2	3	1	2	2	3	2	2	2	3	2	2	1	2	2	1	
Avg	2.2	2.2	2	2.2	2.2	2.2	2.2	2.2	1.8	2.2	2.4	2	2	2	2.2	2	2.125

MBA SEMESTER – III
SUBJECT: ETHICS, VALUES AND STRESS MANAGEMENT

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4.5	0	0	4.5	4	50%	20%	30%	-	100%

A. COURSE OVERVIEW

- To introduce the students with the fundamentals of Business Ethics and to make them aware of ethical practices of the business world.
- To teach them the reasons for stress and how to cope with it in the workplace.
- To help students realize the link between business ethics and strategic management.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Ethics in Business: Business Ethics and Its issues, Moral Development and Moral Reasoning, Arguments for and against Business Ethics, Moral responsibility and Blame. Cases: Business Ethics in Saudi Culture, WorldCom's Whistle-blower, Was National Semiconductor Morally Responsible? Gun Manufacturers and Responsibility. Take Home Cases: Slavery in the Chocolate Industry, Enron's Fall	4	CO1
[2]	Ethical Principles in Business: Utilitarianism: Weighing Social Costs and Benefits, Rights and Duties, Justice and Fairness, The Ethics of Care, Integrating Utility, Rights, Justice and Caring, An alternative to Moral Principles: Virtue Ethics, Morality in International Context. Cases: Working for Eli Lilly & Company, Conflict Diamonds, Exxon Mobil, Amerada Hess, and Marathon Oil in Equatorial Guinea. Take Home Cases: Publius, Unocal in Burma	4	CO1
[3]	The Business System: Government, Markets, and International Trade: Free Markets and Rights: John Locke, Free Markets and Utility: Adam Smith, Free Trade and Utility: David Ricardo, Marx and Justice: Criticizing Markets and Free Trade, Conclusion: The Mixed Economy, the New Property, and the End of Marxism. Cases: Napster's, Grokster's, and StreamCast's Rovolution, Brian's Franchis, Take Home Cases: GlaxoSmithKline, Bristol-Myers Squibb, and AIDS in Africa, Accolade versus Sega	4	CO1
[4]	Ethics in Marketplace: Introduction, Perfect Competition, Monopoly Competition, Oligopolistic Competition, Oligopolies and Public Policy, Cases: Drug Company Monopolies and Profits, Fixing the Computer Memory Market, Oracle and PeopleSoft, Take Home Cases: Playing Monopoly: Microsoft, Archer Daniels Midland and the Friendly Competitors	4	CO2
[5]	Ethics and Environment: The dimensions of pollution and Resource Depletion, The Ethics of Pollution Control, The Ethics of Conserving Depletable Resources. Cases: The Aroma of Tacoma, The Auto Companies in China, Exporting Poison Take Home Cases: The Ok Tedi Copper Mine, Gas or Grouse?	4	CO3

[6]	The Ethics of Consumer Production and Marketing: Markets and Consumer Protection, The Contract View of Business Firm's Duties to Consumers, The Due Care Theory, The Social Costs View of the Manufacturer's Duties, Advertising Ethics, Consumer Privacy Cases: The Tobacco Companies and Product Safety, Advertising Death? New Balance and the "Made in USA" Label, Take Home Cases: Becton Dickinson and Needle Sticks, The Ford/Firestone Debacle	**4**	CO2
[7]	The Ethics of Job Discrimination: Job Discrimination and Its Nature, Discrimination: Its Extent, Discrimination: Utility, Rights, and Justice, Affirmative Action, Cases: Johnson Controls' Fatal Protection Policy, Wall Street: It's Man's World, Peter Oiler and Winn-Dixie Stores, Take Home Cases: Shoulder Kroger Pay for What Ralphs' Employer Did Then? Wal-Mart's Women	**4**	CO2
[8]	The Individual in the Organization: The Rational Organization, The Employee's Obligations to the Firm, The Firm's Duties to the Employee, The Political Organization, Employee Rights, Organizational Politics, The Caring Organization, Cases: Delivering Pizza, Employment at Will at Howmet Corporation? Swingline Moves, Take Home Cases: Gap's Labor Problems, Who Should Pay?	**4**	CO2
[9]	1. What is Stress? Stress and Burnout, Stimulus-Oriented Approach, Response-Oriented Approach, The Psychodynamic Approach, Stress Tolerance Limit, Burnout, Ancient Indian Concepts, Positive Role of Stress, Stress Potential and the Creative Personality, Stress Potential of the Creative Process, Stress Potential for Creative Managers	**4**	CO4
[10]	Organizational Role Stress: The Concept of Role-Stress, Role Space, Role Set, Measurement of Role Stress, Role Space Conflicts, Role Set Conflicts, Correlates of Role Stress, Personal Correlates of Role Stress, Role Stress and Background Factors, Stress and Productivity, Organizational Correlates of Role Stress	**4**	CO5 CO4
[11]	Coping Styles or Strategies: Coping Strategies: Concept, Coping Management, Coping Profiles of Some Groups	**4**	CO5
[12]	Moderators of Stress: Personality Variables, needs as Moderator, Locus of Control as Moderator, Type-A as Moderator, Mental Health as Moderator, Coping Strategies as Moderator and all other variables as moderators	**2**	CO5
[13]	Countering Stress: What an Organization Can do, Theory of Job Characteristics Model, Managing Organizational Stress using the Job Characteristic Approach, Issues in Implementing the Job Characteristic Model, A New Strategy using the Job Characteristics Approach to Manage Organizational Stress, Concept of Role Efficacy as a Reducer of Stress, What Individuals can do, Stress: Its perception and consequences, Awareness of being in a stressful state, What happens during a stressful situation, Proneness to Experience stress and its identification, Coping Mechanisms in Indian Managers, Coping Strategies for Role Stresses, Ways to Manage Stress Effectively, Managing the stress through non drugs methods (all), The Spiritual Dimension of Stress	**4**	CO5

C. TEXT BOOKS

(It is necessary that at least 85% of course content is covered in prescribed textbooks. The format should be as per APA referencing format)

1. Velasquez, M. G. (2006). *Business ethics: Concepts & cases*. Pearson Educación.
2. Pestonjee, D. M. (1992). *Stress and coping: The Indian experience*. Sage Publications Ltd.

D. REFERENCE BOOKS

(The format should be as per APA referencing format)

1. S.K. Chakraborty, *Ethics in Management: Vedantic Perspectives* (New Delhi: Oxford University Press, 1995)
2. Drucker, P. (2012). *Managing in turbulent times*. Routledge.
3. Gandhi, M. (2021). *The story of my experiments with truth: An autobiography*. e-artnow.
4. The Bhagwad Geeta
5. The Holy Bible
6. The Koran

E. COURSE OUTCOMES

(Minimum 5 Cos are required)

CO Number	Skill	Statement
CO1	Evaluate	Increase awareness about real life corporate scandals and ethical reasons behind that at individual, group and system level
CO2	Comprehension	Identify the frameworks that can help deal with real life ethical dilemmas
CO3	Application	Increase the awareness about human rights, environmental ethics, values, gender etc. discrimination
CO4	Synthesis	Create a scientific foundation of stress management
CO5	Analysis	Create awareness about how to deal with the stress experience, including the inputs from the Indian scriptures.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	2	2	3	1	3	2	2	2	2	3	2	3	2	2	3	3	
CO2	1	3	2	2	2	3	3	3	3	2	3	2	3	3	2	2	
CO3	2	2	3	3	3	2	2	2	1	2	2	1	2	2	2	2	
CO4	3	1	1	3	1	2	3	2	2	2	2	2	1	2	2	3	
CO5	2	3	2	2	2	3	2	2	2	2	2	3	3	3	2	2	
Avg	2	2.2	2.2	2.2	2.2	2.4	2.4	2.2	2	2.2	2.2	2.2	2.2	2.4	2.2	2.4	2.225

MBA. SEMESTER – III
SUBJECT: LEGAL ASPECTS OF BUSINESS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4.5	0	0	4.5	4	50%	20%	30%	-	100%

A. COURSE OVERVIEW

- Linkage of the acts done for business for various rights and liabilities arising there from. To make them able to independently interpret the corporate and allied laws.
- To make students understand the legal implications of Business Communication made / received, agreements made, modified, cancelled
- To make the students aware of various commercial laws.
- To make the students understand the legal implications of Business Communication made / received, agreements made, modified, cancelled

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	**Introduction to Law**	**5**	CO1
[2]	**Indian Contract Act:** Nature of Contract, Offer and Acceptance, Consideration, Capacity of Contract, Free Consent, Legality of Object, Void Agreements, Contingent Contacts, Performance of Contract, Discharge of Contract, Remedies of Breach of Contract, Quasi-Contracts	**5**	CO1
[3]	**Special Contracts:** Indemnity and Guarantee, Bailment and Pledge, Contract of Agency, Sales of Goods, Conditions and Warranties, Transfer of Property, Performance Contract, Rights of an Unpaid Seller, Partnership, Relations of Partners, Dissolution of Firm, Laws of Insurance, Life Insurance, Fire Insurance, Marine Insurance	**5**	CO1 CO2
[4]	**Important Provisions of Negotiable Instrument Act**	**5**	CO1 CO2
[5]	**Company Law:** Nature of Company, Kinds of Companies, Formation of Company, Memorandum of Association, Articles of Association, Prospectus, Membership in a Company, Share Capital	**5**	CO3
[6]	**Intellectual Property Rights: Patents, Copyright Act, Trademark Act** Patents: What Can be Patented? WTO and Patents, Compulsory Licensing Copyright Protection: Scope, Rights of Copyright Owner, Registration of Copyright, Exemptions from Copyright Violations, Copyright Infringement Trademark Protection: Trademark and Common Law, Class of Goods in The Trade and Merchandise Marks Act, Registration in the Trade and Merchandise Marks Act, Developments in the field of passing off, The Trade Mark Act	**5**	CO5
[7]	**Important Provisions of Information Technology Act:** Introduction, Scope of the Act, Definitions, Electronic Governance, Digital Signature and Digital Signature Certificates,	**5**	CO5

	Electronic Records, Certifying Authorities, Duties of Subscribers, Network Services Providers, Miscellaneous, Cyber Regulation and Appellate Tribunal.		
[8]	**Right to Information Act:** Citizen, Information and Public Authority, Enforcement and Penalty, Public Authority, Refusal to Information, Rights of Third Party	**5**	CO5
[9]	**MRTP/Competition Act:** Unfair Trade Practices, Restrictive Trade Practices, Unfair Trade Practices, MRTP Commission, CCI, Why India adopted a new competition law, Historical Developments Leading to Enactment of MRTP, Enforcement of MRTP, Economic Reforms and Impact of MRTP, Experience with MRTP, Metamorphosis of MRTP Act to Competition Bill, New Wine in the Old Bottle, Conclusion	**5**	CO4
[10]	**FERA and FEMA:** Scope, Definitions, Authorized Person, Regulation and Management of Foreign Exchange, Contravention and Penalties, Adjudication and Appeals, Directorate of Enforcement, Miscellaneous, Difference Between FERA and FEMA	**5**	CO4

C. TEXT BOOKS

- Pathak, A. (n.d.). Legal Aspects of Business (Latest ed.). Tata McGraw Hill.
- Kapoo, N. (n.d.). Mercantile Law (Latest ed.). New Delhi: Sultan Chand & Co

D. REFERENCE BOOKS

- Abbi, N. K. (n.d.). General Laws and Procedures (Latest ed.). Sultan Chand & Sons.
- Gulshan, S. S. (n.d.). Business Law (Latest ed.). Excel.
- Varadarajan, S. S. (n.d.). SEBI – Law, Practice & Procedure (Latest ed.). Delhi: Commercial Law Publishers (India).

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Evaluate	Understand and Evaluate the different laws used in making a contract.
CO2	Synthesis	Define the laws relating to special contracts along with Negotiable Instrument Act.
CO3	Application	Summarize the law relating to the formation of companies along with the highlights of Companies Act 2013.
CO4	Comprehension	Comprehend the Competition law, FEMA & FERA in India.
CO5	Analysis	Analyse and Outline the concepts of Company Act,2013, SEBI, IPR, IT Act and RTI ACT 2005.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	.

CO1	3	3	2	2	2	2	3	2	2	3	2	1	3	2	3	2	
CO2	2	2	3	2	3	2	2	2	3	3	3	2	2	2	3	3	
CO3	3	3	3	3	2	3	3	3	2	2	2	3	3	3	2	2	
CO4	3	3	2	2	2	2	3	2	2	3	2	3	3	2	3	2	
CO5	3	3	3	2	2	2	3	2	2	3	2	2	3	2	3	2	
..																	
Avg	2.8	2.8	2.6	2.2	2.2	2.2	2.8	2.2	2.2	2.8	2.2	2.2	2.8	2.2	2.8	2.2	

MBA SEMESTER – III
SUBJECT: NEW ENTERPRISE MANAGEMENT

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4.5	0	0	4.5	4	50%	20%	30%	-	100%

A. COURSE OVERVIEW

This section may include motivation, objectives, scope etc. of the subject. It is preferred to describe all in less than 7 lines.

- This course will take a participant through the nitty-gritty of taking decisions on capital allocation framework, generation and screening of project ideas, selecting a project, market & demand analysis, technical analysis, financial estimates & projections, risk analysis of investments, project financing, and finally implementation of a project successfully

.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Importance of this course & how learning it can help us? An overview: Capital investments: Importance & difficulties. Types of capital investments, Phases of capital budgeting, levels of decision making, facets of project analysis, feasibility study: A Schematic diagram, objectives of capital budgeting, common weakness in capital budgeting, Structures and frameworks	2	CO1
[2]	Capital allocation framework: Key criteria, elementary investment options, portfolio planning models, strategic position and action evaluation (space), diversification debate, Investment in capabilities, strategic planning and capital budgeting	2	CO2
[3]	Generation and screening of project ideas: Generation of ideas, monitoring the environment, Corporate appraisal, profit potential of industries: porter model, scouting for project ideas, project rating index, sources of positive net present value	2	CO2
[4]	Market and demand analysis: Situational Analysis & Specification of objectives, collection of secondary information, conduct of market survey, characterization of the market, demand forecasting, market planning	2	CO3
[5]	Technical Analysis: Manufacturing process/technology, technical arrangements, material inputs and utilities, product mix, plant capacity, location and site, machineries and equipment, structures and civil works, environmental aspects, project charts and layouts, schedule of project implementation	2	CO3
[6]	Financial estimates and projections: Cost of project, means of finance, estimates of sales and production, cost of production, working capital requirement and its financing, Profitability projections, Projected Cash flow statement, Projected Balance sheet, Multi-Year Projections	2	CO3
[7]	The Time Value of Money: Time Lines and notation, future value of a single amount, present value of a single amount, future value of an annuity, present value of an annuity,	2	CO3

	Intra-ear compounding and discounting		
[8]	Investment Criteria: Net present value, benefit cost ratio, Internal rate of return, Urgency, Payback period, Accounting rate of return, Assessment of various methods, Investment Appraisal: Indian Practice, Investment Appraisal: International Practice	**2**	CO3
[9]	Project Cash Flows: Elements of the cash flow stream, Basic principles of cash flow estimation, cash flow illustrations, cash flows for a replacement project, viewing a project from other perspectives, How financial institutions and the planning commission define cash flows, biases in cash flow estimation	**3**	CO3
[10]	The cost of capital: Some preliminaries, cost of debt and preference, cost of equity, determining the proportions, weighted average cost of capital, weighted marginal cost of capital schedule, floatation costs and the cost of capital, cost of capital in practice, How financial institutions calculate cost of capital	**3**	CO3
[11]	Risk Analysis of single investments: Sources, measures, and perspectives on risk, sensitivity analysis, scenario analysis, break-even analysis, Hillier model, simulation analysis, managing risk, project selection under risk, risk analysis in practice, how financial institutions analysis risk	**3**	CO3
[12]	Social cost benefit analysis: Rationale for SCBA, UNIDO approach, Net benefit in terms of economic (efficiency) prices, Income distribution impact, adjustment for merit and demerit goods, Shadow prices, SCBA by financial institutions	**3**	CO5
[13]	Financing of projects: Capital structure, menu of financing, equity capital, preference capital, internal accruals, term loans, debentures, working capital advance, miscellaneous sources, raising venture capital, raising capital in international markets	**3**	CO5
[14]	Venture capital: VC Investors, what is a VC investment, What makes a VC Investment different, The VC investment appraisal process and management, the Indian VC industry, Regulation of VC Industry in India, Current concerns of the Indian VC Industry, How to approach a VC fund	**3**	CO4
[15]	Project definition Time planning Reference book: chapter 5	**2**	CO4
[16]	Project management: Forms of project organization, project planning, project control, human aspects of project management, Pre-Requisites for successful project implementation	**3**	CO4
[17]	Network techniques for project management: Development of project network, time estimation, determination of the critical path, scheduling when resources are limited, PERT model, CPM model, Network cost system	**3**	CO4
[18]	Project review and administrative aspects: Control of In-Progress projects, Post-Completion audits, Abandonment analysis, Administrative aspects of capital budgeting, Agency problem, Evaluating the capital budgeting system of an organization	**2**	CO5
[19]	Text book: chapter 23 Critical chain project management	**2**	CO5

	Reference book: chapter 6		

C. TEXT BOOKS

(It is necessary that at least 85% of course content is covered in prescribed textbooks. The format should be as per APA referencing format)

- Chandra Prasanna, 'Projects – Planning, Analysis, Financing, Implementation and Review', Fifth Edition, Tata McGraw Hill

D. REFERENCE BOOKS

(The format should be as per APA referencing format)

- Harvey Maylor, Project Management', Third Edition, Pearson Education
- Goldratt Eliyanhu M, 'Critical Chain', Indian Productivity Council, Chennai

E. COURSE OUTCOMES

(Minimum 5 Cos are required)

CO Number	Skill	Statement
CO1	Evaluate	Help students to analyze their entrepreneurial potential and To develop the confidence into a challenging career of entrepreneurship.
CO2	Comprehension	To help them understand the challenges and evaluation of starting and managing new ventures
CO3	Application	Explaining to prepare a bankable business plan which can be considered prerequisite for starting and obtaining finance
CO4	Synthesis	To learn various tools/Techniques to manage the project
CO5	Analysis	To encourage them to become entrepreneurial manager should they decide to take up job as a manager in an organization

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	3	3	2	2	1	2	2	2	2	3	2	2	2	2	2	3	
CO2	3	3	3	3	3	2	2	2	3	3	3	3	3	3	3	2	
CO3	2	2	3	3	2	3	2	3	3	2	2	3	3	3	3	3	
CO4	2	1	2	3	1	2	2	1	2	3	1	2	1	1	2	2	
CO5	1	2	1	1	3	3	2	2	2	2	3	1	3	2	1	2	
Avg	2.2	2.2	2.2	2.4	2	2.4	2	2	2.4	2.6	2.2	2.2	2.4	2.2	2.2	2.4	2.25

SUBJECT: ADVERTISING AND SALES PROMOTION

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4.5	0	0	4.5	4	50%	20%	30%	-	100%

A. COURSE OVERVIEW

This section may include motivation, objectives, scope etc. of the subject. It is preferred to describe all in less than 7 lines.

- To acquaint the students with concepts and techniques in the application for developing and designing an effective advertising and sales promotion program.
- To sensitize students to the various facets of advertising, public relation and promotion management.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	An Introduction to Integrated Marketing Communications: Marketing, IMC, Promotional Mix, Promotional Management, IMC Planning Process.	**2.5**	CO1
[2]	The Role of IMC in the Marketing Process: Marketing Strategy and Analysis, Target Marketing Process, Developing the Marketing Planning Program, The role of Advertising and Promotion.	**2.5**	CO1
[3]	Organizing for Advertising and Promotion: The role of Ad Agencies and Other Marketing Communication Organization: An Overview, organizing for Advertising and Promotion, Advertising Agencies, Agency Compensation, Evaluating Agencies, Specialized Services, Collateral Services.	**2.5**	CO1
[4]	Perspective on Consumer Behaviour: An Overview, The Consumer Decision Making Process, The Consumer Learning Process, Environmental Influences on Consumer Behaviour, Alternative Approaches to Consumer Behaviour.	**2.5**	CO1
[5]	The Communication Process: The Nature of Communication, A Basic Model of Communication, Analyzing the Receiver, the Response Process, Understanding Involvement, Cognitive Processing of Communications, Summarizing the Response Process.	**2.5**	CO1
[6]	Source, Message, and Channel Factors: Promotional Planning through the Persuasion Matrix, Source factors, Message factors, Channel factors.	**2.5**	CO1
[7]	Establishing Objectives and Budgeting for the Promotional Program: The Values of Objectives, Determining Promotional Objectives, Sales versus communication Objectives, DAGMAR, Problem in setting objectives, Establishing and allocating.	**2.5**	CO1
[8]	Creating Strategy:	**2.5**	CO2

	Planning and Development: The importance of Creativity in Advertising, advertising Creativity, Planning Creative Strategy, The Creative Process, Creative Strategy development.		
[9]	Creating Strategy: Implementation and Evaluation: Appeals and Execution Styles, Creative Tactics, Client Evaluation and Approval of creative work.	**2.5**	CO2
[10]	Media Planning and Strategy: An Overview, Developing the Media Plan, Market Analysis and Target, Establishing Media Objective, Developing and Implementing, Evaluation and Follow-Up, Computers in Media Planning, Characteristics of Media.	**2.5**	CO2
[11]	Evaluation of Broadcast Media: Television, Buying Television Time, Radio.	**2.5**	CO4
[12]	Evaluation of Print Media: Role of Magazines and Newspaper, Magazines, Newspaper.	**2.5**	CO4
[13]	Support Media: The Scope of the Support Media Industry, Out of Home media, Promotional Products Marketing, Other Media.	**2.5**	CO5
[14]	Directing Marketing: An Overview, Direct selling, Evaluating the effectiveness of Direct Marketing.	**2.5**	CO4
[15]	The Internet and Interactive Media: Defining the Internet, developing an Internet Program, the internet and integrated Marketing Communications, Measuring Effectiveness of the Internet, Advantages and Disadvantages of the Internet, Additional Interactive Media.	**2.5**	CO5
[16]	Sales Promotion: The scope and role of sales promotion, the growth of sales promotion, consumer-oriented sales promotion, and consumer oriented sales promotion techniques, Trade Oriented sales promotion, Coordinating sales promotion, Sales Promotion abuse.	**2.5**	CO4
[17]	Public Relations, Publicity, and Corporate Advertising: Public relations, The process of public relations, publicity, corporate advertising.	**2.5**	CO4
[18]	Personal selling: The scope of personal selling, the role of Personal selling, Advantage and Disadvantage, combining personal selling, Evaluating the personal selling effort.	**2.5**	CO4
[19]	Measuring the Effectiveness of the Promotional Program: Argument for and Against Measuring effectiveness, Conducting Research to Measure, The Testing Process, establishing a Program for Measuring, Measuring the effectiveness of other program elements.	**1.5**	CO3
[20]	International Advertising and Promotion: The importance of International Markets, The Role of international, The International Environment, Global versus localized Advertising, Decision Areas in International Advertising, The roles of other Promotional Mix Elements in International Marketing	**1.5**	CO1
[21]	Regulation of Advertising and Promotion: Self-Regulation, Federal Regulation of Advertising, State Regulation, Regulation of Other	**1**	CO2

	Promotional Areas.		
[22]	Evaluating the social, Ethical, and Economic Aspects of Advertising and Promotion: Advertising and Promotional ethics, Social and Ethical Criticism of Advertising, Economics effects of Advertising.	**1**	CO3

C. TEXT BOOKS

(It is necessary that at least 85% of course content is covered in prescribed textbooks. The format should be as per APA referencing format)

Belch E G & Belch M A. Advertising and Promotion: An Integrated Marketing Communications Perspective, 7th ed., Tata McGraw-Hill. India, 2010.

D. REFERENCE BOOKS

(The format should be as per APA referencing format)

- Clow K E. Integrated Advertising, Promotion, and Marketing Communications, 7th ed., Pearson, 2014.
- Kazmi S H H and Batra. S Advertising and Sales Promotion, 5th ed., Excel Books, 2014.

E. COURSE OUTCOMES

(Minimum 5 Cos are required)

CO Number	Skill	Statement
CO1	Evaluate	Describe the marketing communication mix, IMC, communication models, elucidate the role of advertising in marketing communication, design an advertising plan and an advertising program using the 5 Ms of advertising, describe the methods for setting the advertising budget, and describe the functions of advertising agencies.
CO2	Comprehension	Develop a creative strategy using the steps in creative strategy development, explain the various styles of advertising executions, creative tactics, appeals, layouts, describe the elements of a media strategy, explain the implementation of media strategy with IMC perspective, and enumerate emerging media options.
CO3	Application	Describe the methods for testing advertising effectiveness, explain the methods used in advertising research, explain the Social, Economic, Cultural and Ethical aspects of advertising, enumerate the functions of ASCI and types of advertising awards.
CO4	Synthesis	Define sales promotion and its purpose, explain the major decisions in sales promotions, differentiate between consumer and trade promotion tools, coordinate sales promotion with

		advertising.
CO5	Analysis	Define digital media and the digital consumer, explain the advantages, disadvantages and challenges of digital marketing, explain digital marketing methods, social media marketing and platforms, and enumerate methods for digital reputation management.

F. COURSE MATRIX

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	
CO1	2	3	3	3	3	3	2	2	2	2	3	3	3	2	2	2	
CO2	3	3	2	3	3	2	3	3	3	3	2	2	3	1	2	2	
CO3	3	1	3	2	1	3	3	2	3	2	1	3	2	3	3	3	
CO4	1	3	2	2	3	2	3	2	3	2	1	2	2	2	3	2	
CO5	2	2	1	3	3	1	2	3	3	2	3	2	3	3	2	3	
Avg	2.2	2.2	2.4	2.2	2.4	2.4	2.2	2.2	2.4	2.2	2.4	2.4	2.6	2.4	2.4	2.5	2.3438

MBA SEMESTER – III
SUBJECT : CONSUMER BEHAVIOUR

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4.5	0	0	4.5	4	50%	20%	30%	-	100%

A. COURSE OVERVIEW

This section may include motivation, objectives, scope etc. of the subject. It is preferred to describe all in less than 7 lines.

- The basic objective of the course is to develop an understanding about Customers.
- To make students to understand decision-making process for buying goods and services.
- To understand customers as an individual in respect to their personality, perspective, attitude and learning.
- To apprehend students about communication process.
- To comprehend significances of family influences, reference group influences and social class influence while buying Products from the Market.
- To respect culture and sub culture of customers for buying influence of products.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Consumer Behavior: Its origin and strategic Application: Development of the Marketing Concept, Customer value, satisfaction and retention, the impact of digital technologies on marketing strategies, consumer behavior and decision making are interdisciplinary.	3	CO1
[2]	Consumer Research: Consumer research paradigms, the consumer research process, ethics in consumer research.	3	CO2
[3]	Market Segmentation: Meaning, Bases for segmentation, criteria for effective targeting of market segments and implementation segmentation strategies.	3	CO2
[4]	Consumer Motivation: Motivation as a psychological force, the dynamics of motivation, types and systems of needs, the measurement of motives.	3	CO4
[5]	Personality and consumer behavior: Meaning, theories of personality, personality and understanding consumer diversity, brand personality and self and self-image.	3	CO3
[6]	Consumer Perception: Elements of perception, dynamics of perception, consumer imagery, perceived risk.	3	CO2
[7]	Consumer learning: Elements of consumer learning, behavioral learning theories, cognitive learning theory, measures of consumer learning.	3	CO3
[8]	Consumer attitude formation and change: Meaning, structural models of attitudes, attitude formation, strategies of attitude change.	3	CO2

[9]	Communication and consumer behavior: Components of communication, the communication process, designing persuasive communication, marketing communication and ethics.	**3**	CO5
[10]	Reference groups and family influences: Meaning, understanding the power of reference groups, selected consumer related reference group, celebrity and other reference group appeals, socialization of family members.	**3**	CO4
[11]	Social Class and Consumer behavior: Meaning, the measurement of social class, social class mobility, affluent consumer, the working class, techno class.	**3**	CO3
[12]	The influence of culture on consumer behavior: Meaning, culture is dynamic, measurement of culture, American core value, Indian core value.	**3**	CO2
[13]	Subcultures and consumer behavior: Meaning, nationality, religious, geographic, age, sex	**3**	CO4
[14]	Cross cultural consumer behavior: An international perspective: The imperative, cross cultural consumer analysis, alternative multinational strategies, global versus local, cross cultural psychographic segmentation.	**3**	CO3
[15]	Consumer influences and the diffusion of innovation: Meaning, opinion leadership, dynamics of the opinion leadership process, the measurement of opinion, the adoption process, a profile of the consumer innovator.	**3**	CO2
[16]	Consumer decision making and Beyond: Decision, level of consumer decision making, model of consumer decision making. Relationship Marketing	**3**	CO2
[17]	Group Presentation	**2**	CO3

C. TEXT BOOKS

(It is necessary that at least 85% of course content is covered in prescribed textbooks. The format should be as per APA referencing format)

Schiffman L G , Kanuk L L and Kumar S R Kanuk. Consumer Behaviour, 12th ed., Pearson Education, New Delhi, 2011.

D. REFERENCE BOOKS

(The format should be as per APA referencing format)

- Nair S. Consumer Behaviour in India Perspective, 2nd ed., Himalaya Publishing Ltd, New Delhi, 2015.
- Case Study, articles, journal papers, periodicals etc.

E. COURSE OUTCOMES

(Minimum 5 Cos are required)

CO Number	Skill	Statement
CO1	Evaluate	Identify Consumer Behaviour as the most important concept to learn in marketing.
CO2	Comprehension	To Know about the principles in understanding consumer

		behaviour.
CO3	Application	To know factors affecting Consumer Behaviour.
CO4	Synthesis	To identify the steps in the consumer decision making process.
CO5	Analysis	To explain various models of Consumer Behaviour.

F. COURSE MATRIX

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	
CO1	3	3	2	3	1	2	2	2	2	3	2	2	2	2	2	3	
CO2	3	2	3	3	3	2	3	3	3	3	3	3	3	3	3	2	
CO3	2	3	3	2	2	3	3	3	3	2	2	3	3	3	3	3	
CO4	2	1	2	3	1	2	1	1	2	3	1	2	1	1	2	2	
CO5	1	2	1	1	3	3	2	2	2	2	3	1	3	2	1	2	
Avg	2.2	2.2	2.2	2.4	2	2.4	2.2	2.2	2.4	2.6	2.2	2.2	2.4	2.2	2.2	2.4	2.275

MBA SEMESTER – III
SUBJECT: STRATEGIC BRAND MANAGEMENT

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	0	4	4	50%	20%	30%	-	100%

A. COURSE OVERVIEW

- To develop an understanding of basic branding principles and their exposure to classic and contemporary branding applications
- To make the students aware about the role of brands, the concept of brand equity, and the advantages of creating strong brands.
- To increase understanding of the important issues in planning, implementing, and evaluating brand strategies.
- To acquaint the students with the appropriate concepts, theories, models and other tools to make better brand decisions.
- To understand the latest developments and cultivate an understanding of the adjustments to be made in branding strategies over time and geographic boundaries to maximize brand equity.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
1.	• Introduction to Strategy (Reading material)* • Formulating marketing strategies (Reading Material)* • Brands and Brand Management (Ch.1) Case:1Mountain man brewing company: bringing the brand light (Reading Material)*	5	CO1 CO2 CO3
2.	• Brand Positioning and Values (Ch.3) • What are brands good for? (Reading Material)* Case:2 Intel Corporation: Branding an Ingredient	2	CO1 CO2
3.	• Customer Based Brand Equity (Ch.2) • Viewing brands in multiple dimensions (Reading material)* Case: 3 Pepsi Cola Pakistan*	3	CO2 CO3
4.	• Choosing Brand Elements to Build Brand Equity (Ch 4) • Are the Strategic stars aligned for your corporate brand? (Reading material)*	2	CO4 CO5
5.	• Designing Marketing Programs to Build Brand Equity (Ch 5) Case:4 MTV: Building Brand Resonance	2	CO1 CO2
6.	• Integrating Marketing Communications to Build Brand Equity (Ch.6)	4	CO2 CO5

	• Integrated marketing as management of holistic consumer experience (Reading material)* Case-5 DuPont: Managing a Corporate Brand		
7.	• Leveraging Secondary Brand Knowledge to Build Brand Equity (Ch 7) Case:6 Starbucks: Managing a High Growth Brand	3	CO2 CO5
8.	• Developing a Brand Equity Measurement & Management System (Ch 8) • Case: 7 Red Bull: Building Brand Equity in New Ways	3	CO1 CO3
9.	• Measuring Sources of Brand Equity: Capturing Customer Mindset (Ch 9) • Prioritize Brands in the Portfolio (Reading Material)* Case -8 Nivea: Managing a Brand Portfolio.	3	CO1 CO3
10.	• Measuring Outcomes of Brand Equity: Capturing Market Performance (Ch 10) • Don't let your brand falter during a Downturn (Reading Material)* • Case: 9 California Milk Processor Board: Branding a Commodity.	3	CO1 CO2 CO4
11.	• Designing and implementing Brand Strategies (Ch 11) Case: 10 Snapple: Revitalizing a Brand	3	CO2 CO3
12.	• Introducing and naming New Products & Brand Extensions (Ch 12) • Case: 11 Accenture: Rebranding and Repositioning a Global Power Brand	3	CO1 CO2
13.	• Managing Brands over Geographic Boundaries & Market segments (Ch 14) Case: 12 Yahoo!: Managing an Internet Brand	4	CO2 CO3
14.	• Managing Brands over time (Ch 13) • Case: 13 Levi's Dockers: Building a Sub-brand	4	CO1 CO2
15.	• Closing Observations (Ch 15) • Case: 14 Nike: Building a Global Brand	3	CO1 CO4 CO5

C. TEXT BOOKS

(It is necessary that at least 85% of course content is covered in prescribed textbooks. The format should be as per APA referencing format)

4. Strategic Brand Management, Kevin Lane Keller, Ambi M.G. Parmeswaran and Issac Jacob, 4th Edition, Pearson Education.

D. REFERENCE BOOKS

(The format should be as per APA referencing format)

5. Strategic Brand Management, Creating & Sustaining Brand Equity Long term, Jean Noel Kapferer, 2nd Edition, Kogan Page
6. Building Strong Brands, David A. Aaker, Free Press

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Evaluate	Develop an understanding about Product and brand as Marketing Functions.
CO2	Comprehension	Develop an Idea of Product Market evolution.
CO3	Application	Familiarise students about Brand Management.
CO4	Synthesis	Identify about brand positioning and Brand Equity
CO5	Analysis	Develop students to make brand strategies.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
CO2	2	2	1	2	2	2	2	2	2	2	1	2	2	2	1	2	
CO3	3	2	3	3	2	1	2	2	1	2	2	2	2	3	2	1	
CO4	2	2	2	2	1	2	2	1	2	3	3	2	2	1	2	2	
CO5	2	3	2	3	3	3	3	3	3	3	2	2	3	2	2	3	
Avg	2.2	2.4	2	2.4	2	2	2.2	2	2	2.4	2	2	2.2	2	1.8	2	2.1

MBA. SEMESTER – III
SUBJECT: MERGERS AND ACQUISITIONS AND RISK MANAGEMENT

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4.5	0	0	4.5	4	50%	20%	30%	-	100%

A. COURSE OVERVIEW

The course acquaints students about fundamentals, trading and structure of derivatives and leads them to the valuation of derivatives. It develops an understanding of M&A as significant economic activity taking place in today's economy. It familiarizes students with various techniques of corporate restructuring, and valuation methods used by corporate in real life.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	**INTRODUCTION:** • Mergers, Acquisition and Restructuring • The Takeover process	3	CO1
[2]	**M & A THEORIES:** • Theories of Mergers and Tender Offers, • International Takeovers and restructuring • SEBI Guidelines	3	CO1
[3]	**VALUATION - I:** • Accounting for M & A –AS-14, • Companies Act – Section 230-240, Terms of M & A	4	CO1 CO2 CO3
[4]	**VALUATION – II & III:** • Alternative Approaches to Valuation • Increasing the Value of the Organization	4	CO1 CO2 CO3
[5]	**RESTRUCTURING:** • Corporate Restructuring and Divestiture • Financial Restructuring	4	CO1 CO3
[6]	**M & A STRATEGIES:** • Alliances and Joint Ventures, • Employee Stock Ownership, • Going Private and Leveraged Buyouts.	4	CO2
[7]	**STRATEGIES FOR CREATING VALUE:** • Share Repurchases, • Share Buyback Guidelines for Indian companies • Takeover Defenses	3	CO2
[8]	**Introduction to Risk Management** • Overview of the Indian Derivatives Markets, Forward, Futures, Options • Types of Traders, Exchange traded market, Over the counter market • Hedgers, Speculators, and Arbitragers	2	CO4
[9]	**Interest Rates**	2	CO4

	• Types of rates, Measuring interest rates, Zero rates, Bond Pricing. • Duration, Convexity, Theories of term structure of Interest rates		
[10]	**Futures** • Basics of Futures, Mechanics of Futures Markets, Convergence of Futures Price to Spot Price, Daily Settlement and Margins, Forward Vs Futures market, Types of Traders and types of orders. • Hedging Strategies using futures: Cross Hedging, Stock Index Futures, Rolling the Hedge forward • Interest Rates Futures: - Day Count and Quotation Conventions, Eurodollar futures, Duration based hedging strategies.	3	CO4
[11]	**Determination of Forward and Futures Prices** • Investment assets Vs Consumption assets, Known Income and Yields. • Forward and Future contracts on currencies, Futures on Commodities, The cost of Carry, Forward and expected future spot rates	3	CO4
[12]	**Options** • Types of Options, Option Position, Underlying assets, Factors affecting option prices, Specification of stock options, Trading, Commission, Margin, Warrants, Convertibles etc., Upper and Lower Bounds for option prices. • Put-call Parity, Options on Stock Indices, Valuation of European Stock Index Option, Valuation of Stocks paying known dividend Yields	2	CO4
[13]	**Swaps** • Basics of Swaps, Interest Rate Swaps, Day Count Issues. • Valuation of Interest Rate Swaps, Confirmations	2	CO4
[14]	**Binomial Tree** • A one-step binomial model and no arbitrage argument, Risk neutral valuation, Two Step Binomial Trees, American Options, Delta, Matching Volatility with u and d • Valuation of Futures Prices using binomial trees	2	CO5
[15]	**The Black Scholes Merton Model** • Risk Neutral Valuation, Black Scholes Pricing Formulas, Cumulative normal Distribution function, Implied volatiles, effects of dividends on price., • Black's model for valuing futures options	3	CO5
[16]	**The Greek Letters** • Naked and Covered Position, A stop loss Strategy, Delta Hedging, Theta, Gamma, Vega, Rho, Scenario Analysis, Portfolio Insurance. • Brief about Volatility Smiles	2	CO5
[17]	**Value at Risk** • The VAR Measure, Model Building Approach, Linear Model, Quadratic Model. • Monte Carlo Simulation, Stress Testing	2	CO5
[18]	**Strategies** • Bull Spread, Bear Spread, Straddle, Strangle, Strip, Strap, Butterfly Spread.	2	CO5

	• Collar, Calendar Spread, Box Spread, Diagonal Spread		

C. TEXT BOOKS

- Godbole, P. D. (n.d.). *Mergers, Acquisition and Corporate Restructuring* (Latest Edition ed.). Vikas Publishing House.
- Hull, J. C. (n.d.). *Options, Futures and Other derivatives* (Latest Edition ed.). New Delhi: Pearson Education

D. REFERENCE BOOKS

- Gupta, S. P. (n.d.). *Derivatives* (Latest Edition ed.). New Delhi: PHI.
- Bhargava, P. (n.d.). *Derivatives* (Latest Edition ed.). Mumbai: Jaico Publication
- James J.Fred Weston, M. L. (n.d.). *Takeovers, Restructuirng and Corporate Governance* (Latest Edition ed.). Pearson.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Evaluate	Discuss the various forms of corporate restructuring namely Mergers, Acquisitions, Joint ventures, Spinoff, Split-ups, Equity carve out, Divestiture, Corporate Control etc.
CO2	Synthesis	Compute and Evaluate company's valuation by applying asset based, income based, DCF based and market based models.
CO3	Application	Analyse and explore the accounting, legal and taxation framework of various forms of corporate restructuring including M&A and takeover strategies which creates shareholders value.
CO4	Comprehension	Understand the risk management concepts, valuation and trading strategies using derivatives instruments such as futures, forwards, options and swaps.
CO5	Analysis	Identify how derivatives can be used for hedging the adverse price risk movements..

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	.
CO1	3	3	2	2	2	2	3	2	2	3	2	1	3	2	3	2	
CO2	2	2	3	2	3	2	2	2	3	3	3	2	2	2	3	3	
CO3	3	3	3	3	2	3	3	3	2	2	2	3	3	3	2	2	
CO4	3	3	2	2	2	2	3	2	2	3	2	3	3	2	3	2	
CO5	3	3	3	2	2	2	3	2	2	3	2	2	3	2	3	2	
..																	
Avg	2.8	2.8	2.6	2.2	2.2	2.2	2.8	2.2	2.2	2.8	2.2	2.2	2.8	2.2	2.8	2.2	

MBA Semester III

SUBJECT: INDIAN FINCIAL SYSTEMS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4.5	0	0	4.5	4	50%	20%	30%	-	100%

A. COURSE OVERVIEW

To enable the students to understand the working of Indian Financial System as a whole. To provide an insight into the quality and range of the package of the financial services largely provided by the non-banking financial companies.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Introduction of Financial System	3	CO2
[2]	Non-Banking Financial Companies	3	CO1
[3]	Factoring and Forfeiting	2	CO3
[4]	Hire Purchase Finance and Consumer	2	CO5
[5]	Theoretical and Regulatory Framework of Leasing	2	CO5
[6]	Accounting/Reporting Framework and Taxation of Leasing	2	CO2
[7]	Housing Finance	2	CO4
[8]	Bills Discounting	3	CO3
[9]	Venture Capital Financing	3	CO4
[10]	Issue Management: Intermediaries	3	CO1
[11]	Issue Management: Pre-Issue and Post Issue Obligations and Other Requirements	3	CO1
[12]	Capital Market	2	CO3
[13]	The Primary Market	2	CO3
[14]	The Secondary Market	2	CO3
[15]	Depositories and Custodians	2	CO4
[16]	The Debt Market	3	CO2
[17]	Stock Broking	3	CO1
[18]	Money Market	2	CO3
[19]	Credit Rating	2	CO5

[20]	Insurance Services	2	CO4
[21]	Mutual Funds	2	CO4

C. TEXT BOOKS

(It is necessary that at least 85% of course content is covered in prescribed textbooks. The format should be as per ACS referencing format)

1. Financial Services, 4th edition, M Y Khan, Tata McGraw Hill
2. Indian Financial System, 2nd (Second) edition, Bharti V Pathak, Pearson Education
3. Indian Financial System, 4th (Fourth) edition, M Y Khan, Tata McGraw Hill

D. REFERENCE BOOKS

(The format should be as per ACS referencing format)

1. Indian Financial System, 4th (Fourth) edition, M Y Khan, Tata McGraw Hill
2. Indian Financial System, 2nd (Second) edition, H R Machiraju, Vikas Publishing House
3. Financial Institutions and Markets, Meir Khon, Tata McGraw Hill
4. Financial services and System, Dr. S Gurusamy, Vijay Nicole Pvt. Ltd.
5. Business Standard, Economic Times, Business India, Economic Survey Report, RBI Bulletin, other finance related magazines

E. COURSE OUTCOMES

(Minimum 5 Cos are required)

CO Number	Skill	Statement
CO1	Evaluate	Determine Indian Financial System and its Components.
CO2	Comprehension	classify financial services offered in India
CO3	Application	Assess primary and secondary markets in India
CO4	Synthesis	Identify services and role of Merchant Bankers in India.
CO5	Analysis	Infer credit rating agencies in India and express factoring in India.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	.
CO1	2	2	2	2	3	3	1	2	3	3	2	3	2	2	2	3	
CO2	3	3	3	1	3	2	3	2	2	1	3	2	2	3	2	2	
CO3	2	2	2	2	2	2	2	3	2	2	3	3	2	3	2	3	
CO4	2	1	3	3	3	2	3	2	2	3	2	2	2	2	3	2	
CO5	2	3	2	2	1	3	2	1	2	2	2	2	3	2	2	2	
..																	
Avg	2.2	2.2	2.4	2	2.4	2.4	2.2	2	2.2	2.2	2.4	2.4	2.2	2.4	2.2	2.4	2.26

MBA. SEMESTER – III

SUBJECT: SECURITY ANALYSIS & PORTFOLIO MANAGEMENT

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4.5	0	0	4.5	4	50%	20%	30%	-	100%

A. COURSE OVERVIEW

The course acquaints students with notions of Investments and Securities Market Structure. It leads them in to discussion of Modern Investment and Portfolio Theories and equips them with ability to carry out Security Valuations, and Creations and Monitoring of Investment Portfolios.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Introduction to Investment and Securities: Investment, Gambling, Speculation, Investment Objectives, Sweat Equity, Warrants, non-voting shares, Hedging	3	CO1
[2]	Investment Alternatives: Negotiable and Non-negotiable instruments, Other types of investments	2	CO1
[3]	Stock Market Indices: Computation of Index, The BSE Sensitive Index, NSE-50 index (Nifty), CNX Nifty Junior, S&P CNX 500, Selection Criteria	2	CO5
[4]	The Securities and Exchange Board of India: Powers and Functions of SEBI, Legislation governing SEBI functions, Primary and Secondary Market Regulations, Critical Review of SEBI	2	CO1
[5]	Risk and Return: Types of Risks, Minimizing Risk Exposure, Risk Measurement: The anticipated Return, Present Value of Return, Multiple Year Holding Period	3	CO1 CO3
[6]	Debt Instruments and their Valuations: Players in the Debt Market, Valuation of Debt Instruments, Running Yield, Yield to Maturity, Redemption Yield, Holding Period Yield, yields to Call/Put, Yields on Index Linked Bonds, Yield Curves, Risk Management in Bonds, Bond Duration, Convexity, Dispersion	3	CO2
[7]	Term Structure of Interest Rates and Bond Portfolio Management: Yield to Maturity, Time Maturity, Interest Rate Theory and Bond Portfolio	3	CO2
[8]	Fundamental Analysis: Economic Analysis, Industry Analysis, Company Analysis, Earnings of the Company, Financial Statement Analysis	3	CO2 CO3
[9]	Equity Instruments and Their Valuation: Share Valuation, Earnings Valuation, Revenues Valuation, Cash Flow Valuation, Asset Valuation, Yield Valuation, Valuation of Private Companies	3	CO1 CO3
[10]	Technical Analysis: Line Charts, Line and Volume Charts, Reversal Patterns, Continuation Patterns, Bar Charts, Candle Stick Charts, Point and Figure Chart, Dow Theory, Elliott Wave Theory, Flow of Funds, Market Structure, Market Indicators	3	CO4

[11]	Efficient Market Theory:_Basic Concepts, Random Walk Theory, Weak Form of EMH, Predictability of Stock Returns, Semi Strong Form, Strong Form, The Essence of the Theory, Market Inefficiencies	3	CO1 CO4
[12]	Portfolio Construction: Approaches in portfolio construction, Determination of Objectives, Selection of the Portfolio	3	CO5
[13]	Portfolio Markowitz Model: Simple Diversification, The Markowitz Model, Risk and Return with different correlation, Markowitz Efficient Frontier	3	CO5
[14]	The Sharpe Index Model: Single Index Model, Corner Portfolio, Sharpe's Optimal Portfolio, Optimum Portfolio with Short Sales	3	CO5
[15]	Capital Asset Pricing Theory and Arbitrage Pricing Theory: The CAPM, Assumptions, Arbitrage Pricing Theory	3	CO4
[16]	Portfolio Evaluation: Mutual Funds, Sharpe's Performance Index, Treynor's Performance Index, Jenson's Performance Index	3	CO5
[17]	Portfolio Revision: Passive and Active Management, The Formula Plan, Variable Ratio Plan, Revision and the Cost	3	CO5
[18]	Contemporary Issues: International Diversification, Basics of Derivatives Trading and Hedging	2	CO1 CO4

C. TEXT BOOKS

1. Chandra, Prasanna, *"Security Analysis and Portfolio Management"*, Tata McGraw Hill

D. REFERENCE BOOKS

1. Bodie, Kane, Marcus and Mohanty, *"Investment* "Eighth Edition, McGraw Hill, Indian Edition, New Delhi
2. Fischer, Jordan, *"Security Analysis and Portfolio Management",* Pearson Education, New Delhi
3. Bhalla, V K, *"Investment Management"*, 10th Edi, S Chand, Publication
4. Madhumati, Rangnathan, *"Investment Analysis and Portfolio Management"*, Pearson Education, New Delhi
5. Pandya, Falguni, "Security Analysis and Port Folio Management", Jaico Publication, New Delhi, First Edition

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Evaluate	To present approaches of investment analysis and measure risk and return of a single security
CO2	Comprehension	To explain type of debentures and validate the value of a bond using Bond Yield measures.
CO3	Application	To assess the value of an equity share using DDM and P/E approach.
CO4	Synthesis	To estimate risk, return of a portfolio, minimum risk of a portfolio and Detect overpricing and under-pricing of a stock using CAPM model.
CO5	Analysis	To measure Portfolio using portfolio performance measures.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	.
CO1	3	3	2	2	2	2	3	2	2	3	2	1	3	2	3	2	
CO2	3	2	3	2	3	2	2	2	3	3	3	2	2	2	3	2	
CO3	3	3	3	3	2	3	3	3	2	2	2	3	3	3	2	2	
CO4	3	3	2	2	2	2	3	2	2	3	2	3	3	2	3	2	
CO5	2	2	3	2	3	2	2	2	3	3	3	2	2	2	3	3	
..																	
Avg	2.8	2.6	2.6	2.2	2.4	2.2	2.6	2.2	2.4	2.8	2.4	2.2	2.6	2.2	2.8	2.2	

MBA Semester IV

SUBJECT: MANAGEMENT CONTROL SYSTEM

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4.5				4	50%	20%	30%		100%

A. COURSE OVERVIEW

To provide knowledge, insight, and analytical skills related to how a corporation's senior executive design and implement the ongoing management systems that are used to plan and control the firm's performance. To introduce the various control measures of the systems to the students.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	**The Nature Of Management Control System** Basic concepts, Boundaries of management control, Impact of internet on management control.	3	CO5
[2]	**Understanding Strategies:** Goals, The concept of strategy, Corporate-level strategy, Business unit strategy.	3	CO2
[3]	**Behavior in Organization:** Goal congruence, Informal factors that influence goal congruence, The formal control system, Types of organizations, Functions of the controller.	3	CO2
[4]	**Responsibility Centers: Revenue And Expense Center**: Responsibility center, Revenue center, Expense center, Administrative and support centers, Research and development centers, Marketing centers.	3	CO1
[5]	**Profit Center:** General consideration, Business unit as profit centers, Other profit centers, Measuring profitability.	3	CO1
[6]	**Transfer Pricing:** Objectives of transfer pricing, Transfer pricing methods, Pricing corporate services, Administrative of transfer prices.	3	CO3
[7]	**Measuring And Controlling Assets Employed:**	3	CO3

	Structure of the analysis, Measuring asset employed, EVA versus ROI. Additional consideration in evaluating managers, Evaluating the economic performance of the entity.		
[8]	**Strategic Planning:** Nature of strategic planning, Analyzing proposed new programs, Analyzing ongoing programs, Strategic planning process.	3	CO4
[9]	**Budget Preparation:** Nature of budget, Other budgets, Budget preparation process, Behavioral aspects, Quantitative techniques.	4	CO3
[10]	**Analyzing Financial Performance Reports:** Calculating variance, Variation in practice, Limitation of variance analysis.	3	CO3
[11]	**Performance Measurement:** Performance measurement systems, Interactive control.	3	CO4
[12]	**Management Compensation:** Research findings on organizational incentives, Characteristics of incentives compensation plans, Incentives for corporate officers, Incentives for business unit managers, Agency theory.	3	CO2
[13]	**Controls For Differentiated Strategies:** Corporate strategy, Business unit strategy, Top management style.	3	CO4
[14]	**Service Organization:** Service organization in general, Professional service organizations, Financial service organization, Health care organization, Nonprofit organization.	3	CO1
[15]	**Multinational Organization**: Cultural differences, Transfer pricing, Exchange rates.	3	CO2
[16]	**Management Control Of Projects**: Nature of projects, The control environment, Project planning, Project evaluation, Project execution .	4	CO5

C. TEXT BOOKS

(It is necessary that at least 85% of course content is covered in prescribed textbooks. The format should be as per ACS referencing format)

1. Robert N Anthony & Vijay Govindrajan, "Management Control System" Tata McGraw Hill, 12th Edition.

D. REFERENCE BOOKS

(The format should be as per ACS referencing format)

2. Joseph A. Maciarielle, "Management Control System" - Prentice Hall of India (EEE).

3. Subhash Sharma, "Managerial Control System" Tata Mc Graw Hill Publishing Pvt. Ltd

E. COURSE OUTCOMES

(Minimum 5 Cos are required)

CO Number	Skill	Statement
CO1	Evaluate	To measure the various responsibility centres of the business organization.
CO2	Comprehension	To learn the organizational structure of different industries
CO3	Application	To explore the transfer pricing issue with different business units.
CO4	Synthesis	To provide knowledge, insight, and analytical skills related to how a corporation's senior executive design and implement the ongoing management systems that are used to plan and control the firm's performance.
CO5	Analysis	To introduce the various control measures of the systems.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	.
CO1	3	2	3	2	3	3	2	2	3	3	2	3	2	2	2	3	
CO2	2	3	3	2	3	2	3	2	2	1	3	2	2	3	2	2	
CO3	3	2	2	2	2	2	2	3	3	2	2	3	3	3	3	3	
CO4	2	2	3	3	3	2	3	2	2	2	2	2	2	1	3	1	
CO5	2	3	2	2	2	1	2	2	2	2	2	2	3	2	2	2	
..																	
Avg	2.4	2.4	2.6	2.2	2.6	2	2.4	2.2	2.4	2	2.2	2.4	2.4	2.2	2.4	2.2	2.31

MBA SEMESTER – IV
SUBJECT: CONTEMPORARY ISSUES IN MANAGEMENT

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4.5	0	0	4.5	4	50%	20%	30%	-	100%

A. COURSE OVERVIEW

This course is designed to introduce and induct students into the latest developments in the field of Management through case studies and other contemporary pedagogies. Various latest areas like Behavioural Finance, Digital Marketing etc. have been covered in this subject.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Introduction to Behavioral Finance: • Why Psychology Matters • Forecasting Errors • Overconfidence Bias • Conservatism	2	CO1
[2]	The Psychology of Personal Investment Decisions: • Choice Under Constraint • Objectives • Types of Risks • Characteristics of Investments • Human Capital • Risk Management • The Psychology of Personal Finance • Self Deception • Heuristic Simplification • The Catering Theory of Dividends • The Social Dimension • Influence of Emotion and Mood • Prospect Theory • The Disposition Effect • Avoidance of Psychological Biases • Saving and Self-Control • Habitual Non-Savers • Self Control, Personality Traits, and Social Mood • Influences on Retirement and Saving Behaviour • Classifying Investors	2	CO2
[3]	Emotions, Neuroscience and Investing: Investors Dopamine Addict: • The Primacy of Emotion • Emotions: Body or Brain • Emotions: Good, Bad or Both? • Self Control is like a Muscle • Hard-Wired for the Short Term • Hard-Wired to Herd	2	CO3

	• Plasticity as Salvation		
[4]	Surveillance in Stock Exchanges (Introduction)	**2**	CO1
[5]	Rules and Regulations (Securities Contracts Regulation Act, 1956 and Rules, 1957)	**2**	CO2
[6]	Securities and Exchange Board of India Act, 1992,	**2**	CO3
[7]	SEBI (Stock brokers & Sub Brokers) Regulations 1992)	**2**	CO3
[8]	SEBI (Prohibition of Insider Trading) Regulations, 1992, SEBI (Prohibition of Fraudulent and Unfair Trade Practices) Regulations 2000	**2**	CO2
[9]	Introduction to Banking, Banking and Economics	**2**	CO4
[10]	Understanding a Bank's Financials (CAMELS framework)	**2**	CO4
[11]	BASEL Framework (Bank for International Settlements (BIS)) (Basel Accords)	**2**	CO4
[12]	Indian Commodity Futures Market • Understanding Commodities • Derivatives and Commodity Futures Trading • Commodity Derivatives Exchange • The Market Participants • The Financialization of Commodities • Commodity Futures Market in India • The Regulatory Issues in India • Policy issues and challenges • Case Study: o Silver Thursday and Hunt Brothers Scandal o Crude Oil Price Fixing Scandal o The Enron Scandal o The Copper King Scandal o The Guar Futures Trading Scandal o The NSEL Payment Scam	**2**	CO3
[13]	**Introduction to Retail:** • Retail, Function of Retailer, The Marketing-Retail Equation, The Rise of Retailer, The Global Retail Market: Issue and Challenges, Retail of 21st Century, Retail as a Career.	**2**	CO4
[14]	**Retail in India**: • The Concept of Organized Retail, The Evolution of Retail in India, Drivers of Retail Change in India, The size of Retail in India, Key sector in Retails, Retail Retailers.	**2**	CO4
[15]	**Understanding the Retail Consumer**: • The Need for studying Consumer Behaviour, Factors influencing the Retail shopper, The Customer Decision Making Process, Market Research.	**2**	CO5

[16]	**Retail Strategy**: • Strategy, The Concept of the Business Model, Strategy, International Expansion- A Growth Strategy.	**2**	CO3
[17]	**Retail Franchising**: • The Concept of Franchising, Evolution of Franchising, Types of Franchising, Types of Franchising, Advantage of Franchising, Disadvantage of Franchising, Franchising in India and legal issues in Franchising in India.	**2**	CO4
[18]	**Retail Marketing and Branding:** • The role of Marketing in Retail, The Retail Marketing Mix, The STP Approach, The Retail Image, The Retail Communication Mix, The Concept of Branding**.**	**3**	CO5
[19]	**Introduction to Digital Marketing:** Digital Marketing, Internet Users, Digital Marketing Strategy, Digital Advertising Market in India, Skills required in Digital Marketing, Digital Marketing Plan.	**2**	CO3
[20]	**Display Advertising:** Introduction, Types of Ads, Types of Display Ads, Buying Models, Display Plan, Targeting, What makes a Good Ad, Programmatic Digital Advertising, Analytics Tools, Youtube Advertising.	**3**	CO1
[21]	**Search Engine Advertising:** Why pay for Search Advertising, Understanding Ad Placements, Understanding AdRanks, Creating the First Ad Campaign, Enhance Your Ad Campaign, Performance Reports.	**2**	CO2
[22]	**Social Media Marketing:** Facebook Marketing, Linkedln Marketing, Twitter Marketing, Instagram and Snapchat, Mobile Marketing. **Search Engine Optimisation and Web Analytics:** Search Engine, Concept of Search Engine Optimisation, SEO Phases, On Page Optimisation, Off Page Optimisation, Social Media Reach, and Maintenance. Data Collection, Key Metrics, Making Web Analytics Actionable, Multi Channel Attribution.	**2**	CO3
[23]	**Forensic Accounting** Understanding, Analyzing and Interpreting financial statements How to unearth early warning signals by analyzing financial statements?	**2**	CO3

	How to uncover mysteries and tactics of explaining how to analyze various detailed components of financial statements? How to dissect financial statements with surgical precision? How to read between the lines of financial statements beyond what is visible on surface?		
[24]	Network Design and operation in supply chain management Supply chain integration and restructuring Agile supply chains Case studies: 1) Kurlon Limited 2)Vehicle routing at Baroda union 3) Supply chain management at Dalmia Cement Ltd 4) Power equipment (india) ltd	**2**	CO4

C. TEXT BOOKS

(It is necessary that at least 85% of course content is covered in prescribed textbooks. The format should be as per APA referencing format)

No book is recommended as textbook given the nature of the subject.

D. REFERENCE BOOKS

1. Personal Finance and Investments – A Behavioural Finance Perspective By Keith Redhead, Pulbisher: Routledge
2. Behavioural Investing – A practitioner's guide to applying behavioural finance, James Montier, Wiley
3. NPTEL course by Prof Abhijit Chandra (IIT, Kharagpur) on Behavioural and Personal Finance, Module 1, Lecture 2
4. Pradhan, Swapna, Retailing Management, 3rd Edition, McGraw Hill.
5. A Beginner's Guide to Indian Commodity Futures Market by Neeraj Mahajan and Kavaljit Singh, Madhyam
6. Gupta, Seema, Digital Marketing, First edition, McGraw Hill.
7. Bhatia singh, Puneet, Fundamentals of Digital Marketing, Current Edition, Pearson.

E. COURSE OUTCOMES

(Minimum 5 Cos are required)

CO Number	Skill	Statement
CO1	Evaluate	Train the students about latest policy changes in India
CO2	Comprehension	Train students about the latest developments in all areas like

		Marketing, Finance, HR etc.
CO3	Application	Make students aware about changes in Business Environment
CO4	Synthesis	Make students aware about changes in Technology that affect Businesses in India
CO5	Analysis	Teach practical dimensions of latest management theories through latest practical case studies

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	1	2	1	1	2	2	2	2	1	1	2	2	2	2	2	2	
CO2	2	3	2	2	2	2	2	2	2	2	2	2	2	3	2	3	
CO3	3	1	3	3	2	3	3	3	3	3	3	3	3	1	3	2	
CO4	2	3	2	2	3	2	2	2	3	3	2	2	2	3	2	2	
CO5	**2**	3	2	2	2	2	3	2	1	2	3	2	3	1	2	1	
Avg	2	2.4	2	2	2.2	2.2	2.4	2.2	2	2.2	2.4	2.2	2.4	2	2.2	2	2.175

MBA SEMESTER – IV
SUBJECT: SALES AND DISTRIBUTION MANAGEMENT

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4.5	0	0	4.5	4	50%	20%	30%	-	100%

A. COURSE OVERVIEW

This section may include motivation, objectives, scope etc. of the subject. It is preferred to describe all in less than 7 lines.

- To acquaint the students with the concepts, theories, tools & techniques of sales management
- To develop skills of personal selling involving high involvement products
- To develop the skills of managing and leading a sales force
- To understand different channel formats to distribute the products
- To understand different sources, methods to resolve conflicts in marketing channels

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	Cos
[1]	Sales Management and the Business Enterprise: Evolution of the sales department, Sales management, objectives of sales management, sales management & financial results, sales executive as coordinator	2	CO1
[2]	Sales Management, Personal Selling and Salesmanship: Buyer-Seller Dyads, Diversity of Personal-Selling Situations, Theories of Selling: AIDAS theory of selling, ―Right set of circumstances‖ theory of selling, ―Buying formula‖ theory of selling, ―Behavioral equation‖ theory, Prospecting, Sales Resistance, Closing Sales	2	CO1
[3]	Setting Personal-Selling Objectives: Types of personal selling objectives, Market potential, sales potential, sales forecast, Analyzing Market Potential: Market identification, Market motivation, Analysis of Market potential, Market indexes, Sales forecasting Methods, Converting industry forecast to company sales forecast	2	CO1
[4]	Determining Sales-Related Marketing Policies: Product Policies- Relation to product objectives, product line policy, product design policy, product quality and service policy Distribution policies: policies on marketing channels, policies on distribution intensity Pricing Policies- Who to sell: policies on marketing channels, policies on pricing relative to costs, policy on uniformity of prices to different buyers, policy on list pricing, policy on discounts, geographical pricing policies, policy on price leadership, product line pricing policy, competitive bidding policy	2	CO2

[5]	Formulating Personal-Selling Strategy: Competitive Settings and Personal-selling strategy, pure competition, Monopolistic competition, Oligopolistic competition, No direct competition, Personal-selling objectives and personal-selling strategy, sales-related marketing policies and personal-selling strategy	2	CO2
[6]	The Effective Sales Executive: Nature of sales management positions: position guide- sales manager, position guide- district sales manager Functions of the sales executive, qualities of effective sale executives, relations with top management, compensation patterns for sales executives	2	CO3
[7]	The Sales Organization: Purpose of Sales organization, Setting up a sales organization, basic types of sales organizational structures, field organization of the sales department, Centralization versus decentralization in sales force management, schemes for dividing line authority in the sales organization	2	CO4
[8]	Sales Department Relations: Interdepartmental relations and coordination, coordination of personal selling with other marketing activities, coordination of personal selling with other departments, sales department‘s external relations	2	CO4
[9]	Distributive Network Relations: Setting up cooperative programs, role of manufacturer‘s sales force, objectives and methods of manufacturer-distributive-network cooperation, Distributive-Network changes and maintaining relations	2	CO3
[10]	Quotas: Objectives in using quotas, Quotas, the sales forecast, and sales budget, types of quotas and quota-setting procedures, administering the quota system, reasons for not using sales quotas	2	CO3
[11]	Sales Territories: The sales territory concept, reasons for establishing/ revising sales territories, procedures for setting up or revising sales territories, deciding assignment of sales personnel to territories, routing and scheduling sales personnel	2	CO3
[12]	Marketing Channels: Structure and Functions: What is a marketing channel? Why do marketing channels exist and change?: Demand side factors, supply side factors Who belongs to a marketing channel? A framework for channel analysis- Channel Design: Segmentation, channel structure decisions, splitting the workload, degree of commitment, Gap analysis Channel Implementation: Identifying power sources, Identifying channel conflicts, The goal of channel coordination, Insights for specific channel institutions	2	CO5
[13]	Segmentation for marketing channel design : service outputs- End-User channel preferences, service outputs, Segmenting the market by service output demands, Meeting service output demands, The role of service output demand analysis in marketing channel design	2	CO4
[14]	Supply-side channel analysis: channel flows and efficiency analysis- Channel flows defined: Eight Generic channel flows, Customizing the list of flows for a particular channel, who does which channel flows? Describing the current channel with the efficiency template, Using channel flow concepts to design a Zero-based channel, Matching Normative and actual profit Shares: The equity principle	2	CO4

	Channel flow analysis as part of the overall channel audit process		
[15]	Supply-side channel analysis: channel structure and intensity: Coverage versus Assortment: Framing the decisions of upstream and downstream channel members: Why more coverage is better for manufacturers of convenience goods, why downstream channel members dislike intensive distribution, Can the manufacturer sustain intensive distribution? Degree of category exclusivity: The downstream channel member's decision Striking a Deal: How much selectivity to trade away- The Threat of complacency, The nature of the product category, Brand Strategy: Quality positioning and premium pricing, Brand Strategy: Target market Bargaining for influence over channel members: Desired coordination, manufacturer-specific investments by downstream channel members, Dependence balancing: Trading Territory Exclusivity: for category exclusivity Reassurance: Using selectivity to stabilize fragile relationships, The price of the concession: Factoring in opportunity cost Back to the basics: Cutting costs and raising sales: Saving money by limiting the number of trading partners, do more trading partners really mean more revenue?, A caution on the issue of limiting the number of trading partners Simulating the benefits of selectivity while maintaining Intensive coverage, going to market via multiple types of channels, Dual distribution: Going to market via multiple types of channels, dual distribution, carrier-rider relationships	2	CO5
[16]	Gap analysis: Sources and types of channels Gaps, closing channel gaps, Pulling it together: the Gap analysis template	2	CO3
[17]	Channel power: Getting it, using it, Keeping it- The nature of power, power as the mirror image of dependence, The greatest source: Reward power, Four more sources of power, The balance of power, Exercising power: influence strategies	2	CO4
[18]	Managing Conflict to increase channel coordination: Assessing the Degree and nature of channel conflict, the consequences of conflict, major sources of conflict in marketing channels, clash of market domains, fueling conflict, conflict resolution strategies: How they drive conflict and shape channel performance- Resolving conflict: Institutionalized mechanisms designed to contain conflict early, styles of conflict resolution: How channel members handle disputes and negotiate to achieve their goals, resolving conflict and achieving coordination via incentives	2	CO4
[19]	Strategic alliances in distribution: Strategic alliances: Their nature and the motives for creating them, building commitment by creating mutual vulnerability, building commitment by the management of daily interactions, decision structures that enhance trust, moving a transaction through stages of development to reach alliance status, Putting it all together: What does it take and when does it pay to create a marketing channel alliance?	2	CO4
[20]	Vertical integration in Distribution:	2	CO4

	The costs and benefits of vertical integration in marketing channels: Degrees of vertical integration, costs and benefits of the choice to make, the choice to buy distribution: Terms of payment to third parties Deciding when to vertically integrate forward: An economic framework Return on Investment: The usual criterion, Outsourcing as the starting point, six reasons to outsource distribution, Vertical integration forward when competition is low, Vertical integration to cope with environmental uncertainty, vertical integration to reduce performance ambiguity, vertical integration as an observatory on the market or as an option: Economic rationality or rationalization?		
[21]	Legal constraints on marketing channel policies: market coverage policies, customer coverage policies, pricing policies, product line policies, product line policies, selection and termination policies, ownership policies	1	CO4
[22]	Retailing: Retailing defined, choosing a retail positioning strategy, strategic issues in retailing	2	CO5
[23]	Wholesaling: Wholesaling: An overview of the wholesaling sector, what the independent wholesaling sector offers: The essential tasks, Federations of wholesalers, voluntary and cooperative groups, consolidation, export distribution, The future of wholesaler-distributors, A sketch of vertical integration and of agents in wholesaling	2	CO5
[24]	Franchising: What is franchising? What becomes a franchisee? What become a franchisor? The historical roots of franchising, The franchise contract, why franchise systems include company outlets, ongoing challenges facing the franchisor	2	CO5
[25]	Logistics and supply chain management: The impact of logistics and supply chain management, Responding efficiently, Responding rapidly, and putting it all together: What is the right supply chain?	1	CO5
[26]	Group Presentation	2	CO2

C. TEXT BOOKS

(It is necessary that at least 85% of course content is covered in prescribed textbooks. The format should be as per APA referencing format)

- Richard R Still, Cundiff W Edward Govoni A P Norman, "Sales Management: Decision Strategy and Cases", Pearson Education; 5th Edition
- Coughlan, Anderson, Stern, Ansary and Nattarajan, "Marketing Channels", Pearson Education, 7th edition

D. REFERENCE BOOKS

(The format should be as per APA referencing format)

- David Jobber,Geoffrey Lancaster, "Selling & Sales Management", Pearson, Latest Edition
- Panda Tapan K., Sahadev Sunil, "Sales & Distribution Management", Oxford, Latest Edition
- Havaldar, K. K. and Cavale, VM. 'Sales and Distribution Management', Tata McGraw Hill
- Chunawalla, S.A. Sales and Distribution Management, Himalaya Publishing House

E. COURSE OUTCOMES

(Minimum 5 Cos are required)

CO Number	Skill	Statement
CO1	Evaluate	To make them explore and understand the different techniques of selling and distribution of products
CO2	Comprehension	To provide knowledge to understand the efficient way of implementing the sales and distribution strategies along with case studies and practical examples
CO3	Application	To enable them to understand the different techniques of sales and distribution strategies in order to enable the employment in the organization
CO4	Synthesis	To help them understand the Sales & Distribution functions as integral part of marketing functions in a business firm
CO5	Analysis	To make them understand various channel formats & distribution structures in the organization

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	3	3	3	2	3	1	3	2	3	2	3	3	2	3	2	2	
CO2	3	2	3	3	3	2	3	3	3	3	3	2	3	2	3	2	
CO3	2	3	3	2	2	3	3	3	3	2	2	2	2	2	2	2	
CO4	2	1	2	3	1	2	1	1	2	3	1	2	1	1	2	3	
CO5	3	2	2	2	3	3	2	2	2	2	3	1	3	2	1	1	
Avg	2.6	2.2	2.6	2.4	2.4	2.2	2.4	2.2	2.6	2.4	2.4	2	2.2	2	2	2	2.288

MBA SEMESTER – III
SUBJECT : INDUSTRIAL AND SERVICE MARKETING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4.5	0	0	4.5	4	50%	20%	30%	-	100%

A. COURSE OVERVIEW

This section may include motivation, objectives, scope etc. of the subject. It is preferred to describe all in less than 7 lines.

- To develop insights into latest inclination in the service sector and to understand the significance of marketing and management of services, and to face highest challenges in any service related organization.
- To develop insights into emerging trends in the Industrial marketing and tackle issues in the marketing of Industrial goods.

S.No	Course Contents	L+T (hrs)	COs
1	Define Business Marketing in the new era Business Marketing Environment Text, Chapter 1 for concepts of interest, *read* Chapter 2 thoroughly Case: Cumberland Metals, Engineered Products Division, 1980 Case	2.5	CO4
2	The Organization as a customer Organizational buying behavior Text Chapter 3 Case - e-Procurement at Cathay Pacific Airways: e-Business Valuation Case	2.5	CO4
3	Scanning the Business Environment and Gathering Information Business Market Segmentation, Targeting and Positioning Text Chapter 4 Case -The Peppers and Rogers Group Case	2.5	CO4
4	Product Strategy Text Chapter 5 Case: Signode Industries, Inc. (A) Case	2.5	CO4
5	Innovation and New Product Development Developing Pricing Strategies Text Chapter 6 Case: Millipore Corporate Strategy Case	2.5	CO4
6	Business Marketing Channel and Logistic□ Text Chapter 7 Case: WESCO Distribution Case	2.5	CO5
7	Integrated Marketing Communication Text Chapter 8 Case: KONE: The MonoSpace Launch in Germany Case	2.5	CO5
8	Brand Building in Business Market Text Chapter 9	2.5	CO5

	Case: Zucamore, S.A.—Global Competition in Argentina Case		
9	Managing the Sales Force Text Chapter 10 Case: CMR Enterprises, Inc. Case	2.5	CO5

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Introduction to services marketing: Service Dominate the modern economy, Services pose distinctive Marketing Challenges, Important Differences exist among services, Marketing must be integrated with other functions, services success requires a focus on both customer and competitive markets and conclusion.	**1.5**	CO1
[2]	Consumer behaviour in service encounters: Customer interact with service operations, the purchase process for services involves multiple steps, customers have needs and expectations, customers may find it difficult to evaluate services, a services business is a system and conclusion.	**1.5**	CO1
[3]	Positioning Services in Competitive Markets: Focus underlies the search for competitive advantage, Market Segmentation forms the basis for focused strategies, Positioning distinguishes a brand from its competitors, Conduct internal, market and competitors analyses, Use positioning maps to plot competitive strategy, Competitive positioning can be changed and conclusion.	**1.5**	CO1
[4]	Creating the services product: Planning and creating services, Identifying and Classifying Supplementary services, Planning and Branding services Products, New services development and Conclusion.	**1.5**	CO1
[5]	Designing the communication mix for services: Communication plays a key role in marketing, Communicating services presents both challenges and opportunities, Set Clear Objectives for Marketing communication, The Marketing Communication Mix, Branding and Communications, Marketing Communication and the Internet and conclusion.	**1.5**	CO1
[6]	Pricing and Revenue Management: Effective Pricing is central to financial success, Objectives and foundation for setting prices, cost based pricing , value based pricing, competitions based pricing, Revenue management, Ethical concern and perceived fairness of pricing policies, Putting services Pricing into practice and conclusion.	**1.5**	CO2
[7]	Distributing services: Distribution in a services context, the type of contact: options for services delivery, Decision about place and time, Services delivery in cyberspace, the role of intermediaries, Internationally Distributed services and Conclusion.	**1.5**	CO2
[8]	Designing and Managing Services Processes: Blueprinting Services to create valued experiences and productive operations, Service Process redesign, The customer as Coproduce, The problem of Customer Misbehavior and conclusion.	**1.5**	CO2
[9]	Balancing demand and capacity: Fluctuations in Demand Threaten Service Productivity, Many Service	**1.5**	CO2

	Organization are capacity constrained, Patterns and determinants of demand, Demand levels can be managed, Inventory demand through waiting lines and reservation, Minimizing perceptions of waiting time, Creating an effective reservation system, and conclusion.		
[10]	Planning the Service Environment: The purpose of service environments, Consumer response to service environments, Dimensions of the services environment, Putting it all together and conclusion.	**1.5**	CO2
[11]	Managing People for Service Advantage: Service Staff are crucially important, Frontline Work is difficult and stressful, Cycles of failure, mediocrity and success, Human Resources Management: How to get it right, Service Leadership and culture and conclusion.	**1.5**	CO3
[12]	Managing Relationship and Building Loyalty: The search for customer Loyalty, Understanding the customer/firm relationship, Targeting the right customers, Analyzing and Managing the Customer Base, Building Customer loyalty, Customer Relationship Management System and conclusion.	**1.5**	CO3
[13]	Customer Feedback and Service recovery: Customer Complaining behaviour, Customer Response to effective service recovery, principles of effective service recovery systems, Services Guarantees, Discouraging abuse and opportunistic behaviour, Learning from Customer Feedback and conclusion.	**1.5**	CO3
[14]	Improving service quality and productivity: Integrating services quality and productivity strategies, what is service quality?, the gap model: A conceptual tool to identify and correct services, Quality problem, Measuring and Improving Service Quality, Defining and Measuring productivity, Improving services Productivity and conclusion.	**1.5**	CO3
[15]	Organizing for service leadership: The search for synergy in service Management, creating a leading service Organization, In search of leadership and conclusion.	**1.5**	CO3
[16]	Group Presentation	**2.5**	

C. TEXT BOOKS

(It is necessary that at least 85% of course content is covered in prescribed textbooks. The format should be as per APA referencing format)

- Lovelock C and Wirtz J. Service Marketing, 6th ed., Pearson India, 2005.
- Anderson J C, Narus J A, Narayandas D, and Seshadri P V R. Business Market Management, 3rd ed., Pearson India, 2010.

D. REFERENCE BOOKS

(The format should be as per APA referencing format)

- Zeithaml V and Bitner M. Services Marketing-integrating customer focus across the firm, 3rd ed., Tata Mc Graw- Hill, India, 2008.
- Hutt M D and Speh W T. Business Marketing Management: B2B, 10th ed., Cengage Learning Pvt Ltd, 2017.

E. COURSE OUTCOMES

(Minimum 5 Cos are required)

CO Number	Skill	Statement
CO1	Evaluate	Define the service concept and the goods-services continuum, elaborate on the 4Is of services and the associated challenges, explain the segmentation, target marketing and positioning of services.
CO2	Comprehension	Describe the tools of the services marketing mix, elaborate on the measurement of service quality through the service gaps model, explain the strategies for dealing with the 4I's of services.
CO3	Application	Explain the service marketing triangle, explain how customer relationships can be built using segmentation and retention strategies, define CRM, elucidate the factors responsible for CRM growth, describe the types and framework of CRM.
CO4	Synthesis	Explain the characteristics of retail marketing, Describe the type of retailers, role and trends in retailing, level of FDI in retailing, describe the current scenario and problems in Indian retailing, and enumerate retail pricing strategies.
CO5	Analysis	Describe the responsibilities of a store manager, explain the types of store layouts and visual merchandizing techniques, describe the process of planning merchandise assortments, explain buying systems and the retail communication mix.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	3	3	3	2	2	2	3	3	2	2	2	3	3	2	3	3	
CO2	2	2	1	3	3	3	2	3	3	2	1	3	2	3	3	3	
CO3	3	2	2	3	3	2	3	2	2	3	3	2	2	2	2	2	
CO4	3	2	1	3	3	3	3	3	2	3	2	2	3	2	2	2	
CO5	3	3	3	2	2	2	2	2	3	2	3	3	3	2	2	2	
Avg	2.8	2.4	2	2.6	2.6	2.4	2.6	2.6	2.4	2.4	2.2	2.6	2.6	2.2	2.4	2.4	2.45

MBA SEMESTER – IV
SUBJECT: INTERNATIONAL MARKETING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4.5	0	0	4.5	4	50%	20%	30%	-	100%

A. COURSE OVERVIEW

This section may include motivation, objectives, scope etc. of the subject. It is preferred to describe all in less than 7 lines.

- To make the students understanding the Marketing knowledge at Global Level.
- To make the students to learn International Marketing concepts.
- To make students ready to serve in the International Market.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Nature of International Marketing: Challenges and Opportunities Marketing Illustration, Process of International Marketing, International Dimension of Marketing, Domestic Marketing versus International Marketing, The applicability of Marketing.	2.5	CO1
[2]	Trade Theories and Economic Development: Basis for International trade, Exchange ratio, trade, and gain, Systematic Planning to Determine export Opportunities.	2.5	CO1
[3]	Trade Distortion and Marketing Barriers Protection of Local Industries, Marketing Barriers, WTO.	2.5	CO1
[4]	Political Environment: Multiplicity of Political Environment, Measure to Minimize Political Risk.	2.5	CO1
[5]	Legal Environment: Legal system, Intellectual Property and Gray Market.	2.5	CO1
[6]	Culture: Culture, Influence of Culture, Different countries culture.	2.5	CO1
[7]	Consumer Behavior in the International Context: Psychological and Social Dimension, Perspective on consumer behavior, Diffusion Process of Innovations.	2.5	CO2
[8]	Marketing Research and Information System: Nature of Marketing Research, MIS, Basic method of Data Collection, Measurement scale.	2.5	CO2
[9]	Market Analysis and Foreign Market Entry Strategies : Market Analysis, Strategic Alliances, free trade zones.	2.5	CO3
[10]	Product Strategies: Basic Decision and Product Planning	2.5	CO3

	Product, Theory of International Product Life cycle, A move toward world Product		
[11]	Product Strategies Branding and Packaging Decision Branding Decision, Branding levels and Alternatives, Brand Consolidation, Brand Origin and Selection, Brand Characteristics, Brand Protection, Packaging: Functions and Criteria.	**2.5**	CO4
[12]	Distribution Strategies: Channel of distribution Direct and Indirect selling channels, types of intermediaries: Direct channel, Determinants of channel types.	**2.5**	CO5
[13]	Distribution Strategies: Physical Distribution and Documentation Modes of Transportation, Documentation.	**2.5**	CO5
[14]	Promotion strategies: Personal Selling, Publicity, and Sales Promotion Promotion and Communication Sales Promotion.	**2.5**	CO4
[15]	Promotion strategies: Advertising Role of advertising, Standardized International Advertising	**2.5**	CO3
[16]	Pricing Strategic: Basic Decision The Role of Price, Dumping, Transfer Pricing	**2.5**	CO4
[17]	Pricing Strategic: Terms of sale and Payment The Role of Price, Dumping, Transfer Pricing	**2.5**	CO5
[18]	Sources of Financing and International Money Markets Nonfinancial Institution, Financial centers	**2.5**	CO4
[19]	Currencies and Foreign Exchange Money, Foreign exchange, Exchange rate systems, Evaluation of floating rates, financial Implication and strategies	**2.5**	CO3
[20]	Group Presentation	**2.5**	CO2

C. TEXT BOOKS

(It is necessary that at least 85% of course content is covered in prescribed textbooks. The format should be as per APA referencing format)

Onkvisit S and Shaw J. International Marketing: Analysis and Strategy, 3rd ed., Pearson India, 2006.

D. REFERENCE BOOKS

(The format should be as per APA referencing format)

- Keegan W J and Bhargava N K. Global Marketing Management, 8th ed., Pearson India, 2017
- Lee K and Carter S. Global Marketing Management, 3rd ed., Oxford, 2012.

E. COURSE OUTCOMES

(Minimum 5 Cos are required)

CO Number	Skill	Statement
CO1	Evaluate	To distinguish related concept, perspectives, drivers and environment of International business
CO2	Comprehension	To identify, distinguish and interpret global business integration ant national and global level

CO3	Application	To define, outline and analyse global entry strategies
CO4	Synthesis	To identify e-enablers of business
CO5	Analysis	To identify functional resources useful for international business

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	
CO1	2	2	2	3	2	3	2	2	3	2	2	2	3	3	3	3	
CO2	3	3	2	3	2	2	3	3	2	2	3	2	2	3	2	2	
CO3	3	2	2	2	3	3	3	2	3	2	2	3	3	3	3	3	
CO4	2	3	1	2	1	1	2	3	2	3	1	2	1	1	3	3	
CO5	2	2	3	1	3	2	1	2	2	2	3	1	3	2	2	2	
Avg	2.4	2.4	2	2.2	2.2	2.2	2.2	2.4	2.4	2.2	2.2	2	2.4	2.4	2.6	2.6	2.3

MBA Semester IV

SUBJECT: CORPORATE TAX PLANNING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4.5	0	0	4.5	4	50%	20%	30%		100%

A. COURSE OVERVIEW

To enable students to understand provision in Income Tax Act. To make them capable to file return of the income for the corporate etc. To enable students to plan regarding tax liability and also to plan to achieve minimum tax labiality by taking advantage of tax incentives, reliefs etc available in the Income Tax Act

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Residential status & Tax liability Terms used in Income tax Residential status of Tax payers, impact of tax for various type of assesses, calculation of taxable income from residence angle,, Income exempt from tax	4	CO3
[2]	Income from salary: Computation of income from salary, various allowance and their taxability, perquisites and their valuation	5	CO4
[3]	Computation of Agriculture income: Meaning, Methods, examples etc	4	CO2
[4]	Computation of Capital gain: Meaning, methods, income under capital gain, computation, tax on capital gain	4	CO3
[5]	Income from House Property: Meaning, methods, computation from income of house property	4	CO5
[6]	Minimum Alternative Tax (MAT) Meaning, methods, computation of MAT and tax credit	4	CO1
[7]	Income from Business and Profession: Nature and problem, practical application of vital sections , various allowance, relief , weighted deduction etc.	5	CO2
[8]	Clubbing of income: Computation on tax on clubbing of income,	4	CO5
[9]	Set off carry forward of losses: Computation of income after set of losses, deduction from income.	4	CO3
[10]	Computation of Tax liability for companies: Meaning, methods, examples	4	CO4
[11]	Interest for late filling of return, and non-payment of advance tax, Advance Tax Computation of tax liability , tax planning by tax avoidance	4	CO1
[12]	Tax Planning: Tax Planning from various angles, Project on Tax Planning	4	CO2

C. TEXT BOOKS

(It is necessary that at least 85% of course content is covered in prescribed textbooks. The format should be as per ACS referencing format)

1. Student guideline to Income Tax by Vinod and Monica Singhania – Taxman
2. Corporate Tax Planning by Vinod and Monica Singhania - Taxman

D. REFERENCE BOOKS

(The format should be as per ACS referencing format)

E. COURSE OUTCOMES

(Minimum 5 Cos are required)

CO Number	Skill	Statement
CO1	Evaluate	To understand various provision in Income Tax Act
CO2	Comprehension	How to file return of the income for the different assesse.
CO3	Application	To plan regarding tax liability and also to plan to achieve minimum tax liability by taking advantage of tax incentives, reliefs etc available in the Income Tax Act
CO4	Synthesis	To explore how individual and salaried persons can take the exemption from income.
CO5	Analysis	To understand the basics related to Goods and service tax.

F. COURSE MATRIX

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3	PS O4	.
CO1	3	2	3	2	3	3	2	2	3	3	2	3	2	2	2	3	
CO2	2	3	3	2	3	2	3	2	2	1	3	2	2	3	2	2	
CO3	3	2	2	2	2	2	2	3	3	2	2	3	3	3	3	3	
CO4	2	2	3	3	3	2	3	2	2	2	2	2	2	1	3	1	
CO5	2	3	2	2	2	1	2	2	2	2	2	2	3	2	2	2	
..																	
Avg	2.4	2.4	2.6	2.2	2.6	2	2.4	2.2	2.4	2	2.2	2.4	2.4	2.2	2.4	2.2	2.31

MBA. SEMESTER – IV

SUBJECT: INTERNATIONAL FINANCIAL MANAGEMENT

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4.5	0	0	4.5	4	50%	20%	30%	-	100%

A. COURSE OVERVIEW

The course acquaints students with notions of foreign exchange market, exchange rate determination and hedging techniques. It leads them in to discussion of management of foreign exchange risk and exposure by applying different tools of derivatives.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Foundation for International Financial Management: Globalization and Multinational Firm- Dimensions of International finance, Trends in globalization of the world economy; International Monetary System - - Evolution of the International Monetary System, Current exchange rate arrangements, Fixed vs. Flexible Exchange rate regimes; Balance of Payments- Balance of Payments Accounts and Identity	3	CO1
[2]	The Foreign Exchange Market, Exchange Rate Determination and Currency Derivatives: The Market for Foreign Exchange – Function and structure of FX Market, FX Market participants, The Spot Market- spot rate quotations, Bid- Ask spread, Cross rate quotations, Triangular Arbitrage, The Forward Market – Forward Rate quotations, Forward cross exchange rates, Forward Premium/Discount	3	CO2
[3]	International Parity Relationships and Forecasting Foreign Exchange Rates – Interest rate Parity, Purchasing Power Parity, Fisher Effects	3	CO2
[4]	Futures and Options on Foreign Exchange- Futures Contracts & Currency Futures Market, Options Contracts & Currency Options Markets	3	CO3
[5]	World Financial Markets: International Banking and Money Market – International Banking services, Reasons for International Banking, Types of International Banking offices, Capital Adequacy Standards, International Money market	2	CO1 CO4
[6]	International Bond Market – The world's bond markets, Foreign bonds and Eurobonds, Types of instruments, International Bond market credit ratings	2	CO1 CO4
[7]	International Equity Markets- Market Structure and Trading practices, International Equity Market Benchmarks, Trading in international equities- Cross listing of shares, Yankee stock offerings, The European stock market, ADR, GDR	2	CO1 CO4
[8]	Interest rate and Currency Swaps- Types of swaps, Swap market quotations, Interest and Currency swaps, Risk of Interest rate and currency swaps	3	CO3
[9]	Foreign Exchange Exposure and Management: Management of Transaction Exposure – Types of exposure, Hedging Foreign Currency	4	CO3

	Receivables and Payables by Forward market hedge, Money Market hedge and Options market hedge		
[10]	Management of Economic Exposure- Measuring Economic Exposure, operating exposure- Meaning and Determinants, Managing operating exposure	3	CO3
[11]	Management of Translation Exposure- Translation Methods, FASB 52, Management of translation exposure	2	CO3
[12]	Financial Management of Multinational Firm: Foreign Direct Investment and Cross-Border Acquisitions- Global trends in FDI, Reasons to invest overseas, Cross border mergers and acquisitions, Political risk and FDI; Multinational Cash Management- The management of international cash balances, Netting systems, Centralized vs. decentralized cash management	3	CO1 CO2
[13]	Foreign Trade Contracts and Procedures: Incoterms	3	CO5
[14]	Letter of Credit – Meaning, Mechanism and Advantages, Types of Letter of Credit; Operation of a Letter of Credit- Salient Features, Responsibilities and Liabilities of parties	3	CO5
[15]	Finance of Foreign Trade: Financing Exports- Packing Credit Advance, Pre-shipment Credit in Foreign Currency, Advances against duty drawback, Other services to Exporters	3	CO5
[16]	Project Exports and Investments Abroad- Financing of Project Exports, Export of Services, Export Guarantees, Indian Investments Abroad	3	CO5
[17]	Export Import Bank of India – Lending to Indian Exporters, Lending to Foreign Government, Companies, Loans to Commercial Banks in India, Non-Lending Services	3	CO5
[18]	Financing Imports- Trade regulations, Exchange control regulations, opening a Letter of credit, Payment of Import bills, Import Trust Receipt	2	CO5

C. TEXT BOOKS

1. Eun & Resnick, "*International Financial Management*", Tata McGraw Hill, Latest edition

D. REFERENCE BOOKS

1. C. Jeevanandam, "*Foreign Exchange & Risk Management*", Sultan Chand, Latest edition
2. Shapiro, "*Multinational Financial Management*", Tata McGraw Hill, Latest edition
3. P.G. Apte, "*International Financial Management*", Tata McGraw Hill, Latest edition

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Evaluate	Describe the integration of international financial markets and analyse implications for financial managers
CO2	Synthesis	Forecast exchange rates by evaluating operations of foreign exchange rate markets and international parity relationships.
CO3	Application	Identify and hedge the risks and exposures by applying different tools of derivatives in the international financial markets.
CO4	Comprehension	Describe and analyse differences across international equity and debt markets

CO5	Analysis	Identify the documentation, processes and instruments used in the financing of international trade.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	.
CO1	3	2	2	3	2	2	2	3	3	3	3	2	3	3	3	2	
CO2	2	3	3	2	2	2	3	3	3	2	2	2	2	3	2	3	
CO3	3	3	3	3	2	2	3	2	2	2	2	2	3	2	3	3	
CO4	2	2	1	2	2	2	2	3	3	2	3	2	3	2	2	2	
CO5	2	1	2	1	3	3	2	1	1	2	1	3	1	1	2	1	
..																	
Avg	2.4	2.2	2.2	2.2	2.2	2.2	2.4	2.4	2.4	2.2	2.2	2.2	2.4	2.2	2.4	2.2	

MBA. SEMESTER – IV
SUBJECT: STRATEGIC FINANCIAL MANAGEMENT

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4.5	0	0	4.5	4	50%	20%	30%	-	100%

A. COURSE OVERVIEW

- To develop the perspective of financial policy as a subset of corporate strategy & to have insight on financial decision situation.
- Identify and evaluate appropriate sources of finance, their risks and costs.
- Assess potential investment decisions and strategies.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	**Present Values, The Objectives Of The Firm And Corporation Governance** • Introduction To Present Value • Foundation Of The Net Present Value • Corporate Goals And Corporate Governance	2	CO1
[2]	**How to Calculate Present Values** • Valuing Long Lives Assets • Compound Interest And Present Value • Nominal and Real Rate Of Interest	2	CO1
[3]	**Why Net Present Value Leads To Better Investment Decision Than Other Criteria** • A Review of Basics • Payback • Internal Rate Of Return	2	CO1 CO2
[4]	**Making Investment Decision With The Net Present Value Rule** • What To Discount • Equivalent Annual Costs	2	CO1 CO2
[5]	**Introduction To Risk, Return And The Opportunity Cost Of Capital** • Capital Market History • Measuring Portfolio Risk • Calculating Portfolio Risk • Diversification And Value Additivity	4	CO1 CO2 CO3
[6]	**Risk And Return** • The Relationship Between Risk And Returns • Validity And Role Of The CAPM	4	CO3
[7]	**Capital Budgeting And Risk** • Company And Project Costs Of Capital • Measuring Cost Of Capital • Discount Rate Of International Projects	4	CO1 CO2 CO3
[8]	**A Project Is Not A Black Box** • Sensitivity Analysis • Monte Carlo Simulation • Real Option And Decision Trees	2	CO2 CO4
[9]	**Financing And Valuation** • The After Tax WACC	2	CO1 CO2

	• Valuing Business • Adjusted Present Value		
[10]	**Understanding Options** • Calls, Puts And Shares • What Determine Option Values?	**2**	CO4
[11]	**How Corporation Issue Securities** • Venture Capital • The Initial Public Offerings • Securities Sales By Public Companies	**2**	CO1
[12]	**Pay-out Policy** • The Choice Of Payout Policy • Dividend Payments And Stock Repurchase • How Do Companies Decide On The Payout	**4**	CO2
[13]	**Real Option** • The Value Of Follow On Investment Opportunities • The Timing Option • Flexible Production	**1**	CO4
[14]	**Valuing Option** • A Simple Option-Valuation Model • The Binomial Model • The Black-Scholes Formula	**4**	CO4
[15]	**Leasing And Hire Purchase** • What Is Leasing? • Why Lease? • Operating Lease • Hire-Purchase Arrangement	**2**	CO5
[16]	**Financial Management Of Sick Units** • Definition Of Sickness • Causes Of Sickness • Symptoms Of Sickness • Prediction Of Sickness • Debt Restructuring	**2**	CO5
[17]	**Working Capital Management: Extension** • Cash Budget Simulation • Advance In Inventory Management • Working Capital Leverage	**5**	CO5
[18]	**Value Based Management** • Methods And Key Premises Of VBM • Alcar Approach • EVA Approach • BCG Approach	**4**	CO5

C. TEXT BOOKS

- Myers, B. &. (n.d.). *Principles of Corporate Finance* (Latest Edition ed.). The McGraw Hill.
- Chandra, P. (n.d.). *Financial Management, Theory and Practice* (Latest Edition ed.). The McGraw Hill

D. REFERENCE BOOKS

- D.Balbirer, A. C. (n.d.). *Modern Corporate Finance* (Latest Edition ed.). Pearson Education.
- Lasher, W. R. (n.d.). *Practical FInancial Management* (Latest Edition ed.). Thomos House Western Publication

- Pandey, I. M. (n.d.). *Financial Management* (Latest Edition ed.). Vikas Publication.
- Patel, C. D. (n.d.). *A Guide to corporate Finance* (Latest Edition ed.). Bharat Law Publication.
- Patel, C. D. (n.d.). *Financial Derivatives - A Theory, Concepts and Problems* (Latest Edition ed.). Bharat Law Publication.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Evaluate	Estimating Cost of capital and examine the impact of capital budgeting decisions on a company's value
CO2	Synthesis	Business valuation of corporations with an alignment of various financial decisions especially dividend and retention policy.
CO3	Application	Explain the relationship between the risks and returns Capital emphasizing on Market History, Measuring Portfolio Risk, Diversification And value additivity including validity and role Of The CAPM.
CO4	Comprehension	Financing and valuation of options based on the Binomial Model and The Black-Scholes models including real options.
CO5	Analysis	Managing of working capital with practical implications and appraising value based management based on EVA, MVA, BCG Approach and Alcar Approach along with Leasing And Hire Purchase and managing sick units.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	.
CO1	3	3	2	2	2	2	3	2	2	3	2	1	3	2	3	2	
CO2	2	2	3	2	3	2	2	2	3	3	3	2	2	2	3	3	
CO3	3	3	3	3	2	3	3	3	2	2	2	3	3	3	2	2	
CO4	3	3	2	2	2	2	3	2	2	3	2	3	3	2	3	2	
CO5	3	3	3	2	2	2	3	2	2	3	2	2	3	2	3	2	
..																	
Avg	2.8	2.8	2.6	2.2	2.2	2.2	2.8	2.2	2.2	2.8	2.2	2.2	2.8	2.2	2.8	2.2	

SUBJECT : Communication Skills

Teaching Scheme (Hours/Week)				Credits	Examination Scheme			
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac
-	-	2	2	1	-	-	-	25

A. COURSE OVERVIEW

The course is intended to familiarize students with the basics of English language and help them to learn to identify language structures for correct English usage. To enable the students to adopt strategies for effective reading and writing skills. It helps students to carry out day to day communication at the work place by adequate understanding of various types of communication to facilitate efficient interpersonal communication.

B. COURSE CONTENT

NO	TOPIC	Practical	COs
[1]	Concord, Tenses, Impersonal Passive Voice, Conditional Sentences, Conjunctions and Prepositions, Idioms.	4	CO1
[2]	Nature and Scope, Communication Networks, Supervisor and Em-ployee Communication, Organizational Structure, Lack of Trust, Un- ethical Communication. Non-verbal Communication: Significance and Forms, Elements of Non-verbal Communication. Cross-cultural Communication: Concept, Different Communication Styles and Strategies. Technology-enabled Business Communication: Tools, Impact, Effec- tiveness. Case Study.	6	CO2 CO3
[3]	Business Messages: Importance, Types, Approaches, Stages. Business Letter Writing: Principles and Components, Kinds of Busi-ness Letters Instructions: Written Instructions, Format, Audience Analysis, Char- acteristics Business Reports: Kinds, Characteristics, Parts, Elements, Steps Proposals: Types, Components, Format, Proposal Layout and Design Resume: Format, Types, Video Resumes, Send Resumes, Online Re- cruitment: Process and Techniques.	8	CO3 CO5
[4]	Interviews: Principles, General Preparations, Follow up, Questions Group Discussion: Planning and Preparation, Steps.	6	CO4 CO5

C. TEXT BOOKS

1. Meenakshi Raman and Prakash Singh, *Business Communication;* Oxford University Press
2. Meenakshi Raman and Sangeeta Sharma, *Technical Communication;* Oxford University Press

D. REFERENCE BOOKS

1. Sangeeta Sharma & Vinod Mishra , *Communication Skills for Engineers and Scientists*; PHI
2. William Sanborn Pfeiffer and T. V. S. Padmaja, *Technical Communication*; Pearson

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Apply	Effective use of tenses and Conditional Sentences for academic writing
CO2	Analyze	Identify Various Means of Professional Communication
CO3	Apply	Practice Effective Business Writing and Correspondence
CO4	Apply	Exercise Interviews and Group Discussion Practices
CO5	Apply	Understanding Professional Environment and Being Competent

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
CO1	2	2	2	2	3	2	-	-	1	3	-	-	2
CO2	2	2	2	2	3	2	-	-	3	3	2	-	2
CO3	2	2	2	3	2	2	-	-	2	3	2	-	2
CO4	2	2	2	2	2	2	-	-	3	3	2	-	2
CO5	2	2	2	1	1	2	-	-	3	3	2	-	2
Avg	2	2	2	2	2.2	2	-	-	2.4	3	2	-	2

SUBJECT : SOFTWARE ENGINEERING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	-	2	6	5	60	40	25	25	150

A. COURSE OVERVIEW

This course describes software engineering approaches and principles. It imparts the knowledge of various software process models as well as phases of software development. The course includes agile development and testing approach used for software development. It gives understanding of various quality measures of software and development process .

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Software and Role of Software, Types (nature) of Software, Software Engineering-A Layered Technology, Software Process, Software Myths, Software Engineering Practices.	3	CO1
[2]	Process Models – A Generic Process Model, Process Assessment and Improvement, Overview of Prescriptive Process Models: Waterfall, Incremental, Evolutionary, Concurrent, Overview of Specialized Process Models: Component-Based, Formal Methods, Aspect-Oriented Software Development, Unified Process, Personal and Team Process Models.	8	CO1 CO2
[3]	Requirements Engineering, Establishing the Ground Work, Eliciting Requirements, Developing Use Cases, Building the Requirement Model, Negotiating Requirements, Validating Requirements.	5	CO1 CO3
[4]	Requirements Analysis: Domain Analysis, Analysis Rules of Thumb, Requirements Modelling Approaches: Scenario Based, Information Based, Flow Oriented Strategies.	5	CO1 CO3
[5]	Abstraction, Architecture, Aspects, Cohesion, Coupling, Data Design, Design Process, Functional Independence, Good Design, Information Hiding.	5	CO1 CO4
[6]	Software Architecture, Importance of Architecture, Architectural Descriptions and Decisions, Architectural Mapping Using Data Flow.	4	CO4
[7]	User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Web App Interface Design.	4	CO4
[8]	Agility and Cost of Change, Agile Process, Extreme Programming, Introduction to Agile Process Models: Adaptive Software Development, Dynamic Systems Development Method, Scrum, Crystal, Feature Driven Development, Lean Software Development, Agile Modeling, Agile Unified Process, Advantages and Disadvantages of Agile.	8	CO5
[9]	Agile Requirements Abstraction Model, Requirements Management in Agile Environment, Agile Requirements Prioritization, Agile Requirements Modeling and Generation, Collaborative User Story Creation.	7	CO5
[10]	Agile Testing – Principles, Methods & Advantages, Agile Testing Quadrants: the Purpose of Testing, Technology- Facing Tests that Supports the Team, Overview of Agile Testing Methods: Test Driven, Ac-	8	CO5

	ceptance Test Driven, and Behaviour Driven Development.		
[11]	Verification and Validation, Software Quality Assurance, Software Quality, Capability Maturity Model (SEI-CMM), International Standard Organization (ISO), Comparison of ISO-9000 Certification, SEI-CMM, Reliability Issues, Reliability Metrics.	3	CO6

C. TEXT BOOKS

1. Robert C. Martin, *Agile Software Development, Principles, Patterns and Practices* ; Prentice Hall
2. Lisa and Janet, *Agile Testing – A Practical Guide For Testers And Agile Teams*
3. Roger Pressman, *Software Engineering A practitioner's Approach*; 6th ed.; Mcgraw-Hill International Edition

D. REFERENCE BOOKS

1. Jim Highsmith, *Agile Software Development Ecosystems*; Addison Wesley
2. Rajib Mall, *Fundamentals of Software Engineering;* 3rd ed.; PHI
3. Ian Sommerville, *Software Engineering*; 5th ed.; Addision Wesley

E. COURSE OUTCOMES

CO1	Understand	Describe the importance of software engineering approaches, principles, models and processes.
CO2	Analyse	Identify an appropriate process model for effective planning for the given system.
CO3	Analyse	Perform requirements engineering for the given system.
CO4	Apply	Prepare robust software design for given system requirements individually and in team.
CO5	Apply	Demonstrate Agile software development and testing.
CO6	Understand	Understand significance of software reliability and quality measures for lifelong software practices

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
CO1	2	1	-	-	-	-	3	1	-	-	-	-	-
CO2	2	2	3	3	-	-	3	3	3	-	3	-	-
CO3	3	3	3	3	-	-	3	3	3	-	3	-	-
CO4	2	3	3	3	-	-	-	2	3	-	3	-	-
CO5	3	2	2	2	-	-	2	2	3	-	3	-	-
CO6	-	1	1	1	-	-	2	1	-	-	-	-	-
Avg	2	2	2	2	-	-	2.1	2	2	-	2	-	-

MCA SEMESTER – II
SUBJECT : SEMINAR PRESENTATION

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
-	-	2	2	1	-	-	-	25	25

A. COURSE OVERVIEW

The course aims to develop learners' communication, presentation and report writing skills lifelong. It enables the learner strengthen and practice discussion abilities, develop Internet research skills, increase vocabulary, improve reading and listening comprehension & build confidence for oral communicative purposes.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand	Independently explore and identify a suitable technological topic.
CO2	Understand	Find relevant literature for a given technological topic individually and in a team.
CO3	Analyse	Perform detailed literature review on the identified topic to pursue lifelong learning.
CO4	Evaluate	Summarise reviewed literature.
CO5	Create	Prepare a detailed informative report individually and in a team based on the reviewed literature.
CO6	Create	Prepare an effective presentation.
CO7	Apply	Deliver presentations to individuals and groups to practice lifelong in a professional environment.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
CO1	3	2	-	-	2	2	3	-	1	2	2	-	2
CO2	3	2	-	-	2	2	3	-	2	2	2	-	2
CO3	2	3	-	-	2	2	2	-	2	2	2	-	2
CO4	1	2	-	-	2	2	2	-	2	2	2	-	2
CO5	2	2	-	-	2	2	2	-	2	2	2	-	2
CO6	2	2	-	-	2	2	3	-	2	2	2	-	2
CO7	1	1	-	-	2	2	3	-	3	2	2	-	2
Avg	2	2	-	-	2	2	2.57	-	2	2	2	-	2

C. TEXT BOOKS

SUBJECT : SOFTWARE DESIGN AND TESTING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	-	-	4	4	60	40	25	-	125

A. COURSE OVERVIEW

This course provides a way of thinking about real world information system design problems and their solutions using various UML models. It covers various phases of software testing life cycle. The course will enable the learners to use various testing techniques and automated testing tools. It also introduces testing of web-based and object-oriented systems.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	The Importance of Modeling. Object-Oriented Modeling and Principles, An Overview and Conceptual Model of UML	6	CO1
[2]	Classes, Relationships and Other Common Mechanisms, Types of Diagrams, Class Diagrams, Interfaces: Types and Roles, Object Diagrams	9	CO1 CO2
[3]	Interactions, Use-cases, Use-Case Diagrams, Interaction Diagrams, Activity Diagrams, State-chart Diagrams.	9	CO2
[4]	Patterns and Frameworks, Component Diagrams, Deployment Diagrams, A Detailed Case Study on System Analysis and Design using Unified Approach.	6	CO2
[5]	Introduction and Evolution of s/w Testing, Definition and Goals of Testing, Effective and Exhaustive Testing, Software Testing Life Cycle (STLC), Testing Terminology and Methodology.	3	CO3
[6]	Verification, Verification of Requirements, High-level and Low-Level Design, How to Verify Code? Validation, Validation Activities: Unit Testing, Integration Testing, Function Testing, System Testing, Acceptance Testing, Overview of Regression Testing	6	CO3
[7]	Static Testing: Inspection, Structured Walkthroughs, Technical Reviews Dynamic Testing Black-Box Testing: Boundary Value Analysis, Equivalence-Class Testing, White-box Testing: Need of White-box Testing, Basis Path Testing, Graph and Loop Testing, Data Flow Testing.	8	CO3
[8]	Test Organization, Structure of Testing Group, Test Planning, Detailed Test Design and Test	3	CO4
[9]	Need for Automation, Categorization of Testing Tools, Selection of Testing Tools, Cost Incurred in Testing Tools, Guidelines for Automated Testing, Overview of some Commercial Testing Tools.	4	CO3
[10]	Object-Oriented Testing (OOT) Basics, Comparison: Conventional testing and OOT, Issues in OOT, Issues in testing Inheritance, Various OO Testing Techniques.	3	CO5
[11]	Overview of Web-Based Systems, Web Technology Evolution And Comparison with Traditional Software, Challenges in Testing Web-Based Systems, Web Engineering, Testing Web-Based Systems.	3	CO5

1. Grady Booch, James Rumbaugh, and Ivar Jacobson. *The Unified Modeling Language User Guide;* Low Price Edition, Pearson Education
2. Naresh Chauhan. *Software Testing Principles and Practices;* Oxford Publication

D. REFERENCE BOOKS

1. Joseph Schumuller. *Teach yourself UML in 24 Hours; 3rd ed.;* Sams Publication.
2. Rax Black, Eric Van Veenendaal and Dorothy Greham. *Foundations of Software Testing ISTQB Certification*; Cengage Learning.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand	Describe Object Oriented Methodology and Unified Modeling Language for software design and development
CO2	Apply	Prepare overall design using various UML models and diagrams.
CO3	Apply	Understand software testing life cycle and efficiently use modern testing techniques and tools to test software.
CO4	Evaluate	Write and execute test plan, test case and test specification
CO5	Understand	Discuss object-oriented and web-based testing techniques.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
CO1	2	-	1	1	-	1	1	2	1	-	-	-	-
CO2	3	3	3	3	-	3	3	2	3	-	-	-	-
CO3	2	3	3	2	-	3	2	2	2	-	-	-	-
CO4	3	3	3	3	-	3	3	2	3	-	-	-	-
CO5	1	1	-	1	-	1	1	2	1	-	-	-	-
Avg	2.2	2	2	2	-	2	2	2	2	-	-	-	-

C. TEXT BOOKS

SUBJECT : WEB DEVELOPMENT WITH PHP

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	-	2	6	5	60	40	25	25	150

A. COURSE OVERVIEW

This course provides the knowledge necessary to design and develop dynamic, object oriented, database-driven and MVC based web applications using PHP. It will enable learners to work with the server environment and database interaction using MySQL. The course also makes learners familiar with popular PHP development frameworks.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	A Brief Introduction to Apache, Mysql, PHP and Open Source, Configuring Apache, Mysql and PHP, PHP Structure and Syntax, Creating PHP Program, PHP Using HTML	9	CO1
[2]	PHP Files, Variables, Data Types, Strings, Arrays, Operators PHP in Web Applications: Getting Information from the User, Working with HTML Forms, Persisting Data with Cookies, Conditionals, Switch… Case, Loops, Function Declaration, Function Arguments, Return Statement, Type Hinting and Return Types, Reading and Writing Files, File System Functions.	14	CO1 CO2
[3]	Classes and Objects, Properties, Methods, Constructors, Magic Methods, Properties and Methods Visibility, Encapsulation, Namespaces, Autoloading Classes, Inheritance, Overriding Methods, Abstract Classes, Interfaces, Polymorphism, Traits, Handling Exceptions, Anonymous Functions.	10	CO3
[4]	Connecting to the Database using PHP Data Objects, Performing Queries, Prepared Statements MVC: The MVC Pattern, using Composer, Managing Dependencies, Autoloader with PSR-4, Adding Metadata, Working with Requests, The Request Object, Filtering Parameters from Requests, Mapping Routes to Controllers, The Router, Model, View, Controller, Implementation of MVC Application, Dependency Injection.	14	CO4
[5]	The Purpose of Frameworks, The Main Parts of a Framework, Other Features of Frameworks, Authentication and Roles, ORM, Complete and Robust Frameworks, Lightweight and Flexible Frameworks Popular Frameworks: Symfony 2, Zend Framework 2 Laravel Framework: Composer, Laravel Homestead, Virtual Box, and Vagrant, File Structure, Routing, A Static Method, Controller Class, View and Blade, Environment, Database Migration, Eloquent Model Class, Model, View, Controller Workflow, HTML Form Builder, A CRUD Application, Conditional Rules, Custom Validation, Form Validation.	13	CO5

1. Elizabeth Naramore, Jason Gerner, Yann Le Scouarnec, Jeremy Stolz and Michael K. Glass. *Beginning PHP6, Apache, and MySQL Web Development;* Wrox,
2. Antonio Lopez. *Learning PHP 7;* 2016 Packt Publishing
3. Sanjib Sinha. *Beginning Laravel;* Apress

D. REFERENCE BOOKS

1. Atkinson Leon. Suraski Zeev. *Core PHP Programming*; Pearson Publication
2. Robin Nixon. *Learning PHP, MySQL & JavaScript; 4th ed.;* O'Reilly Publication.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand	Explain the basics of open-source software and the building blocks of PHP
CO2	Apply	Experiment handling of HTML forms, files and cookies in PHP
CO3	Apply	Demonstrate robust object-oriented programs with PHP
CO4	Create	Develop MVC based and database centric web applications using PHP and MySQL
CO5	Apply	Summarize different PHP frameworks and develop basic CRUD applications using Laravel framework

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
CO1	2	1	1	1	-	-	1	-	1	-	-	-	2
CO2	2	3	2	3	2	-	2	-	2	-	2	-	2
CO3	2	1	3	2	2	-	2	-	2	-	2	-	2
CO4	3	3	3	3	3	-	3	-	3	-	3	-	2
CO5	2	2	2	1	3	-	2	-	2	-	3	-	2
Avg	2.2	2	2.2	2	2	-	2	-	2	-	2	-	2

C. TEXT BOOKS

SUBJECT: Mobile Application Development

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	-	2	6	5	60	40	25	25	150

A. COURSE OVERVIEW

This course is intended to make learners capable of developing applications for mobile devices. It will enable learners to develop data centric applications on android platform. The course also covers hybrid mobile application development.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	The Evolution of Mobile Application Development, Different Ecosystems: Apple, Google, Microsoft, Problems with Ecosystem-Based Applications, Web Sites and Web Views for Mobile Devices, Adding Javascript, Hybrid Mobile Applications, Front-End and Back-End Development, Introduction to Testing Mobile Applications, Native Vs. Hybrid Mobile Applications.	4	CO1
[2]	An Android Platform, Android SDK Features, Which Devices Android Runs on, Why Android For Mobile Development, Comparison of Android with other Platform, Android Development Framework, Understanding Android Software Stack, Android Application Architecture Installing and Updating Android SDK, Android Development Tools: AVD Manager, Android SDK Manager, Emulator, Dalvik Debug Monitor Service, Debug Bridge, Hierarchy View and Lint Tool, Monkey and Monkey Runner.	3	CO1
[3]	Building Blocks of Android Application, The Application Manifest File, Manifest Editor,Creating Resources, Using Resources, Android Application Lifecycle, Application's Priority and Its Process States, Extending and Using Android Application Class, Overriding the Application Lifecycle Events Android Activities: Creating Activities, Activity Lifecycle, Activity Stacks, Activity States, Monitoring State Changes, Understanding Activity Lifetimes, Android Activity Classes Introduction to an Intent, Starting Activities, Sub Activities and Services using Implicit and Explicit Intents.	4	CO1 CO2
[4]	Fundamental Android UI Design, Assigning UI To Activities, Layout Classes, Defining Layouts, Linear Layout, Relative Layout, Grid Layout, Optimizing Layouts Fragments, Creating New Fragment, Fragment LifeCycle, Fragment Manager, Fragment Specific LifeCycle Events, Fragment States, Adding Fragments to Activities, Using Fragment Transaction, Interfacing Between Fragments and Activities, Fragment Without User Interfaces, Android Fragment Classes.	7	CO2
[5]	Toolbox Controls, Creating and Modifying Views, Creating Compound Controls, Custom Views, Handling User Interaction Events, Custom Controls, Customizing Array Adapter and Simple Cursor Adapter.	10	CO2
[6]	Introduction to Sqlite Database, Content Values and Cursors, Working with Sqlite Databases: Opening and Creating Database without	8	CO4

	Sqlite Open Helper, Querying Database, Extracting Values from a Cursor, Adding, Updating and Removing Rows, Content Provider's URI Address, Content Provider Transaction, Adding, Deleting and Updating Content, Storing and Accessing Files from a Content Provider, Introduction to Native Android Content Providers.		
[7]	Broadcasting Events with Intents, Introduction to Intent Filters and Broadcast Receiver Saving Simple Application Data: Shared Preferences, Saved Application UI State, Files Creating, Saving and Retrieving Shared Preferences, Persisting the Application Instance State, Working with the File System	4	CO2
[8]	Introduction to Location Based Services, Emulator with Location Based Services, selecting a Location Provider, Finding your Current Location Hardware Support Phone States, Monitoring Changes in Phone State using the Phone Listener, Using Intent Receiver to Monitor Incoming Calls SMS and MMS, Sending SMS at for Telephony, Initiating Phone Calls, Replacing Native Dialer, Accessing Telephony Properties and MMS Using Intents, Sending SMS Using SMS Manager, Listening For Incoming SMS.	5	CO2
[9]	iOS Layer, Windows Phone Layer, Browser-Based Applications and Browser Runtime, How Hybrid Application Works Basics of HTML 5 and Useful APIS : Integrated and Associated APIS Data Formats: Using XML, JSON, JQuery Basics, JQuery Selectors, Server-Side Support SOA Architecture: Web Services, WCF Services, Rest Based Services, CSS, Bootstrap, Skeleton HMAD Development and Packaging Frameworks, Testing Mobile Applications.	5	CO3
[10]	HTML with JQuery, Event Handling in JQuery, Live Event Binding in JQuery Using On function, JQuery Plug-in-based Approach to Generating a UI, Miscellaneous Libraries and Plugins, Responsive UI, Frequently Used Style Classes.	4	CO3
[11]	Saving A File to Device Storage, Opening a Local File from Device Storage, Displaying the Contents of a Directory, Creating a Local Sqlite Database, Uploading a File to a Remote Server Via a Post Request, Caching Content using the Web Storage Local Storage API	6	CO4

C. TEXT BOOKS

1. Reto Meier. *Professional Android 4 Application Development;* Wrox (Willey) Publication
2. Mahesh Panhale. *Beginning Hybrid Mobile Application Development*; Apress
3. Matt Gifford. *PhoneGap Mobile Application Development Cookbook;* PACKT.

D. REFERENCE BOOKS

1. Lauren Dercey & Shane Conder. *Android Wireless Application Development Vol-I Android Essential; 3rd ed.;* Pearson
2. W.Frank Ableson, Robi Sen, Chris King, C. Enrique Ortiz. *Android in action; 3rd ed.;*, Dreamtech Press.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand	Describe mobile application environment, android development framework and android application structure.
CO2	Apply	Develop native mobile applications using android
CO3	Apply	Develop hybrid mobile applications using opensource platform
CO4	Apply	Design and develop dynamic mobile applications with sqlite database

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
CO1	3	1	-	-	-	-	2	-	1	-	-	-	-
CO2	3	3	3	3	3	-	2	-	2	-	3	-	-
CO3	2	2	2	2	3	-	2	-	2	-	2	-	-
CO4	3	3	3	3	3	-	2	-	3	-	3	-	-
Avg	2.75	2.2	2	2	2.25	-	2	-	2	-	2	-	-

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	-	2	6	5	60	40	25	25	150

A. COURSE OVERVIEW

This course makes learners understand virtualization concepts and ecosystem of cloud computing. The course covers key services of public cloud for deploying applications on the cloud platform. It includes containerization and DevOps concepts. Enables Learners set up applications in container as well as DevOps environment. The course contains fundamentals of openstack platform.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Defining Cloud Computing, Cloud Types, Characteristics of Cloud Computing, The Role of Open Standards, Benefits of Cloud Computing, Cloud Architecture, Cloud Computing Service Models (IaaS, SaaS, PaaS, IDaaS, CaaS).	9	CO1
[2]	Introduction to Virtualization Technologies, Advanced Load Balancing on Google Cloud, Understanding Hypervisors, Virtual Machine Types, Oracle VirtualBox, KVM.	5	CO3
[3]	Using Amazon Web Services, Understanding Amazon Web Services (AWS), AWS Components and Services, Working with Elastic Compute Cloud (EC2), Working with Amazon Storage Systems: Amazon Simple Storage Systems (S3), Amazon Elastic Block Storage (EBS), Understanding Amazon Database Services: Different Database Services of AWS, Amazon Relational Database Service (RDS), Steps for Creating RDS and Connect with EC2 Application Using Microsoft Cloud Services: Microsoft Cloud Services, Windows Azure Platform, Azure Service, Azure Content Delivery Network, Azure Virtual Machine, SQL Azure, Windows Live Services.	16	CO2
[4]	Introduction to Docker Container, Advantage of Container over Virtual Machine, Work with Docker Image and Container, Work with Data Docker, Publish Docker Image on Public Repository,Container Orchestration Docker Swarm: Docker Swarm Architecture, Steps for Creating Docker Swarm Kubernetes: Introduction to Kubernetes, Kubernetes Architecture Docker and DevOps: Continuous Integration, Continuous Delivery, Need for CI/CD, Running Jenkins Master within Docker Container,Setup Build Job,Test Job with Jenkins Master.	16	CO3
[5]	Introduction to OpenStack and its Components, Keystone - OpenStack Identity Service, Nova- OpenStack Compute, Swift- OpenStack Object Storage.	8	CO4
[6]	Security in Cloud: Securing the cloud, Securing Data, Establishing identity and Presence, Docker and Security.	6	CO5

C. TEXT BOOKS

1. Barrie Sosinsky, *Cloud Computing Bible;* Wiley Publishing Inc.
2. Kevin Jackson, Cody Bunch, Egle Sigler, *OpenStack Cloud Computing Cookbook;* 3rd ed.; Packt Publishing
3. Ian Miell, Aidan Hobson Sayers, *Docker in Practice;* 2nd ed.; Manning

D. REFERENCE BOOKS

1. https://docs.aws.amazon.com
2. https://docs.microsoft.com/en-us/azure/
3. https://docs.openstack.org
4. https://help.ubuntu.com/community/KVM
5. Thomas Erl, Zaigham Mahmood, and Ricardo Puttini, *Cloud Computing Concepts Technology and Architecture ;* Prentice Hall
6. Anthony Velte, Tony Velte, Robert Elsenpeter, *Cloud Computing A Practical Approach;* McGrawHill
7. Nigel Poulton, *Docker Deep Dives;* 4th ed.;

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand	Describe cloud computing ecosystem
CO2	Apply	Develop and deploy cloud based applications on public clouds
CO3	Apply	Work with virtualization and containerization
CO4	Understand	Describe openstack fundamentals
CO5	Understand	Understand importance of security measures on cloud environment

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
CO1	3	2	1	1	-	1	2	-	2	-	-	-	-
CO2	3	3	3	3	3	3	3	-	3	-	-	-	-
CO3	3	3	3	3	3	3	3	-	3	-	-	-	-
CO4	3	-	1	2	2	1	2	-	1	-	-	-	-
CO5	3	2	2	1	2	2	2	-	1	-	-	-	-
Avg	3	2	2	2	2	2	2.4	-	2	-	-	-	-

SUBJECT : APPLIED MACHINE LEARNING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	-	2	6	5	60	40	25	25	150

A. COURSE OVERVIEW

This course will introduce the field of Machine Learning, in particular focusing on the core concepts of supervised and unsupervised learning. It familiarizes the learners with the techniques on learning by a model, its evaluation and implementation of basic algorithms to construct a learning model using Python libraries. The course covers fundamentals of neural networks and regression.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	Cos
[1]	Python: Introduction to Python, Basic Loop Structure of Python, Use of Pandas, NumPy, Sklearn, Matplotlib, Scipy, Scikit-learn library Data Preprocessing: Introduction to Outlier, Missing Data, Types of Data, NULL Values, Handle Categorical Data, Display Data Graphically.	9	CO1 CO6
[2]	Introduction to machine learning, Key Terminology, Types of Machine Learning, Key Tasks, Right Algorithm, Steps for Developing a Machine Learning Application, Python for Machine Learning.	5	CO1
[3]	Classification Naïve Bayes Method: Introduction to Bayesian Decision Theory, Naive Bayes Classification, Estimating Accuracy Decision Tree: Introduction, Building and Splitting Decision Tree, Decision Forest Introduction Logistic Regression: Logistic Regression Introduction, Sigmoid Function, Classification with Logistic Regression, Find Best Regression Coefficient K-Nearest Neighbor: Introduction, Distance Measurement, Classification with K-Nearest-Neighbor, Case Study.	14	CO2
[4]	Linear Regression: Introduction, Finding Best Fitting Line using Least - Square Method, Solving Regression with Gradient Decent Decision Tree Regression: Building tree with continuous and Discrete Features, Using CART for Regression Case Study.	7	CO3
[5]	Clustering Introduction to Cluster Analysis, K-Mean Clustering: Steps for K-Mean Clustering, Generates Clusters, Hierarchical Clustering: Introduction, Distance Measurement between Clusters, Agglomerative Method for Creating Clusters, Locating Regions of High Density using DBSCAN Association Rule Mining: Introduction, Terminology, Working of Apriori Algorithm, Working of Eclat Algorithm Case Study.	12	CO4
[6]	Introduction to Perceptron, Single-layer Neural Network, Introduction to Multilayer Neural Network Architecture, Activating Neural Network using Forward Propagation, Introduction to Back Propagation, Train Neural Network via Back Propagation.	8	CO5

[7]	Introduction to Principal Component Analysis, steps for PCA Algorithm, Features Transformation, PCA using Python.	5	CO5

C. TEXT BOOKS

1. Sebastian Raschka, *Python Machine Learning ;* Packt Publication
2. GK Gupta, *Introduction to Data Mining with Case Study*
3. Peter Harrington, *Machine Learning in Action;* Dreamtech Press

D. REFERENCE BOOKS

1. Stephen Marsland, *Machine Learning Algorithmic Perspective*
2. Shai Shalev-Sharwtzs, Shai Ben-David, *Understanding Machine Learning from Theory to Algorithm ;* Cambridge University Press
3. Tom M Mitchell, *Machine Learning;* McGraw Hill
4. I H Witten, Eibe Frank, Mark A Hall, *Data Mining: A Practical Machine Learning Tools and techniques;* 3rd ed.; Elsevier

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand	Describe the basic machine learning concept and perform data preprocessing operations
CO2	Understand	Distinguish between Supervised and Unsupervised learning techniques
CO3	Apply	Apply classification and regression techniques
CO4	Apply	Apply clustering and association rules techniques
CO5	Understand	Understand dimensionality reduction using principal component analysis and Neural Network fundamentals.
CO6	Evaluate	Demonstrate Python libraries for machine learning and implement basic machine learning algorithms using Python.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
CO1	2	1	-	-	2	-	2	-	2	3	2	-	2
CO2	2	2	3	3	-	-	2	-	2	3	2	-	2
CO3	2	3	3	3	3	-	3	-	3	2	3	-	2
CO4	3	3	3	3	3	-	3	-	2	2	2	-	2
CO5	2	2	1	-	1	-	-	-	-	1	-	-	2
CO6	3	1	3	3	3	-	2	-	3	1	3	-	2
Avg	2.33	2	2.16	2	2	-	2	-	2	2	2	-	2

SUBJECT : BIG DATA ANALYTICS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	-	2	6	5	60	40	25	25	150

A. COURSE OVERVIEW

This course gives an overview of technologies used for Big Data storage, retrieval and its processing. It covers working with Apache Hadoop, Map Reduce, programming tools PIG & HIVE in Hadoop ecosystem.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	Cos
[1]	Big Data and Its Importance, Big Data Characteristics, Types of Big Data, Differentiate: Traditional and Big Data Approach, Traditional Data Warehouse Approach, Big Data Approach, Advantages of Big Data Analytics, Big Data Applications, Overview of Data Analytics Life Cycle.	5	CO1
[2]	Introduction to Hadoop, Core Hadoop Components: HDFS, Hadoop Common Package, MapReduce, YARN, Overview of Hadoop Ecosystem: Hbase, Hive, HCatalog, Pig, Sqoop, Oozie, Mahout, ZooKeeper, Physical Architecture, Comparing SQL Data Bases and Hadoop, Hadoop Limitations.	7	CO2
[3]	Distributed File Systems, Physical Organization of Compute Nodes, Large Scale File-System Organization, Grouping by Key, Coping with Node Failures Anatomy of Map Reduce Program: Hadoop Data Types, Mapper, Reducer, Partitioner- Redirecting Output from Mapper, Combiner - Local Reduce, Word Counting Example with Predefined Mapper and Reducer Class Map Reduce Patterns: Count, Min, Max, Average, Top N, Filter, Distinct, Sorting, Joins Algorithms Using Map Reduce:Matrix Multiplication, Relational Operators (Selection, Projection, Union, Intersection), Computing Natural Join, Grouping and Aggregation.	15	CO5
[4]	The Design of HDFS, HDFS Concepts: Blocks, Name Node, Data Node, Block Caching, Command Line Interface, Basic File System Operations, Hadoop File Systems, Interfaces, The Java Interface: Reading data, Writing Data, Directories, Querying the File System, Deleting Data, Data Flow: Anatomy of File Read, Anatomy of File Write, Coherency Model, Parallel Copying With distcp.	10	CO3 CO4
[5]	Apache Sqoop: Getting Sqoop, Sqoop Connectors, A Sample Import, Working With Imported Data, Imported Data and Hive, A Sample Export.	5	CO3 CO4
[6]	Pig: Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators.	6	CO3 CO4
[7]	Hive: Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined	7	CO3 CO4

	Functions.		
[8]	Hbase : HBasics, Concepts, Clients, Example, Differentiate: Hbase and RDBMS.	5	CO3

C. TEXT BOOKS

1. Arshdeep Bahga & Madisetti, *Big Data Science and Analytics - A Hands On Approach;*
2. Tom White,,*Hadoop: The Definitive Guide;* 4th ed.; O'Reilly Media
3. Chuck Lam , Manning, *Hadoop in Action*
4. Radha Shankarmani, M Vijayalakshmi , *Big Data Analytics;* 2nd ed.; Wiley

D. REFERENCE BOOKS

1. Venkat Ankam, *Big Data Analytics;* Packt Publishing Ltd.,
2. Seema Acharya, Subhashini Chhellappan, *Big Data and Analytics;* Wiley
3. Judith Hurwitz, Alan Nugent, Dr. Fern Halper, and Marcia Kaufman, *Big Data for Dummies*
4. EMC Education Services, *Data Science & Big Data Analytics Discovering, Analyzing, Visualizing and Presenting Data;* Wiley

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand	Understand the fundamentals of Big Data Analytics
CO2	Understand	Explain working of Hadoop ecosystem.
CO3	Understand	Differentiate various big data technologies like Hadoop, MapReduce, Sqoop, Pig, Hive, Hbase.
CO4	Apply	Develop Big Data solutions using Hadoop ecosystem
CO5	Apply	Apply Map Reduce programming model to access and process data on Distributed File System.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
CO1	2	1	2	2	-	-	2	-	2	-	1	-	3
CO2	2	1	2	2	1	-	2	-	2	-	1	-	3
CO3	2	2	-	2	3	-	2	-	2	-	2	-	2
CO4	2	3	3	2	3	-	2	-	2	-	3	-	1
CO5	2	3	3	2	3	-	2	-	2	-	3	-	1
Avg	2	2	2	2	2	-	2	-	2	-	2	-	2

SUBJECT : ADVANCED JAVA PROGRAMMING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	-	2	6	5	60	40	25	25	150

A. COURSE OVERVIEW

This course provides the knowledge necessary to understand J2EE architechture and develop dynamic web pages using java servlets and java server pages. It enables learners to develop data centric Web Application using Hibernate. Learners will understand how to develop RESTful web services using Java.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Introduction to J2EE Platform, Challenges and Requirements for Enterprise Application Development, Introduction to Enterprise Architecture Styles, J2EE Container Architectures, J2EE Server and Containers, J2EE Architecture, Introduction to Web Containers and microservices.	10	CO1 CO2
[2]	Introduction to Java Servlet, Servlet Lifecycle, Servlet Implementations, Servlet Configuration, Servlet Exceptions, Requests & Responses, Servlet Session Tracking, Servlet Context & Collaboration, Introduction to Events and Event Handling [Context Level Events and Session Level Events] Introduction to Filter: Filter and Filter Chain, Filter API, Deployment Descriptor for Filter, Sample Filter in Web Application.	14	CO1 CO2 CO3
[3]	Introduction, JSP Directives, Scripting Elements, Introduction to Java Beans, Standard JSP Actions, JSP Implicit Objects, Scopes, Expression Language, JSP Tag Extensions: Tag Handlers, Library Descriptors, using with JSP Page, Deploying and Packing, Integrating JSPTL into JSP Pages, Introduction to XML and XML Usage, Developing MVC Application Using Servlets, JSP and POJO Beans.	12	CO1 CO2 CO3
[4]	Define REST, Restful Architecture, Restful Clients, Accessing Restful Services, Restful Web Service Design, Introduction to JAX-RS and Jersey, Annotations, Web Service Architecture, Implementation with JAX-RS – Jersey, Securing Web Service, Performance	12	CO2 CO5
[5]	Understanding Persistence and Paradigm Mismatch, Introduction to Object-Relational Mapping, Java Hibernate, Hibernate Architecture, Hibernate Object Life Cycle, Hibernate Configuration File and Mapping Files, Working with Hibernate Objects, Session Operations, Hibernate Strategies, Mapping of Relations, Introduction to Fetching Strategies, Querying Using HQL.	12	CO2 CO3 CO4

C. TEXT BOOKS

1. Subrahmanyan Allamaraju, Cedric Buest, Daniel O'Connor Et Al. *Professional Java Server Programming J2EE 1.3 Edition;* Apress Publications.
2. Jose Sandoval, *Restful Java Web Services;* Packt Publication.
3. Christian Bauer, Gavin King, Manning, *Hibernate in Action*.

D. REFERENCE BOOKS

1. *Java Server Programming Java EE 7 (J2EE 1.7) Black Book;* Dreamtech Press
2. Daniel O'Connor, Gordon Van Huizen, Jason Diamond Et Al, *Professional Java Server Programming J2EE Edition;* Wrox Publications.
3. Bryan Basham, Kathy Sierra, Bert Bates,*Head First Servlet and JSP;* O'Reilly Publication

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand	Understand Components of Advanced JAVA Technology: Servlet, JSP and Java Bean
CO2	Apply	Work with Web Containers
CO3	Create	Develop & Deploy Database Driven Multitier Enterprise Applications Using J2EE
CO4	Apply	Map classes and object association to relational database with hibernate
CO5	Apply	Demonstrate RESTful API using Java's JAX-RS framework.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
CO1	2	2	2	-	2	-	2	-	1	-	2	-	2
CO2	2	2	1	-	3	-	2	-	2	-	2	-	2
CO3	3	2	3	-	3	-	2	-	3	-	3	-	2
CO4	2	2	2	-	1	-	2	-	2	-	2	-	2
CO5	1	2	2	-	2	-	2	-	2	-	1	-	2
Avg	2	2	2	-	2.2	-	2	-	2	-	2	-	2

Syllabi Book

For

Post Graduate Course of

Civil-Structural Engineering

Department of Civil Engineering
Faculty of Technology
Dharmsinh Desai University
Nadiad – 387 001, Gujarat, India.
http://www.ddu.ac.in

(w.e.f July- 2021)

M. TECH. SEMESTER – I (CIVIL-STRUCTURAL ENGINEERING)
SUBJECT: ADVANCED STRUCTURAL MECHANICS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	0	4	4	60	40	25	0	125

A. COURSE OVERVIEW

The objective of this course is to strengthen matrix structural analysis by most versatile methods. Also, to introduce various advanced analysis topics including nonlinear analysis.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Review of concepts of structural analysis	**02**	CO1
[2]	Member stiffness approach for analysis of skeletal structures: beams, plane truss, plane frame, grid, space truss, space frame with computer programming	**20**	CO2
[3]	Special Problems: effect of shear deformation in stiffness matrix, torsional effects for thin-walled member inclusive of torsional bending, finite joints (both rigid and flexible); consideration of local load (inclusive of temperature) effects; formulation of geometric stiffness due to axial force; linear buckling analysis.	**08**	CO3
[4]	Introduction to Material non-linearity and Geometric non-linearity, assumption of non-linear analysis; Secant and Tangent Stiffness Matrices, Various methods to solve non-linear equations, Non-linear analysis of truss, Plastic Analysis: Step by step procedure of analysis, Non-linear analysis of frames	**06**	CO4

C. TEXT BOOKS

1. William Weaver, James M. Gere; *Matrix Analysis of Framed Structure;* 3rd ed.; Van Nostrand Reinhold: New York
2. Dr. A. S. Meghre, S. K. Deshmukh, Matrix Methods of Structural Analysis; Charotar Publishing House

D. REFERENCE BOOKS

1. Ghali, Amin Neville, Structural Analysis _ A Unified Classical And Matrix Approach; Seventh Edition, Taylor And Francis, 2017
2. John F. Fleming, Computer Analysis of Structural Systems; McGraw-Hill Companies
3. K. I. Majid, Non-Linear Structures; Butterworths
4. William McGuire, Richard H. Gallagher, Ronald D. Ziemian, Matrix Structural Analysis, 2nd Edition, Faculty Books.

E. COURSE OUTCOMES

On the successful completion of this course
CO1: Students will be able to use member stiffness method for analysis of different structures.
CO2: Students will be able to handle special analysis cases.
CO3: The course will give basic knowledge of nonlinear analysis.
CO4: Students will be able to evaluate and analyse results provided by the commercial software for the purpose of analysis & design.

F. COURSE MATRIX

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	2	1	3	1	2	1	2	2	1	3	1
CO2	1	3	1	3	1	3	3	1	3	2	2	3	1	3
CO3	2	2	3	2	3	2	3	2	1	1	3	2	3	2
CO4	2	2	2	1	2	1	2	3	2	3	1	1	2	2
Avg														

M. TECH. SEMESTER – I (CIVIL-GEOTECHNICAL ENGINEERING)
SUBJECT: ADVANCED FOUNDATION ENGINEERING [MS109]

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	0	4	4	60	40	25	-	125

A. COURSE OVERVIEW

The course is designed for to build the necessary theoretical background for design and construction of foundation systems.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	**Shallow Foundations** Bearing capacity theories (Shear criteria): Prandtl's, Rankine's, Meyerhof's, Skempton's, Bearing capacity from Plate Load Test.	3	CO1
[2]	**Bearing Capacity of Combined Footings** Rectangular combined footings, trapezoidal combined footings	2	CO1
[3]	**Bearing Capacity of Raft or Mat Foundation** Introduction, Common types of Mat foundation, Bearing Capacity calculation.	2	CO1
[4]	**Pile Foundations** Methods of determining axial load carrying capacity of single pile: Dynamic formulae (Engineering News Formula and Modified Hiley's Formula), Pile Load Test on sand, clay and layered soil, Efficiency of Pile group, Axial load carrying capacity of pile group in clay and sand, Negative skin friction, Ultimate lateral resistance of single pile: Brom's theory, Concept of Free head and Fixed head pile, Lateral load carrying capacity of single pile as per IS-2911 in cohesive and cohesionless soil, Dimensional analysis of elastic pile theory (Reese and Matlock) in cohesionless soil, Reese's approach in cohesive soil, design of pile cap.	11	CO2
[5]	**Under-reamed Pile** Introduction, Installation method, Bearing capacity of under-reamed pile.	3	CO2
[6]	**Well Foundations** Types of wells, components of well foundation, requirement of shape of wells, Forces acting on wells, Lateral stability of well foundation	5	CO3
[7]	**Free and fixed cantilever sheet pile walls, anchored bulkheads** Cantilever sheet pile wall in sand and clay, Anchored sheet pile wall, Free earth support method and Fixed earth support method.	6	CO4
[8]	**Foundations on difficult subsoil** Collapse potential and settlement, Computation of collapse settlement, treatment method, General characteristics of swelling soils, Design of foundation in swelling soils	2	CO5
[9]	**Ground Improvement Techniques** Improvement techniques, Surface compaction, Drainage method, Vibration Method, Pre-compression and consolidation, Grouting, Chemical stabilization	2	CO5

C. TEXT BOOKS

1. Das, B. M. (2020). *Advanced Soil Mechanics*, Fifth Edition. United Kingdom: Taylor & Francis Group.
2. Punmia B. C. *Soil Mechanics and Foundations*; Laxmi Publications

D. REFERENCE BOOKS

1. Murthy V. N. S, *Soil Mechanics and Foundation Engineering;* UBS Publisher
2. Arora K. R. *Soil Mechanics and Foundation Engineering;* Standard Publishers Distributors
3. Das B. M. *Principles of Geotechnical Engineering*; Tata McGraw Hill.
4. Bowles J. E. *Physical and Geotechnical Properties of soils*; McGraw Hill Book Company
5. Saran, S. (2018). *Analysis and Design of Substructures*: Limit State Design. India: CBS Publishers & Distributors.
6. Coduto, D. P. (2001). *Foundation Design: Principles and Practices* (2nd Edition). United Kingdom: Prentice Hall.
7. Kaniraj, S. R., Kaniraj, A. (1988). *Design Aids in Soil Mechanics and Foundation Engineering*. India: Tata McGraw-Hill.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Apply	Design of shallow footings like isolated and mat footings.
CO2	Apply	Design of Deep foundation like pile and under-reamed pile.
CO3	Understand	Understand types of well and analyse Lateral stability of well foundation.
CO4	Analyze	Analyse anchored and cantilever sheet pile wall.
CO5	Remember	Identify expansive soil and suggest suitable types of ground improvement techniques.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	2	3	2	3	2	3	3	3
CO2	3	3	3	3	3	3	2	3	2	3	2	3	3	3
CO3	3	3	3	3	3	3	2	3	2	3	2	3	3	3
CO4	3	3	3	3	3	3	2	3	2	3	2	3	3	3
CO5	2	2	1	2	1	2	1	3	2	3	1	3	2	1

M. TECH. SEMESTER – I (CIVIL-STRUCTURAL ENGINEERING)
SUBJECT: SOLID MECHANICS WITH FINITE ELEMENT APPLICATIONS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	0	4	4	60	40	25	0	125

A. COURSE OVERVIEW

To Understand the use of FEM to a range of Engineering Problems and the application of the FEM technique to solve linear 2D structural beams and Continuum problems

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Linear elasticity; stress, strain, constitutive relations; Boundary conditions; Description of an elasticity problem as a boundary value problem, Plane stress, strain, axial symmetrical problems.	[12]	CO1 CO4
[2]	Introduction to plasticity, Yield condition; ideal elasto-plastic material.	[12]	CO2
[3]	Analysis of Continuum and discrete structures, finite element principle and solution for continuum problems, steps in finite element analysis, principles of discretization, formulation of element stiffness matrix based on direct, variation principles, shape functions, numerical integration, convergence, 2-D formulations for plane stress, plane strain, axisymmetric including isoperimetric elements, introduction to 3D brick elements for Continuum problems.	[24]	CO3 CO5

C. TEXT BOOKS

1. Cook R.D; *Concepts and Applications of Finite Element Analysis*, 1st Edition; Wiley, John & Sons 2006

D. REFERENCE BOOKS

1. K J Bathe; Finite Element procedures in engineering analysis, Prentice- Hall India Pvt. Ltd, 1982
2. J. N. Reddy; An Introduction to Finite Element Methods, 3rd edition; John Wiley and sons, 2005
3. Tirupathi K., Chandrapatla, Ashok D. Belagundu, "Introduction to Finite Elements in Engineering", 1st edition, 2013.
4. S. S. Rao, "The Finite Element Methods in Engineering", Elsevier, 4th Edition, 2013
5. Krishnamoorthy C.S; Finite Element Analysis; McGraw-Hill India: New Delhi, 2019

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Evaluate	Understand the Solid mechanics
CO2	Comprehension	Learning the basics of Theory of Elasticity
CO3	Develop	Formulate stiffness matrices for Bar, truss, beam, plane stress problems.
CO4	Analysis	Analyse 1D and 2D problems using Finite element method
CO5	Design	Apply the numerical methods to Continuum problems

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	.
CO1	3	3	3	2	2	2	1	1	3	2	1	2	3	3	
CO2	2	2	3	1	2	2	1	1	3	2	1	3	2	2	
CO3	2	3	2	2	2	-	-	1	2	1	2	2	2	2	
CO4	3	2	3	3	3	2	-	1	3	2	1	2	3	2	
CO5	2	3	2	3	3	1	-	1	3	1	2	3	2	3	
Avg															

M. TECH. SEMESTER – I (CIVIL-STRUCTURAL ENGINEERING)
SUBJECT: DESIGN & DETAILING OF STRUCTURAL ELEMENTS: RCC

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	0	2	4	3	40	0	25	25	90

A. COURSE OVERVIEW

This course is to introduce the basic design philosophy and principles of concrete structure design. The course combines basic structural fundamentals and analysis methods into a single unified treatment and provides a background to understand the structural design methods in the design field.

This course provides the concepts of design the various structural RCC elements using different design methods with application to structural engineering problems as per relevant Indian Standards.

B. COURSE CONTENT

NO	TOPIC	L (hrs)	COs
[1]	Introduction to various design methods i.e. Working Stress Method, Ultimate Load Method and Limit State Method.	2	CO1
[2]	• Design of Singly Reinforced and Double Reinforced Rectangular Beams for Limit State of Collapse for Flexure. Development of non-linear moment-curvature relationship. • Design of Flanged Beams for Limit State of Collapse for Flexure • Design of Rectangular Beams for Limit State of Collapse for Shear and Torsion.	6	CO2
[3]	Design of One-way and Two-way simply supported and continuous Slabs.	5	CO3
[4]	Design of Short and Slender Columns subjected to Axial Load and Uniaxial or Biaxial Bending. Development of non-linear P-M-M relationship.	6	CO4
[5]	Design of Isolated and Combined Footings. Preparation and use of excel sheets for RCC element design	5	CO5

C. TEXT BOOKS

1. H. J. Shah, *Reinforced Concrete, Vol. I and II*, Charotar Publishing.
2. S Unnikrishna Pillai & Devdas Menon, *Reinforced Concrete Design*, Tata McGraw Hill Publication

D. REFERENCE BOOKS

1. N. Krishna Raju, R. N. Pranesh, *Reinforced Concrete Design*, New Age International Publishers.
2. P. C. Varghese, *Design of RCC Structures*, PHI Publications
3. Punmia B.C "Advanced RCC Design" Laxmi Publications Pvt. Ltd". 2006.
4. Varghese A. V., Advanced Reinforced Concrete, Varghese, Prentice Hall of India.

5. Sinha S. N., Reinforced Concrete Design, Tata Mc-Graw Hill, Delhi.
6. Indian standard Code: 456 2000, *Code of Practice for plan & reinforced concrete.*
7. Special Publications -16, *Design Aids for Reinforced Concrete to IS: 456*, 1987

E. COURSE OUTCOMES

(Minimum 5 Cos are required)

CO Number	Skill	Statement
CO1	Understanding	To understand various design methods of structures and brief history.
CO2	Design	Design of RCC Structural Beams elements for flexure, shear and torsion using Limit State Methods.
CO3	Design	Design of RCC Structural slabs elements for flexure using Limit State Methods.
CO4	Design	Design of short and long column for axial and bending using Limit state method
CO5	Design	Design of sub structure element of regular building using IS code standard.

M. TECH. SEMESTER – I (CIVIL-STRUCTURAL ENGINEERING)

SUBJECT: DESIGN & DETAILING OF STRUCTURAL ELEMENTS: STEEL

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	0	2	4	3	40	0	25	25	90

A. COURSE OVERVIEW

To make students familiar with the elemental design of steel structures.

B. COURSE CONTENT

NO	TOPIC	L (hrs)	COs
[1]	Introduction to various design methods i.e., Working Stress Method, Ultimate Load Method and Limit State Method - Brief History and Comparison.	1	CO1
[2]	Connections (riveted, bolted & welded) for Unstiffened, Moment and Shear resisting Structural Connections, Design and detailing of connection between Roof Truss to Column, Column to Beam, Beam to Beam and Truss to Bed Block.	6	CO1 CO2
[3]	• Design of Tension and Compression members made up of single and built-up sections, Choice of sections • Lacing and battering column. • Design of laterally restrained and unrestrained beams including deflection check.	8	CO3
[4]	Design of members subjected to combined actions, bending with compression/tension.	5	CO4
[5]	Design of Slab base subjected to axial load, uniaxial bending.	4	CO5

C. TEXT BOOKS

1. Subramanian. N, *Design of steel structures*; Oxford Publication Press.
2. Duggal, S.K, *Limti State Design of Steel Strctures*; McGraw Hill Education (P) Ltd, New Delhi.

D. REFERENCE BOOKS

1. S.S Bhavikati. *Design of Steel Strcutures: By Limit State Method as per IS 800-2007;* I. K. International Pvt. Ltd.
2. Ramamrutham. S. *Design of steel structures*; Dhanpat Rai Publishing Company.
3. Dr. Ramchandra, & Virendra Gehlot, Design of Steel Structures; Vol-1 & Vol-2; Scientific Publishers Journals Dept.
4. Dayaratnam. P, *Design of steel structures*; S.Chand Publisher, 2007.

E. IS SPECIFICATION

1. IS: 800:2007, Indian Standard General Construction in Steel-Code of Practice.
2. SP 6(1):1964, Handbook for Structural Engineers

F. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Comprehension	Students will be able to understand the fundamental concept of design
CO2	Evaluate	Students will be able to understand the design of connections
CO3	Application	Students will be able to design the elements subjected to Tension, Compression & Flexure
CO4	Application	Students will be able to design the elements subjected to combined axial force and bending.
CO5	Application	Students will be able to design the slab base

M. TECH. SEMESTER – I (CIVIL-STRUCTURAL ENGINEERING)
SUBJECT: THEORY OF THIN PLATES AND SHELLS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	1	0	3	3	40	0	25	0	65

A. COURSE OVERVIEW

Objective of the course:

- To study the behaviour of the plates and shells with different geometry under various types of loads.
- Classical approaches will be used to provide the student with a firm grasp of the fundamentals necessary to perform critical interpretations, required when computer-based solutions are implemented in practice.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Thin plate: small deflection theory, plate equation. Applications of Navier's solution, Levy's solution, tables & charts for solution of rectangular and circular plates, use for rectangular water tanks with different boundary conditions.	**16**	CO1, CO2
[2]	Shell behaviour, shell surfaces and characteristics, classification of shells equilibrium equations in curvilinear co-ordinates. Stress-strain & force displacement relations. Membrane analysis of shells of revolution and cylindrical shells under different loads.	**16**	C03
[3]	Applications of membrane solution of elliptic paraboloids and hyperboloids. Solution of some typical problems.	**4**	CO4

C. TEXT BOOKS

1. S. Timoshenko, S. Woinowsky-Krieger; *Theory of Plates and Shells*; McGraw-Hill

D. REFERENCE BOOKS

1. W. T. Marshall*; The Design of Cylindrical Shell Roofs*; Princeton
2. G. S. Ramaswamy; *Design and Construction of Concrete Shell Roofs*; R.E. Krieger
3. N. K. Bairagi; *A Text Book of Plate Analysis*; Khanna Publishers
4. N. K. Bairagi; *Shell Analysis*; Khanna Publishers
5. R. Szilard; *Theory and Analysis of Plates: Classical, Numerical and Engineering Methods;* John Wiley & Sons

E. COURSE OUTCOMES

On the successful completion of this course students will be able to

CO1: Students will demonstrate key factual knowledge of the underlying assumptions in the theory of plates and shells.

CO2: Students shall understand the rudimentary principles involved in the analysis and design of plates and shells.

CO3: The solutions will be developed by the students towards understanding of structural behaviour using applications of plates & shells.

CO4: Students will be able to relate the academic material of the theory of plates and shells to real-life problems.

F. COURSE MATRIX

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	2	1	3	1	2	1	2	2	1	3	1
CO2	1	3	1	3	1	3	3	1	3	2	2	3	1	3
CO3	2	2	1	2	3	2	3	2	1	1	1	2	3	1
CO4	2	2	3	3	2	1	1	3	2	3	3	1	2	3

M. TECH. SEMESTER – I (CIVIL-STRUCTURAL ENGINEERING)

SUBJECT: THEORY OF STRUCTURAL STABILITY

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	1	0	3	3	40	0	25	0	65

A. COURSE OVERVIEW

To make students familiar with the concepts of structural stability.

B. COURSE CONTENT

NO	TOPIC	L (hrs)	COs
[1]	Criteria for Design of Structures: Stability, Strength, and Stiffness, Classical Concept of Stability of Discrete and Continuous Systems, Linear and nonlinear behaviour.	5	CO1
[2]	Stability of Frames: Member Buckling versus Global Buckling, Slenderness Ratio of frame members.	8	CO2
[3]	Stability of Beams: Lateral torsional buckling. Stability of Columns: Axial and Flexural Buckling, Lateral Bracing of Columns, Combined Axial, Flexural and Torsion Buckling. Stability of Plates: Axial flexural buckling, shear flexural buckling, buckling under combined loads.	8	CO3 CO4
[4]	Introduction to Inelastic Buckling and Dynamic Stability	3	CO5

C. TEXT BOOKS

1. Stephen P. Timoshenko, James M Gere, *Theory of Elastic Stability*; 2nd ed; Dover Publications, Inc.

D. REFERENCE BOOKS

1. Alexander Chajes. *Principles of Strctural Stability Theory:* Prentice-Hall, Inc., Englewood Cliffs, New Jersey.
2. N. G. R. Iyenger. *Structural Stability of Columns and Plates*; Ellis Horwood Publisher, Ltd.
3. Bleich F. Buckling, *Buckling Strength of Metal Structures*; 1st ed; McGraw-Hill.

F. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Comprehension	Students will be able to understand basic concepts of stability of structures, concept of stability of discrete and continuous systems, linear and nonlinear behaviour.
CO2	Evaluate	Students will be able understand the concept of stability and evaluate the stability of frames
CO3	Analysis	Students will be able to understand the concept of stability for member and evaluate the stability of member such as beam and column
CO4	Analysis	Students will be able to evaluate the stability of plates element
CO5	Comprehension	Students will be able to understand the concepts of inelastic buckling and dynamic stability

M. TECH. SEMESTER – I (CIVIL-STRUCTURAL ENGINEERING)
ELECTIVE PAPER – I
SUBJECT: ADVANCED CONCRETE TECHNOLOGY

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	1	0	3	3	40	0	25	0	65

A. COURSE OVERVIEW

Concrete is the integral part of the structures so it is important to know the rudiments as well as the advancements in the field of concrete technology. This subject would deal with the important advanced learning topics on cement chemistry, microstructure properties of concrete, mix proportioning, Non-destructive testing methods and various types of special concrete.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Cement: Hydration, chemistry and microstructure of cement paste, special cement	3	CO1
[2]	Microstructures of concrete: Interfacial transition zone, Structure-property relationships.	3	CO1
[3]	Chemical and mineral admixtures in concrete: Types, Mechanism, Application.	3	CO2
[4]	Properties of hardened concrete: Strength, stress-strain behavior, Dimensional stability, Fracture mechanics and concrete failure mechanism.	3	CO4
[5]	Mix Design: Concrete mix design (IS, ACI, BS)	3	CO3
[6]	Concrete Durability: Physical deterioration (abrasion, erosion, cracking) Chemical attack (sulphates/seawater/acid), Corrosion, Durability improvement measures.	3	CO1
[7]	Testing and quality assurance of concrete: Testing of fresh concrete, Destructive and non-destructive evaluation of hardened concrete, statistical quality control.	3	CO4
[8]	Special concrete: Cement and polymer concrete compositions, Self-compacting concrete, Ready mixed concrete, High performance concrete.	3	CO5

C. TEXT BOOKS

1. Neville, A.M. *Properties of Concrete*; 5th ed.; Pearson education publication: 2012.

D. REFERENCE BOOKS

1. Mehta, P. K.; Monterio, P. J. M. *Concrete -Microstructure, Properties and Materials*; 4th ed.;, McGraw Hill Publishers: New Delhi,2017

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Comprehension	Understand chemistry of cement, microstructure of concrete and durability related aspects of cement concrete.
CO2	Application	Learn various types of chemical and mineral admixtures and apply this knowledge in using these admixtures in cement concrete
CO3	Design	Design the concrete mixes using various mix proportioning techniques
CO4	Evaluation	Evaluate the hardened properties of concrete using various destructive and non-destructive techniques
CO5	Decision Making	Decide the correct type of special concrete for the specific engineering construction by applying the knowledge on special concrete.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	--
CO1	2	1	1	1	-	1	1	2	1	-	1	2	-	-	
CO2	1	1	2	2	-	2	3	2	1	1	2	2	1	-	
CO3	1	1	2	2	1	2	2	2	2	2	2	2	1	-	
CO4	1	1	2	2	1	2	1	2	2	2	2	2	1	-	
CO5	1	1	1	2	-	2	2	2	2	2	3	2	1	-	
..															
Avg															

M. TECH. SEMESTER – I (CIVIL- STRUCTURAL ENGINEERING)

SUBJECT: AUDIT COURSE – I: DISASTER MANAGEMENT

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	0	0	2	0	0	0	0	0	0

A. DETAILED SYLLABUS

1. Introduction
   Disaster: Definition, Factors and Significance; Difference between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

2. Repercussions of Disasters and Hazards: Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

3. Disaster Prone Areas In India
   Study of Seismic Zones; Areas Prone To Floods and Droughts, Landslides and Avalanches; Areas Prone To Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemics

4. Disaster Preparedness And Management
   Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.

5. Risk Assessment
   Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.

6. Disaster Mitigation
   Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends in Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs Of Disaster Mitigation in India.

B. RECOMMENDED TEXT / REFERENCE BOOKS

1. Disaster Management in India: Perspectives, issues and strategies - R. Nishith, Singh AK
2. Disaster Mitigation Experiences and Reflections - Sahni, PardeepEt.Al.
3. Disaster Administration and Management Text and Case Studies - Goel S. L.

M. TECH. SEMESTER – I (CIVIL-STRUCTURAL ENGINEERING)
SUBJECT: DYNAMICS AND EARTHQUAKE ENGINEERING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	0	4	4	60	40	25	0	125

A. COURSE OVERVIEW

The course is designed for impart the knowledge of causes and effects of earthquakes on structures in structural engineering. This course provides the concepts of theories of vibration of SDOF and MDOF systems also gives the background of seismic analysis of RCC structures using IS Code provisions. This course helpful to understand design methodology as per IS codes provisions that improved later load resistance of the structures.

B. COURSE CONTENT

NO	TOPIC	L (hrs)	COs
[1]	SDOF Systems: Equation of motion, free vibration, harmonic load, evaluation of damping, periodic load, general load (time-domain, frequency domain) response spectrum load.	8	CO1, CO2
[2]	MDOF systems: Structural matrices, undamped free vibrations; generation of damping matrix; mode superposition analysis; practical considerations.	10	CO1, C03
[3]	Characterization of ground motion; earthquake intensity and magnitude; recording instruments and baseline correction; predominant period and amplification through soil; Earthquake spectra for elastic and in-elastic systems, idealization of structural systems for low, medium and high-rise building;	10	CO4
[4]	Effect of foundation/soil on earthquake response; Codal provisions.	8	CO5

C. TEXT BOOKS

1. A.K.Chopra; *Dynamics of structures*, Pearson, New Delhi
2. Manish Shrikhande & Pankaj Agrawal; *Earthquake resistant design of structures*, PHI Publication, New Delhi.

D. REFERENCE BOOKS

1. Mario Paz, *Structural Dynamics: Theory and Computation*, 2nd Edition, CBS Publisher.
2. R,W.clough and J.Penzien, *Dynamics of Structures*, 2nd revised Edition, McGraw – Hill Education,
3. S.K.Duggal, *Earthquake resistance design of structures*, Oxford University Press, New Delhi.
4. Park & Pauly; *Behaviour of RC structure*
5. Criteria for earthquake resistant design General provision & Building - IS: 1893 (Part I)-2016
6. Code of Practice for Ductile Detailing of RC Structures - IS: 13920 (2016).

7. IITK-bmtpc, Earthquake Tips "Learning Earthquake Design and Construction" by C.V.R.Murthy, Building Material and Technology Promotion Council

E. COURSE OUTCOMES

(Minimum 5 Cos are required)

CO Number	Skill	Statement
CO1	Analysis	Determine the response of single and multi-degree freedom systems.
CO2	Application	Demonstrate the knowledge and understanding of principles of dynamics under varying loading conditions.
CO3	Application	Apply appropriate techniques to analyze and interpret data for solving problems related to single and multi-degree freedom systems.
CO4	Understanding	Understand earthquake ground motion characteristics and earthquake spectra
CO5	Analysis	Determine response of foundation/soil under dynamic loading and IS codal provision

M. TECH. SEMESTER – I (CIVIL-STRUCTURAL ENGINEERING)
SUBJECT: SOIL STRUCTURE INTERACTION

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	0	4	4	60	40	25	0	125

A. COURSE OVERVIEW

The objective of this course is to make student understand about the importance of Soil Structure Interaction in design of structures. Application of Soil structure Interaction to various structural elements will be shown.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Critical study of conventional methods of foundation design; Nature of complexities of soil structure interaction; Application of advanced techniques of analysis such as the finite element method, finite differences, relaxation and interaction for the evaluation of soil-structure interaction for different types of structures under various conditions of loading and subsoil characteristics;	12	CO1
[2]	Preparation of comprehensive design-oriented computer programs for specific problems.	04	CO2
[3]	Interaction problems based on the theory of sub-grade reaction such as beams, footings, rafts bulkheads etc, Analysis of different types of framed structures founded on stratified natural deposits with linear and non-linear stress-strain characteristics.	10	CO4
[4]	Determination of axial and lateral pile capacities; group action of piles considering stress-strain characteristics of real soils.	10	CO3

C. TEXT BOOKS

1. Analysis and design of foundation - J. Bowles
2. Numerical Methods in Geotechnical Engg. - Desai & Christian

D. REFERENCE BOOKS

1. Elastic Analysis of Soil Foundation Interaction - A P S Selvadurai
2. Advanced Geotechnical Engineering - C S Desai, M. Zaman

E. COURSE OUTCOMES

On the successful completion of this course
CO1: Students will have basic understanding of Soil Structure Interaction.
CO2: Students will solve beams on elastic foundation problem and its application.
CO3: Students will be able to understand effect of Soil structure interaction to deep foundation.
CO4: Students will be able to analyse raft foundation resting on soil using soil springs.

F. COURSE MATRIX

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	2	3	3	1	2	1	2	2	1	3	1
CO2	1	3	1	3	1	3	3	1	3	2	2	3	1	3
CO3	3	2	1	2	1	2	3	2	1	1	1	2	3	1
CO4	2	2	3	3	2	1	1	3	2	3	3	1	2	3

M. TECH. SEMESTER – II (CIVIL-STRUCTURAL ENGINEERING)
SUBJECT: ELECTIVE PAPER – II (PRESTRESSED CONCRETE)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	0	4	4	60	40	25	0	125

A. COURSE OVERVIEW

Understand the basics of prestressed concrete and analysis of beams. And Students able understand the concept of Design, deflection, losses as per the relevant design code

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Prestressing concepts, materials, systems of prestressing and losses	[12]	CO1
[2]	Introduction to working stress method, limit state analysis and design of members for bending. Shear torsion and forces.	[24]	CO2 CO4
[3]	End block design. Deflections, use of relevant codes of practice.	[12]	CO3 CO5

C. TEXT BOOKS

1. N. Krishna Raju. Prestressed Concrete.; Tata McGraw-Hill Publishing Co. 2006.

D. REFERENCE BOOKS

1. Mallick S.K. and Gupta A.P, “Prestressed Concrete”, Oxford & IBH. 2009
2. Lin T.Y. and Ned.H.Burns, “Design of prestressed Concrete Structures”, Third Edition, Wiley India Pvt. Ltd., New Delhi, 2013.
3. Pandit.G.S. and Gupta.S.P., “Prestressed Concrete”, CBS Publishers and Distributers Pvt. Ltd, 2012
4. Rajagopalan.N, “Prestressed Concrete”, Narosa Publishing House, 2002.
5. D Nawy E.G, “Prestressed Concrete: A fundamental approach”, Prentice Hall, 2013

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand	Understand the principles & necessity of prestressed concrete structures
CO2	Evaluate	Able to Analyse the flexural, shear and torsion behaviour of Prestressed beams
CO3	Analysis	learn to handle element design the of pre-stress concrete structure
CO4	Evaluate	Design the prestressed concrete members for flexure and shear as per the relevant design code
CO5	Application	Design of end block as per the relevant design code

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	.
CO1	3	3	2	3	1	1	1	2	3	2	2	2	3	2	
CO2	2	3	2	2	2	1	1	2	3	1	2	1	2	3	
CO3	3	2	3	3	3	1	1	1	3	1	3	2	2	3	
CO4	2	2	3	2	1	1	1	2	3	2	2	2	3	2	
CO5	3	3	2	2	2	1	1	2	3	1	2	1	3	2	
Avg															

M. TECH. SEMESTER – I (CIVIL-STRUCTURAL ENGINEERING)
SUBJECT: BRIDGE ENGINEERING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	0	4	4	60	40	25	0	125

A. COURSE OVERVIEW

The objective of this course is to make students aware about the different types of bridges and to understand design philosophy. Also, to mould them to be ready to analyse and design bridges.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Loading Standards.	06	CO1
[2]	Design of Slab Girder and T- Girder bridge.	10	CO2
[3]	Design of prestressed concrete girder and box girder bridges considering only primary torsion. Design of end block.	12	CO3, CO4
[4]	Piers, Abutments, Wing walls factors effecting and stability. Well foundations. Design of well, Construction, open sinking of walls, Plugging, sand filling and casting of well cap.	8	CO5

C. TEXT BOOKS

1. M. G. Aswani, V. N. Vazirani, M. M. Ratwani, *Design of Concrete Bridges;* Khanna Publishers

D. REFERENCE BOOKS

1. Dr. V. K. Raina, *Concrete Bridge Practice Analysis*, *Design and Economics*; 3rd Edition Shroff Publishers and Distributors Pvt. Ltd.
2. N. Krishna Raju, *Design of Bridges;* Oxford & IBH Publishing Company Pvt. Ltd.

E. COURSE OUTCOMES

On the successful completion of this course students will be able to

CO1: Students will have basic knowledge about loading standards for bridge design

CO2: Design Slab Girder and T- Girder RCC Bridges

CO3: To understand need of prestress concrete for bridge design.

CO4: Design prestressed concrete bridges

CO5: To understand foundation design for bridges.

F. COURSE MATRIX

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	2	1	3	1	2	1	2	2	1	3	1
CO2	1	3	1	3	1	3	3	1	3	2	2	3	1	3
CO3	2	2	1	2	3	2	3	2	1	1	1	2	3	1
CO4	2	2	3	3	2	1	1	3	2	3	3	1	2	3
CO5	2	3	2	1	2	1	3	3	2	3	1	1	2	2
Avg														

M. TECH. SEMESTER – I (CIVIL-STRUCTURAL ENGINEERING)
SUBJECT: NUM. METHODS & APPLICATIONS TO STRUCTURAL ENGG.

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	0	4	4	60	40	25	0	125

A. COURSE OVERVIEW

To familiarize the students in the field of differential equations to solve Initial -Boundary value problems associated with engineering applications. To obtain solutions for functional optimization related problems using MATLAB software. Student developed MATLAB code of numerical methods to structural engineering problem. Students developed in depth knowledge of various structural engineering software.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Advanced MATLAB Applications for Solution of non – linear algebraic equations, numerical solutions of ordinary differential equations and partial differential equations, its applications to structural engineering problems. Solution of Eigen value problems, iterative methods & transformation methods. Use of software for transformation methods. Computer oriented algorithms	18	CO1 CO2, CO3
[2]	Correlation and regression, Principles of least squares, Euler's equation - Functional dependent on first and higher order derivatives	8	CO4
[3]	• Laplace transform methods, Laplace equation -Properties of harmonic functions -Fourier transform methods for Laplace equation. • Application to Structural Engineering: Software Usage: Modeling, analysis and design using professional software like STAAD, STRAP, STRUDS, RISA 3D as Group exercise	10	CO5

C. TEXT BOOKS

Chapra S C and Canale R P, *Numerical Methods for engineering*, Mcgraw-Hilllnc, 7th Edition, 2016.

D. REFERENCE BOOKS

1. Rajasekaran. S, *Numerical Methods in Science and Engineering A Practical Approach*, S.Chand & Co., New Delhi, 1st edition, 1999 (Reprint 2012).
2. Scheid F, *Theory and problems of Numerical analysis*, New York. McGraw Hill Book Co. (Shaum Series), 1988.
3. Sastry S S, *Introductory Methods of Numerical Analysis*, Prentice-Hall of India, 1998
4. S.C. Chhapra, *Applied Numerical Methods with MATLAB for Engineers and Scientists*, McGraw Hill Education.
5. J.H. Mathews and K.D. Fink, *Numerical Methods using MATLAB*, Pearson Publishing.

E. COURSE OUTCOMES

(Minimum 5 Cos are required)

CO Number	Skill	Statement
CO1	Understanding	Understand the basics of MATLAB programming
CO2	Application	Develop the computer programs in MATLAB for numerical methods
CO3	Application	Apply MATLAB for solving structural engineering problems
CO4	Application	Applying Laplace equation and Laplace transformation to engineering problem and Euler's equation
CO5	Analysing	Develop mathematically model and analyse physical system

M. TECH. SEMESTER – I (CIVIL-STRUCTURAL ENGINEERING)
SUBJECT: STRUCTURAL OPTIMIZATION AND RELIABILITY

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	0	4	4	60	40	25	0	125

A. COURSE OVERVIEW

Objective of the course:

- To make students aware, about the different optimization techniques used for structural optimization.
- To introduce structural optimization and reliability as tool for future research activity.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Introduction to optimization, optimization techniques for unconstrained and constrained optimization problems, Classical Optimization, Lagrange Multiplier technique and Kuhn – Tucker conditions, Solution of NLP by direct methods and by series of unconstrained optimization problems, formulation of different types of structural optimization problems.	14	CO1
[2]	Computation of derivatives of response quantities with respect to design variables. Minimum weight design of trusses, frame, etc.	08	CO2
[3]	Concept of Structural safety, design methods, basic statistics, probability Theory, statistics for concrete and steel properties, probabilistic analysis of loads	08	CO3
[4]	Basic structural reliability Monte Carlo method, level 2 reliability, reliability-based design and reliability of simple structural systems	06	CO3

C. TEXT BOOKS

1. Singiresu S. Rao; *Optimization: Theory and Applications*; Halsted Press

D. REFERENCE BOOKS

2. Erwin Kreyszig; *Advanced Engineering Mathematics;* Wiley
3. A. J. Morris; *Foundations of Structural Optimization: A Unified Approach;* John Wiley & Sons Limited, Chichester.

E. COURSE OUTCOMES

On the successful completion of this course students will be able to

CO1: To apply different optimization techniques in structural engineering.
CO2: To apply different structural reliability methods.
CO3: Can develop research proposal on optimization and reliability in design practice.

F. COURSE MATRIX

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	2	3	3	1	2	1	2	2	1	3	1
CO2	1	3	1	3	1	3	3	1	3	2	2	3	1	3
CO3	2	2	3	3	2	1	1	3	2	3	3	1	2	3

M. TECH. SEMESTER – I (CIVIL-STRUCTURAL ENGINEERING)
SUBJECT: DESIGN AND DETAILING OF RCC STRUCTURES

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	0	3	5	3.5	40	0	25	25	90

A. COURSE OVERVIEW

The goal of this course is to apply the knowledge acquired in Structural Analysis and Reinforced Concrete courses to the design of reinforced concrete structures. To introduce various aspects of planning of buildings and know about different types of loads. To introduce various structural systems for buildings with their behaviour and analysis. Students are able to learn detail about software and its implementation.

B. COURSE CONTENT

NO	TOPIC	L (hrs)	COs
[1]	Complete design and structural detailing of structures, viz. Design of grid floors, deep beams.	4	CO1
[2]	Design of shear wall, Design of material retaining structures, silos, bunkers, Water Tanks, Chimney,	6	CO1, CO2
[3]	Multistory buildings, Earthquake Resistant Design, machine foundation	9	CO3, CO4
[4]	Check for serviceability limits, analytical calculations for deflection, crack width, fire resistance, Detailing of various RC Structures	5	CO5

C. TEXT BOOKS

1. P. C. Varghese, *Advanced Reinforced Concrete Design*, 2nd Edition, PHI Learning Pvt. Ltd., 2009. ISBN: 812032787X, 9788120327870.
2. Krishnam Raju, N., *Design of Reinforced Concrete Structures*, 2 nd Edition, CBS Publishers and Distributors, New Delhi, 2007.

D. REFERENCE BOOKS

1. Pillai and Devadas Menon, *Reinforced Concrete Design*, 2nd Edition, Tata McGraw Hill Publishing Co. Ltd., 2003.
2. S. R. Karve and V. L. Shah, *Illustrated Design of Reinforced Concrete Buildings*, Structures Publishers.
3. S. Ramamrutham, *Design of Reinforced concrete Structures*, 2nd Edition, Dhanpat Rai Publishing Co Pvt Ltd, , 2015.
4. Pankaj Agarwal and Manish Shrikhande, *Earthquake resistant design of structures*, 3rd Edition PHI learning Private Ltd, , 2013.
5. R Park and T Paulay, Reinforced Concrete Structures, 2nd Edition, John Wiley & Sons, USA, 2013.
6. Indian standard Code 456 2000, *Code of Practice for plan & reinforced concrete.*
7. Special Publications -16, *Design Aids for Reinforced Concrete*, to IS: 456.
8. IS Codes: IS:456, IS:875 (all parts), IS:1893(P-1,2), IS:4326, IS:13920, IS: 3370 (P-1 to 4), SP:16, SP:34.

E. COURSE OUTCOMES

(Minimum 5 Cos are required)

CO Number	Skill	Statement
CO1	Understanding	Understanding of various structural configuration and its behaviour.
CO2	Design	Design of special RCC structures and its elements.
CO3	Analysing	Earthquake resistance design of multistorey building under different loading condition.
CO4	Analysing	Modelling and analysing of structures in different software.
CO5	Application	Develop detailing of reinforcement for RCC elements

M. TECH. SEMESTER – II (CIVIL-STRUCTURAL ENGINEERING)

SUBJECT: DESIGN & DETAILING STEEL STRUCTURES

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	0	3	5	3.5	40	0	25	25	90

A. COURSE OVERVIEW

To make students familiar with the design of steel structures.

B. COURSE CONTENT

NO	TOPIC	L (hrs)	COs
[1]	Introduction and application of Cable structures, Cold form Sections, Castellated beams, light metal structures, Stability of portal frame.	2	CO1
[2]	Plastic design of continuous beam, portal frames, Design of Plate Girders, and Gantry Girders.	6	CO2 CO3
[3]	Complete design and structural detailing of structures, Chimney, Steel bridges, Multi-storeyed buildings,	8	CO3 CO4
[4]	Complete design and structural detailing of structures: Industrial building, Godowns, cantilever sheds, platform roofs, Towers etc.	8	CO5

C. TEXT BOOKS

1. Subramanian. N, *Design of steel structures*; Oxford Publication Press.
2. Duggal, S.K, *Limti State Design of Steel Strctures*; McGraw Hill Education (P) Ltd, New Delhi.

D. REFERENCE BOOKS

1. S.S Bhavikati. *Design of Steel Strcutures: By Limit State Method as per IS 800-2007;* I. K. International Pvt. Ltd.
2. Ramamrutham. S. *Design of steel structures*; Dhanpat Rai Publishing Company.
3. Dr. Ramchandra, & Virendra Gehlot, Design of Steel Structures; Vol-1 & Vol-2; Scientific Publishers Journals Dept.
4. Dayaratnam. P, *Design of steel structures*; S.Chand Publisher, 2007.

E. IS SPECIFICATION

1. IS: 800:2007, Indian Standard General Construction in Steel-Code of Practice.
2. IS: 875 (Part 1 to 5), Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures.
3. IS: 6533 (Part-1 & 2), Design and Construction of steel Chimney- Code of Practice.
4. SP 6(1):1964, Handbook for Structural Engineers

F. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Comprehension	Students will be able to understand the fundamental concept of stability of structures, cable structures, cold form sections
CO2	Application	Students will be able to understand fundamental concepts of Plastic design of Continuous beam
CO3	Decision Making	Students will be able to design and detail plate girder and gantry girder
CO4	Decision Making	Students will be able to design and detail chimney, steel bridges & multi-storeyed building
CO5	Decision Making	Students will be able to design and detail the Industrial structures and towers.

M. TECH. SEMESTER – II (CIVIL-STRUCTURAL ENGINEERING)
SUBJECT: RESEARCH METHODOLOGY [SG202]

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	2	2	2	2	2	2	2	2	2

A. COURSE OVERVIEW

The objective of this course is to understand the basic concepts of research and its methodologies, identify appropriate research topics, select and define appropriate research problem and parameters, prepare a research proposal and research documentation.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations	7	CO1
[2]	Effective literature studies approaches, analysis Plagiarism, Research ethics	4	CO2
[3]	Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee	4	CO3
[4]	Nature of Intellectual Property - Patents, Designs, Trademark and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.	4	CO5
[5]	Patent Rights - Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.	4	CO4
[6]	New Developments in IPR - Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.	4	CO5

C. TEXT BOOKS

1. Ranjit Kumar, “Research Methodology: A Step-by-Step Guide for beginners”

D. REFERENCE BOOKS

1. Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science & engineering students”
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”
3. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd ,2007.
4. Mayall, “Industrial Design”, McGraw Hill, 1992.
5. Niebel, “Product Design”, McGraw Hill, 1974.
6. Asimov, “Introduction to Design”, Prentice Hall, 1962.

7. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", 2016.
8. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Create	Students will be able to understand the concept of research and its methodologies and formulate research problem.
CO2	Evaluate	Students will be able to review existing literature in a given research area.
CO3	Application	Students will be able to document research findings effectively.
CO4	Understand	Students will be able to understand importance of research ethics law of patents and copy right
CO5	Understand	Students will be able to explore on various IPR components and process of filing.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	1	3	2	1	2	3	3	1	3	1	-
CO2	2	3	2	1	2	1	1	2	3	2	1	3	1	-
CO3	1	1	-	1	2	1	-	2	3	3	-	3	-	-
CO4	1	1	-	-	1	2	-	3	2	2	1	3	-	-
CO5	1	1	-	-	1	1	-	1	2	2	1	3	-	-
Avg														

M. TECH. SEMESTER –II (CIVIL- STRUCTURAL ENGINEERING)

SUBJECT: AUDIT COURSE – II: PEDAGOGIC STUDIES

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	0	0	0	0	0	0	0	0	0

A. DETAILED SYLLABUS

1. Introduction and Methodology:
   Aims and rationale, Policy background, Conceptual framework and terminology, Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions**.** Overview of methodology and Searching.
2. Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.
3. Evidence on the effectiveness of pedagogical practices, Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.
4. Professional development: alignment with classroom practices and followup support Peer support, Support from the head teacher and the community, Curriculum and assessment, Barriers to learning: limited resources and large class sizes
5. Research gaps and future directions, Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

B. RECOMMENDED TEXT / REFERENCE BOOKS

1. Culture and pedagogy: International comparisons in primary education. - Alexander RJ
2. Read India: A mass scale, rapid, 'learning to read' campaign - Chavan M

Syllabi Book

For

Post Graduate Course of

Civil-Geotechnical Engineering

Department of Civil Engineering
Faculty of Technology
Dharmsinh Desai University
Nadiad – 387 001, Gujarat, India.
http://www.ddu.ac.in

(w.e.f July- 2021)

M. TECH. SEMESTER – I (CIVIL-GEOTECHNICAL ENGINEERING)
SUBJECT: SOIL ENGINEERING-I [MG110]

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	0	4	4	60	40	25	-	125

A. COURSE OVERVIEW

The course is designed for to establish an understanding of the fundamental concepts of mechanics of different types of soil materials including behavior of materials.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	**Problems in Geotechnical Engineering** Soil, its behaviour, Types of problems in Geo. Engg., Concept of point, line and plane, Effective Stress Principle	2	CO1
[2]	**Preliminary definitions and W-V relationships** Three phase system of soil, Unit Weight, Water content, Specific gravity, Porosity, Void ratio, Degree of Saturation, Relative density	2	CO1
[3]	**Index Properties of Soil** Grain size distribution, Effective size of particle, Stoke's law, Viscosity, Sedimentation analysis, Consistency of soils, Atterberg's Limit: Liquid Limit, Plastic Limit and Shrinkage Limit, Activity of clays, Sensitivity of clays, Thixotropy of clays	4	CO1
[4]	**Classification of Soil** Particle size classification, Textural classification, Highway Research Board classification, Unified Soil Classification System, I.S. classification	2	CO2
[5]	**Soil Water, Soil Structure and Clay Mineralogy** Hygroscopic moisture, Capillary water, Gravitational water, Absorbed water, Adsorbed water, Slaking of clay, Bulking of sand Inter-particle forces, Single grained structure, Honeycomb structure, Flocculent structure, Dispersed structure, Clay Minerals	2	CO2
[6]	**Permeability of soils** Introduction, Darcy's law, Discharge velocity, seepage velocity, Poisseuille's law, Validity of Darcy's law, Factors affecting permeability, Co-efficient of permeability, Constant Head permeability test, Falling Head permeability test, Permeability of stratified soil, Field Permeability tests	4	CO3
[7]	**Seepage Analysis** Introduction to Seepage, Seepage pressure, Laplace equation, Flow net construction, Determination of quantity of seepage and seepage pressure and uplift pressures, Quick sand condition, Phreatic lines of an earth dam	3	CO3
[8]	**Stress Distribution in soils** Introduction, Boussinesq's equation for concentrated load, Westergaard's equation for concentrated loads, Comparison of Boussinesq and Westergaard's equations, Line loads, Strip loads, Stresses beneath the corner of a rectangular foundation, Stresses under uniformly loaded circular footing, vertical stress beneath loaded areas of irregular shape, Pressure isobars, Newmark's Influence chart	6	CO4

[9]	**Compaction in soils** Definition, theory of compaction, Laboratory compaction tests, Factors affecting compaction in the field, Effect of compaction on soil properties, Field compaction, Specifications of field compaction, Equipments for compaction	2	CO5
[10]	**Compressibility of Soils** Compressibility of Soils, Definition and Mechanism of Soil, Consolidation, Spring Analogy, Compression Index, Coefficient of Compressibility, Coefficient of volume change, Derivation of Terazagi's One Dimensional consolidation Equation, Time factor and consolidation ratio, calculation of consolidation settlement for uniform pressure increment in clay layer, one Dimensional consolidation test, Laboratory and theoretical time curves, Concept of sand drain to redue the time of consolidation	9	CO5

C. TEXT BOOKS

1. Verma A.K. *Geotechnical and Foundation Engineering*; Charotar Publishing House Pvt. Ltd.
2. Punmia B. C. *Soil Mechanics and Foundations*; Laxmi Publications

D. REFERENCE BOOKS

1. Murthy V. N. S, *Soil Mechanics and Foundation Engineering;* UBS Publisher
2. Arora K. R. *Soil Mechanics and Foundation Engineering;* Standard Publishers Distributors
3. Das B. M. *Principles of Geotechnical Engineering*; Tata McGraw Hill.
4. Bowles J. E. *Physical and Geotechnical Properties of soils*; McGraw Hill Book Company
5. SP-36 (Part 1) - 1987 : Compendium of Indian Standards on Soil Engineering - Laboratory Testing of Soils for Civil Engineering Purpose
6. SP-36 (Part 2) - 1988 : Compendium of Indian Standards on Soil Engineering - Field Testing of Soils for Civil Engineering Purpose

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand	Determine index and engineering properties of soils.
CO2	Understand	Classify soil classification and mineralogy.
CO3	Evaluate	Determine Permeability and Seepage properties of soil
CO4	Evaluate	Determine the effect of stresses in soil
CO5	Evaluate	Evaluate compaction and compressibility parameters of soils

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	1	3	1	1	1	2	1	2	-	1	2	0
CO2	2	3	1	2	1	1	1	2	1	2	-	1	3	0
CO3	3	3	1	1	2	1	1	2	2	3	-	2	3	1
CO4	3	3	1	1	2	2	2	2	2	3	-	2	2	2
CO5	1	2	1	3	1	1	1	2	1	2	-	1	2	2

M. TECH. SEMESTER – I (CIVIL-GEOTECHNICAL ENGINEERING)
SUBJECT: ADVANCED FOUNDATION ENGINEERING [MS109]

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	0	4	4	60	40	25	-	125

A. COURSE OVERVIEW

The course is designed for to build the necessary theoretical background for design and construction of foundation systems.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	**Shallow Foundations** Bearing capacity theories (Shear criteria): Prandtl's, Rankine's, Meyerhof's, Skempton's, Bearing capacity from Plate Load Test.	3	CO1
[2]	**Bearing Capacity of Combined Footings** Rectangular combined footings, trapezoidal combined footings	2	CO1
[3]	**Bearing Capacity of Raft or Mat Foundation** Introduction, Common types of Mat foundation, Bearing Capacity calculation.	2	CO1
[4]	**Pile Foundations** Methods of determining axial load carrying capacity of single pile: Dynamic formulae (Engineering News Formula and Modified Hiley's Formula), Pile Load Test on sand, clay and layered soil, Efficiency of Pile group, Axial load carrying capacity of pile group in clay and sand, Negative skin friction, Ultimate lateral resistance of single pile: Brom's theory, Concept of Free head and Fixed head pile, Lateral load carrying capacity of single pile as per IS-2911 in cohesive and cohesionless soil, Dimensional analysis of elastic pile theory (Reese and Matlock) in cohesionless soil, Reese's approach in cohesive soil, design of pile cap.	11	CO2
[5]	**Under-reamed Pile** Introduction, Installation method, Bearing capacity of under-reamed pile.	3	CO2
[6]	**Well Foundations** Types of wells, components of well foundation, requirement of shape of wells, Forces acting on wells, Lateral stability of well foundation	5	CO3
[7]	**Free and fixed cantilever sheet pile walls, anchored bulkheads** Cantilever sheet pile wall in sand and clay, Anchored sheet pile wall, Free earth support method and Fixed earth support method.	6	CO4
[8]	**Foundations on difficult subsoil** Collapse potential and settlement, Computation of collapse settlement, treatment method, General characteristics of swelling soils, Design of foundation in swelling soils	2	CO5
[9]	**Ground Improvement Techniques** Improvement techniques, Surface compaction, Drainage method, Vibration Method, Pre-compression and consolidation, Grouting, Chemical stabilization	2	CO5

C. TEXT BOOKS

1. Das, B. M. (2020). *Advanced Soil Mechanics*, Fifth Edition. United Kingdom: Taylor & Francis Group.
2. Punmia B. C. *Soil Mechanics and Foundations*; Laxmi Publications

D. REFERENCE BOOKS

1. Murthy V. N. S, *Soil Mechanics and Foundation Engineering;* UBS Publisher
2. Arora K. R. *Soil Mechanics and Foundation Engineering;* Standard Publishers Distributors
3. Das B. M. *Principles of Geotechnical Engineering*; Tata McGraw Hill.
4. Bowles J. E. *Physical and Geotechnical Properties of soils*; McGraw Hill Book Company
5. Saran, S. (2018). *Analysis and Design of Substructures*: Limit State Design. India: CBS Publishers & Distributors.
6. Coduto, D. P. (2001). *Foundation Design: Principles and Practices* (2nd Edition). United Kingdom: Prentice Hall.
7. Kaniraj, S. R., Kaniraj, A. (1988). *Design Aids in Soil Mechanics and Foundation Engineering*. India: Tata McGraw-Hill.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Apply	Design of shallow footings like isolated and mat footings.
CO2	Apply	Design of Deep foundation like pile and under-reamed pile.
CO3	Understand	Understand types of well and analyse Lateral stability of well foundation.
CO4	Analyze	Analyse anchored and cantilever sheet pile wall.
CO5	Remember	Identify expansive soil and suggest suitable types of ground improvement techniques.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	2	3	2	3	2	3	3	3
CO2	3	3	3	3	3	3	2	3	2	3	2	3	3	3
CO3	3	3	3	3	3	3	2	3	2	3	2	3	3	3
CO4	3	3	3	3	3	3	2	3	2	3	2	3	3	3
CO5	2	2	1	2	1	2	1	3	2	3	1	3	2	1

M. TECH. SEMESTER – I (CIVIL-STRUCTURAL ENGINEERING)
SUBJECT: SOLID MECHANICS WITH FINITE ELEMENT APPLICATIONS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	0	4	4	60	40	25	0	125

A. COURSE OVERVIEW

To Understand the use of FEM to a range of Engineering Problems and the application of the FEM technique to solve linear 2D structural beams and Continuum problems

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Linear elasticity; stress, strain, constitutive relations; Boundary conditions; Description of an elasticity problem as a boundary value problem, Plane stress, strain, axial symmetrical problems.	[12]	CO1 CO4
[2]	Introduction to plasticity, Yield condition; ideal elasto-plastic material.	[12]	CO2
[3]	Analysis of Continuum and discrete structures, finite element principle and solution for continuum problems, steps in finite element analysis, principles of discretization, formulation of element stiffness matrix based on direct, variation principles, shape functions, numerical integration, convergence, 2-D formulations for plane stress, plane strain, axisymmetric including isoperimetric elements, introduction to 3D brick elements for Continuum problems.	[24]	CO3 CO5

C. TEXT BOOKS

1. Cook R.D; *Concepts and Applications of Finite Element Analysis*, 1st Edition; Wiley, John & Sons 2006

D. REFERENCE BOOKS

1. K J Bathe; Finite Element procedures in engineering analysis, Prentice- Hall India Pvt. Ltd, 1982
2. J. N. Reddy; An Introduction to Finite Element Methods, 3rd edition; John Wiley and sons, 2005
3. Tirupathi K., Chandrapatla, Ashok D. Belagundu, "Introduction to Finite Elements in Engineering", 1st edition, 2013.
4. S. S. Rao, "The Finite Element Methods in Engineering", Elsevier, 4th Edition, 2013
5. Krishnamoorthy C.S; Finite Element Analysis; McGraw-Hill India: New Delhi, 2019

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Evaluate	Understand the Solid mechanics
CO2	Comprehension	Learning the basics of Theory of Elasticity
CO3	Develop	Formulate stiffness matrices for Bar, truss, beam, plane stress problems.
CO4	Analysis	Analyse 1D and 2D problems using Finite element method
CO5	Design	Apply the numerical methods to Continuum problems

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	.
CO1	3	3	3	2	2	2	1	1	3	2	1	2	3	3	
CO2	2	2	3	1	2	2	1	1	3	2	1	3	2	2	
CO3	2	3	2	2	2	-	-	1	2	1	2	2	2	2	
CO4	3	2	3	3	3	2	-	1	3	2	1	2	3	2	
CO5	2	3	2	3	3	1	-	1	3	1	2	3	2	3	
Avg															

M. TECH. SEMESTER – I (CIVIL-GEOTECHNICAL ENGINEERING)

SUBJECT: SUBSURFACE EXPLORATIONS: CONCEPT TO CONCLUSION [MG111]

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	1	0	3	3	40	0	25	-	65

A. COURSE OVERVIEW

The process of collection soil data for the assessment soil properties at a site through series of laboratory and field investigation is collectively called Sub-soil Exploration Enables the engineers to draw soil profile indicating the sequence of soil strata and the properties of soil and rock involved. Get to know the use of software and manually for Report preparation in subsurface explorations.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	For Soil as well as Rock : Problems and phases of foundation investigations, planning of subsurface exploration program, defining no. of boreholes, depth of boreholes, insitu tests and sampling frequency for each borehole, other insitu tests,	4	CO1
[2]	samples to be collected, type and no. of lab. test to be carried out on various samples, tendering and specifications, soundings and drilling, sample requirements, sampling, methods and equipment, Handling, preservation and Transportation of samples, sample preparation, insitu testing, analysis of the results of insitu and lab testing,	4	CO2
[3]	Characteristic strength deformation parameters for geotechnical design, detailed reporting for various geotechnical problems.	4	CO3
[4]	Use of software and manually for Report preparation in subsurface explorations.	4	CO4
[5]	Insitu testing includes SPT, SCPT, DCPT, Static and Cyclic plate load test as well as Pile Load test,	4	CO5
[6]	Block Vibration test, Electrical resistivity test, Seismic refraction tests, Ground penetration radar, high strain and low strain non-destructive testing of pile etc.	4	CO6

C. TEXT BOOKS

1. Principles of Foundation Engg. – B. M. Das

D. REFERENCE BOOKS

1. Foundation Engineering Handbook – Leonards
2. Principles of Foundation Engg. – B. M. Das
3. Analysis and design of foundation– J. E. Bowles
4. Foundation design Manual – N. V. Nayak
5. Handbook of Geotechnical engg. – R. K. Rowe

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand	To make students understand concepts of methods of boring,
CO2	Understand	Types of samples & sampling, field tests
CO3	Evaluate	To evaluate strength parameter
CO4	Apply	To prepare soil report manually and use of software
CO5	Understand	To provide brief explanation on pile load test other cone penetration test
CO6	Evaluate	To explain in detail Advanced topics on in-situ soil testing

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	3	2	2	2	2	1	2	2	3	1	1
CO2	2	2	1	2	2	3	2	1	2	2	1	2	1	1
CO3	2	1	2	2	1	2	2	1	2	2	1	2	1	1
CO4	2	1	2	2	1	2	2	1	1	2	1	2	3	3
CO5	2	1	1	2	1	2	2	1	2	2	1	2	3	3
CO6	2	1	2	2	1	2	2	1	1	2	1	2	3	3

M. TECH. SEMESTER – I (CIVIL-GEOTECHNICAL ENGINEERING)

SUBJECT: GEOTECH. LAB TESTING PRACTICE [MG112]

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
0	0	4	4	2	0	0	50	50	100

A. COURSE OVERVIEW

Geotechnical investigations provide methodology for evaluating soil and rock engineering properties and based on these data soil report. Geotechnical laboratory tests consist of number of tests for the properties of soil. Soil testing is an important function of geotechnical testing and civil engineering in the design of foundations, highway/road pavements, embankments and other earth structures. Geotechnical testing provides valuable information on soil mechanics and materials common to soils such as silt, clay, sand, gravel or rock.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Laboratory Tests on Soil: sample preparation, testing, analysis	0	**CO1**
[2]	Reporting as per IS Code, uncertainty analysis of test results,	0	**CO2**
[3]	Grain size distribution for coarse grain soil, fine grain soil: dry sieve analysis, wet sieve analysis, hydrometer analysis, liquid limit, plastic limit, shrinkage limit, free swell test	0	**CO3**
[4]	Light compaction test, heavy compaction test, unconfined compressive strength, direct shear test, triaxial compression test, vane shear test	0	**CO4**
[5]	Constant head and falling head permeability test, One dimensional consolidation test, swell pressure test	0	**CO5**
[6]	Rock core sample preparation, rock tests,	0	**CO6**

C. TEXT BOOKS

1. Lab. Soil Testing – Lambe T. W

D. REFERENCE BOOKS

1. Head, H.K Manual of laboratory testing: Vol: 1 to 3,1981
2. Compendium of Indian standards on soil Engineering part I, 1987

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Comprehension	Evaluate various soil characteristics Apply knowledge of soil exploration
CO2	Application	Determination of Index properties
CO3	Evaluate	Evaluate compaction properties of soils
CO4	Evaluation	Determination of engineering property i.e., shear strength of soil
CO5	Evaluate	Obtain engineering properties like permeability of soils
CO6	Evaluate	Gather expertise in Rock samples testing

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	2	3	3	2	2	3	2	3	2	2
CO2	-	2	2	3	2	2	1	3	2	3	2	2	1	2
CO3	1	2	3	-	3	2	1	2	1	2	3	2	1	2
CO4	2	3	3	2	2	3	2	3	3	2	2	3	2	2
CO5	2	2	1	3	2	3	2	2	1	3	2	3	1	2
CO6	3	2	1	2	1	2	3	2	1	2	1	2	1	2

M. TECH. SEMESTER – I (CIVIL-GEOTECHNICAL ENGINEERING)
SUBJECT: ENVIRONMENTAL GEOTECHNOLOGY [MG1__]

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	1	0	0	3	40	0	25	0	65

A. COURSE OVERVIEW

This course is designed to understand environmental effect on soil properties and how to deal with foundation problems on contaminated soils.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Introduction to environmental geotechnique, source, production and classification of wastes	4	CO1
[2]	Soil-pollution interaction, effects of pollutant on soil properties, foundation problems on contaminated clays	5	CO2
[3]	Hazardous waste management, criteria for selection of sites for waste disposal facilities, subsurface disposal techniques	8	CO3, CO4
[4]	Passive containment systems, monitoring and performance of waste facilities.	7	CO5

C. TEXT BOOKS

1. Criteria for Hazardous Waste Landfills: CPCB Publication, Feb. 2001.
2. Geotechnology of Waste Management - Oweis I, S. and Khera R.P.

D. REFERENCE BOOKS

Proceeding of the Workshop on Geotechnical Hazardous Waste Management at DDU Nadiad

E. COURSE OUTCOMES

(Minimum 5 Cos are required)

CO Number	Skill	Statement
CO1	Understand	Understand the basics of Environmental Geotechnology.
CO2	Evaluate	Determine the efffects of pollutant on soil properties
CO3	Remember	Criteria for selection of site for waste disposal facilities
CO4	Understand	Understand Subsurface disposal technique
CO5	Analyse	Analyse passive containment system

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	1	3	1	1	1	2	1	2	-	1	2	1
CO2	2	3	1	2	1	1	1	2	1	2	-	1	2	1
CO3	3	3	1	1	2	1	1	2	2	3	-	2	2	1
CO4	3	3	1	1	2	2	2	2	2	3	-	2	2	1
CO5	1	2	1	3	1	1	1	2	1	2	-	1	2	1

M. TECH. SEMESTER –I (CIVIL_GEOTECHNICAL ENGINEERING)

SUBJECT: ROCK MECHANICS [MG2__]

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	1	0	3	3	40	0	25	0	65

A. COURSE OVERVIEW

The process of collection soil data for the assessment soil properties at a site through series of laboratory and field investigation is collectively called Sub-soil Exploration. Enables the engineers to draw soil profile indicating the sequence of soil strata and the properties of soil and rock involved.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Physical and structural geology of rocks, classification of rocks	4	**CO1**
[2]	mapping of joins, Classification of inferential testing,	4	**CO2**
[3]	transitional materials, engineering property evaluation;	4	**CO3**
[4]	laboratory methods and insitu tests, friction in rocks, elasticity and strength of rocks,	4	**CO4**
[5]	insitu stress determination, application of rock mechanics in engineering and underground openings,	4	**CO5**
[6]	slope stability and foundation problems.	4	**CO6**

C. TEXT BOOKS

1. Rock Mechanics – Goodman, F. E.

D. REFERENCE BOOKS

1. Rock Engineering– Ohn, A. Franklin and Maurice B. Dusseault,
2. Rock Mechanics in Engineering Practical – Stagg K G & Zienkiewicz 0 C
3. Rock Mechanics – Muller
4. Engineering in Rocks for Slopes, Foundation and tunnels – Ramamurthy T.
5. Engineering Rock Mechanics – An Introduction to the Principles – Hudson J A and Harrison J P

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand	Classify the Rock mass and rate the quality of rock.
CO2	Evaluation	mapping of joins, Classification of inferential testing,
CO3	Application	Apply the knowledge of engineering and assess the influence of in situ stress in the stability of various underground excavations and also acquire the knowledge of design of opening in rocks.

CO4	Evaluation	design the foundations resting on rocks. Able to carry out suitable foundation for the structure resting on rock.
CO5	Understand	Apply the knowledge of engineering and understand the stress – strain characteristics and geological structures.
CO6	Application	Apply the knowledge on rock mechanics and analyse the stability of rock slopes and arrive at the bearing capacity of shallow and deep foundations resting on rocks considering the presence of joints.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	3	2	2	1	3	2	2	3	3	2	-
CO2	1	3	2	2	3	3	1	2	2	3	3	3	2	-
CO3	1	2	2	3	3	3	2	3	2	3	3	3	2	2
CO4	2	2	2	2	3	3	2	2	2	1	1	1	2	2
CO5	2	3	2	3	3	3	2	3	2	1	1	1	2	1
CO6	2	2	2	3	3	3	2	2	2	1	1	1	2	1

M. TECH. SEMESTER – I (CIVIL-GEOTECHNICAL ENGINEERING)
SUBJECT: NUM. METHODS & APPLICATION TO GEOTECHNICAL ENGG. [MG113]

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	1	0	0	3	40	0	25	0	65

A. COURSE OVERVIEW

The course aims at learning various numerical methods and understanding and applying the applications of these methods in Geotechnical Engineering.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Advanced Matlab Applications for: Solution of non – linear algebraic equations, , numerical solutions of ordinary differential equations and partial differential equations, its applications to structural engineering problems. Solution of Eigen value problems, iterative methods & transformation methods. Use of software for transformation methods. Computer oriented algorithms	4	CO1
[2]	Correlation and regression, Principles of least squares Euler's equation -Functional dependent on first and higher order derivatives	5	CO2
[3]	Laplace transform methods, Laplace equation -Properties of harmonic functions -Fourier transform methods for Laplace equation.	6	CO3
[4]	Application : Excel spread sheets for the design of shallow foundations, laboratory testing applications, settlement calculations, pile foundations etc.	4	CO4
[5]	Constitutive modeling of soil, Software Usage: Applications of Geo4, Z-soil, Plaxis, STAAD, STRAP etc. for Soil Structure Interaction and geotechnical design problems.	5	CO5

C. TEXT BOOKS

1. Salvadori, M. G., Baron, M. L. (1964). *Numerical Methods in Engineering*. United States: Prentice-Hall.
2. Wilson, E. L., Bathe, K. (1976). *Numerical methods in finite element analysis*. United Kingdom: Prentice-Hall.
3. Scarborough, J. B. (1930). *Numerical Mathematical Analysis*, By James B. Scarborough.
4. *Numerical Methods in Geomechanics*: Proceedings of the NATO Advanced Study Institute, University of Minho, Braga, Portugal, Held at Vimeiro, August 24 – September 4, 1981. (2012). Netherlands: Springer Netherlands.

D. REFERENCE BOOKS

1. Bowles, J. E. (1997). Foundation Analysis and Design. Singapore: McGraw-Hill.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Apply	Applications of Matlab in solutions of various equations
CO2	Understand	Understand Correlation and regression
CO3	Understand	Understand Laplace transform methods
CO4	Apply	Apply Excel spread-sheets of design of foundation system
CO5	Analyze	Analyze the soil behaviour in softwares under various conditions

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	1	3	1	1	1	2	1	2	-	1	2	3
CO2	2	3	1	2	1	1	1	2	1	2	-	1	2	3
CO3	3	3	1	1	2	1	1	2	2	3	-	2	2	3
CO4	3	3	1	1	2	2	2	2	2	3	-	2	3	3
CO5	1	2	1	3	1	1	1	2	1	2	-	1	3	3

M. TECH. SEMESTER – I (CIVIL-GEOTECHNICAL ENGINEERING)
SUBJECT: SOIL ENGINEERING-II [MG207]

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	0	2	5	4	60	40	25	-	65

A. COURSE OVERVIEW

The course is designed for to establish an understanding of the fundamental concepts of mechanics of different types of soil materials including shear strength behavior of materials and its applications in various elements of Geotechnical Engineering.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	**Shear Strength of Soils** Mohr's strength theory, Mohr-Coulomb theory, Types of shear tests: Direct shear test, Unconfined compression test, triaxial compression test, Drainage conditions – UU, CU, CD, Vane shear Test, Effective Stress principle, Skemptom's pore pressure parameters, Stress Path method, Stress path – field cases	6	CO1
[2]	**Critical State Soil Mechanics** Introduction, CSSM representation, soil yielding, Cam Clay model, Modified Cam Clay model, Peak state, Prediction of soil behaviour from MCCM, CSSM problems	4	CO1
[3]	**Earth Pressure Theory** Active and passive earth pressure due to backfill, Earth Pressure at rest, Rankine's earth pressure theory, Coulomb theory of earth pressure	5	CO2
[4]	**Design of Retaining Wall** Introduction, Type of Retaining wall, Principles of design of retaining wall, Gravity retaining wall, Cantilever retaining wall	4	CO2
[5]	**Stability of Slopes** Idealized Condition used in the analysis, factor of safety, Infinite and finite slopes, Stability of Infinite slopes, Introduction to Swedish Circle Method of Analysis, Fellenius method, Taylor's Stability Number, Friction Circle Method, Bishop's Method	5	CO3
[6]	**Sheet Pile Wall** Classification, Cantilever sheet pile wall in cohesive and cohesionless soil, Design of anchored bulk head: Free & Fixed Earth support method, Soil pressure on Braced excavation	8	CO4
[7]	**Introduction to Rock Mechanics** Geological classification of rock, basic terminologies, Index Properties of rock, Classification of rock for engineering purposes, Strength classification of intact rocks, Laboratory tests of rocks, modes of failure of rocks	4	CO5

C. TEXT BOOKS

1. Verma A.K. *Geotechnical and Foundation Engineering*; Charotar Publishing House Pvt. Ltd.
2. Punmia B. C. *Soil Mechanics and Foundations*; Laxmi Publications

D. REFERENCE BOOKS

1. Murthy V. N. S, *Soil Mechanics and Foundation Engineering;* UBS Publisher
2. Arora K. R. *Soil Mechanics and Foundation Engineering;* Standard Publishers Distributors
3. Das B. M. *Principles of Geotechnical Engineering*; Tata McGraw Hill.
4. Bowles J. E. *Physical and Geotechnical Properties of soils*; McGraw Hill Book Company
5. SP-36 (Part 1) - 1987 : Compendium of Indian Standards on Soil Engineering - Laboratory Testing of Soils for Civil Engineering Purpose
6. SP-36 (Part 2) - 1988 : Compendium of Indian Standards on Soil Engineering - Field Testing of Soils for Civil Engineering Purpose

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Evaluate	Determine shear strength properties of soils
CO2	Evaluate	Determine earth pressure values and its application in Retaining wall
CO3	Analyse	Analyse the stability of slope
CO4	Apply	Design and analyse sheet pile wall
CO5	Understand	Determine basic properties of rock and understand its behaviour

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	1	3	1	1	1	2	1	2	-	1	3	2
CO2	2	3	1	2	1	1	1	2	1	2	-	1	3	3
CO3	3	3	1	1	2	1	1	2	2	3	-	2	3	3
CO4	3	3	1	1	2	2	2	2	2	3	-	2	3	3
CO5	1	2	1	3	1	1	1	2	1	2	-	1	1	0

M. TECH. SEMESTER – II (CIVIL-GEOTECHNICAL ENGINEERING)
SUBJECT: SOIL STRUCTURE INTERACTION

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	0	4	4	60	40	25	0	125

A. COURSE OVERVIEW

The objective of this course is to make student understand about the importance of Soil Structure Interaction in design of structures. Application of Soil structure Interaction to various structural elements will be shown.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Critical study of conventional methods of foundation design; Nature of complexities of soil structure interaction; Application of advanced techniques of analysis such as the finite element method, finite differences, relaxation and interaction for the evaluation of soil-structure interaction for different types of structures under various conditions of loading and subsoil characteristics;	12	CO1
[2]	Preparation of comprehensive design-oriented computer programs for specific problems.	04	CO2
[3]	Interaction problems based on the theory of sub-grade reaction such as beams, footings, rafts bulkheads etc, Analysis of different types of framed structures founded on stratified natural deposits with linear and non-linear stress-strain characteristics.	10	CO4
[4]	Determination of axial and lateral pile capacities; group action of piles considering stress-strain characteristics of real soils.	10	CO3

C. TEXT BOOKS

1. Analysis and design of foundation - J. Bowles
2. Numerical Methods in Geotechnical Engg. - Desai & Christian

D. REFERENCE BOOKS

1. Elastic Analysis of Soil Foundation Interaction - A P S Selvadurai
2. Advanced Geotechnical Engineering - C S Desai, M. Zaman

E. COURSE OUTCOMES

On the successful completion of this course
CO1: Students will have basic understanding of Soil Structure Interaction.
CO2: Students will solve beams on elastic foundation problem and its application.
CO3: Students will be able to understand effect of Soil structure interaction to deep foundation.
CO4: Students will be able to analyse raft foundation resting on soil using soil springs.

F. COURSE MATRIX

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	2	3	3	1	2	1	2	2	1	3	1
CO2	1	3	1	3	1	3	3	1	3	2	2	3	1	3
CO3	3	2	1	2	1	2	3	2	1	1	1	2	3	1
CO4	2	2	3	3	2	1	1	3	2	3	3	1	2	3

M. TECH. SEMESTER – II (CIVIL-GEOTECHNICAL ENGINEERING)
SUBJECT: GEOPHYSICAL EXPLORATIONS [MG2__]

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	1	0	0	3	40	0	25	0	65

A. COURSE OVERVIEW

This course aims at learning various geophysical methods of exploring the ground to understand the various physical and engineering properties of soil and rock.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	**Introduction** An overview of geophysical methods of exploration; classification – major /minor; artificial / natural; applications and limitations, need for integrated surveys. Physical properties, rocks-density, susceptibility, resistivity and elastic wave velocities, factors controlling the properties, numerical values for important rock types, concept of physical property contrast. Role of geophysics in understanding the internal structure of the earth and plate tectonics.	6	CO1
[2]	**Gravity Methods** Earth's gravity field, origin, variation with elevation and depth, temporal and transient variations, international gravity formula, geoid, spheroid. Principle of gravity exploration, concept of gravity anomaly; gravimeters, gravity surveys, reduction of data, free air, Bougrer and topographic correlations; concepts of regional and residuals; contamination and derivative maps. Quantitative interpretation of anomaly maps, identification of faults, folds and contacts, principles of quantitative interpretation with reference to spheres, cylinders and thin horizontal sheets; concepts of modeling and inversion.	4	CO2
[3]	**Magnetic Methods** Earth's magnetic field, origin; magnetic elements, interrelationships, transient and temporal variations; IGRF; principle of magnetic method, origin of anomalies, induced and remanant magnetizations; magnetometers, proton precession and fluxgate; plan of magnetic surveys, reduction of data; anomaly maps, identification of structures; familiarization of magnetic anomalies over spheres, sheets and dykes; interpretation of magnetic anomalies of sheets and dykes. Airborne magnetometry, plan of surveying and presentation of results.	5	CO3
[4]	**Electrical and Electromagnetic Methods** Self-potential method, origin of SP; resistivity method, concept of apparent resistivity, Werner, Schlumberger and Dipole-dipole configurations; electrical sounding, interpretation through curve matching, electrical profiling; elements of electromagnetic methods, in phase, out of phase components, identification of conductors from EM anomalies.Telluric and magneto methods, application in oil exploration.	4	CO4
[5]	**Seismic Methods** Elastic propagation in rocks, Hooke's Law, acoustic impedance; Snell's	5	CO5

	Law, principles of seismic refraction method, travel time curves over horizontal interfaces and faults, interpretation of results; principles of seismic reflection method, travel time curves, over horizontal and dipping layers, interpretation; concept of RMS interval and average velocities; seismic data acquisition on land and sea, sub-bottom profilers, seismic sources, air gun, etc., processing of seismic reflection data, single channel and multi channel seismic data interpretation methods, pitfalls, seismic stratigraphy, velocity pull ups, bright spots etc., Technological advances in seismic data processing, modern survey techniques; GPS; reservoir characterization.		

C. TEXT BOOKS

1. Radhakrishna Murthy, I.V., (1998). *Gravity and magnetic interpretation in exploration geophysics*. Geol. Soc. India, Bangalore.
2. Jhon, Milsom (2003). *Field Geophysics*, 3rd Edn. John Wiley, London.
3. Dobrin, M.B. and Savit, C.H. (1988). *Introduction to geophysical prospecting*, 4th Edn., McGraw Hill, New York.
4. Saha, J. G. *Seismic data processing manual*, ONGC Pub. Dehradun.
5. Coffeen, J.A. 1986. *Seismic exploration fundamentals and seismic techniques for finding oil*, 2nd Edn. Pennwell Pub. Co., Tulsa, Oklahoma.
6. Domenico, S.N. 1983. *Modern Seismic Exploration concepts*. Tulsa, Oklahoma.
7. Macquillin, R. Bacon, M.(eds). 1984. *An introduction to seismic interpretation, reflection seismics in petroleum exploration*, Grahmam, Trot.

D. REFERENCE BOOKS

1. M.B.R.Rao, (1993). *Outlines of geophysical prospecting*, English Book Depo, Dehradun.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand	Understand the need of Geophysical methods and classify it.
CO2	Apply	Gravity methods: uses, application and interpretation of results
CO3	Apply	Magnetic methods: uses, application and interpretation of results
CO4	Apply	Electrical and electromagnetic methods: uses, application and interpretation of results
CO5	Apply	Seismic methods: uses, application and interpretation of results

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	1	3	1	1	1	2	1	2	-	1	2	1
CO2	2	3	1	2	1	1	1	2	1	2	-	1	2	2
CO3	3	3	1	1	2	1	1	2	2	3	-	2	2	2
CO4	3	3	1	1	2	2	2	2	2	3	-	2	2	2
CO5	1	2	1	3	1	1	1	2	1	2	-	1	2	2

M. TECH. SEMESTER – II (CIVIL-GEOTECHNICAL ENGINEERING)

SUBJECT: EARTHDAM ENGINEERING [MG208]

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	1	0	3	3	40	0	25	0	65

A. COURSE OVERVIEW

The course will provide knowledge on effective stress analysis; Stability of earth and rock fill dams; Steady state seepage and rapid draw down cases. Design of earth dams, Pore pressure during construction stage, Methods of seepage control in earth dams. Seismic analysis of embankment and measuring instruments.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Factors influencing design of earthdams, types of earthdams, Control of pore pressure within the dam and foundation,	4	**CO1**
[2]	critical study of earthdam failures, embankment settlement during and after construction, differential settlement and cracks,	4	**CO2**
[3]	construction pore pressures and control, seepage analysis, various methods of construction of flownets, methods of foundation treatment,	4	**CO3**
[4]	critical evaluation of methods of stability analysis, dams with impervious membranes of manufactured materials like reinforced concrete, steel plates and asphaltic conctrete,	4	**CO4**
[5]	embankment construction procedures,	4	**CO5**
[6]	equipment, methods of quality control, measuring instruments, performance observations, aseismic design, slope protection, rockfill construction.	4	**CO6**

C. TEXT BOOKS

1. Sherrared - Earth Dam Engg.

D. REFERENCE BOOKS

2. Creager W. P. - Engineering for dams, Wiley, 1967.
3. Singh, B. - Earth and Rockfill dam, Sarita Prakashan, 1973.
4. Sowers G. I. - Earth and Rockfill dam engineering,
5. Earth Manual, - USBR Publication.
6. Arcold - Volume on earth and rockfill dams.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand	Recognize potential failure modes or deformation types for soil slopes and embankments
CO2	Application	Distinguish the common causes/triggering mechanisms for landslides/slope instabilities
CO3	Design	Determine the stability of a slope using slope stability manually
CO4	Evaluation	Design proper slope and stable earthen structure as per requirement
CO5	Decision Making	Construction of earth dam work
CO6	Understand	Instrumentation in Earthen Dam

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	3	2	3	1	3	1	2	2	2	3	2	2	-
CO2	1	2	2	2	3	2	2	2	3	2	2	2	2	-
CO3	2	2	3	2	2	2	2	1	1	2	2	1	3	1
CO4	2	1	1	2	2	1	1	2	2	2	3	2	3	1
CO5	1	2	2	2	3	2	2	1	1	2	2	1	2	-
CO6	3	3	2	2	1	1	1	2	2	2	3	2	2	-

M. TECH. SEMESTER – II (CIVIL-GEOTECHNICAL ENGINEERING)

SUBJECT: GROUND IMPROVEMENT TECHNIQUES [MG2__]

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	1	0	3	3	40	0	25	0	65

A. COURSE OVERVIEW

Various processes of ground improvements are available to increase the strength, reduce compressibility, reduce permeability of weak soils, or improve groundwater conditions. Further, if there is any foundation distress in the existing structures, in-place foundation treatment can be applied to rehabilitate the structure.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Weak deposts- identification, problems associated with weak deposits, Mitchel chart for applicability of treatment methods	4	**CO1**
[2]	Insitu compaction of cohesionless soil, injection grouting, soil stabilization, vibroflotation, reloading, sand drains	4	**CO2**
[3]	prefabricated vertical drains, stone columns, dynamic consolidation, blasting, compaction piles	4	**CO3**
[4]	Ground water control methods, diaphragm walls, well point system	4	**CO4**
[5]	Geo-reinforcement applications	4	**CO5**
[6]	Techniques for expansive soils, loess	4	**CO6**

C. TEXT BOOKS

1. An Intro. To Ground Improvement Engg. – Satyendra mittal

D. REFERENCE BOOKS

1. Construction and Geotechnical Methods in Foundation Engg. – Koerner R. M.
2. Foundation Engineering in Difficult Subsoil Conditions - Zeevart L.
3. Foundation Engineering in Difficult Ground – Bell F. G.
4. Engg. Principles of Ground Modifications – Haussman M. R.
5. Earth Reinforcement and Soil Structure – Jones J E P.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand	The different ground improvement techniques.
CO2	Understand	The methods of stabilisation

CO3	Apply	The basic concept of consolidation of soil
CO4	Understand	Understand the basic concept of water control methods
CO5	Understand	Understand the basic concepts of geosynthetics
CO6	Evaluate	The concept of shear strength in difficult soils

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	2	3	2	-	3	3	1	2	3	2	1
CO2	3	3	3	3	1	2	3	3	3	2	-	3	2	2
CO3	3	3	3	3	2	2	3	3	3	1	3	3	2	1
CO4	3	3	3	3	1	3	3	-	3	1	-	3	3	3
CO5	3	3	3	3	1	1	3	3	2	3	1	3	3	2
CO6	3	2	3	2	3	1	-	3	3	1	-	3	2	2

M. TECH. SEMESTER – II (CIVIL-GEOTECHNICAL ENGINEERING)
SUBJECT: REINFORCED EARTH AND GEOTEXTILES

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	0	0	3	3.0	60	0	0	0	60

A. COURSE OVERVIEW

This section may include motivation, objectives, scope etc. of the subject. It is preferred to describe all in less than 7 lines.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Basic introduction to the elements of ground engineering characteristics of reinforcing materials, definition of reinforced and advantage of RE.	5	CO1
[2]	Soil reinforcement interaction, behaviour of reinforced earth walls, basis of wall design, the coulomb force method, the Rankine force method, internal and external stability condition,	9	CO2, CO3
[3]	Field application of RE, randomly reinforced earth and analysis of reinforced soils, testing of soil reinforcements.	6	CO4
[4]	Definitions, functions, properties and application of geotextiles, design of geotextile applications,	5	CO1, CO2, CO3
[5]	definitions, functions, properties and application of geo membranes, design of geo membranes	5	CO1, CO2, CO3
[6]	applications, geo textiles associated with geo membranes, testing on geo Textiles, environmental efforts, ageing and weathering.	6	CO1, CO4

C. TEXT BOOKS

1. Koerner R.M. . *Designing with Geosynthetics*; 3rd ed.; Prentice Hall. University of Michigan, 1994.

D. REFERENCE BOOKS

1. Rao G.V., *Geosynthetics- New Horizons;* 5th ed.; Asian Books Private Ltd.: New Delhi, 2012.
2. Swami Saran,. *Reinforced soil and its engineering applications,*; McWiley, Hoboken, New Jersey, 2019.
3. G L Sivakumar Babu, *An Intro. To Soil reinf. And Geosymthetics*, 1st ed. Universities Press (India) Pvt. Ltd.2013.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Evaluate	Prepare and Understand the Reinforced Earth & Geotextile.
CO2	Comprehension	Identify the various methods of analysis and failure modes.
CO3	Analysis	Application of methods to analyse and design reinforced earth walls.
CO4	Application	Application of geotextile for various functions performed by geotextiles.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	1	1	1	1	1	1	1	1
CO2	3	3	3	3	3	3	3	3	3	3	3	3
CO3	2	2	2	2	2	2	2	2	2	2	2	2
CO4	1	-	-	1	1	-	2	-	1	1	-	1
Avg												

M. TECH. SEMESTER – II (CIVIL-STRUCTURAL ENGINEERING)
SUBJECT: RESEARCH METHODOLOGY [SG202]

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	2	2	2	2	2	2	2	2	2

A. COURSE OVERVIEW

The objective of this course is to understand the basic concepts of research and its methodologies, identify appropriate research topics, select and define appropriate research problem and parameters, prepare a research proposal and research documentation.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations	7	CO1
[2]	Effective literature studies approaches, analysis Plagiarism, Research ethics	4	CO2
[3]	Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee	4	CO3
[4]	Nature of Intellectual Property - Patents, Designs, Trademark and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.	4	CO5
[5]	Patent Rights - Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.	4	CO4
[6]	New Developments in IPR - Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.	4	CO5

C. TEXT BOOKS

1. Ranjit Kumar, “Research Methodology: A Step-by-Step Guide for beginners”

D. REFERENCE BOOKS

1. Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science & engineering students”
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”
3. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd ,2007.
4. Mayall, “Industrial Design”, McGraw Hill, 1992.
5. Niebel, “Product Design”, McGraw Hill, 1974.
6. Asimov, “Introduction to Design”, Prentice Hall, 1962.

7. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “Intellectual Property in New Technological Age”, 2016.
8. T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Create	Students will be able to understand the concept of research and its methodologies and formulate research problem.
CO2	Evaluate	Students will be able to review existing literature in a given research area.
CO3	Application	Students will be able to document research findings effectively.
CO4	Understand	Students will be able to understand importance of research ethics law of patents and copy right
CO5	Understand	Students will be able to explore on various IPR components and process of filing.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	1	3	2	1	2	3	3	1	3	1	-
CO2	2	3	2	1	2	1	1	2	3	2	1	3	1	-
CO3	1	1	-	1	2	1	-	2	3	3	-	3	-	-
CO4	1	1	-	-	1	2	-	3	2	2	1	3	-	-
CO5	1	1	-	-	1	1	-	1	2	2	1	3	-	-

M. TECH. SEMESTER –II (CIVIL- STRUCTURAL ENGINEERING)

SUBJECT: AUDIT COURSE – II: PEDAGOGIC STUDIES

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	0	0	0	0	0	0	0	0	0

A. DETAILED SYLLABUS

1. Introduction and Methodology:
   Aims and rationale, Policy background, Conceptual framework and terminology, Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions**.** Overview of methodology and Searching.
2. Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.
3. Evidence on the effectiveness of pedagogical practices, Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.
4. Professional development: alignment with classroom practices and followup support Peer support, Support from the head teacher and the community, Curriculum and assessment, Barriers to learning: limited resources and large class sizes
5. Research gaps and future directions, Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

B. RECOMMENDED TEXT / REFERENCE BOOKS

1. Culture and pedagogy: International comparisons in primary education. - Alexander RJ
2. Read India: A mass scale, rapid, 'learning to read' campaign - Chavan M

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B. Tech. Semester I

SUBJECTS	Teaching Scheme			Total	Credit	Examination Scheme (Marks)				
	Th	Tut	Pract			Th	Sess	TW	Prac	Total
Mathematics I	3	1	0	4	4.0	60	40	-	-	100
Basic Electrical Engineering	3	1	2	6	5.0	60	40	50	-	150
Programming for Problem Solving I	4	0	3	7	5.5	60	40	50	-	150
Engineering Graphics & Design	1	0	4	5	3.0	-	-	100	-	100
Software Workshop	0	0	2	2	1.0	-	-	50	-	50
	11	2	11	24	18.5	180	120	250	-	550

B. Tech. Semester II

SUBJECTS	Teaching Scheme			Total	Credit	Examination Scheme (Marks)				
	Th	Tut	Pract			Th	Sess	TW	Prac	Total
Mathematics II	3	1	0	4	4.0	60	40	-	-	100
Programming for Problem Solving II	4	0	3	7	5.5	60	40	50	-	150
Physics	3	1	2	6	5.0	60	40	50	-	150
Hardware Workshop	0	0	4	4	2.0	-	-	100	-	100
English	2	0	2	4	3.0	40	-	50	-	90
Environmental Sciences	2	0	0	2	0.0	40	-	-	-	40
	14	2	11	27	19.5	260	120	250	-	630

B. TECH. SEMESTER – I (EC/CE/IT)

SUBJECT: MATHEMATICS - I

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
3	1	0	4	4	60	40	-	-	100

Reference Code BSC102

A. COURSE OBJECTIVE

The objective of this course is to familiarize the prospective engineers with techniques in calculus, matrices, vector spaces and multivariable calculus.

B. DETAILED SYLLABUS

[1] CALCULUS

Evolutes and involutes, Evaluation of definite and improper integrals; Beta and Gamma functions and their properties, Applications of definite integrals to evaluate surface areas and volumes of revolutions. Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule, Maxima and minima.

[2] MATRICES

Matrices, Vectors: addition and scalar multiplication, matrix multiplication; Rank of a Matrix, Linear systems of equations, Determinants, Cramer's Rule, Inverse of a matrix, Gauss Elimination and Gauss Jordan method.

[3] VECTOR SPACES

Eigenvalues, Eigenvectors, Symmetric, Skew-symmetric, and Orthogonal Matrices, Linear Independence of vectors, Diagonalization.

[4] MULTIVARIABLE CALCULUS (DIFFERENTIATION)

Limit, Continuity and Partial derivatives, Directional derivatives, Total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Vector Differential Calculus; Gradient, curl and divergence.

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 40th Edition, 2007.

2) G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint,2002.

3) Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

4) D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.

5) Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

6) Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint,2010.

7) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

8) V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, AffiliatedEast–West press, Reprint 2005.

D. COURSE OUTCOMES

At the end of the course, student should be able to

- Solve engineering problems involving calculus, matrices and vector space.
- Use mathematical tools to solve problems in calculus, matrices and vector space.

B. TECH. SEMESTER – I (EC/CE/IT)

SUBJECT: BASIC ELECTRICAL ENGINEERING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
3	1	2	6	5	60	40	50*	-	150

Reference Code ESC101

*TW Marks includes Viva based on TW

A. COURSE OBJECTIVE

The course imparts an in-depth understanding of the fundamental concepts with an objective to expose the students to the various types of electrical, electronic and magnetic circuits and their applications. This course is designed to provide knowledge of fundamentals and various laws in electromagnetic and magnetic circuits, electrostatics.

B. DETAILED SYLLABUS

[1] DC CIRCUITS

Electrical circuit elements (R, L and C), impact of temperature, voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first order RL and RC circuits.

[2] AC CIRCUITS

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-phasebalanced circuits, voltage and current relations in star and delta connections

[3] ELECTRO-MAGNETIC INDUCTION

Introduction, Magnetic effect of electric current, Current carrying conductor in magnetic field, Law of electromagnetic induction, Induced emf, Self-Inductance (L), Mutual Inductance (M), and Coupling coefficient between two magnetically coupled circuits (K), Inductances in seriesand parallel.

[4] MAGNETIC CIRCUITS

Introduction, Definition of Magnetic quantities, Magnetic circuit, Leakage flux, Fringing effect, Comparison between magnetic and electric circuits

[5] TRANSFORMERS

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections

[6] ELECTRICAL MACHINES

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited

DC motor. Construction and working of synchronous generators, Construction, Principles and working theory and Types of DC Motors & Generators, 1-Ph & 3-Ph Induction Motor, AC Generator

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Basic Electrical, Electronics and Computer Engineering, R. Muthu Subramanian, S.Salvahanan, K. A. Muraleedharan, 2nd Edition, Tata McGraw Hill

2) Electronics Principles, Albert Paul Malvino, 6th Edition, Tata McGraw Hill

3) Electrical Technology (Vol: II), B. L. Theraja , A. K. Theraja, 23rd Edition, R. Chand &Company

4) Basic Electrical Engineering, D.P. Kothari, I. J. Nagrath, 3rd Edition, Tata McGraw Hill

5) Introduction to VLSI Circuit & Systems, John P. Uyemura, 1st Edition, John Willey & Sons Inc.

6) Basic Electrical Engineering, D.C. Kulshreshtha, 1st Edition, Tata McGraw Hill

7) Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson

8) Electrical Engineering Fundamentals, V.D. Toro, 2nd Edition, Prentice Hall India

9) Fundamentals of Electrical Engineering, L.S. Bobrow, , Oxford University Press

D. COURSE OUTCOMES

At the end of the course, student should be able to

- Apply basic circuital laws (KVL, KCL and Ohm's) and Theorems (Thevenin's and Norton's) for simplifying the complex resistive network to compute node voltages and loop currents for given excitation.
- Analyze Single Phase AC Circuits, compute and demonstrate the waveforms and phasor diagram representation of alternating quantities.
- Design low pass, high pass, band pass and band elimination filter networks, analyse the frequency response of circuits to show the correlation between time domain and frequency domain response specifications.
- Analyze 3-Phase circuit (star-delta) and compute power for balanced and unbalanced load.
- Predict the behaviour of any electrical and magnetic circuits with an ability to identify, formulate, and solve magnetic circuit problems in electrical machines
- Model the Equivalent Circuit of a Transformer for Performance Analysis
- Discriminate the constructional details, principle of operation and applications of AC and DC electrical machines.

B.TECH. SEMESTER – I (EC/CE/IT)

SUBJECT: PROGRAMMING FOR PROBLEM SOLVING - I

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
4	0	3	7	5.5	60	40	50	-	150

Reference Code ESC201

A. COURSE OBJECTIVE

The objectives of teaching this course are:

- To impart in-depth understanding of fundamental programming concepts to build C programs.
- To explain conditional branching, iteration/looping, code reusability and pointers using C Programming Language.
- To demonstrate and teach how to code, document, test, and implement a well-structured C program.

B. DETAILED SYLLABUS

[1] OVERVIEW OF C

Basic structure of C program, compiling and running C program

[2] CONSTANTS, VARIABLES AND DATA TYPES

Types of constants, basic data types, identifier, variable, enum, symbolic constant, typedef, keywords, overflow and underflow

[3] OPERATORS AND EXPRESSIONS

Arithmetic, relational, logical, assignment, bitwise, and sizeof() operators, operator precedenceand associativity, expression evaluation

[4] MANAGING INPUT OUTPUT OPERATIONS

getchar() and putchar() functions, formatted I/O using printf() and scanf()

[5] DECISION MAKING AND BRANCHING

if and if...else statement, nested and ladder if...else, conditional operator, switch statement, gotostatement with warning

[6] DECISION MAKING AND LOOPING

while, do...while, and for loops, nested loops, break and continue statements

[7] ARRAYS AND STRINGS

Introduction to arrays, declaration, initialization and access of one-dimensional and two-dimensional arrays, Introduction to multi-dimensional and variable length arrays, declaration and initialization of strings, printing and scanning strings to/from standard I/O, string handlingfunctions, list of strings

[8] USER-DEFINED FUNCTIONS

Function prototype and function declaration, function definition, function call, actual and

formal parameters/arguments, return type and return statement, Nested function call, recursion,scope, visibility, and lifetime of variables.

[9] STRUCTURES AND UNIONS

Defining structure, declaring and initializing structure variables, typedef, accessing structure members, copying and comparing structure variables, nested structures, arrays and structures,structures and functions, unions

[10] POINTERS

Introduction, accessing address of a variable, declaration and initialization of pointer variables, Accessing variable using pointer, chain of pointers, scale factor and pointer expressions, pointers and arrays, pointer to array Vs array of pointers, passing arrays and strings to the function, array of pointers, pointers and functions, pointers and structures, const pointer vs pointer to const

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Programming in ANSI C by Balagurusamy, 8th Ed., Tata McGraw Hil

2) Programming with C by Byron Gottfried, 3rd Ed., McGraw Hill Education

3) The C Programming Language by Kernighan and Ritchie, 2nd Ed., PHI Learning

4) Expert C Programming: Deep C Secrets by Peter Van Der Linden, Pearson Education

5) Let Us C by Yashvant Kanetkar, 12th Ed., BPB Publication

6) Programming in C by Ashok N. Kamthane, 2nd Ed., Pearson Education

D. COURSE OUTCOMES

At the end of the course, student should be able to

- Use and understand language syntax and concepts for C Programming.
- Comprehend and use C Programming concepts to solve algorithmic and logical problems.
- Analyse the given problem and to formulate appropriate C language solution based on definitive language concept(s).
- Design a flowchart or a diagram for given problem and create C programs using decision making, branching, looping, user defined function, array, structure, pointers, etc.
- Apply concepts to write, compile, debug, execute, and document C programs with different test cases using appropriate tool(s).

B. TECH. SEMESTER – I (EC/CE/IT)

SUBJECT: ENGINEERING GRAPHICS AND DESIGN

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
1	0	4	5	3	-	-	100*	-	100

Reference Code ESC102

*TW Marks includes Viva based on TW

A. COURSE OBJECTIVE

The objectives of teaching this course are:

- To Understand the drawing importance in Engineering.
- To Describe the 3-Dimensional object into different 2-Dimensional view.
- To Develop skills in Reading and Interpretation of Engineering Drawings.
- To enhance drawing skills through hands-on training in a CAD lab using engineering software.

B. DETAILED SYLLABUS

[1] Introduction to Engineering Drawing Covering, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales –Plain, Diagonal and Vernier Scales;

[2] Orthographic Projections Covering, Principles of Orthographic Projections-Conventions Projections of Points and lines inclined to both planes; Projections of planes inclined Planes
- Auxiliary Planes;

[3] Projections of Regular Solids Covering, those inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.

[4] Sections and Sectional Views of Right Angular Solids Covering, Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid,Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects fromindustry and dwellings (foundation to slab only)

[5] Isometric Projections Covering, Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;

[6] Overview of Computer Graphics Covering, listing the computer technologies that impact on graphical communication, demonstrating knowledge of the theory of CAD software.

[7] Customization & CAD Drawing consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and

ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;

[8] Annotations, layering & other Functions Covering applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines(extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wire frame models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multi view, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling;

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar PublishingHouse
2) Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, PearsonEducation
3) Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4) Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
5) (Corresponding set of) CAD Software Theory and User Manuals

D. COURSE OUTCOMES

At the end of the course, student should be able to

- Skills in understanding and interpreting engineering drawings so that concepts can be communicated graphically more effectively.
- Demonstrate correct usage of methods, concept, and theories to illustrate and solve problem of conics, lines, planes, solids, and surface and many more.
- Choose a suitable standard projection method, break down a complex 3D problem into various orthographic and sectional orthographic views, and highlight missing features.
- Practical Exposure in a computer aided software to generate isometric projection and compose standard components of different streams

B. TECH. SEMESTER – I (EC/CE/IT)

SUBJECT: SOFTWARE WORKSHOP

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
0	0	2	2	1	-	-	50*	-	50

Reference Code ESC202

*TW Marks includes Viva based on TW

A. COURSE OBJECTIVE

The objective of the course is to familiarize students with various software tools and technology. The course aims at providing hands on experience related to basic software installation, usage of Operating systems and various essential software utilities.

B. DETAILED SYLLABUS

[1] OPERATING SYSTEM BASICS

Introduction to Operating System and Linux Architecture

[2] SOFTWARE INSTALLATION

Installation of open source/freeware software using package manager for programming/simulation.

[3] SHELL COMMANDS

Linux usage, commands & shell scripting. Command structure and general purpose utility

[4] FILE HANDLING

basic of file handling. The file system, Handling ordinary files, File attributes and permission,file system details

[5] SHELL SCRIPTING

Basic Shell commands, Looping and Branching,

[6] SHELL UTILITIES

Find command and shell, simple filters, advance filters.

[7] EDITORS

VI editor for basic text editing, LATEX for scientific documents and report writing.

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Unix : Concepts and Applications, Sumitabha Das, 4th Edition, Tata McGraw Hill

D. COURSE OUTCOMES

After completing the course, the students will

- have knowledge of installation and maintainance of softwares
- be able to perform computational tasks using various utilities and commands related to operating systems
- be able to manage and maintain software system on a PC.

B. TECH. SEMESTER II (EC/CE/IT)

SUBJECT: MATHEMATICS-II

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
3	1	0	4	4	60	40	0	0	100

Reference Code BSC301

A. COURSE OBJECTIVE

The objective of this course is to familiarize the prospective engineers with techniques in Differential Equations, numerical methods and laplace transform.

B. DETAILED SYLLABUS

[1] FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS AND INTRODUCTION TO HIGHER ORDER DIFFERENTIAL EQUATIONS

Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type, second order linear differential equations with variable coefficients, Method of variation of parameters, Cauchy-Euler equation.

[2] NUMERICAL METHODS

Ordinary differential equations: Taylor's series, Euler and modified Euler's methods, Runge-Kutta method of fourth order for solving first order equations, Solution of algebraic and transcendental equations: Newton Raphson's Method, Numerical integration : Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.

[3] MULTIVARIABLE CALCULUS (INTEGRATION)

Multiple Integration: Double integrals (Cartesian), Change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Triple integrals (Cartesian), Scalar line integrals,Vector line integrals, Scalar surface integrals, Vector surface integrals, Theorems of Green, Gauss and Stoke's.

[4] LAPLACE TRANSFORM

Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions, Finding inverse Laplace transform by different methods, Convolution theorem. Evaluation of integrals by Laplace transform, Solving ODE by Laplace Transform method.

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 40th Edition, 2007.

2) G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Ed.,Pearson, 2002.

3) Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

4) W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary ValueProblems, 9th Edn., Wiley India, 2009.

5) S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.

6) E. A. Coddington, An Intro. to Ordinary Differential Equations, Prentice Hall India, 1995.

7) J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc- GrawHill, 2004.

8) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications,Reprint, 2008.

D. COURSE OUTCOMES

After completing the course, the students will

- Solve engineering problems involving differential equation, numerical methods and laplace transform.
- Use mathematical tools to solve problems in differential equations, numerical methods and laplace transform.

B. TECH. SEMESTER – II (EC/CE/IT)

SUBJECT: PROGRAMMING FOR PROBLEM SOLVING - II

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
4	0	3	7	5.5	60	40	50*	-	150

Reference Code ESC201

*TW Marks includes Viva based on TW

A. COURSE OBJECTIVE

The objectives of teaching this course are:

- To provide fundamental concepts of object-oriented programming like abstraction, inheritance, polymorphism etc. and explain differences between object-oriented programming and procedural programming
- To teach programmatic implementation of these concepts using c++ language.
- Explain signifiance of these concepts to learn subjects like software engineering and object-oriented design and analysis.

B. DETAILED SYLLABUS

[1] BASICS OF C++

Overview, Program structure, keywords, identifiers, constants, data types, symbolic constants, declaration of variables, operators, namespaces, control structures, dynamic memory – C style – malloc(), calloc(), realloc() and free() Vs C++ style - new and delete keywords, reference andpointer

[2] FUNCTIONS IN C++

main function (variations in signature), function prototype, inline functions, call and return by reference, default parameters, function overloading

[3] INTRODUCTION TO OBJECT ORIENTED PROGRAMMING

Procedural Vs Object Oriented Programming, Principles of OOP, Benefits and applications of OOP

[4] CLASSES AND OBJECTS – ENCAPSULATION AND ABSTRACTION

Introduction, private and public members, Defining member functions, static members, Objects as function arguments and return type, friend functions, const member functions, Constructors and their types, Destructor, Operator overloading, type conversion

[5] INTRODUCTION TO C++ STRING CLASS

[6] INHERITANCE

Introduction, types of inheritance – single, multiple, multilevel, hierarchical, and hybrid inheritance, Protected members, overriding, virtual base class

[7] POLYMORPHISM

Introduction, Pointers and Objects, this pointer, pointer to derived classes, virtual and pure virtual functions, dynamic binding

[8] INPUT/OUTPUT

Introduction to streams, standard I/O stream objects, stream classes, unformatted and formatted I/O, manipulators

[9] EXCEPTION HANDLING

Basics of exception handling, try-catch-throw, rethrowing exceptions, user defined exceptions

[10] TEMPLATES

Basics of class templates and function templates

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Object-Oriented programming with C++, Seventh Ed., by E Balagurusamy, TMH publication
2) The C++ Programming Language, Fourth Ed., by Bjarne Stroustrup, Addison-Wesleypublication
3) Object-Oriented Programming in C++, Fourth Edition, by Robert Lafore, SAMS publication
4) Accelerated C++: Practical Programming by Example, First Edition, by Andrew Koenig andBarbara E. Moo, Addison-Wesley publication
5) C++ Black Book, First edition, by Steven Holzner, Paraglyph Press
6) C++: The Complete Reference, Fourth Edition, by Herbert Schildt, McGraw Hill Education

D. COURSE OUTCOME

At the end of the course students should be able to:

- Use and understand language syntax and concepts for C++ Programming along with templates for class and function.
- Apply Object Oriented Programming (OOP) concepts to solve algorithmic and logical problems.
- Identify the given problem and to formulate appropriate C++ language solution based on OOP Principle(s).
- Write C++ programs using Encapsulation, Abstraction, Inheritance, Polymorphism, Exception Handling, etc. to solve given problem(s).
- Apply concepts to write, compile and execute C++ programs with different test cases. Also be able to debug and document C++ programs.

B. TECH. SEMESTER II (EC/CE/IT)

SUBJECT: PHYSICS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
3	1	2	6	5	60	40	50*	-	150

Reference Code BSC101

*TW Marks includes Viva based on TW

A. COURSE OBJECTIVE

The objective of this course is to relate the concept of physics with the ever-growing field of Information and Communication Technology. This course provides knowledge on the electronic devices such as Semiconductor Diodes: Bipolar Junction transistors, Amplifiers: Sinusoidal Oscillators: & build capability for designing various circuits of electronic devices. The course elaborates the concepts associated with Optoelectronics, Communication and Semiconductor switching devices. It also provides comprehensive idea about analog modulation & demodulation techniques (AM, FM and PM) and digital modulation (ASK, FSK and PSK).

B. DETAILED SYLLABUS

[1] SEMICONDUCTORS

Intrinsic and extrinsic semiconductors, Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction, Metal-semiconductor junction (Ohmic and Schottky), Semiconductor materials of interest for optoelectronic & other devices.

[2] DIODE

Introduction to P-N junction Diode and V-I characteristics, Half wave and Full-wave rectifiers, capacitor filter. Zener diode and its characteristics, Zener diode as voltage regulator, Special purpose diodes.

[3] LIGHT-SEMICONDUCTOR INTERACTION

Radiative transitions and optical absorption, LED and LASER, Photo detectors.

[4] ACTIVE COMPONENTS AND APPLICATIONS

BJT: Structure and input-output characteristics of a BJT, The Unbiased Transistor, Transistor Currents , Biased Transistor, a single stage voltage divider biasing, Emitter Bias, The CE Connections, The Base Curve, Collector curve, Transistor approximation Variation in current Gain, The Load Line, The Operating point, Recognizing Saturation, BJT as a switch & Amplifiers, LED Drivers.

[5] OSCILLATORS

General form of oscillator, Sinusoidal oscillator, phase shift oscillator, Crystal Oscillator.

[6] MOSFET

MOS physics and mode of operations, nFET current-voltage relationship, MOS pass characteristics and CMOS inverter, Dynamic RAM (DRAM) 1T bit-cell.

[7] FIBER OPTICS

Fiber Optics and Optoelectronics, Historical Developments, A Fiber-Optic Communication System, Advantages of Fiber-Optic Systems, Ray Propagation in Optical Fibers, Fundamental Laws of Optics, Ray Propagation in Step-Index Fibers, Ray Propagation in Graded-Index Fibers

[8] COMMUNICATION SYSTEMS

Communication system components, Analog modulation- AM, FM,PM.
Digital modulation-ASK, FSK, PSK

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Electronics Principles, Albert Paul Malvino, 6thEdition, Tata McGraw Hill

2) David Griffiths, Introduction to Electrodynamics

3) S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley (2008).

4) R.P Khare, Fiber Optics and Optoelectronics, Oxford University Press

5) Sanjay Sharma, Communication Systems: Analog and Digital

6) Halliday and Resnick, Physics

7) W. Saslow, Electricity, magnetism and light

8) Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc. (1995).

9) B. E. A. Saleh and M. C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc., (2007).

10) Yariv and P. Yeh, Photonics: Optical Electronics in Modern Communications, OxfordUniversity Press, New York (2007).

11) P. Bhattacharya, Semiconductor Optoelectronic Devices, Prentice Hall of India (1997)

12) Behrouz A. Forouzan, Data communication and networking.

13) B. P lathi, Modern Digital and Analog Communication Systems, Third edition.

D. COURSE OUTCOME

At the end of the course, students will be able to

- Illustrate intrinsic and extrinsic semiconductors, their applications and carrier generation and recombination with variations in doping density, temperature and other regulations.
- Design half wave, full wave rectifier circuit and voltage regulator circuit using Zener diode, PN diode and NPN, PNP transistors.
- Implement a transistor as a switch and Analyse Transistor input output characteristics, biasing circuits, Compute load line and calculate the operating point.
- Analyse structure of the oscillator and discriminate Sinusoidal oscillator, Phase shift oscillator and Crystal oscillator.
- Assess the performance & characteristics of Opto-electronic semiconductor devices like LED, LASER, Photo detectors
- Devise the ray optics propagation in step index and graded index fiber and Synthesize the use of optoelectronic devices in fiber optic communications.
- Illustrate pro and cons of analog and digital modulation techniques (AM, FM, PM, ASK, FSK, PSK) based on the need of system components.
- Justify the requirement of CMOS based on the fundamental study of nMOS and pMOS and describe working of 1 bit DRAM cell.

B. TECH. SEMESTER II (EC/CE/IT)

SUBJECT: HARDWARE WORKSHOP

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
0	0	4	4	2	-	-	100*	-	100

Reference Code ESC202

*TW Marks includes Viva based on TW

A. COURSE OBJECTIVE

The objective of the course is to familiarize students with various hardware tools and techniques. The course aims at imparting practical knowledge of various electronic components, computer hardware, and internet technology.

B. DETAILED SYLLABUS

[1] ELECTRONIC COMPONENTS

Digital Multi-meter, Power Supply, Function Generator, Cathode Ray Oscilloscope, Digital Oscilloscope, Measurement of Phase Difference in single phase circuit, Various Electrical and Electronics component like LED, LDR, Photo-diode, MOSFET, MCB and Relay.

[2] COMPUTER HARDWARE

Introduction to a personal computer and its basic peripherals, installation of Operating System Software and the required device drivers. Students are suggested to perform similar tasks on theLaptop scenario wherever possible.

[3] PERIPHERALS

Programming of Computer Ports & Interfacing of Electronic Components, Cables and Connectors like RJ45, RS232 and CRO probe.

[4] INTERNET

Introduction to Internet & World Wide Web modules, Making a PC Internet ready: Introduction to Internet and TCP/IP, Ethernet Connection, WiFi connection, configure TCP/IP (IP, Gateway,DNS, and Proxy), and use of ping command, Information sharing and data transfer over Local Area Network and Internet.

[5] WEB INFRASTRUCTURE

Basic Components of Web Sites, Front end & back end tools and technology. HTML & CSS, Developing, Configuring and deploying a website.

[6] IOT BOARDS AND CIRCUIT SIMULATION

Introduction to IOT boards like Arduino, Raspberry Pie etc. Interfacing, Circuit designing andPCB designing.

[7] MINI PROJECT

Student will develop a mini project related to the topics listed above.

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Electronic Components and Materials Principles, Dr. Madhuri A Joshi, 2nd Edition, ShroffPublishers & Distributors PVT. LTD.

2) A Textbook of Computer Hardware and Networking, Jyotika Deshmukh, D J Publications

3) Learning Web Design, Jennifer Robbins, 4th edition, O'Reilly Media

D. COURSE OUTCOME

After completing the course, the students will,

- have knowledge of various electronics components and computer hardware.
- The students will be aware of Internet Technology infrastructure.

B.TECH. SEMESTER II (EC/CE/IT)

SUBJECT: ENGLISH

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
2	0	2	4	3	40	-	50*	-	90

Reference Code HSMC201

*TW Marks includes Viva based on TW

A. COURSE OBJECTIVE

The objective of the course is to provide basic knowledge of English language to students coming from different background. The course aims to teach English Grammar and Communications skills which will be useful to engineers.

B. DETAILED SYLLABUS

[1] VOCABULARY BUILDING

The concept of Word Formation, Root words from foreign languages and their use in English, Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives, Synonyms, antonyms, and standard abbreviations.

[2] BASIC WRITING SKILLS

Sentence Structures, Use of phrases and clauses in sentences, Importance of proper punctuation, Creating coherence, Organizing principles of paragraphs in documents,
Techniques for writing precisely

[3] IDENTIFYING COMMON ERRORS IN WRITING

Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Clichés

[4] NATURE AND STYLE OF SENSIBLE WRITING

Describing, Defining, Classifying, Providing examples or evidence, Writing introduction and conclusion

[5] WRITING PRACTICES

Comprehension, Précis Writing, Essay Writing

[6] ORAL COMMUNICATION

(This unit involves interactive practice sessions in Language Lab) Listening Comprehension, Pronunciation, Intonation, Stress and Rhythm, Common, Everyday Situations: Conversations and Dialogues, Communication at Workplace, Interviews, Formal Presentations

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Practical English Usage. Michael Swan. OUP. 1995.

2) Remedial English Grammar. F.T. Wood. Macmillan.2007

3) On Writing Well. William Zinsser. Harper Resource Book. 2001

4) Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.

5) Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.

6) Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

D. COURSE OUTCOME

After successful completion of the course, students will be able to

- Understand the vocabulary and their root forms to enhance vocabulary level
- Enhance thier writing in effective way
- Ractify common errors in their speaking and writing
- Develop efficiency in writing
- Be competent at Public Speaking and Interviews
- Acquire Proficiency in all four skills of Language

B. TECH. SEMESTER – II (EC/CE/IT)

SUBJECT: ENVIRONMENTAL STUDIES

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
2	0	0	2	0	40	--	--	--	40

Reference Code MC-II

A. COURSE OBJECTIVE

The objective for this course is to bring awareness about sustainable development is a key to the future of mankind. Understanding, analyzing and proposing solutions to the contemporary environmental issues and problems of pollution, population explosion, solid waste disposal, environmental degradation, economic productivity, global warming, ozone layer depletion and loss of biodiversity.

B. DETAILED SYLLABUS

[1] THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Definition, scope and importance & Need for public awareness

[2] NATURAL RESOURCES

Renewable and non-renewable resource: Natural resources and associated problems**,** Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams, and their effects on forests and tribal people ,Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams benefit and problems,Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies, Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies, Energy resources: Growing energy needs, renewable and non-renewableenergy sources, use of alternate energy sources, case studies, Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification, Role of anindividual in conservation of natural resources. Equitable use of resources of sustainable lifestyles

[3] ECOSYSTEMS

Concept of an ecosystem, Structure and function of an ecosystem, producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids, Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem andAquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries)

[4] BIODIVERSITY AND ITS CONSERVATION

Introduction definition: Genetic, species and ecosystem diversity, Bio-geographical classification of India, Value of biodiversity: Consumptive use, productive use, social,

ethical, aesthetic and option values. Biodiversity at global, national and local levels, India as a mega- diversity nation, Hot-spots of biodiversity, Threats to biodiversity, habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity

[5] ENVIRONMENTAL POLLUTION

Definition, Causes, effects and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste management, causes, effects and control measures of urban and industrial wastes, Role of an individual in prevention of pollution, Pollution case studies, Disaster management: floods, earthquake, cyclone and landslides

[6] SOCIAL ISSUES AND THE ENVIRONMENT

From unsustainable to sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people: its problems and concerns. Case studies, Environmental ethics: Issues and possible solutions, Climate change: Global warming, acid rain, ozone layer depletion, nuclear accidentsand holocaust, Case studies, Wasteland reclamation, Consumerism and waste products, Environment Protection Act: Air (Prevention and Control of Pollution) Act, Water (Prevention &Control of Pollution) Act, Wildlife rotection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation,
Public awareness

[7] HUMAN POPULATION AND THE ENVIRONMENT

Population growth, variation among nations, population explosion, Family Welfare Program, environment and human health, human rights, Value education, HIV/AIDS, Women and Child Welfare, Role of Information Technology in Environmental and human health, Case studies

[8] FIELD WORK

Visit to a local area to document environmental assets (river/forest/grassland/hill/mountain), Visit to a local polluted site – Urban / Rural / Industrial/ Agricultural, Study of common plants, insects, birds, Study of simple ecosystems – pond, river, hill, slopes etc.

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Erach Bharucha Textbook of Environmental Studies; Second Edition, Universities Press:Hyderabad, 2013.

2) Rajagopalan, R. Environmental Studies; Oxford University Press: India, 2015.

3) Varandani, N. S. Basics of Environmental studies; Lambert Academic Publishing: Germany,2013.

4) Rao, C. S. Environmental Pollution Control Engineering; Wiley publishers: New Delhi,2006.

5) Clark, R. S. Marine Pollution; Clanderson Press Oxford: Bath, 2001.

6) Cunningham, W.P.; Cooper; Gorhani, T. H. E.; Hepworth, M.T., Environmental Encyclopedia;Jaico Publ. House: Mumbai, 2001.

7) De, A. K. Environmental Chemistry; Wiley Eastern: New Delhi, 2006.

E. COURSE OUTCOME

After learning this course students should be able to : •

- Recall, understand and interpret the terminologies used in environmental studies correctly
- Relate the importance of natural resources, biodiversity, hotspots and deduce the threats to biodiversity
- Analyse the factors causing environmental pollution, formulate the role of an individual in abatement and control of pollution, improve disaster management techniques
- Evaluate the social issues involved in climate change, water conservation, rainwater harvesting, wasteland reclamation, consumerism and waste generation, environmental ethics, environmental laws and requirement of public awareness
- Understand the issues related to population, family welfare programs, human health, value education, and role of IT in environment
- Make use of the field work including visits to local areas to document environmental assets, assess the polluted sites, study species and ecosystems in our surroundings

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B. Tech. Semester III

SUBJECTS	Teaching Scheme			Total	Credit	Examination Scheme (Marks)				
	Th	Tut	Pract			Th	Sess	TW	Prac	Total
Data Structure and Algorithms	3	1	2	6	5.0	60	40	25	25	150
Database Management Systems	3	1	2	6	5.0	60	40	25	25	150
Design of Digital Circuit	3	1	2	6	5.0	60	40	25	25	150
Probability and Statistics	2	0	0	2	2.0	40	-	-	-	40
Universal Human Values	3	0	0	3	3.0	60	-	-	-	60
Essence of Indian Knowledge Tradition	2	0	0	2	0.0	-	-	-	-	-
Web Development Workshop	0	0	2	2	1.0	-	-	25	25	50
	16	3	8	27	21	280	120	100	100	600

B. Tech. Semester IV

SUBJECTS	Teaching Scheme			Total	Credit	Examination Scheme (Marks)				
	Th	Tut	Pract			Th	Sess	TW	Prac	Total
Discrete Mathematics	3	1	0	4	4.0	60	40	-	-	100
Design and Analysis of Algorithm	4	0	2	6	5.0	60	40	25	25	150
Computer System Architecture	4	0	2	6	5.0	60	40	25	25	150
Professional Elective-I	4	0	2	6	5.0	60	40	25	25	150
Software Engineering Principles and Practices	3	1	2	6	5.0	60	40	25	25	150
Software Project	0	0	2	2	1.0	-	-	25	25	50
	18	2	10	30	25.0	300	200	125	125	750

B. TECH. SEMESTER – III (CE)

SUBJECT: DATA STRUCTURE AND ALGORITHMS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
4	0	2	6	5	60	40	25	25	150

Reference Code CS301

A. COURSE OBJECTIVE

Learn different types of data representation and handling which is one of the fundamental concept of computer engineering. Detailed study of various data structures and their applications. Provide an in-depth knowledge of various techniques which will be useful for problem solving.

B. DETAILED SYLLABUS

[1] BASIC CONCEPTS

Algorithm specifications.

[2] ARRAYS

Array as an abstract data type, representation of Arrays

[3] STACKS & QUEUES

Stack as an abstract data type, queue as an abstract type, evaluation of expressions

[4] LINKED LIST

Singly linked lists, doubly linked list, circular list, linked stacks and queues, polynomials, generalized lists.

[5] TREES

Introduction, binary trees, binary tree traversal and tree iterators, additional binary tree operations, threaded binary trees, heaps, binary search tree, forests, Huffman algorithm.

[6] GRAPHS

The graph abstract data type, graph traversal, directed graph, weighted graph, shortest path-Dijkastra's algorithm, minimum spanning tree.

[7] SORTING

Insertion sort, quick sort, merge sort, heap sort, shell sort, count sort, sorting on several keys,list and table sort, summary of internal sorting.

[8] HASHING

Hash table, hash function, collision, collision resolution techniques.

[9] SEARCH TECHNIQUES

Sequential search, Binary search, AVL trees, 2-3 trees, 2-3-4 trees, read-black trees, B-trees,Digital search trees, Tries.

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Data Structures and Algorithms in Java (4th edition) by Michael T. Goodrich and Roberto Tamassia Publisher: John Wiley & Sons, Inc

2) Data Structures and Program Design in C, Second Edition, by Robert L. Kruse, Bruce P. Leung,Pearson Education.

3) Data Structures And Algorithms Made Easy In JAVA by Narasimha Karumanchi, Publisher:Careermonk Publications (Sep 2011).

4) An Introduction to Data Structures with Applications, Second Edition, by Tremblay and Soren-son, McGraw Hill.

D. COURSE OUTCOME

- Obtaining in-depth knowledge of various data structures used by computers.
- To learn selection of appropriate data structure for a specific requirement.
- To be able to write efficient programs to solve various real life problems.
- To create a foundation and motivation for learning and exploring various methods of data handling.

B. TECH. SEMESTER – III (CE)

SUBJECT: DATABASE MANAGEMENT SYSTEMS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
4	0	2	6	5	60	40	25	25	150

Reference Code CS501

A. COURSE OBJECTIVE

* Objective of this course is to provide details of database architecture
* To create database with constraints in normalized form and query it efficiently
* To learn different structures-file organization of database with proper indexing
* To gain knowledge how transaction works, transaction ACID properties, concurrency control, deadlock, recovery of database on failure.
* To prepare logical database design of any System

B. DETAILED SYLLABUS

[1] BASIC CONCEPTS

Purpose of database system, View of data, Database abstraction and Models, Database Languages, Transaction management, Storage management, Database administrator, Database users, Overall system structure.

[2] ENTITY RELATION MODEL

Entity sets, Relationship sets, Attributes, Constraints, Keys, Entity relationship diagrams, Weak entity sets, Generalization, Specialization, Aggregation, Design of an E-R database schema, Reduction of an E-R schema to tables.

[3] RELATIONAL DATABASE MANAGEMENT SYSTEM

Relational Model, Structure of database, Relational algebra, Extended relational algebra operation, tuple relational calculus, Domain relational calculus, Modification of database, Views, Structured Query Language, Background, Basic structure, Integrity Constraints, Domain constraints, Referential integrity, Assertions, Triggers, Functional Dependencies, Database Pitfalls in relational database design, Decomposition, Normalization, I,II,III normal Forms, Normalization using functional dependencies, Normalization using multi valued dependencies, Domain key normal form, Alternative approach to database design

[4] FILE SYSTEM STRUCTURE

Indexing & Hashing, File organization, Organization of records in files, Data dictionary storage, Basic concepts of indexing, Order indices, B- Tree index files, B+ -Tree index files, Static hashing & Dynamic Hashing.

[5] QUERY PROCESSING

Overview, Catalog information for cost estimation, Measures of query cost, Selection

operation, Sorting, Join operation, Other operations, Choice of evaluation plans

[6] TRANSACTION PROCESSING

Transaction concepts, Transaction state, Implementation of atomicity & durability, Concurrent executions, Serializability, Conflict serializability, View serializability, Testing of conflict and view serializability.

[7] CONCURRENCY CONTROL

Lock based protocols, Time-stamp based protocol, Validation based protocol, Multiple granularity, Multi-version schemes, Deadlock handling, Insert & delete operations, Concurrency in index structures.

[8] RECOVERY SYSTEM

Failure classification, Storage structure, Recovery & Atomicity, Log-based recovery,Shadow paging, Recovery with concurrent transactions, Buffer management, Failure with loss of non-volatile storage, Advance recovery techniques.

[9] DISTRIBUTED DATABASE

Security and Integrity of data base

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) "Data Base System Concepts", Henry F. Korth and A. slberschatz 2nd Edition, McGraw-Hill 1991.

2) An Introduction to Database Systems", C.J.Date, Pearson Publication

D. COURSE OUTCOME

- To understand database architecture and different types of database users.
- To Create Entity-Relationship Diagram for the given system and to create normalized relational database from it with proper constraints.
- To install database on their machines and will be able to query,manipulate and manage it efficiently.
- To Understand concepts of Transactions, requirement of ACID properties, issues related to concurrency, deadlock transaction failure and recovery with their related protocols/solutions

B. TECH. SEMESTER – III (CE)
SUBJECT: DESIGN OF DIGITAL CIRCUITS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
4	0	2	6	5	60	40	25	25	150

Reference Code ESC302

A. COURSE OBJECIVE

To acquire the basic knowledge of various digital logic components to understand digital electronics circuits. To prepare students to perform the analysis and design of various digital electronic circuits.

B. DETAILED SYLLABUS

[1] BINARY SYSTEMS

Introduction to Digital Computers and Digital Systems, Binary Numbers, Number Base Con- version, Octal and Hexadecimal Numbers, complements, binary Codes, Binary Storage and Registers, Binary Logic, Integrated Circuits.

[2] BOOLEAN ALGEBRA AND LOGIC GATES

Basic Definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Opera- tions, Digital Logic Gates, IC Digital Logic Families.

[3] SIMPLIFICATION OF BOOLEAN FUNCTIONS

The Map Method, Two and Three Variable Maps, Four-Variable Map, Five and Six Variable Maps, Product of Sums Simplification, NAND and NOR Implementations, Don't-Care Con- ditions, The Tabulation Method, Determination of Prime-Implicants, Selection of Prime-im- plicants, Concluding Remarks.

[4] COMBINATIONAL LOGIC

Introduction, Design Procedure, Adders, Subtractors, Code Conversion, Analysis Procedure, Multilevel NAND Circuits, Multilevel NOR Circuits, Exclusive OR and Equivalence Functions.

[5] COMBINATIONAL LOGIC WITH MSI AND LSI

Introduction, Binary Parallel Adder, Decimal Adder, Magnitude Comparator, Decoders, Multiplexers, Read-Only Memory (ROM), Programmable Logic Array (PLA), Concluding Remarks.

[6] SEQUENTIAL LOGIC

Introduction, Flip-Flops, Triggering of Flip-Flops, Analysis of Clocked Sequential Circuits, State Reduction and Assignment, Flip-Flop Excitation Tables, Design Procedure, Design of Counters, Design with State Equations.

[7] REGISTER, COUNTERS AND THE MEMORY UNIT

Introduction, Registers, Shift Registers, Ripple Counters, Synchronous Counters, Timing Se- quences, The Memory Unit, Examples of Random Access Memories.

[8] DIGITAL INTEGRATED CIRCUITS

Introduction, Bipolar Transistor Characteristics, RTL and DTL Circuits, Integrated-Injection Logic, Transistor-Transistor Logic, Emitter-Coupled logic, Metal-Oxide Semiconductor, Complementary MOS.

[9] VERILOG

Introduction, Overview of Digital Design with Verilog HDL, Gate-level Modeling (full ad-dre, multiplexer, full substractor, comparator, decoder, demultiplexer, Flip-flops)

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Digital Logic and Computer Design, M.Morris Mano

2) VERILOG HDL, Samir Palmitkar, Pearson Education

D. COURSE OUTCOME

At the end of the course, students will be able to

- Understand, convert and examine the structure of various number systems and its application in digital design.
- Design and optimize Boolean functions and combination circuits.
- Understand, analyse and design sequential circuits.
- Apply the concept of finite state machines for digital system design

B.TECH. SEMESTER – III (CE)

SUBJECT: PROBABILITY AND STATISTICS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
2	0	0	2	2	40	-	-	-	40

Reference Code BSC201

A. COURSE OBJECTIVE

B. DETAILED SYLLABUS

[1] BASIC PROBABILITY

Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.

[2] CONTINUOUS PROBABILITY DISTRIBUTION

Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities.

[3] BIVARIATE DISTRIBUTION

Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.

[4] BASIC STATISTICS

Measures of Central tendency: Moments, skewness and Kurtosis – Probability distributions: Binomial, Poisson and Normal – evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 2000.
2) E. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 2006.
3) P. G. Hoel, S. C. Port and C. J. Stone, "Introduction to Probability Theory", Universal BookStall, 2003.
4) S. Ross, "A First Course in Probability", Pearson Education India, 2002.
5) W. Feller, "An Introduction to Probability Theory and its Applications", Vol. 1, Wiley, 1968.
6) N.P. Bali and M. Goyal, "A text book of Engineering Mathematics", Laxmi Publications,

2010.
7) T. Veerarajan, “Engineering Mathematics”, Tata McGraw-Hill, New Delhi, 2010.

D. COURSE OUTCOME

B. TECH. SEMESTER – III (CE)

SUBJECT: UNIVERSAL HUMAN VALUES

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
3	0	0	3	3	60	-	-	-	60

Reference Code HSMC301

A. COURSE OBJECTIVE

This introductory course input is intended:

- To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings
- facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

B. DETAILED SYLLABUS

[1] COURSE INTRODUCTION

Need, Basic Guidelines, Content and Process for Value Education Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels

[2] UNDERSTANDING HARMONY IN THE HUMAN BEING

Harmony in Myself! Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya

[3] UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY

Harmony in Human-Human Relationship Understanding Harmony in the family – the basic unit of human interaction, Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Vishwas; Difference between intention and competence, Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha)- from family to world family!

[4] UNDERSTANDING HARMONY IN THE NATURE AND EXISTENCE

Whole existence as Co-existence : Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence

[5] IMPLICATIONS OF THE ABOVE HOLISTIC UNDERSTANDING OF HARMONYON PROFESSIONAL ETHICS

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order

C. RECOMMENDED TEXTBOOK/ REFERENCE BOOKS

1) R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professionalEthics, Excel books, New Delhi, 2010, ISBN 978-8-174-46781-2
2) JeevanVidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
3) Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
4) The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5) Small is Beautiful - E. F Schumacher.
6) Slow is Beautiful - Cecile Andrews
7) Economy of Permanence - J C Kumarappa
8) Bharat Mein Angreji Raj - PanditSunderlal

E. COURSE OUTCOME

- The students start exploring themselves: get comfortable with each other and with the teacher; they start appreciating the need and relevance for the course.

- The students are able to note that the natural acceptance (intention) is always for living in harmony, only competence is lacking!

- The students are able to present sustainable solutions to the problems in society and nature. They are also able to see that these solutions are practicable and draw roadmaps to achieve them.

- The students are able to grasp the right utilization of their knowledge in their streams of Technology/Engineering/Management/any other area of study to ensure mutual fulfilment. E.g. mutually enriching production system with rest of nature.

B.TECH. SEMESTER – III (CE)

SUBJECT: ESSENCE OF INDIAN KNOWLEDGE TRADITION

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
2	0	0	2	0	-	-	-	-	-

Reference Code MC-2

A. COURSE OBJECTIVE

The course aims at imparting basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian Traditional knowledge Systems connecting society and nature. Holistic life style of yogic science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions. The course focuses on introduction to Indian Knowledge Systems, Indian perspective of modern scientific world-view, and basic principles of Yoga and holistic health care system. The course also focuses on Indian philosophical traditions, Indian linguistic Tradition, and Indian artistic tradition.

B. DETAILED SYLLABUS

[1] BASIC STRUCTURE OF INDIAN KNOWLEDGE SYSTEM

Ashtadashvidya, 4 - Ved, 4 - Upved, (Ayurved, dhanurved, gandharvved, sthapatya, etc), 6 – Vedang (shiksha, kalp, nirukti, vyakaran, jyotish, chhand) 4 upang (dharmshastra, mimansa, purana, tarkshastra)

[2] MODERN SCIENCE AND INDIAN KNOWLEDGE SYSTEM

Relating modern science with Tradition Indian knowledge, Relevance of Indian Knowledge System

[3] YOGA AND HOLISTIC HEALTH

Different types of Yoga, Role of Yoga in building holistic health

[4] CASE STUDIES

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) V. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, Bharatiya Vidya Bha-van, Mumbai. 5 th Edition, 2014

2) Swami Jitatmanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan

3) Swami Jitatmanand, Holistic Science and Vedant, Bharatiya Vidya Bhavan

4) Fritz of Capra, Tao of Physics

5) Fritz of Capra, The Wave of life

6) VN Jha (Eng. Trans.), Tarkasangraha of Annam Bhatta, International Chinmay Foundation,Velliarnad, Arnakulam

7) GN Jha (Eng. Trans.), Ed. RN Jha, Yoga-darshanam with Vyasa Bhashya, Vidyanidhi

Prakashan, Delhi 2016
8) RN Jha, Science of Consciousness Psychotherapyand Yoga Practices, Vidyanidhi Prakashan,Delhi 2016
9) P B Sharma (English translation), Shodashang Hridayan

D. COURSE OUTCOME

At the end of the course, students should be able to,

- understand, connect up and explain basics of Indian traditional knowledge in modern scientific perspective.
- learn holistic life stype of yogic science and wisdom.
- understand indian philosophical, linguistic and artistic traditions.

B. TECH. SEMESTER – III (CE)

SUBJECT: WEB DEVELOPMENT WORKSHOP

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
0	0	2	2	1	-	-	25	25	50

A. COURSE OBJECTIVE

To learn basics to advanced concepts of Javascripts. To learn jQuery fundamentals To learn HTML, CSS, and JavaScript framework Bootstrap 5

B. DETAILED SYLLABUS

[1] JAVASCRIPT

Variable Naming Rules and JavaScript Data Types, let vs var, 'use strict', operators and expressions, Javascript – flow control (branching and looping)

[2] JAVASCRIPT FUNCTIONS & ARRAYS

Javascript functions, function expression, and arrow functions. Javascript template literals, and tagged template literals, Javascript arrays, object literals and constructor functions, avascript: spread operator, destructuring arrays and objects, closure

[3] DOM & BASIC JQUERY

[4] BOOTSTRAP

Introduction to Bootstrap, Bootstrap Grid, Bootstrap Components, Bootstrap Plug-Ins

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Web Design with HTML, CSS, JavaScript and jQuery Set, by John Ducket, Wiley
2) Javascript: The Good Parts, first edition, by Douglas Crockford, O'Reilly
3) Bootstrap 4 quick start, by Jacob D. Lett, Bootstrap Creative

D. COURSE OUTCOME

Students will be able to

- Develop familiarity with the JavaScript language.
- Learn to use best-practice idioms and patterns.
- Understand concepts commonly used in dynamic language programming, such as introspection, higher-order functions, and closures.
- Become adept at implementing client-side interfaces through the use of the DOM and jQuery
- Become familiar with common libraries and tools that are used in web application development at client side.

B. TECH. SEMESTER – IV (CE)

SUBJECT: DISCRETE MATHEMATICS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
4	0	0	4	4	60	40	-	-	100

Reference Code CS 401

A. COURSE OBJECTIVE

The objective of this course is to teach students how to think logically and mathematically. The course stresses on mathematical reasoning and describes different ways in which mathematical problems could be solved. There are four thematic areas covered in this course: mathematical reasoning, combinatorial analysis, discrete structures, and mathematical modeling. Topics in this course include reccurence relation and generating functions,logic, set theory, counting, graph theory, trees, boolean algebra, and modeling computation.

B. DETAILED SYLLABUS

[1] SETS AND PROPOSITIONS

Combination, finite, uncountably infinite and infinite sets, mathematical induction, principles of inclusion and exclusion, propositions.

[2] PERMUTATION, COMBINATION, DISCRETE PROBABILITIES

Rules of sums and products, permutations, combinations, generation, discrete probability, conditional probability, information.

[3] RELATION AND FUNCTIONS

Relational model of data bases, properties of binary relations, equivalence relation, partitions, partial ordering, lattices, chains and antichains, functions and pigeon-hole principle.

[4] GRAPHS

Basic terminology, multi- and weighted graphs, paths, circuits, shortest path, Eulerian path, Traveling Salesman problem, factors of a graph, planar graphs.

[5] TREES

Trees, rooted trees, path length, prefix codes, binary search trees, spanning trees and cut- sets, minimum spanning trees, transport networks.

[6] FINITE STATE MACHINE

FSM as models of physical systems, equivalent machines, FSM as language recognizer.

[7] COMPUTABILITY AND FORMAL LANGUAGES

Russel's paradox and non-computability, ordered sets, languages, phrase structured grammars, types of grammars and languages.

[8] DISCRETE NUMERICAL FUNCTIONS

Manipulations of numerical functions, asymptotic behavior, generating functions, combinatorial problems.

[9] GROUP

Groups and sub-groups, generators, evaluation of powers, cosets, Lagrange's theorem, permutation group and Burnsides theorem, group codes, isomorphism, automorphism, homomorphism, normal subgroups, rings, integral domains and fields, ring homomorphism, polynomial rings and cyclic codes.

[10] LATTICES AND BOOLEAN ALGEBRA

Lattices and algebraic systems, principle of duality, properties of algebraic systems, distributive lattices, boolean algebras, uniqueness, boolean functions and expressions, propositional calculus.

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) "Elements of Discrete Mathematics", C.L. Liu, 2nd Ed., McGraw-Hill
2) "Modern Applied Algebra", Birkoff and Bartee, McGraw-Hill, CBS.
3) "discrete mathematics - a unified approach", stephen a. Wiitala, computer science series, mcgraw-hill.

D. COURSE OUTCOME

Students will be able to:

- Solve counting problems based on set principles and operations.
- Apply counting principles to determine likelihood of the event under consideration.
- Demonstrate an understanding of relations and functions and be able to determine their properties.
- Model problems in Computer Science using graphs and trees.
- Model problems of counting using recurrence relations and generating functions
- Use finite-state machines to model computer operations

B. TECH. SEMESTER IV (CE)
SUBJECT: DESIGN & ANALYSIS OF ALGORITHM

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
4	0	2	6	5	60	40	25	25	150

Reference Code CS404

A. COURSE OBJECTIVE

The subject is oriented towards importance of algorithm for solving any industry problem. It highlights how different algorithms for the same task affect the overall execution time. Various strategies to develop and analyze the algorithm were broadly covered in the subject. Use of suitable data structures in algorithm is also discussed. it also separates decision problems and optimization problems. It also covers recursive and non-recursive algorithms to solve the problem.

B. DETAILED SYLLABUS

[1] Introduction to algorithms

[2] Elementary Data structures

[3] Methods for solving recurrence relation for finding time complexity

[4] Overview of searching & sorting techniques

[5] The Greedy Methodology

[6] Dynamic Programming

[7] Graph Traversal & Searching

[8] Backtracking Techniques

[9] Branch & Bound Techniques

[10] Lower bound theory

[11] NP-Hard & NP-Complete problmes

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Fundamentals of Computer Algorithms by Horowitz, Sahni, Galgotia Pub.

2) Fundamentals of Algorithms by Brassard & Brately, PHI.

3) Introduction to Algorithms by Coreman, Tata McGraw Hill.

4) The art of Computer Programming Vol.I & III, Kunth, AddisionWesley.

D. COURSE OUTCOME

- Develop efficient and effective computer algorithm.
- Analyze algorithms and estimate their worst-case and average-case behavior.
- This will help for development of efficient and optimized software and problem solving approach.
- Apply their theoretical knowledge in practice (via the practical component of the course).

B. TECH. SEMESTER – IV (CE)

SUBJECT: COMPUTER SYSTEM ARCHITECTURE

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
4	0	2	6	5	60	40	25	25	150

Reference Code CS402

A. COURSE OBJECTIVE

The objective of this course is to learn the structure and Functions of various components of the CPU. It is focused on various ways to represent the data and instructions, basic design of the ALU,Control Unit, Designing of the registers. To learn the basic concepts of pipelining and Interfacing of IO device and memory with the CPU.

B. DETAILED SYLLABUS

[1] BASIC FUNCTIONAL BLOCKS OF A COMPUTER

CPU, memory, input-output subsystems, control unit, datapath design, interconnection structure, register transfer language, register transfer, bus and memory transfers, arithmetic logic shift unit

[2] DATA REPRESENTATION

Signed number representation, fixed and floating point representations, character representation, IEEE 754 standard of representation

[3] BASIC COMPUTER ORGANIZATION AND DESIGN

Instruction codes, computer registers, computer instructions, timing and control, instruction cycle, memory reference instructions, I/O instructions, design of accumulator logic.

[4] DATAPATH DESIGN

Computer arithmetic - integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication - shift-and-add, Booth multiplier, carry save multiplier, etc. Division - non-restoring and restoring techniques, floating point arithmetic

[5] CONTROL UNIT DESIGN

Hardwired control, micro programmed control, nano programmed control

[6] PROGRAMMING THE BASIC COMPUTER

Introduction, machine language, assembly language, the assembler, program loops, programming arithmetic and logic operations, subroutines, I/O programming.

[7] CENTRAL PROCESSING UNIT

Register organization, stack organization, instruction format, addressing mode, data transfer and manipulation, program control, RISC processors.

[8] PIPELINING

Basic concepts of pipelining, throughput and speedup, pipeline hazards.

[9] INPUT OUTPUT ORGANIZATION

Peripheral devices, I/O interface, asynchronous data transfer, modes of transfer, priority interrupt, DMA, I/O processors, serial communication

[10] MEMORY ORGANIZATION

Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policy.

[11] CASE STUDY : 8085 MICROPROCESSOR

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Computer System Architecture by Morris Mano, 3rd Ed., PHI
2) Computer Architecture and Organization by John P. Hayes, Computer science series, McGRAW-HILL
3) Microprocessor Architecture, Programming and Applications With The 8085 by R.S. Gaonkar 5thEd., CBS Publisher
4) Computer Organization and Design: The Hardware/Software Interface by David A. Patterson andJohn L. Hennessy, Elsevier.
5) Computer Organization by Carl Hamachar, Zvonco Vranesic and Safwat Zaky, McGraw Hill.
6) Computer Organization and Architecture: Designing for Performance by William Stallings, Pear-son Education.

D. COURSE OUTCOME

- The students will be able to: Design the ALU using the register level components.
- Students will be able to design the control unit for the basic instruction set.
- Students will be able to understand how the interrupts and DMA is used when dealing with the peripheral devices.
- Students will be able to understand the interfacing between various level of memories with the CPU.

B. TECH. SEMESTER – IV (CE)

SUBJECT: JAVA TECHNOLOGIES

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
4	0	2	6	5	60	40	25	25	150

Reference Code CS503

A. COURSE OBJECTVE

The objective of this course is to equip the learners with the core and advanced features of contemporary Java which would enable them to work with complex programs related to managing data and processes over the network and also to make the students familiar with the concepts of hibernate and Spring Frameworks.

B. DETAILED SYLLABUS

[1] LANGUAGE FUNDAMENTALS

The Java Environment: Java Program Development, Java Source File Structure, Compilation Executions,Basic Language Elements: Lexical Tokens, Identifiers, Keywords, Literals, Com- ments, Primitive Data-types, Operators

[2] CLASSES & OBJECTS IN JAVA

Class, Object and Object reference, Object Life time and Garbage Collection, Creating and Operating Objects, Constructor and initialization code block, Access Control, Modifiers, Nested class, Inner Class, Anonymous Classes, Abstract Class and Interfaces, Defining Methods, Method Overloading, Dealing with Static Members, Use of “this” reference, Use of Modifiers with Classes & Methods.

[3] IMPLEMENTING INHERITANCE & POLYMORPHISM

Types of Inheritance in Java, Inheriting Data Members and Methods, Role of Constructors in inheritance, Overriding Super Class Methods, Use of “super”, Polymorphism in inheritance, Type Compatibility and Conversion, Implementing interfaces.

[4] PACKAGE

Organizing Classes and Interfaces in Packages, Package as Access Protection, Defining Package, CLASSPATH Setting for Packages, Making JAR Files for Library Packages, Import and Static Import, Naming Convention for Packages

[5] EXCEPTION HANDLING

Exceptions & Errors, Types of Exception, Control Flow In Exceptions, JVM reaction to Exceptions, Use of try, catch, finally, throw, throws in Exception Handling, In-built and User Defined Exceptions, Checked and Unchecked Exceptions

[6] ARRAY & STRING HANDLING

Array basics, String Array, String class, StringBuffer and StringBuilder class, String Tokenizer Class and Object Class

[7] MULTI-THREADED PROGRAMMING

Understanding Threads, Needs of Multi-Threaded Programming, Thread Life-Cycle, Thread Priorities, Synchronizing Threads, Inter Communication of Threads

[8] INPUT/OUTPUT OPERATION IN JAVA

Streams and the new I/O Capabilities, Understanding Streams, The Classes forInput and Output, The Standard Streams, Working with File Object, File I/O Basics, Reading and Writing to Files, Buffer and Buffer Management, Read/Write Operations with File, Channel, Serializing Objects

[9] COLLECTION FRAMEWORK & GENERICS

Collections of objects, Collections: Sets, Sequence, Map, Understanding Hashing, Use of Array List & Vector, Generics Class, Lamda Expression, Functional Reference, Method Reference, Optional Classes, Processing data with streams

[10] NEW APIS (JAVA 8) AND JDBC CONCEPTS

Lambda Expressions, Method References, Default method, Stream API, Date Time API

Introduction to Java Database Connectivity(JDBC), Types of JDBC Drivers, Steps to createJDBC Application, JDBC API Classes and Interfaces

[11] INTRODUCTION TO JAVAEE

Web Server, N-tier Architecture, Introduction to web Container and Structure of web Application

[12] JAVA SERVLETS

A simple Web Application, HTTP Protocol, Servlet Interface, Servlet LifeCycle, Servlet Configuration and Exceptions, Servlet Request and Responses, Session Tracking with JavaServlet, Servlet Context, Servlet Listeners

[13] JAVA SERVER PAGES

Introduction to JSP, its lifecycle, Scripting Elements, Comments, Implicit objects, JSP Directives, JSP Standard Actions and JSTL

[14] HIBERNATE FRAMEWORK

Introduction to O-R Mapping Hibernate Basics, Hibernate Architecture, Hibernate Configurations, POJO (Plain Old Java Objects) classes and O/R Mapping Object Identifier, Hibernate mapping (One-to-One Association, One-to-Many Association Many-to-One Association, Many-to-Many Association, Collection Mapping, Component mapping), Inheritance Mapping, Hibernate Query Language, Criteria Queries, Hibernate in Web Application.

[15] SPRING FRAMEWORK

Introduction, The IoC Container and Beans, The Application Context, Dependency

Injection, Data Validation and Type Conversion, Package Dependencies and Build Tool (Maven /Gradle), Spring Boot with Initializer, Test Driven development with Spring Boot, Aspect Oriented Programming, Spring Web MVC, Spring and Persistence, Securing a Web Application

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Core Java Volume I –Fundamentals, 8th Edition by Cay Horstmann and Gray Cornell, PearsonEducation

2) Java 8 in Action: Lambdas, Streams, and Functional-style Programming by Raoul-Gabriel Urma, Mario Fusco, and Alan Mycroft, Manning publications

3) Professional Java Server Programming by Subrimanyan & Cedric, SPD Publications

4) Spring in Action , 5th edition , by Craig Walls, MANNING Publications

5) Hibernate in Action by Christian Bauer and Gavin King, MANNING Publications

6) Thinking in Java by Bruce Eckel, 4thEd., Pearson Education.

7) Learning Java by By Patrick Niemeyer and Jonathan Knudsen, 4thEd., O‟reilly Media.

8) Head First Servlets and JSP, 2nd edition, by Bert Bates, Kathy Sierra & Bryan Basham, O'ReillyMedia.

9) J2EE Complete Reference, James Keogh, TMH.

D. COURSE OUTCOME

At the end of the course, the students will be able to:

- Acquire quality knowledge of the features of core Java.
- Apply the advance concepts of Java programming with database connectivity.
- Design and develop platform independent applications using a variety of component based frameworks.
- Implement the concepts of Hibernate and Spring for the rapid development of enterprise applications.

B. TECH. SEMESTER – IV (CE)

SUBJECT: VISUAL TECHNOLOGY

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
4	0	2	6	5	60	40	25	25	150

Reference Code CS503

A. COURSE OBJECTIVE

The objective of this course is to introduce event-driven programming language Visual C++. The course aims on developing application using document/view architecture, dialogue based applications and reusable component development. Emphasis of the course is on hands-on programming experience with Visual C++ in building real world data driven applications.

B. DETAILED SYLLABUS

[1] INTRODUCTION

Introduction to Windows programming, introduction to VC++ IDE

[2] WINDOWS GUI PROGRAMMING

Messages (Message passing and handling), GDI Objects (Pen, Brush, etc.), Mouse Handling

, Keyboard Handling, Mapping Modes, Menu, Tool bar and Status bar, Scrolling and Split-ting views

[3] DOCUMENT/VIEW ARCHITECTURE

Serialization (storing and retrieving to and from disk)

[4] MULTI-THREADED PROGRAMMING

[5] DIALOG BASED APPLICATION

Model and Model-less dialogues, Windows dialog controls, Buttons, Edit box, Check box, Radio Button, combo box, list box, Animation control, spin control, slider control, Tree view control, List view control.

[6] ACTIVE X CONTROL

Using Active X control, Creating Active X control

[7] DATABASE CONNECTIVITY USING DAO

[8] DLL DEVELOPMENT

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Mastering Visual C++ 6.0, By: Michael J. Young.
2) Programming with microsoft visual c++ 6.0, by devid j. kruglicnski, george shepherd., scot wings.

D. COURSE OUTCOME

- Create windows GUI based applications.
- Create Document / View Architecture and Multithreaded applications in VC++.
- Create Dialog based application using various controls.
- Create data driven applications and DLL development.

B. TECH. SEMESTER – IV (CE)

SUBJECT: SOFTWARE ENGINEERING PRINCIPLE AND PRACTICES

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

Reference Code CS-S

A. COURSE OBJECTIVE

The objective of the course is to understand software engineering, types of software requirements, variuos traditional process models, agile process models, software testing etc. Students will also learn various UML diagrams and will learn various design guidelines. Students will learn how to prepare good softwarte requirement specification document. They will learn various types of software testing techniques. Concepts of SCM, version management, DevOps and various software development platforms will also be taught.

B. DETAILED SYLLABUS

[1] INTRODUCTION TO SOFTWARE ENGINEERING

[2] PROCESS MODELS

Traditional Models, Unified Process models and Agile Models

[3] PROCEDURAL MODELING

Requirement engineering: Requirement engineering Process, Eliciting requirements, SRS, Design concepts and principles, Architectural design, User interface design, Component level design, Deployment-level Design Elements

[4] OBJECT ORIENTED MODELING

Classes, Object, UML Diagrams: Use case, Sequence, Class, State, Activity, Sequence, Component, and Deployment.

[5] TESTING STRATEGY AND TACTICS

Software Testing strategies, White box testing, Basis path testing, Control structure testing, Black box testing, Object oriented testing.

[6] AGILE SOFTWARE DEVELOPMENT

Scrum, Xtreme Programming, Continuous Integration and Continuous Delivery, Test driven development.

[7] VERSION CONTROL AND SOFTWARE DEVELOPMENT PLATFORM

Version Control and change management, git, introduction to online tools and platforms, GitHub, Jira, DevOps, Azure, and Jenkin

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Software Engineering, Pressman, McGraw-Hill, 1992
2) Object oriented modeling and design with UML, M. Blaha and J. Rumbaugh
3) Agile Software Development with SCRUM, Ken Schwaber and Mike Beedle
4) Grady Booch, Object Oriented Analysis & Design, Benjamin/Cummings, 1994

D. COURSE OUTCOME

- Understand software engineering concepts
- Understand various types of software requirements and prepare software requirement specification document
- Learn how to draw various diagrams and prepare design document
- Understand various agile principles and learn various agile process models
- Know software testing and various types of testing
- Learn the concepts of DevOps, SCM and various software development platforms.

B. TECH. SEMESTER – IV (CE)

SUBJECT: SOFTWARE PROJECT

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
0	0	2	2	1	-	-	25	25	50

A. COURSE OBJECTIVE

* Understand tools and technology required to develop software applications.
* Build a full stack web applications.

B. DETAILED SYLLABUS

[1] PROJECT BASED LEARNING

- Student at the beginning of a semester may be advised by his/her supervisor (s) for recommended courses.
- Students will work together in a team (at most three)
- Students are required to get approval of project definition from the department.
- After approval of project definition students are required to report their project work on weeklybasis to the respective internal guide.
- Project will be evaluated at least once per week in laboratory Hours during the semesterand finalsubmission will be taken at the end of the semester as a part of continuous evaluation.

C. RECOMMENDED TEXT / REFERENCE BOOKS

NA

D. COURSE OUTCOME

- Use REST framework for web application development
- Learn programming language (Python) for web application development.
- Learn to develop front end back end codes and interface it with the application.
- Testing of the web application.

BACHELOR OF TECHNOLOGY

COMPUTER ENGINEERING

SYLLABI BOOK

3rd Year B.Tech. Program

With effect from 2022-23

Department of Computer Engineering
Faculty of Technology
Dharmsinh Desai University
Nadiad – 387 001, Gujarat, India.

http://www.ddu.ac.in

B. Tech. Semester V

SUBJECTS	Teaching Scheme			Total	Credit	Examination Scheme (Marks)				
	Th	Tut	Pract			Th	Sess	TW	Prac	Total
Microprocessor Fundamental and Programming	**3**	**1**	**2**	**6**	**5.0**	60	40	25	25	150
Open Elective – I (Web Application Development)	**2**	**0**	**2**	**4**	**3.0**	40	-	25	25	90
Operating Systems	**4**	**0**	**2**	**6**	**5.0**	60	40	25	25	150
Advanced Algorithms	**4**	**0**	**2**	**6**	**5.0**	60	40	25	25	150
Advanced Technologies	**3**	**1**	**2**	**6**	**5.0**	60	40	25	25	150
Smart Device Programming	**0**	**1**	**2**	**3**	**2.0**	-	-	25	25	50
	16	3	12	31	25.0	280	160	150	150	740

B. Tech. Semester VI

SUBJECTS	Teaching Scheme			Total	Credit	Examination Scheme (Marks)				
	Th	Tut	Pract			Th	Sess	TW	Prac	Total
Professional Elective - II	4	0	2	6	5.0	60	40	25	25	150
Theory of Automata and Formal Languages	3	1	0	4	4.0	60	40	-	-	100
Open Elective – II (Web Service Development)	2	0	2	4	3.0	40	-	25	25	90
Machine Learning	4	0	2	6	5.0	60	40	25	25	150
Computer Networks	4	0	2	6	5.0	60	40	25	25	150
System Design Practice	0	1	2	3	2.0	-	-	25	25	50
	17	2	10	29	24.0	280	160	125	125	690

B. TECH. SEMESTER – V (CE)

SUBJECT: MICROPROCESSOR FUNDAMENTALS & PROGRAMMING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
3	1	2	6	5.0	60	40	-	-	100

Reference Code CS502

A. COURSE OBJECTIVE

To introduce students with the architecture and operation of typical microprocessors and microcontroller. To familiarize the students with the programming and interfacing of microprocessors. To provide foundation for designing real world applications using microprocessors and microcontroller.

B. DETAILED SYLLABUS

[1] Introduction

Basic micro-processor architecture, ALU, registers, system bus, Peripherals. Introduction to assembly language.

[2] 8086 ASSEMBLY LANGUAGE PROGRAMMING TECHNIQUES

Objectives, Program Development Steps, Constructing the Machine Codes for 8086 Instructions, Writing Programs for Use with an Assembler, Assembly Language Program Development Tools, Flags, Jumps and WHILE-DO Implementation, REPEAT-UNTIL Implementation and Examples, Debugging Assembly Language Programs

[3] IF-THEN-ELSE STRUCTURES, PROCEDURES & MACROS

Objectives, IF-THEN, IF-THEN-ELSE, & Multiple IF-THEN-ELSE Programs, Writing and Using Procedures, Writing and Using Assembler Macros.

[4] 8086 INSTRUCTION DESCRIPTION & ASSEMBLER DIRECTIVES

Instruction Description, Assembler Directives.

[5] 8086 SYSTEM CONNECTIONS, TIMING AND TROUBLESHOOTING

Objectives, 8086 Hardware Review, Addressing Memory and Ports in Microcomputer Systems, 8086 Timing Parameters, Troubleshooting a Simple 8086-based Microcomputer

[6] Interfacing

Interfacing RAM, ROM and I/O with the microprocessor

[7] INTERRUPTS AND INTERRUPT SERVICE PROCEDURES

Objectives, 8086 Interrupts and Interrupt Response, Hardware Interrupt Applications

[8] GENERAL-PURPOSE PROGRAMMABLE PERIPHERAL DEVICES

Basic Programming Concepts & Programmable Devices
•8259 - Programmable Interrupt Controller
•8251 - Programmable Interface device - Serial I/O
•8255 - Programmable Peripheral Interface
•8254 - Programmable Interval Timer
•8279 – Programmable Keyboard/Display Interface
•8237 - DMA Controller

[9] Introduction to Microcontroller

8051 architecture, pin diagram, instruction set, memory interfacing

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Microprocessors And Interfacing (Programming & Hardware), Douglas V. Hall, McGraw Hill

2) 8086 Prrogramming and Advance Processor Architecture, M. T. Savaliya, WIND Series, 2012

3) INTEL MICROPROCESSORS 8086/8088, 80186/80188, 80286, 80386, 80486, PENTIUM AND PENTIUM PRO PROCESSORBY BARRY B. BREY

4) Architecture, Programming & applications with 8085/8-8080A, R. S. Gaonkar

5) 8051 Microcontroller. by K.J.Ayela, Penron publication

D. COURSE OUTCOME

After completion of the course, students are expected to be able to

- Visualize and understand different instruction formats and addressing modes
- Comprehend the key components of various architectures
- Demonstrate assembly language programming proficiency
- Develop interface logic for interconnection of peripheral devices with microprocessor and microcontroller
- Design solutions of real world applications in the relevant field

B. TECH. SEMESTER – V (CE)
SUBJECT: WEB APPLICATION DEVELOPMENT

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	0	2	4	3.0	40	-	25	25	90

A. COURSE OBJECTIVE

The objective of this course is to make the students familiar Web Application Development. The subject provides knowledge of .NET framework and .NET core architecture along with the knowledge of core C# language. The emphasis is given on building real world data driven applications. The ORM entity framework should be used while building web applications. The students will understand the complete application life cycle of a web application starting from designing to deployment on a local server.

B. DETAILED SYLLABUS

[1] .NET Framework

Architecture, Assembly development, Page life cycle of ASP.NET web application, Introduction to Visual Studio Editor, Web application development using server controls, State management for ASP.NET web application, Data driven ASP.NET web application using ORM (EF)

[2] Programming in C#

Environment, Literals, Variables and Data Types, Operators and Expressions, Handling arrays, Manipulating strings, Classes and objects, Inheritance, Interfaces, Delegates, Lambda Expression, LINQ, Events, Exception handling, Asynchronous programming

[3] .NET Core

Middleware And Request Pipeline in ASP.NET Core, .NET Core MVC, MVC Pattern, Routing, Razor, Model Validation, Test Driven Development, Tag helpers, Debugging, Tracing and Logging.

[4] Deployment

Deployment of .NET application to IIS, Deployment of .NET application to Cloud server

C. RECOMMENDED TEXT / REFERENCE BOOKS

(1) Beginning ASP.NET 4.5 in C#. Author : Matthew Macdonald, Publisher : Apress

(2) Pro. ASP.NET Core MVC Sixth Edition, Author : Adam Freeman, Publisher : Apress

(3) Professional C# 7.0 and .NET Core 2.0, Author : Christian Nagel, Publisher : Wrox

(4) ASP.NET Core in Action, Author : Andrew Lock, Publisher : MANNING

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Develop assembly(dll/exe) applications

- Design and develop database driven web applications using .NET Framework
- Construct amplifiers with active loads along with the Study of frequency response of all amplifiers
- Design and develop dynamic, cross-platform web applications using .NET Core and MVC design patterns.
- Utilize EF Core ORM for powering .NET Core driven web applications.
- Host web application into IIS and cloud environments.

B. TECH. SEMESTER – V (CE)
SUBJECT: OPERATING SYSTEM

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
4	0	2	6	5.0	60	40	25	25	150

Reference Code CS513

A. COURSE OBJECTIVE

To introduce students with the basic concepts of operating systems. To make students aware about details of Process management and synchronization issues. To provide detailed understanding of process based deadlocks and various aspects of memory management. To familiarize students about file and disk management aspects

B. DETAILED SYLLABUS

[1] Introduction

What is an OS?, Simple Batch Systems, Multi programmed Batched Systems, Time Sharing Systems, Personal-Computer Systems, Parallel Systems, Distributed Systems, Real-Time System

[2] Computer-System Structure

Computer-System Operation, I/O Structure, Storage Structure, Storage Hierarchy, H/W protection, General System Architecture

[3] Operating Systems Structures

System components, OS services, System calls, System programs, system structure, Virtual machines, System Design & implementation, System Generation

[4] Processes

Process concept, Process Scheduling, Operation on Processes, Cooperating processes, Interprocess Communication

[5] CPU Scheduling

Basic concepts, Scheduling criteria, Scheduling algorithms

[6] Process Synchronization

Background, The critical-section Problem, Synchronization H/W, Semaphores, classical problems of synchronization, Critical Regions, Monitors

[7] Deadlocks

System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from deadlocks, Combined Approach to deadlock handling

[8] Memory Management
Background, Logical versus Physical Address space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging

[9] Virtual Memory
Background, Demand Paging, Performance of Demand Paging, Page Replacement, Page-replacement algorithms, Allocation of frames, Thrashing, Other Considerations, Demand segmentation

[10] File-System Interface
File concept, Access methods, Directory Structure, Protection, Consistency semantics

[11] File-System Implementation
File-System Structure, allocation methods, Free-space Management, Directory Implementation, Efficiency and performance, Recovery

[12] I/O Systems
Overview, I/O H/W, Application I/O interface, Kernel I/O subsystem, Transforming I/O Requests to H/W operations. Performance

[13] Secondary-Storage Structure
Disk Structure, Disk scheduling, Disk Management, Swap-space management, Disk reliability

[14] Distributed System Structures
Network operating Systems, Distributed Operating Systems, Remote services, Robustness, Design issues

[15] Distributed File Systems
Features of good DFS, Naming and Transparency, Remote File Access, Stateful Versus stateless service, File replication, Example systems

[16] Case studies on:
1. UNIX operating system
2. LINUX operating system
3. Windows NT

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Operating Systems, internals and design principles by William Stallings, PHI

2) Operating System Concepts : Silbertschatz, Galvin, Addison Wesley.

3) Modern Operating System : Design and Implementation Tanenbaum, PHI

4) Operating system Concepts : Milan Malinkovic, TMI

D. COURSE OUTCOME

After completion of the course students will develop

- Ability to understand detailed concepts of operating systems
- Detailed understanding of the ways in which processes are handled by the operating system
- Ability to understand and analyse different aspects of memory management
- In depth knowledge of file system structures, disk operations and various algorithms related to operating systems.

B. TECH. SEMESTER – V (CE)

SUBJECT: ADVANCED ALGORITHMS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
4	0	2	6	5.0	60	40	25	25	150

Reference Code CS514

A. COURSE OBJECTIVE

The subject focuses on Advancement in Algrotihms along with its applicability and time complexity. It disucusses pattern searching algorithms. Gemetric algorithms highlights how to find convex Hull from the set of points in the 2-D plane and how to check itersection of two line segements in air-line traffic control. It elaborates the importance of Approximate algorithms for industry problems where exact solution is not possible. Obejctiveof Theory of reduction is to use solution of one problem for another problem

B. DETAILED SYLLABUS

[1] Randomized Algorithm :
Probability and random variables, Probabilistic analysis, Randomized algorithms, Monte Carlo Algorithm, Las Vegas Algorithm, Primality Testing algorithms.

[2] Flow Network :
Max Flow Problem, Max Flow - Min Cut duality, Ford Fulkerson Algorithm, Various algorithms to solve Max-Flow problem, Applications of Network Flow problems.

[3] String Algorithms
Naive String Matching algorithm, The Rabin-Karp algorithm, The Knuth-Morris-Pratt algorithm

[4] Computational Geometry :
Line-Segment properties, Determine intersection between line segments, Finding Convex Hull, Finding Closest pair of points.

[5] Reduction
Theory of reduction, Linear time reduction, Polynomial time reduction, Identifying lower bound using reduction

[6] NP-Hard and NP-Complete Problems
Unsolvable problem classes, NP-Hard Problems, Proving a problem NP-Hard, NP-Complete Problems, NP-Completeness proof

[7] Linear Programming :
Standard and slack form, Formulating problem as linear programs, The simplex algorithm, Duality, basic feasible solutions.

[8] Approximation Algorithm

Approximation technique to solve hard problems, randomization and linear programming based approximation, Polynomial time approximation

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Introduction to Algorithms, Thomas H. Corman, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, Third addition, PHI Learning private ltd.
2) Fundamentals of computer algorithms, Second Edition, Ellis Horowitz, Sartaj Sahni, S. Rajasekaran, Universities Press
3) Fundamentals of Algorithmics, Gilles Brassard, Paul Bratley, PHI Learning private ltd
4) Algorithm Design, Pearson/Addison-Wesley, Jon Kleinberg, Eva Tardos, Addison-Wesley

D. COURSE OUTCOME

- The students will be able to interprete and be able to apply the algorithms in various ways to solve industry problems
- Students can do performance comparisons of various algorithms for the same problem
- Students can do Mathematical model formulation of the industry problem using the principles of Operation Research
- Students can think in the direction of approximate solution when exact solution is hard or impossible to achieve.

B. TECH. SEMESTER – V (CE)

SUBJECT: ADVANCED TECHNOLOGY

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
3	1	2	6	5.0	60	40	25	25	150

Reference Code CS515

A. COURSE OBJECTIVE

- The main goal of the subject is to learn advance concepts, technologies and tools in web application development.
- The emphasis is on developing cross platform web application which uses web services.

B. DETAILED SYLLABUS

[1] **JSON:**
Introduction, advantages, syntax, datatypes, objects and schema

[2] **AJAX:**
Introduction, Browsers support, Action, XMLHttpRequest,

[3] **JQuery:**
Introduction, selectors, attributes, traversal, CSS, DOM, Events, AJAX and effects

[4] **Node.js:**
Introduction to Node.js, Using events, listeners, timers and callbacks, buffers, streams, file system, Express.js framework, Mongoose module, Working with Data and Socket services, Processes and Clusters

[5] **No SQL:**
Introduction to No SQL database, pros and cons of NoSQL, Types of NoSQL databases

[6] **MongoDB:**
Introduction, designing database, queries, projection, indexing, aggregation, replication and Sharding.

[7] **TypeScript:**
Introduction, types, variables, operators, functions, strings, arrays, tuples, union, interfaces, classes, objects, namespaces, modules.

[8] **Angular:**
Introduction, architecture, components, modules, directives, data and event binding, templates, pipes, forms, routing, dependency injection, services, testing, materials.

[9] **React.js**:
Introduction, ES6, JSX, components, state, lifecycle, props, forms, events, refs, keys, router, flux, redux, saas.

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) "Pro Angular" by Adam Freeman, 3rd Edition, Apress Publication

2) "Beginning Node.js, Express and MongoDB Development" by Greg Lim

3) "MongoDB in Action" by Kyle Banker, Peter Bakkum, et al., 2nd Edition, Manning Publication

4) "Beginning jQuery: From the Basics of jQuery to Writing your Own Plug-ins" by Jack Franklin and Russ Ferguson, 2nd Edition, Apress publication

5) "Learning React: Functional Web Development with React and Redux" by Alex Banks and Eve Porcello, O'reilly Publication

6) "Node.js in Action" by Alex Young, Bradley Meck et al., 2nd Edition, Manning Publication

7) "Pro React 16" by Adam Freeman, 1st Edition, Apress publication

8) "React Quickly: Painless web apps with React, JSX, Redux, and GraphQL" by Azat Mardan, Manning Publication

D. COURSE OUTCOME

At the end of the course students will be able to

- Design rich and interactive user interface using Angular/React. Build dynamic web pages using Angular/React (client-side), Node.js (server side) and MongoDB (NoSql database).

B. TECH. SEMESTER – V (CE)
SUBJECT: SMART DEVICE PROGRAMMING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
0	1	2	3	2.0	-	-	25	25	50

Reference Code CS

A. COURSE OBJECTIVE

The Objective of this course is to expose students to programming of various smart devices. This will help students to use the computational power of ubiquitous smart devices to solve real world problems. This will help students to create applications which can easily reach masses.Students will be able to write code once and use the same code to create applications for different platforms.

B. DETAILED SYLLABUS

[1] Programming Framework
Introduction to Dart programming language and Flutter framework. Installation of Flutter

[2] DART - Programming
Data types, variables, operators and decision making (branching and looping)

[3] DART - Programming
Functions and classes, Nullability and Collections

[4] Dart – Programming
Asynchronous programming, concurrency and unit testing

[5] FLUTTER
Introduction to Widgets, Layouts and gestures, State management

[6] FLUTTER
Connectivity with the database and automated testing, Packages and access to REST APIs

[7] FLUTTER
Controlling smart devices (like lamp or fan) using applications developed with the Flutter framework. Deployment of the Flutter application.

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Dart Apprentice, first edition, by Jonathan Sande & Matt Galloway
2) Quick Start Guide to Dart Programming, by Sanjib Sinha, Apress
3) Beginning App Development with Flutter, by Rap Payne, Apress
4) Flutter Apprentice, by Kevin D Moore, Michael Katz and Vincent Ngo

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- write programs using Dart programming language
- develop applications using Flutter framework for android, ios, macos, windows and linux

platforms

- connect to database and access REST APIs from application developed using Flutter
- write automated test cases for testing their Flutter code and be able to deploy their application on various platforms
- control smart hardware devices like lamps and fans from Flutter application

B. TECH. SEMESTER – VI (CE)

SUBJECT: ADVANCED COMPUTER ARCHITECTURE

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
4	0	2	6	5.0	60	40	25	25	150

Reference Code CS610

A. COURSE OBJECTIVE

- To get familiarity with 8087 Math Co-Processor and Maximum mode of 8086
- To understand advanced processor architectures like 80286, 80386 and Protected Virtual Addressing Mode, segmentation,paging.
- To understand Parallel Processing techniques like loop splitting, expression splitting using shared memory and multipleprocesses
- To learn about pipelining, its issues and solutions, parallel processor architectures.
- To learn Parallel algorithms like Bitonic sorting, Gauss Elimination for solving system of Linear equations and to evaluateperformance of the algorithms

B. DETAILED SYLLABUS

- 8086 Maximum Mode Operation, Signal Description, 8087 Math Co-Processor, Architecture of 8087 Floating PointProcessor, Pin Functions of 8087,Register Set-Control Word Register, Status Word Register, Tag Word Register, Stack Registers, Instruction Set and Programming.
- 80286 Processor Architecture, Pin Functions, Register set-Programmer Invisible Registers, Features of 80286, Real Addressing Mode, Protected Virtual Addressing Mode-Protection Level Mechanisms for Code and Data, Segmentation in Protected Mode, Instruction Set and features of 80287.
- 80386 Processor Architecture, Pin Functions, Register set-General Purpose, Debug Registers, Test Registers, EFLAG, Control Registers Features of 80386, Real Addressing Mode, Protected Virtual Addressing Mode-Protection, Multitasking, Interrupt Handling, Segmentation, Paging Mechanism in PVAM, Instruction Set, Addressing Mode, Virtual 8086 Mode.
- Features of 80486 Processor, Cache Types-L1, L2 cache, TLB, M-Way Set Associative Cache Organization, Differences between 80386 and 80486. Pentium Processor Architecture and Features, Memory Management Unit of Pentium, New Instructions of Pentium, Features of Pentium PRO, Pentium2 and Pentium 4.

- Parallel Processing
  Introduction, Different Types of Parallelism, Pipelining, Hazards-Structural, Data, Control hazard, Super-pipelining, Super Scalar Architecture, BTB(Branch Target Buffer), BPB(Branch Prediction Buffer), Distributed Memory, Shared Memory, Symmetric Multiprocessing, Array Processors, Vector Processors, Systolic Arrays.

- Programming using Shared Memory

- Loop Splitting, Self Scheduling, Contention or Race Conditions in Parallel Computing, Solution to Contention using Spin Locks, Expression Splitting, Indirect and Block Scheduling, Barriers.

- Parallel Algorithm Design and Analysis- Sorting, Searching, Matrix Multiplication, Solving System of Linear Equations etc.

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) INTEL MICROPROCESSORS 8086/8088, 80186/80188, 80286, 80386, 80486, PENTIUM AND PENTIUM PRO PROCESSOR BY BARRY B. BREY
2) Walter A. Tribal, The 80386, 486 and Pentium Processor
3) "Parallel Computers Architecture and Programming", V.Rajaraman, C. Siva Ram Murthy, PHI, New Delhi
4) Parallel Processing By Stevens Brawer
5) Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar "Introduction to Parallel Computing", Second Edition, Addison Wesley, 2003. ISBN: 0-201-64865.
6) Advance Microprocessor and Peripherals –by A K RAY, K M BHURCHANDI, Second-Edition, The McGraw-Hill
7) S.G.Akl, "The Design and Analysis of Parallel Algorithms", PHI, 1989.
8) F.T.Leighton, "Introduction to Parallel Algorithms and Architectures: Arrays, Trees, Hypercubes", MK Publishers, San Mateo California, 1992.
9) Wilkinson, M.Allen,"Parallel Programming Techniques and Applications using networked workstations and parallel computers", Prentice Hall, 1999.
10) Michael J. Quinn, "Parallel computer theory and practice", McGraw Hill, Second Edition, 1994

D. COURSE OUTCOME

- To be able to make programs using instructions of 8087

- To learn and implement shared memory multi-programming
- To learn about advanced processor architectures
- To learn about MPI (Message passing Interface) library and to make programs using that.
- To learn, analyze working of Parallel Algorithms and its issues, limitations, overheads etc.

B. TECH. SEMESTER – VI (CE)
SUBJECT: NETWORK & INFORMATION SECURITY

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5.0	60	40	25	25	150

Reference Code CS618

A. COURSE OBJECTIVE

- To make students aware about the goals and issues of network and information security
- To teach various security algorithms and necessary mathematical concepts
- To make students aware about how to enhance the security while transmiting data over network and how security at different layers of Network Model are required to realize the overall security

B. DETAILED SYLLABUS

[1] Conventional Encryption
Conventional Encryption Model, Steganography, Classical Encryption Techniques

[2] Conventional Encryption Techniques
Simplified Des, Block Cipher Principles, Data Encryption Standards, Differential And Linear Cryptography Principles, Block Cipher Design Principles, Modes Of Operations, Algorithms Like Triple Des, International Data Encryption Algorithm, Blowfish, Rc5, Cast-128, Rc2, Characteristics Of Advanced Symmetrical Block Cipher, Issues Of Conventional Encryption Like Traffic Distribution, Random Number Generation, Key Distribution

[3] Public Key Cryptography
Principles Of Public-Key Cryptography, RSA Algorithm, Key Management, Elliptic Curve Cryptography, Diffie-Hellman Key Exchange

[4] Number Theory
Prime And Relative Prime Numbers, Modular Arithmetic, Euler‟s Theorem, Euclid‟s Algorithm, Discrete Logarithm Tics

[5] Message Authentication And Hash Functions:
Authentication Requirement, Functions, Message Authentication Code, Hash Functions, Security Of Hash Functions And Macs, MD5 Message Digest Algorithm, Secure Hash Algorithm, Ripemd-160, Hmac

[6] Introduction To E-Commerce:
Introduction To E-Commerce, Transactions On E-Commerce, Requirement Of Security On E-Commerce

[7] Network Security
Digital Signatures, Authentication Protocols, Digital Signature Standards, Application Authentication Techniques Like Kerberos, X.509 Directory Authentication Services, Active Directory Service Of Windows NT/Windows 2000

[8] IP Security E-Mail Security

IP Security Overview, Architecture, Authentication Header, Encapsulation Security Payload, Combining Security Association, Key Management, Pretty Good Privacy, S/Mime And Types

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Cryptography And Network Principles And Practice Fourth Edition, William Stallings, Pearson

D. COURSE OUTCOMES

- Students will be able to understand basic Mathematical foundation required for various security mechanisms.
- Students will be able to use cryptographic algorithms to make their applications secure against network security threats
- Students will be able to analyze the security aspects and will be able to choose correct security mechanism and relevant algorithms for implementation
- Students will be able to use the concepts/algorithms to advance his/her career as network security engineer

B. TECH. SEMESTER – VI (CE)
SUBJECT: THEO. OF AUTOMATA AND FORMAL LANGUAGES

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	0	4	4.0	60	40	-	-	100

Reference Code CS614

A. COURSE OBJECTIVE

Students will learn:

- Mathematical Proof Techniques
- Various models of Computation
- Basics of Parsing

B. DETAILED SYLLABUS

Major Topics:
Formal languages, Automata, Computability, introduction to computational complexity, NP-completeness. Course contents

[1] Review of Mathematical background
Sets, functions, logical statements, proofs, relations, languages, Mathematical induction, strong principle, Recursive definitions

[2] Regular Languages and Finite Automata
Regular expressions, regular languages, applications, Finite automata, memory requirement in a recognizer, definition, representation, extended notation, string recognition, union, intersection and complement of regular languages. Non-deterministic finite automata, lambda transitions, equivalence, algorithms, examples. Kleen's theorem. Minimization of Finite automata. Non-regular and regular languages, criterion, Pumping Lemma, decision problems and decision algorithms, Regular languages in relation to programming languages.

[3] Context-Free Languages and Push-Down Automata
Context-free languages, definition, union, concatenation, examples etc. derivation tree and ambiguity. Simplified and Normal forms, Chomsky normal form. Push-Down Automata, definition, examples, deterministic PDA, two types of acceptances and their equivalence. Equivalence of CFG and PDA. Introduction to parsing, top-down and bottom-up parsing. Non-CFL and CFL, Pumping Lemma for CFL, intersection and complement.

[4] Turing Machines
Models of computation, TM definition, combining TMs, computing a function with

TMs. variations on Turing Machines, doubly infinite and more than one Tapes, non-deterministic and Universal TM, Recursively Enumerable languages, Unrestricted and context-sensitive grammars and their relation to TM, Linear Bounded Automata, Chomsky hierarchy, Unsolvable problems, Halting problem, Post's correspondence, applications to CFLs. Computability, Primitive recursive functions, computable functions, PR functions, bounded operations. Non- primitive recursive functions.

[5] Introduction to Computational complexity

Tractable problems, growth rate, time complexity of TM. NP-completeness

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) "Introduction to Languages and Theory of Computation", John C. Martin, McGraw-Hill

2) "Computation : Finite and Infinite", Marvin L. Minsky, Prentice-Hall

D. COURSE OUTCOMES

- Students will be able to prove theorems using Principles of Mathematical Induction
- Students will be able to build models for various formal languages
- Students will be able to understand evolution of computational theory based on the models of computation
- Students will be able to understand how syntax checking works
  Students will understand importance of deterministic and non-deterministic models

B. TECH. SEMESTER – VI (CE)
SUBJECT: WEB SERVICE DEVELOPMENT

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	0	2	4	3.0	40	-	25	25	90

A. COURSE OBJECTIVE

The objective of this course is to familiarize the students with the concepts and principles of service orientation. We aim to cover SOAP-based and RESTful web services and to guide the students to implement them. The course will give detailed knowledge of concepts of micro-services architecture and make students aware about the concepts of application containers.

B. DETAILED SYLLABUS

[1] Principles of Service Orientation

Common principles, interrelation between principles, comparing service orientation with object orientation.

[2] Web services

Web Services roles, Service Descriptions with WSDL and Messaging with SOAP, UDDI basics. Web service coordination, orchestration, and choreography. Windows Communication Foundation: Introduction, Operations, Service, data and message contracts.

[3] Web API

Introduction, controller, configuration, routing, parameter binding, action return type, media type formatters. message handlers, action filters, CRUD operation, Http client to consume Web API, dependency injection.

[4] Micro services

Introduction, architecture, features, monolithic vs. micro-services, principles, advantages.

[5] **Containers:**

Introduction, creation, configuration, commands. e.g. Docker, Podman, Coordinating containerized applications: Introduction, architecture, components, commands, configuring cluster. e.g. Docker Swarm, Kubernetes

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Thomas Erl, “Service-Oriented Architecture: Concepts, Technology, and Design”, Pearson Education.

2) Tugberk Ugurlu, Alexander Zeitler and Ali Kheyrollahi, “Pro. ASP .NET Web API”, Apress.

3) Sam Newman, “Building Microservices”, O’Reilly.

4) Sean P. Kane and Karl Matthias, “Docker: Up & Running”, O’Reilly.

5) Brendan Burns and Kelsey Hightower, “Kubernetes: Up and Running” , O’Reilly.

6) Kurtz, Jamie, Wortman, Brian, “ASP.NET Web API 2: Building a REST Service from Start to Finish”, Apress.

7) Ronnie Mitra and Irakli Nadareishvili, “Microservices: Up and Running”, O’Reilly.

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- understand service orientation concepts and principles.
- design and develop service oriented applications in standard manner
- develop SOAP based and RESTful web services.
- design and development of micro-services and containers.

B. TECH. SEMESTER – VI (CE)
SUBJECT: MACHINE LEARNING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5.0	60	40	25	25	150

Reference Code CS622

A. COURSE OBJECTIVE

- Learn basic principles and techniques of machine learnings
- Develop ability to solve real world problems which requires computational intelligence

B. DETAILED SYLLABUS

[1] Introduction

Overview ,Supervised and unsupervised learning, Learning task, instances, features, labels, reward/loss, training, testing

[2] Classification

Overview of classification: setup, training, test, validation dataset, overfitting. Classification families: linear discriminative, non-linear discriminative, decision trees, probabilistic (conditional and generative), nearest neighbor

[3] Decision tree classification

Purity, Gini index, entropy, Algorithms for constructing a decision tree, Pruning methods to avoid over-fitting, Regression trees

[4] Probabilistic classifiers

Basics of Probability, Classifiers, LDA, QDA, Generative classifiers: Naive Bayes classification, Conditional classifier: Logistic

[5] Regression

Linear regression, Logistic regression

[6] Hyper Plane Classifier and convex optimization

Loss regularization framework for classification, loss functions: square, perceptron, logistic, hinge, regularizer. Review of convex optimization and unconstrained function

[7] Support Vector Machine

Max margin motivation: low density, high stability, Margin geometry to primal SVM formulation for separable training data, Dual formulation and role of alpha in a form of sparse local regression, Inseparable data, slack variables, hinge loss, upper bound on 0/1 training loss Handling non-linear regression by lifting data points to higher dimension,Polynomial, Gaussian, RBF kernels, Sequential minimal optimization (SMO) algorithm

[8] Clustering

Mixture model and Expectation maximization, K-Means Clustering, Distance based clustering, Density based clustering techniques

[9] Ensamble learning
Bagging and Boosting, Random forest, Adaboost

[10] Dimensionality reduction
Curse of dimensionality, Principal Component Analysis, Latent Semantic Analysis

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Machine Learning. T. Mitchell. McGraw-Hill, 1997.

2) Understanding Machine Learning. Shai Shalev-Shwartz and Shai Ben-David. Cambridge University Press. 2017

3) Pattern recognition and machine learning by Christopher Bishop, Springer Verlag,2006.

D. COURSE OUTCOMES

- Understand various supervised and unsupervised learning algorithms.
- Ability to analyze performance of Machine Learning algorithms.
- Understand the mathematical foundation required for solving problems using machine learning techniques.
- Ability to apply various machine learning techniques to solve the real world problems.

B. TECH. SEMESTER – VI (CE)
SUBJECT: COMPUTER NETWORKS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5.0	60	40	25	25	150

Reference Code CS611

A. COURSE OBJECTIVE

- To develop an understanding of modern network architectures from a design and performance perspective.
- To develop an understanding of different components of computer networks, various protocols, technologies and their applications.

B. DETAILED SYLLABUS

[1] Introduction

Uses of computer Networks, Network Hardware-LAN,MAN,WAN, internetworks. Network Software - Design Issues, interfaces & Services, Connection Oriented & Connectionless services. Service primitives. Relationship of services to protocols. Reference Models - OSI & TCP/IP, their comparison & critiques.

[2] The Physical Layer

Transmission Media – magnetic media, twisted pair, baseband & broadband, fiber optics. Wireless Transmission – radio, microwave, infrared & lightwave. Narrowband ISDN, Broadband ISDN & ATM. Cellular Radio- Paging systems, cordless telephones, analog & digital telephones.

[3] The Data Link Layer

DLL Design issues, Error Detection & Correction. Elementary Data link Protocols - Utopia, Stop N Wait, Automatic Repeat Request. Sliding Window Protocols - 1 bit sliding window, Go Back N, Selective Repeat Protocols.

[4] Medium Access Sublayer

Channel Allocation Problem - Static & Dynamic. Multiple Access protocols - ALOHA, CSMA, Collision Free Protocols, Limited contention protocols, WDMA protocol, wireless LAN protocols. IEEE standards 802 for LAN & MAN - 802.2, 802.3, 802.4, 802.6 & related numericals. Bridges - From 802.x to 802.y, transparent Bridges, Spanning Tree, Source Routing Bridges, remote bridge & problems. Comparison of 802 bridges, High Speed LANs - FDDI, fast ethernet.

[5] The Network Layer

Network layer Design issues. Routing Algorithms. Congestion Control Algorithms - general policies, congestion prevention policies, traffic shaping, flow specifications, congestion control in VC subnets, choke packets, load shedding, jitter control and congestion control for malfunctioning. The network layer in the internet - the IP protocol, IP addresses & subnets

[6] The Transport Layer

The Transport Service, Elements of Transport Protocols, The Internet Transport Protocols - TCP service model, TCP protocol, TCP Segment Header, TCP Connection Management, TCP Transmission Policy, TCP Congestion Policy. UDP & overview of Socket. Performance Issues - Performance problems in Computer Networks (case study), Measuring Network Performance (case study).

[7] The Application Layer

Network Security - Traditional Cryptography, Two Fundamental Cryptographic Principles, Secret-Key Algorithms, Public- key Algorithms, Authentication protocols, Digital Signatures, Social Issues., E-mail (case study), SNMP (case study).

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Computer Networks - Andrew Tanenbaum, 3ed, PHI

2) Data & Computer Communications - William Stallings, 2ed, Maxell Macmillan Int.

3) Communication Networks, Fundamental Concepts & key Architecture - Leon-Garcia & Widjaj, Tata-McGraw Hill

D. COURSE OUTCOMES

At the end of the course, students will be able to

- Analyse and troubleshoot various network parameters.
- Understand functionality of network devices.
- Comprehend functionality of various protocols and algorithms.
- Design basic computer network configurations.
- Recognize the technological trends of Computer Networking.

B. TECH. SEMESTER – VI (CE)
SUBJECT: SYSTEM DESIGN PRACTICE (MINI PROJECT)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
0	1	2	3	2.0	-	-	25	25	50

Reference Code CS621

A. COURSE OBJECTIVE

Understand how to use Software Process life cycle in the development of the complete software.

B. DETAILED SYLLABUS

- Student at the beginning of a semester may be advised by his/her supervisor (s) for recommended courses. Students will work together in a team (at most three) with any programming language.
- Students are required to get approval of project definition from the department.
- After approval of project definition students are required to report their project work on weekly basis to the respectiveinternal guide.
- Project will be evaluated at least once per week in laboratory Hours during the semester and final submission will be taken at the end of the semester as a part of continuous evaluation.

C. RECOMMENDED TEXT / REFERENCE BOOKS

Not applicable

D. COURSE OUTCOMES

- Students will be able to identify, analyse and define the scope of the project.
- They will decide suitable tools and technologies required for project development.
- Student will learn how to apply OOPS concepts, draw UML diagrams and perform black-box and white box testing.
- Students will be able to decide suitable User-interface for their project

BACHELOR OF TECHNOLOGY

COMPUTER ENGINEERING

SYLLABI BOOK

4th Year B.Tech. Program

With effect from 2023-24

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B. Tech. Semester VII

SUBJECTS	Teaching Scheme			Total	Credit	Examination Scheme (Marks)				
	Th	Tut	Pract			Th	Sess	TW	Prac	Total
Artificial Intelligence	4	0	2	6	5.0	60	40	25	25	150
Elective I	4	0	2	6	5.0	60	40	25	25	150
Elective II	4	0	2	6	5.0	60	40	25	25	150
Elective III	4	0	2	6	5.0	60	40	25	25	150
Compiler Construction	4	0	2	6	5.0	60	40	25	25	150
	20	0	10	30	25	300	200	125	125	750

B. Tech. Semester VIII

SUBJECTS	Teaching Scheme			Total	Credit	Examination Scheme (Marks)				
	Th	Tut	Pract			Th	Sess	TW	Prac	Total
Project/Industrial Training					14.0	0	0	100	300	400
Seminar					4.0	0	0	100	0	100
Effective Technical Communication	1	0	4	5	3.0	0	0	100	0	100
	1	0	4	5	21	0	0	300	300	600

Elective I, II and III in 7th semester are offered from the list of the following subjects

PEC : Professional Elective Course
CS : Computer Science
S : System
A: Applications
D: Data Science

Coures Name	Category
Cloud computing and IoT	PEC : CS-S
Image Processing	PEC : CS-A
Big Data Analytics	PEC : CS-D
Embedded Systems	PEC : CS-S
Computer Graphics	PEC : CS-A
Advanced Computer Network	PEC : CS-S
Knowledge Discovery	PEC: CS-D
Mobile Application Development	PEC : CS-A
Distributed Operating Systems	PEC : CS-S

B. TECH. SEMESTER – VII (CE)
SUBJECT: ARTIFICIAL INTELLIGENCE

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

Reference Code CE701

A. COURSE OBJECTIVE

The main objective of this course is to make students aware about achievements and vast opportunities present in the fields of AI. The course covers importantly three main facets of AI designing: Search Technique, Knowledge Representation and Learning. The course additionally covers advanced topics in the field such as Fuzzy Logic, Game Playing, Natural Language Processing, Evolutionary Computations and Expert Systems.

B. DETAILED SYLLABUS

[1] Introduction to Artificial Intelligence
Introduction problems, problem space, production systems, problem characteristics

[2] Search Techniques
Uniformed search techniques (best-first search, Depth-First search), Heuristic search techniques (General and test, Hill climbing, Simulated anncalling, A* algorithm, Constraint satisfaction, Means-end-analysis) Adverserial search techniques (Game playing, MINIMAX algorithm, alpha-Beta pruning)

[3] Knowledge Representative
Propositional Logic, predicate logic, Instance and isa relationship, semantic net, frames.

[4] Fuzzy Logic
Definition, need fuzzy set, fuzzy operators, fuzzy control systems, limitations

[5] Inference techniques
Representing knowledge using rules, procedure versus declarative knowledge, forward versus backward reasoning, unification, resolution.

[6] Natural Language Processing
Introduction NLP, NLU, phase of NLP (Morphological analysis, syntactic analysis, semantic analysis, discourse integration), introduction to Machine Translation.

[7] Expert System
ES architectures, representation and use of domain knowledge, expert system shells, knowledge acquisition.

[8] PROLOG
Facts and predicate, data types, goal finding, backtracking, simple object, compound objects, use of cut and fail predicates, recursion, lists, simple input/output.

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Artificial Intelligence by Elaine Rich and Kevin Knight, TMH
2) Introduction to Turbo PROLOG by Carl Townsend, BPB
3) Artificial Intelligence : A Modern Approach by Stuart Russell and Peter Norvig, PHI
4) Artificial Intelligence and Expert System by D.W. Patterson, PHI
5) Introduction to Applied Fuzzy Logic by Ahmed Abraham, PHI

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Understand conceptual and contextual meaning of AI and views of AI.
- Analyze and represent an AI problem
- Aware of several logic based techniques for knowledge representation and inference.
- Create interactive programs using declarative programming language PROLOG.
- Represent problems with uncertain information with the use of fuzzy logic representation and solve using fuzzy inference mechanisms.
- Design intelligent systems using Game Playing, Expert Systems and Evolutionary algorithms

B. TECH. SEMESTER – VII (CE)
SUBJECT: EMBEDDED SYSTEMS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

Reference Code CE710

A. COURSE OBJECTIVE

To introduce the concepts of an embedded system design, design methodology, programming language and to describe the real-time system concepts.

B. DETAILED SYLLABUS

[1] Programming languages for embedded systems
Desirable characteristics of programming languages for embedded systems, low-level versus high-level language, main language implementation issues : control, typing, exdception handling, modularity and multithreading, major programming languages for embedded systems : Assembly, C/C++, Java and Esterel. Timing characteristics of embedded systems : hard, soft and firm systems : fail-safe and fail-operational systems, guaranteed- response, bes-effort, event and time-triggered systems, timing constraints in embedded systems.

[2] Performance analysis of embedded sysems
Software timing characterization and analysis methods.

[3] Runtime and operational system design
Real time and non-real time applications, task assignment and scheduling : characteristics of tasks, task assignments and multi-tasking, Static and dynamic scheduling under constrains.

[4] Memory management and synchronization for embedded software :
Mutual exclusion, deadlock, starvation and lockouts : priority assignments, inversion, event flags and signals, software optimization techniques under constraints : size, performance, embaddedibility metrics.

[5] Compilation techniques for embedded software :
Code generation, re- targetability, code optimization.

[6] Examples of embedded and real-time software systems, real time applications.

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Software design methods for concurrent and real-time systems by Gomaa, Addision-Wesley 1993.
2) Real-time systems by H. Kopetz, Kluwer 1997
3) Co-synthesis of hardware and software for Embedded Systems by R. Gupta, Khuwer 1995

4) Introduction to real-time software design by S. Allworht, Springer-Verlag, 1984.
5) Real Time Systems by C.M. Krishna, Mc-Graw Hill 1997
6) Code generation for Embedded Processors by Peter Marwedel, G. Goosens, Kluner Academic Pub. 1993.
7) Embedded system design : Aunified hardware software introduction by Frank Vahid and Tony Givargis,John Wiley & Sons
8) Additional reading from selected journal papers

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Understand the issues in designing embedded system
- Design customized single purpose processor
- Understand the concepts of real-time systems
- Solve problems of real-time task scheduling and resource sharing

B. TECH. SEMESTER – VII (CE)
SUBJECT: ADVANCED COMPUTER NETWORKS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

Reference Code CE713

A. COURSE OBJECTIVE

To provide advanced topics of computer networking and to introduce network programming.

B. DETAILED SYLLABUS

[1] Introduction

Introduction to internetworking, TCP/IP protocol stack, Internetworking concepts..

[2] TCP/IP Protocols

Addressing scheme (classful and classless), subnetting and supernetting, Ipv6, ARP, RARP, ICMP, IGMP, RIP, OSPF, BGP, DNS, application layer protocols : FTP, TFTP, NFS.

[3] Sockets interface

Introduction to socket function, connect, accept, listen, bind function calls, TCP client server, concurrent server to server multiple clients..

[4] I/O multiplexing

I/O models : blocking, polling, signal driven, multiplexed. Select system call, multiplexed TCP server to serve clients, use of p select.

[5] UDP socket

UDP socket functions, difference : blocking, polling, signal driven, multiplexed. Select system call, multiplexed TCP server to serve clients, use of p select

[6] Domain name server

Introduction to DNS, resource record and resolver function, mapping between IP address and domain name.

[7] IPv4 and IPv6 interperability

Introduction, IPv4 client-server, IPv-6 address testing macro, source code portability.

[8] Deamon process

Introduction to daemon process, syslog, creating a daemon process, i net daemon.

[9] Advance UDP socket

Receiving flags, destination address and interface info, adding reliability to UDP, concurrent UDP server.

[10] Broadcasting and multicasting

Broadcast address structure, broadcast client-server, multicasting address structure, multicasting on WAN, multicasting v/s broadcasting, multicast example.

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Unix network programming vol. 1 by W.R. Stevens
2) TCP/IP protocol suite by B.A. Forouzan
3) TCP/IP vol. 1 by D.E. Comer
4) TCP/IP Vol. 1 by W.R. Stevens

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Be familiar with several common programming interfaces for network communication.
- Have a detailed knowledge of the TCP/UDP Sockets
- Design and write client-server programs
- Use of unix network programming system calls for handling multiple client requests

B. TECH. SEMESTER – VII (CE)
SUBJECT: DISTRIBUTED OPERATING SYSTEMS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

Reference Code CE716

A. COURSE OBJECTIVE

To give students knowledge of the principles, architectures, algorithms, programming models used in distributed systems. Also, to give detailed idea about on Distributed operating system concepts whichincludes Mutual exclusion algorithms, Deadlock detection algorithms and agreement protocols.

B. DETAILED SYLLABUS

[1] Introduction to Distributed Systems

[2] Interprocess Communication and Coordination

[3] State Maintenance

[4] Distributed Mutual Exclusion Algorithms

[5] Election Algorithms

[6] Fault Tolerance and Distributed Agreement

[7] Database Techniques

[8] Check Point and Recovery

[9] Distributed Deadlock Detection

[10] Load Balancing & Scheduling

[11] Security

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) "Distributed Operating Systems and Algorithms" by Randy Chow and Theodore Johnson, Addison Wesley, 1997

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- understand issues of the Distributed Environment and different mechanisms to handle them
- Ability to demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system
- Gain understanding of the various resource management techniques for distributed systems
- Ability to summarize the major security issues associated with distributed systems along with the range of techniques available for increasing system security

B. TECH. SEMESTER – VII (CE)
SUBJECT: IMAGE PROCESSING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

Reference Code CE714

A. COURSE OBJECTIVE

The objective of the course is to understand the image formation and representation. To Learn various enhancement and restoration techniques in different domains. Learn about the various compression techniques.

B. DETAILED SYLLABUS

[1] Introduction

[2] Image Transformation Techniques

[3] Image Enhancement Algorithms

[4] Image Restoration Methods

[5] Image Compression Techniques

[6] Image Segmentation Schemes

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) R.C.Gonzalez and R.E.Woods, "Digital Image Processing", Addison-Wesley Longman, Inc, 1999
2) A.K.Jain, "Digital Image Processing", PHL
3) M.Sonka, V.Hlavac, and R.Boyle – Image processing, Analysis and Machine vision, Thomson Asia pvt. Ltd, 1999.

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Apply various enhancement and restoration techniques in both spatial and frequency domain.
- Decide which technique would be suitable for a given application.
- Make decision based upon the requirement which compression technique to apply.
- Segment the images for further processing

B. TECH. SEMESTER – VII (CE)
SUBJECT: KNOWLEDGE DISCOVERY

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

Reference Code CE715

A. COURSE OBJECTIVE

The objective of the course is to understand the digital data generated by various sources and to find implicit patterns from it which can be utilized for business intelligence. Students will be able to understand the problems in the digital data and will learn various data cleaning, data transformation, data reductions techniques. They will learn various machine learning algorithms to apply on the data which will help in decision making in industries..

B. DETAILED SYLLABUS

[1] Introduction

An overview of data warehousing and data mining

[2] Data Pre-processing

Overview, Need for pre-processing
Issues related to efficient data handling (Extraction, Transformation, And updating of large databases (ADDED) Data Cleaning
Data Integration & Transformation Data Reduction
Discretization & Concept Hierarchy Generation

[3] Data warehouse and OLAP technology

Multi-dimensional Data Cubes
Star, Snow Flakes, & Fact Constellation Schema Concept Hierarchies
OLAP
Data Warehouse Architecture
Steps for design and construction of data warehouse A 3-tier data warehouse architecture
ROLAP, MOLAP, HOLAP.
Data Warehouse Implementation

[4] Mining Frequent patterns, Association and Correlation Logic

Basic Concepts,
Item set mining methods
Mining association rules
Correlation analysis

[5] Classification & prediction

An Overview & Basic Concepts Classification by decision tree induction Bayesian Classification

[6] Cluster Analysis

An Overview & Basic Concepts Partitioning methods Hierarchical methods
Density-Based methods Outlier analysis

[7] Graph Mining

Methods for Mining Frequent Subgraphs
Mining Variant and Constrained Substructure Patterns
Applications: Graph Indexing, Similarity Search, Classification and Clustering

[8] Mining Multimedia, Text, and Web Data

Multimedia Data Mining

- Similarity Search in Multimedia Data
- Multidimensional Analysis of Multimedia Data
- Classification and Prediction Analysis of Multimedia Data
- Mining Associations in Multimedia Data
- Audio and Video Data Mining

Text Mining

- Text Data Analysis and Information Retrieval
- Dimensionality Reduction for Text
- Text Mining Approaches

Mining the World Wide Web

- Mining the Web Page Layout Structure
- Mining the Web‟s Link Structures to Identify
- Authoritative Web Pages
- Mining Multimedia Data on the Web
- Automatic Classification of Web Documents
- Web Usage Mining

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Jiawei Han & Micheline Kamber, “Data Mining – Concepts & Techniques”,2nd edition, Morgan Kaufmann Publishers
2) Data mining: multimedia, soft computing, and bioinformatics By Sushmita Mitra, Tinku Acharya, published by John Wiley and Sons
3) Introduction to Data Mining. Tan, Steinbach, Kumar. Addison-Wesley. 2006.

D. COURSE OUTCOMES

At the end of the course students will :

- Be able to understand various sources of data generation and how to deal will heterogeneous data.
- learn various data cleaning, data transformation, data reductions techniques.
- learn various supervised and unsupervised algorithms
- learn various outlier detection techniques
- learn data warehousing concepts and they will also learn the concepts of text mining, web mining and multimedia miningDesign intelligent systems using Game Playing, Expert Systems and Evolutionary algorithms

B. TECH. SEMESTER – VII (CE)
SUBJECT: MOBILE APPLICATION DEVELOPMENT

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

Reference Code CE717

A. COURSE OBJECTIVE

The Mobile Application Development course is designed to teach students to develop mobile applications for the Android devices that use basic and advanced phone features. Students will also be able to deploy applications to the Android marketplace for distribution.

B. DETAILED SYLLABUS

[1] Getting started with mobility

Mobility landscape, Mobile platforms, Mobile apps development, Overview of Android platform, setting up the mobile app development environment along with an emulator, a case study on Mobile app development

[2] Building blocks of mobile apps

App user interface designing – mobile UI resources (Layout, UI elements, Draw-able, Menu), Activity- states and life cycle, interaction amongst activities. Application functionality beyond user interface - Threads, Async task, Services – states and life cycle, Notifications, Broadcast receivers, Telephony and SMS APIs. Native data handling – on-device file I/O, shared preferences, mobile databases such as SQLite, and enterprise data access (via Internet/Intranet)

[3] Sprucing up mobile apps

Graphics and animation – custom views, canvas, animation APIs, multimedia – audio/video playback and record, location awareness, and native hardware access (sensors such as accelerometer and gyroscope)

[4] Testing mobile apps

Debugging mobile apps, White box testing, Black box testing, and test automation of mobile apps, JUnit for Android, Robotium, MonkeyTalk

[5] Taking apps to market

Versioning, signing and packaging mobile apps, distributing apps on mobile market place

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Android – Wireless Application Development by Lauren Darcey and Shane Conder, 3rd Ed., Pearson Education
2) Beginning Android Application Development by Wei-Meng-Lee, Wiley Publication
3) Professional Android 4 Application Development by Reto Meier, Wiley Publication

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- apply layout management and multi-layout definition techniques to create adaptable user interfaces for mobile applications that share a common data model.
- manage user data and multimedia on a mobile device via the Android framework libraries.
- use the sensors available on mobile devices to enhance user interaction and feedback.
- publish Applications to the Google Play Store.

B. TECH. SEMESTER – VII (CE)
SUBJECT: MACHINE LEARNING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

Reference Code CE701

A. COURSE OBJECTIVE

This course introduces several fundamental concepts and methods for machine learning. The objective is to familiarize the audience with some basic learning algorithms and techniques and their applications, as well as general questions related to analyzing and handling large data sets. Several software libraries and data sets publicly available will be used to illustrate the application of these algorithms. The emphasis will be thus on machine learning algorithms and applications, with some broad explanation of the underlying principles.

B. DETAILED SYLLABUS

[1] Introduction

Overview ,Supervised and unsupervised learning, Learning task, instances, features, labels, reward/loss, training, testing

[2] Classification

Overview of classification: setup, training, test, validation dataset, overfitting. Classification families: linear discriminative, non-linear discriminative, decision trees, probabilistic (conditional and generative), nearest neighbor.

[3] Decision tree classification

Purity, Gini index, entropy, Algorithms for constructing a decision tree, Pruning methods to avoid over-fitting, Regression trees

[4] Probabilistic classifiers

Basics of Probability, Classifiers, LDA, QDA, Generative classifiers: Naive Bayes classification, Conditional classifier: Logistic

[5] Regression: Linear Regression, Logistic regression, Hyper plane

[6] Classifier and convex optimization

Loss regularization framework for classification, loss functions: square, perceptron, logistic, hinge, regularizer. Review of convex optimization and unconstrained function

[7] Support Vector Machine

Max margin motivation: low density, high stability, Margin geometry to primal SVM formulation for separable training data, Dual formulation and role of alpha in a form of sparse local regression, Inseparable data, slack variables, hinge loss, upper bound on 0/1 training loss Handling non-linear regression by lifting data points to higher dimension,Polynomial, Gaussian, RBF kernels, Sequential minimal optimization (SMO) algorithm

[8] Clustering

Mixture model and Expectation maximization, K-Means Clustering, Distance based clustering, Density based clustering techniques

[9] Ensamble learning

Bagging and Boosting, Random forest, Adaboost

[10] Dimensionality reduction

Curse of dimensionality, Principal Component Analysis, Latent Semantic Analysis

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Machine Learning. T. Mitchell. McGraw-Hill, 1997.
2) Understanding Machine Learning. Shai Shalev-Shwartz and Shai Ben-David. Cambridge University Press. 2017
3) Pattern recognition and machine learning by Christopher Bishop, Springer Verlag,2006.

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Familiarity with the concepts of machine learning.
- Modelling real world problems using machine learning techniques.
- Capability to implement machine learning algorithms (Using Python)

B. TECH. SEMESTER – VII (CE)
SUBJECT: BIG DATA AND ANALYTICS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

Reference Code CE720

A. COURSE OBJECTIVE

The objective of the course is to understand digital data, data preprocessing, data warehousing and various supervised and unsupervised algorithms. Students will learn big data, sources of big data and various platforms to handle big data. They will also learn HADOOP and its components.

B. DETAILED SYLLABUS

[1] Types of Digital Data (Structured, Semi-Structured, Unstructured)

[2] Introduction to Big Data.

[3] Te Big Data Technology Landscape
NoSQL – NewSQL
Hadoop- Introduction to Eco system

[4] Hadoop – Distributed File System and Processing using MapReduce

[5] Introduction to Map Reduce Programming

[6] Introduction to Big Data Analytics

[7] Data Storage and Handling (Apache Cassandra/mongoDB)

[8] Querying Data using Hive/Pig like components

[9] Data Reporting Tools (i.e. Community Edition : Jasper Soft

[10] The realm of Data Science

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Big Data and Analytics – Seema Acharya and Subhashini C – Wiley India
2) Hadoop: The Definitive Guide by Tom White
3) Big Data Analytics: Methods and Applications by B. L. S. Prakasa Rao (Editor), S. B. Rao (Editor)

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Learn various types of digital data and how to deal with them.
- Learn various data cleaning, data transformation, data reductions techniques.
- Students will learn various supervised and unsupervised algorithms
- Understand big data, sources of big data, characteristics of big data
- Students will learn HADOOP and its components.
- Learn concepts of mapreduce programming.

B. TECH. SEMESTER – VII (CE)
SUBJECT: COMPILER CONSTUCTION

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

Reference Code CE718

A. COURSE OBJECTIVE

The objective of this course is to get familiar with the different phases of a compiler, to learn algorithms for parsing and their usefulness in semantic analysis. This course will help to realize the need of run time environment support, symbol table organization, garbage collection, various machine independent code optimization techniques etc. Also, the course involves developing programs using LEX and YACC.

B. DETAILED SYLLABUS

[1] Introduction

Language processor, Structure of compiler, the science of building compilers, Applications of language processors

[2] Lexical analysis

The role of lexical analyzer, input buffering, specification of tokens, recognition of tokens, lexical analyzer generator (lex)

[3] Syntax analysis

Top-down parsing, Bottom-up parsing, Introduction to LR parsing, More powerful LR parsers, Using ambiguous grammars, Parser generators (yacc)

[4] Syntax directed translation (SDT)

Syntax directed definitions (SDD), Evaluation order of SDD‟s, Applications of SDT, SDT schemes

[5] Intermediate code generation

Variants of syntax tree, three-address code, types and declarations, translation of expressions, type checking

[6] Runtime Environments

Storage organization, stack allocation of space, access to non-local data on the stack, heap management

[7] Code generation

Issues in the design of code generator, the target language, addresses in the target code, basic blocks and flow-graphs, optimization of basic blocks, peephole optimization, register allocation and assignments

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Compiler: Principles, techniques and tools by Aho, Ullman and Sethi, 2nd Ed., Pearson Education

2) Theory and Practice of Compiler Writing, Jean-Paul Tremblay, Paul G. Sorenson, McGraw Hill

D. COURSE OUTCOMES

- To know how a compiler tokenizes, parses the input program and how different phases of compiler are involved.
- To be able to develop programs using LEX (Tool for Automatic Lexical Analyzer) and YACC (tool for Automatic Parser Generator).
- Understanding how different code optimization techniques reduce time or space required for the runtime.
- Understanding the semantic aspects of compilation like how type insertion, checking, code generation etc. can be done

B. TECH. SEMESTER – VIII (CE)
SUBJECT: PROJECT/INDUSTRIAL TRAINING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
0	0	30	30	14	-	-	100	300	400

Reference Code AF801

B. TECH. SEMESTER – VIII (CE)
SUBJECT: SEMINAR

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
-	-	-	-	4	-	100	-	-	100

Reference Code AF802

Each student has to give two seminars on project/ given topic during their project duration.

The students will undertake project work for the period of full semester. They should design/develop the hardware and/or software system. They may also undertake project involving study and analysis of hardware and system in the organization.

They are supposed to prepare and submit a project report as a part of their term work and give seminars on their project work. The students may be sent to the industry / organization for their project and they are to timely report to the Institute regarding monitoring and necessary guidance. The faculties should arrange visits at the places of projects.
They should arrange for demonstration of the project work, if any. They are to be examined based on viva and/or demonstration. The main purpose of industrial training is to acquaint students with the administrative and organizational details of a company.

They should know what are the basic rules followed in a company and how a employee should behave and work in the company.

SYLLABI BOOK

Bachelor of Technology (B.Tech.)
in
Information Technology

Department of Information Technology,
Faculty of Technology,
Dharmsinh Desai University, Nadiad – 387 001, Gujarat, India.
Website: http://www.ddu.ac.in

DHARMSINH DESAI UNIVERSITY, NADIAD

CBCS BASED TEACHING SCHEME AND DETAIL SYLLABUS FOR B.TECH. (INFORMATION TECHNOLOGY)

FOR THE BATCH 2017 – 2021

SEMESTER I (2017-2018)

Subject Code	Subjects	Teaching Scheme (Hrs./week)			Exam Scheme					
		L	T	P	Theory	Sess	TW	Prac	Total	Credits
AF 111	Mathematics - I	4	0	0	60	40	0	0	100	4.0
AF 115	Engineering Graphics	4	0	3	60	40	50	0	150	5.5
AF 122	Basic Electrical & Electronics Engineering	4	0	2	60	40	25	25	150	5.0
AF 124	Engineering Mechanics	3	0	1	60	40	25	25	150	3.5
AF 126	Work Shop - I	0	0	3	0	0	50	0	50	1.5
CT 116	Element of Linux OS & C Programming - I	4	0	2	60	40	25	25	150	5.0
ES 110	Environmental Science	3	0	0	60	0	0	40	100	3.0
		22	**0**	**11**	**360**	**200**	**175**	**115**	**850**	**27.5**

SEMESTER II (2017-2018)

Subject Code	Subjects	Teaching Scheme (Hrs./week)			Exam Scheme					
		L	T	P	Theory	Sess	TW	Prac	Total	Credits
AF 201	Mathematics - II	4	0	0	60	40	0	0	100	4.0
AF 212	Electronics Principles	4	0	2	60	40	25	25	150	5.0
AF 214	Mechanics of Solids	3	0	2	60	40	25	25	150	4.0
AF 215	Heat Power	4	0	2	60	40	25	25	150	5.0
AM 210	Engineering Economics & Principles of Management	3	0	0	60	0	0	40	100	3.0
CT 215	C Programming - II	4	0	2	60	40	25	25	150	5.0
CT 217	Electronics Workshop	0	0	2	0	0	50	0	50	1.0
		22	**0**	**10**	**360**	**200**	**150**	**140**	**850**	**27.0**

SEMESTER III (2018-2019)

Subject Code	Subjects	Teaching Scheme (Hrs./week)			Exam Scheme					
		L	T	P	Theory	Sess	TW	Prac	Total	Credits
AF 301	Mathematics - III	4	0	0	60	40	--	--	100	4.0
IT 301	Design of Digital Circuits	4	0	2	60	40	25	25	150	5.0
IT 302	Computer Peripherals	--	0	2	0	--	25	25	50	1.0
IT 303	Object Oriented Programming	4	0	2	60	40	25	25	150	5.0
IT 304	Discrete Mathematics	4	0	2	60	40	25	25	150	5.0
IT 305	Communication Systems	4	0	2	60	40	25	25	150	5.0
		20	**0**	**10**	**300**	**200**	**125**	**125**	**750**	**25.0**

SEMESTER IV (2018-2019)

Subject Code	Subjects	Teaching Scheme (Hrs./week)			Exam Scheme					
		L	T	P	Theory	Sess	TW	Prac	Total	Credits
AF 410	Financial and Managerial Accounting	3	0	0	60	40	0	0	100	3.0
AF 411	Mathematics – IV	4	0	0	60	40	0	0	100	4.0
IT 402	Computer Organization	4	0	2	60	40	25	25	150	5.0
IT 403	Microprocessor Architecture Programming and Interfacing	4	0	2	60	40	25	25	150	5.0
IT 406	Data Structures and Algorithms	4	0	2	60	40	25	25	150	5.0
IT 407	Computer and Communication Networks	4	0	2	60	40	25	25	150	5.0
		23	**0**	**8**	**360**	**240**	**100**	**100**	**800**	**27.0**

SEMESTER V (2019-2020)

Subject Code	Subjects	Teaching Scheme (Hrs./week)			Exam Scheme					
		L	T	P	Theory	Sess	TW	Prac	Total	Credits
AF 501	Professional Communication - I	1	0	2	50	0	0	50	100	2.0
IT 502	Database Management System	4	0	2	60	40	25	25	150	5.0
IT 509	Design & Analysis of Algorithm	4	0	2	60	40	25	25	150	5.0
IT 510	Core Java Technology	4	0	2	60	40	25	25	150	5.0
IT 511	Theory of Automata & Formal Language	4	0	0	60	40	0	0	100	4.0
	Elective - I									
IT 506	Advanced Microprocessor Architecture	4	0	2	60	40	25	25	150	5.0
IT 506A	Embedded System	4	0	2	60	40	25	25	150	5.0
		21	**0**	**10**	**350**	**200**	**100**	**150**	**800**	**26.0**

SEMESTER VI (2019-2020)

Subject Code	Subjects	Teaching Scheme (Hrs./week)			Exam Scheme					
		L	T	P	Theory	Sess	TW	Prac	Total	Credits
CT 616	Software Engineering	4	0	2	60	40	25	25	150	5.0
IT 607	Applied Operating System	4	0	2	60	40	25	25	150	5.0
IT 608	Language Translator	4	0	2	60	40	25	25	150	5.0
IT 619	Advance Java Technology	4	0	2	60	40	25	25	150	5.0
AF 601	Professional Communication - II	1	0	2	50	0	0	50	100	2.0
	Elective - II									
IT 618	Design Patterns and Application Frameworks	4	0	2	60	40	25	25	150	5.0
IT 618A	Mobile Computing	4	0	2	60	40	25	25	150	5.0
IT 618B	Digital Switching System	4	0	2	60	40	25	25	150	5.0
IT 618C	Computer Graphics	4	0	2	60	40	25	25	150	5.0
		21	**0**	**12**	**350**	**200**	**125**	**175**	**850**	**27.0**

SEMESTER VII (2020-2021)

Subject Code	Subjects	Teaching Scheme (Hrs./week)			Exam Scheme					
		L	T	P	Theory	Sess	TW	Prac	Total	Credits
IT 704	Data Analysis & Information Extraction	4	0	2	60	40	25	25	150	5
IT 707	System Design Practice	0	0	2	0	0	25	25	50	1
IT 714	Knowledge System	4	0	2	60	40	25	25	150	5
IT 717	Distributed Computing	4	0	2	60	40	25	25	150	5
IT 719	Web Technology	4	0	2	60	40	25	25	150	5
	Elective - III									
IT 718	E-Commerce and E-Security	4	0	2	60	40	25	25	150	5
IT 718A	Introduction to Neural Networks	4	0	2	60	40	25	25	150	5
IT 718B	Digital Image Processing	4	0	2	60	40	25	25	150	5
IT 718C	Cloud Computing	4	0	2	60	40	25	25	150	5
IT 718D	Mobile App. Development	4	0	2	60	40	25	25	150	5
		20	**0**	**12**	**300**	**200**	**150**	**150**	**800**	**26.0**

SEMESTER VIII (2020-2021)

Subject Code	Subjects	Teaching Scheme (Hrs./week)			Exam Scheme					
		L	T	P	Theory	Sess	TW	Prac	Total	Credits
AF 801	Project/Industrial Training	0	0	28	0	0	100	300	400	14.0
AF 802	Seminar	0	0	08	00	100	0	0	100	4.0
		0	**0**	**36**	**0**	**100**	**100**	**300**	**500**	**18.0**

AF 111 – MATHEMATICS - I
SEM-I (1st Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	--	4	--	4	60	40	--	--	100

[A] OBJECTIVES OF THE COURSE

- Ability to analysis and solve problems in both familiar and unfamiliar situations including those in real-life contexts with better accuracy.
- Able to apply knowledge of key theories, concepts, tools and techniques of Mathematics to solve structured and unstructured Engineering problems.
- Understand and be able to use the language, symbols and notation of mathematics
- Use different forms of mathematical representation (formulae, diagrams, tables, charts, graphs and models)
- Generate and/or analyze information, find relationships and patterns, describe these mathematically as general rules, and justify or prove them.

[B] DETAILED SYLLABUS

1) DIFFERENTIAL CALCULUS

Applications of differential calculus to geometrical problems, equation of tangent & normal, angle between two curves, subtangent, subnormal, length of tangent & length of normal, pedal equation, radius of curvature of plane curves in cartesian, polar and parametric equations, radius of curvature at origin by newton's method and by method of expansion.

2) SUCCESSIVE DIFFERENTATION

Leibnitz's theorem, Maclaurin's theorem, Taylor's theorem, Applications to obtain expansion of functions.

3) INTEGRAL CALCULUS

Curve Tracing, applications for finding area, length of arc, volume and surface area of solids of revolutions.

4) REDUCTION FORMULA FOR

Reduction formula for $\int_0^{\frac{\pi}{2}} \boldsymbol{sin^n x\, dx}$, $\int_0^{\frac{\pi}{2}} \boldsymbol{cos^n x\, dx}$, $\int_0^{\frac{\pi}{2}} \boldsymbol{sin^m x\, cos^n x\, dx}$, $\int_0^{\frac{\pi}{4}} \boldsymbol{tan^n x\, dx}$, $\int_0^{\frac{\pi}{4}} \boldsymbol{cot^n x\, dx}$…

5) BETA AND GAMMA FUNCTION
Definition, properties, relation between Beta and Gamma functions, use in evaluation of definite integrals.

6) ELLIPTIC AND ERROR FUNCTIONS
Definitions and Properties and use in evaluation of definite integrals.

7) FIRST ORDER DIFFERENTIAL EQUATION
Formation of differential equations, general and particular solution, equations of first order & first degree of the type variables separable, homogenous, reducible to homogenous, linear & exact and reducible to these forms. Application to geometrical and physical problems.

[C] LEARNING OUTCOMES

- To answer at least about the convergence or divergence of integral when integral is not easily evaluated using techniques known.
- Able to evaluate the volume and surface area of the solid generated by revolving the solids by Integration.
- Apply the knowledge of differential equation to solve some practical problems such as electrical circuits, Newton's Law of cooling and problem related to orthogonal trajectories.
- Apply the knowledge of differentiation to obtain the series of function.
- Able to evaluate curvature of the given function.

[D] RECOMMENDED TEXTBOOKS

1) Engineering Mathematics-II by: Shanti Narayan, S. Chand & Company (PVT.) Ltd. Ram nagar, Delhi
2) Higher Engineering Mathematics. by: Dr. B.S.Grewal, Khanna publishers, Delhi

[E] REFERENCE BOOKS

1) Engineering Mathematics-I, by: Shanti Narayan, S. Chand & Company (PVT.) Ltd.
2) Applied Mathematics, by: P.N. & J.N. Wartikar,
3) Engineering Mathematics-I by: I.B. Prasad

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE):

Not applicable

AF 115 – ENGINEERING GRAPHICS
SEM-I (1st Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	**TUTORIAL**	**PRACTICAL**	**L+T**	**P**	**TOTAL**	**THE.**	**SESS.**	**PRAC.**	**T/W**	**TOTAL**
4	--	3	4	1.5	5.5	60	40	--	**50**	150

[A] OBJECTIVES OF THE COURSE

- The course is aimed at developing basic graphic skills in preparation of basic drawings
- Developing skills in reading and Interpretation of engineering drawings to efficiently communicate ideas graphically
- To understand dimension and annotation two-dimensional engineering drawings
- To understand objects in two-dimensional views to improve visualization skills
- Comprehend general projection theory, with an emphasis on the use of orthographic projection to represent three-dimensional

[B] DETAILED SYLLABUS

1) PLANE GEOMETRY: ENGINEERING CURVES
Construction of curves used in engineering such as Conics (Ellipse, Parabola, Hyperbola) Cycloidal curves -Cycloid, Epi-Cycloid, Hypo-Cycloid, involutes, Archemedian spirals

2) SOLID GEOMETRY
Projections of Points, Projections of Lines, construction for H.T. & V.T. Applications of projection of points and lines Projections of regular planes such as square, rectangle, triangle, circle, pentagon, hexagon, rhombus, etc. Projections of Right & Regular Solids (Prisms, Pyramids, Cylinder and Cone)

3) ORTHOGRAPHIC PROJECTIONS
First angle projection method and third angle projection method. Dimensioning techniques and methods. Conversion of pictorial views into Orthographic Projections with dimensions.

4) SECTIONAL ORTHOGRAPHIC PROJECTION
Orthographic vies with section, types of sections - Full section, half section, offset section, Local section, Partial section, Conventions adopted for sectional views, interpretation of orthographic views.

5) ISOMETRIC PROJECTIONS
Conversion of Orthographic views into isometric Projections and views

6) MACHINE PARTS
Sketches of various important machine parts with empirical dimensions: Types of threads, Bolts, various types of Nuts, locking devices for Nuts, Rod connections like Cotter Joint & Knuckle Joint, Shaft: Couplings like protected type shaft: coupling and pin type flexible cou pling, Bearings, Welded Joints, etc.

7) COMPUTER GRAPHICS
Introduction to Computer Graphics.

[C] LEARNING OUTCOMES

[D] RECOMMENDED TEXTBOOKS

1) Engineering Drawing by: N. D. Bhatt
2) Engineering Drawing Vol. l & Vol. 2. by: P. J. Shah

[E] REFERENCE BOOKS

1) Fundamentals of Engineering Drawing. by: Luzadder
2) A Text Book of Geometrical Drawing. by: P. S. Gill
3) A Text Book of Machine Drawing by: P. S. Gill

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

- The term work shall be based on the above syllabus.

AF 122 – BASIC ELECTRICAL & ELECTRONICS ENGINEERING
SEM-I (1st Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

- To expose the students to the concepts of various types of electrical, electronic and magnetic circuits and their applications.

[B] DETAILED SYLLABUS

1) FUNDAMENTALS OF CURRENT ELECTRICITY AND DC CIRCUITS

Introduction, Computation of Resistance at constant temperature, Temperature dependence of Resistance, Computation of Resistance at different temperatures, Ohm's law statement, Illustration and limitation, Kirchhoff's laws-statement and illustration, Resistance in parallel and current division technique, Method of solving a circuit by Kirchhoff's laws.

2) MAGNETIC CIRCUITS

Introduction, Definition of Magnetic quantities, Magnetic circuit, Leakage flux, Fringing effect, Comparison between magnetic and electric circuits.

3) ELECTROMAGNETIC INDUCTION

Introduction, Magnetic effect of electric current, Current carrying conductor in magnetic field, Law of electromagnetic induction, Induced emf, Self-Inductance (L), Mutual Inductance (M), and Coupling coefficient between two magnetically coupled circuits (K), inductor in series.

4) AC FUNDAMENTALS

Introduction, Waveform terminology, Concept of 3-phase emf generation, Root mean square (RMS) or effective value, Average Value of AC, Phasor representation of alternating quantities, Analysis of AC circuit.

5) SINGLE PHASE AC CIRCUITS

Introduction, j operator, Complex algebra, Representation of alternating quantities in rectangular and polar forms, RL series circuit, RC

series circuit, RLC series circuit, Admittance and its components, Simple method of solving parallel AC circuits, Resonance.

6) ELECTRICAL MACHINES
Working principles of DC machine, Transformer, Three phase Induction Motor.

7) DIODE THEORY
Semiconductor theory, Conduction in crystals, Doping source, The unbiased diode, Forward bias, Reverse bias, Linear devices, The diode graph, Load lines, Diode approximations, DC resistance of a diode.

8) DIODE CIRCUITS
The sine wave, The transformer, The half wave rectifier, The full wave rectifier, The bridge rectifier, The capacitor input f ilter, Diode clipper and clamper circuit.

9) SPECIAL PURPOSE DIODES
The Zener diode, The Zener regulator, Optoelectronic devices

[C] LEARNING OUTCOMES

At the completion of the course, students will be able to…

- Analyse the various electric and magnetic circuits.
- Understand 1-phase and 3-phase supply terminology.
- Understand the effect of R, L and C in single phase ac circuit.
- Compare various diode circuits and rectifier circuits.
- Understand significance of resonance in series and parallel RLC circuit.
- Identify the various parts of electrical machines and their working.

[D] RECOMMENDED TEXT BOOK

1) Basic Electrical, Electronics and Computer Engineering, by: R. Muthusubramanian, S. Salivahanan, K. A. Muraleedharan, 2nd Edition, Tata McGraw Hill.
2) Electronics Principles, by: Albert Paul Malvino, 6th Edition, Tata McGraw Hill.

[E] REFERENCE BOOKS

1) Electrical Engineering, by: B. L. Theraja, 23rd Edition, S. Chand & Company Ltd.
2) Electrical Machines, by: B. L. Theraja, 23rd Edition, S. Chand & Company Ltd.

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1) Basic Electronic Devices
2) Verification of Ohm's Law
3) Resistance, Inductance and Power Factor of Single-Phase Circuit
4) Charging and Discharging of a Capacitor
5) R-L and R-C Circuit
6) Resonance in R-L-C Series Circuit
7) Diode Characteristic
8) Half Wave and Full Wave and Bridge Rectifier Circuits
9) Clipper Circuit and Clamper Circuit

AF 124 - ENGINEERING MECHANICS
SEM-I (1st Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
3	--	1	3	0.5	3.5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

- Comprehensive and theory-based understanding of the natural and physical sciences and the engineering fundamentals applicable to the engineering discipline.

[B] DETAILED SYLLABUS

1) STATICS

Introduction, engineering and S.I. units, accuracy in engineering calculations, Vector's composition and resolution, concept of Rigid Body. Resultant of a force system: i) Concurrent Coplanar Force System ii) Non-concurrent Coplanar Force System (a) parallel and (b) non-parallel Using analytical as well as graphical methods. iii) Simple cases of concurrent force system in space.

Concept of internal force, free body diagram. Equilibrium of force system listed above.

Friction: Friction on an inclined plane, ladder friction, wedge friction, screw friction, belt and rope drive.

Centre of gravity of lines, plane figures, volumes, bodies and Pappu's Theorem. Principle of Virtual Work and its application.

Types of Beams, Types of Supports, Support Reaction for statically determinate beams.

2) DYNAMICS

Rectilinear motion, Circular motion, Projectiles, Relative velocity, Instantaneous center in plane motion. Laws of Motion, Motion along an inclined plane, Principle of conservation of Momentum, Mass Moment of Inertia in Rotational Motion, Motion of connected bodies, Impulse and Momentum, Impact, work power and Energy, D Alembert's principle, vibrations of SDOF systems. Motion along a smooth curve and super elevation.

[C] LEARNING OUTCOMES

After completion of the course students should be able to:

- Understand and describe concept of rigid body
- Describe resultant force systems using analytical and graphical methods
- Describe concept of internal forces
- Describe various types of motions like rectilinear, circular. Projectile etc.
- Understand and describe laws of motion and its applications

[D] RECOMMENDED TEXTBOOKS

1) Mechanics for Engineers - Statics by: F. P. Beer and E. R. Johnston Jr.
2) Mechanics for Engineers - Dynamics by: F. P. Beer and E. R. Johnston Jr.
3) Engineering Mechanics: Statics & Dynamics by: A. K. Tayal

[E] REFERENCE BOOKS

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1) Experiments - Problems based on theory

AF 126 - WORK SHOP – I
SEM-I (1st Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
--	--	3	--	1.5	1.5	--	--	--	50	50

[A] OBJECTIVES OF THE COURSE

- Students belonging to all branches of engineering are made understand workshop layout, importance of various sections/shops of workshop, General safety rules and work procedure of work shop
- Students belonging to all branches of engineering are made understand importance or workshop practice in engineering and are given exposure to use practically by themselves of basic tools and equipment used for performing basic operations related to carpentry, tin smithy and plumbing individually

[B] DETAILED SYLLABUS

1) INSTRUCTION
Kinds of wood, types of carpentry tools, carpentry joints, Plumbing tools, pipe fittings, tin smithy and soldering tools.

2) DEMONSTRATIONS
Operation of wood working machines.

[C] LEARNING OUTCOMES

- After successful completion of this course, students belonging to all branches of engineering would be able to understand and able to use themselves of basic workshop tools used in carpentry, tin smithy and plumbing

[D] RECOMMENDED TEXTBOOKS

[E] REFERENCE BOOKS

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

Each candidate shall submit the following term work.

1) Practice job in carpentry ---- One job.
2) Simple carpentry joint---- One job.
3) Threading of pipe and pipe fittings ---- One job.
4) Tin smithy and soldering ---- One job.

CT 116 - ELEMENT OF LINUX OS & C PROGRAMMING - I
SEM-I (1st Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

- To teach basics of Linux Operating System.
- To teach the general-purpose utility commands, file system, to set permissions for files/directories, basic of process, editors and shell programming.
- To understand basic Structure of the C-Programming, declaration and usage of variables.
- To develop programming skills using the fundamentals and basics of C Language.
- To develop C programs using operators, conditional and iterative statements.

[B] DETAILED SYLLABUS

1) BASICS OF OPERATING SYSTEM

2) LINUX ARCHITECTURE
Kernel, shell and applications, Features of Linux, Basics of Command: Locating Commands, Types of Commands [Internal and External], Structure of Commands, Getting HELP: Commands like man, what is, aprpos

3) LINUX USAGE
Logging in to a Linux System, switching between virtual consoles and the graphical environment, changing your password, the root user, Editing text files.

4) GENERAL PURPOSE UTILITY
cal, date, echo, be, script, who, uname

5) THE FILE SYSTEM
Linux File Hierarchy Concepts, Some Important Directories, Current Working Directory, File and Directory Names, Absolute and Relative Pathnames, Changing Directories, listing Directory Contents, Copying Files and Directories, Moving and Renaming Files and Directories,

Creating and Removing Files, Creating and Removing Directories,

6) **THE FILE SYSTEM IN-DEPTH**
Partitions and Filesystems, inodes and Directories, cp and inodes, mv and inodes, rm and inodes, Hard links, Symbolic (or soft) Links, The Seven Fundamental Filetypes, Checking Free Space, mounting storage devices, Compressing and Archiving Files.

7) **USERS, GROUPS AND PERMISSIONS**
Users, Groups, Permission Types, Examining Permissions, Interpreting Permissions, Changing File Ownership, Changing Permissions - Symbolic Method, Changing Permissions - Numeric Method, User and Group ID Numbers, /etc/passwd, /etc/shadow and /etc/group files, User Management tools, System Users and Groups, Default Permissions, Special Permissions for Executables, Special Permissions for Directories.

8) **FINDING AND PROCESSING FILES**
Locate, locate Examples, find, Basic find Examples, find and logical Operators, find and Permissions, find and Numeric Criteria, find and Access Times, executing commands with find, find Execution Examples, The GNOME Search Tool.

9) **BASICS OF PROCESS**

10) **TEXT EDITOR:** vi

11) **SHELL PROGRAMMING**
Scripting Basics, Creating Shell Scripts, Generating Output, Handling Input, Exit Status, Control Structures, Conditional Execution, File Tests, String Tests, for and sequences, continue and break, Using positional parameters, handling parameters with Spaces, Scripting at the command line, Shell Script debugging.

12) **OVERVIEW OF C**

13) **CONSTANTS, VARIABLES AND DATA TYPES**

14) **OPERATORS AND EXPRESSIONS**

15) **MANAGING INPUT OUTPUT OPERATIONS**

16) **DECISION MAKING AND BRANCHING**

17) **DECISION MAKING AND LOOPING**

[C] LEARNING OUTCOMES

- On completion of this course the student should be able to identify and use UNIX/Linux utilities to create and manage simple file processing operations and organize directory structures with appropriate security.
- Student can develop shell scripts to perform more complex tasks.
- Using C programming students can design, implement, test, debug, and executes the programs.
- They will understand the concept of flow of control and program structures.
- They will know concepts in problem solving and to write diversified solutions using C language.

[D] RECOMMENDED TEXTBOOKS

1) Unix: Concept and Applications by Sumitabha Das, 4th Ed., Tata McGraw Hill
2) Programming in ANSI C by Balaguruswamy, 5th Ed., Tata McGraw Hill

[E] REFERENCE BOOKS

1) Let Us C by Yashvant Kanetkar, 12th Ed., BPB Publication
2) Programming in C by Ashok N. Kamthane, 2nd Ed., Pearson Education
3) Linux Programming by Example: The Fundamentals 1st Edition, Pearson Education

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1) Overview of the UNIX operating system
2) Explain the following commands: clear, cal, who, date, tput, exit, pwd,bc, wc, cat
3) Explain the following commands: cd, mkdir, rmdir, rm, cp,cmp,comm.,diff
4) (i) Explain the file permission (ii) Explain the following commands: chmod, chown, chgrp
5) (i) Explain the following commands ps, kill, umask, more, less. (ii) Solve problems using find command
6) (i) Design shell script to find average of numbers
(ii) To find which number is greater amongst the three entered number
(ii) Design a shell script by which only the word "DDU" is displayed from the lines in any file
7) (i) Design a shell script which would display the summation of the digits of the given number
(ii) Design the shell script to reverse a given number
(ii) Design the shell script for a simple calculator
8) (i) Design shell script to count no. of ordinary files and directories in your system
(ii) Design a shell script to create looping patterns
9) (i) Overview of Turbo C++ IDE & GCC (ii) WAP to display a "Hello world" message
10) (i) Use of \n, \t and escape sequences

(ii) W. A. P to convert the temperature unit from Fahrenheit to Celsius using the formula C=(F-32)/ 18
(iii) Assume that any month is of 30 days. Now you are given total days. Find out the exact number of Years, Months & Days
(iv) You are given time in total seconds. Convert it into Hour: Min: Seconds format.

11) (i) W.A. P to determine whether input number is ODD or Even. Display appropriate message
(ii) W.A. P that will display grad of student according to his/ her marks using if else ladder
(iii) W.A.P that computes and prints the Factorial of a given number
(iv) W.A.P that computes and prints the Fibonacci series

12) (i) W.A. P to print the different patterns
(ii) W.A. P to count Blanks, Tabs and Newlines using while and getchar
(iii) W.A.P for a calculator using do while
(iv) W.A.P to check whether the input number is prime or not
(v) W.A.P to display even numbers between 2 to 20 without using the modulo operation

ES 110 - ENVIRONMENTAL SCIENCE
SEM-I (1st Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
3	--	--	3	--	3	60	--	40	--	100

[A] OBJECTIVES OF THE COURSE

- The objective for this course is to bring awareness about sustainable development is a key to the future of mankind. Continuing problems of pollution, solid waste disposal, degradation of environment, issues like economic productivity and national security, global warming, the depletion of ozone layer and loss of biodiversity have made everyone aware of environmental issues. Managing environmental hazards have become very important. It is now even more critical than ever before for mankind as a whole to have a clear understanding of environmental concerns and to follow sustainable development practices.

[B] DETAILED SYLLABUS

1) UNIT-1 THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES (2 lectures)

- Definition, scope and importance, Need for public awareness.

2) UNIT 2: NATURAL RESOURCES

- Renewable and non-renewable resources, Natural resources and associated problems.
- Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
- Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies
- Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies.
- Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
- Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

3) UNIT 3: ECOSYSTEMS

- Concept of an ecosystem, Structure and function of an ecosystem, producers, consumers and decomposers, Energy flow in the eco system
- Ecological succession, Food chains, food webs and ecological pyramids
- Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem and Aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries)

4) UNIT 4: BIODIVERSITY AND ITS CONSERVATION

- Introduction Definition: genetic, species and ecosystem diversity.
- Bio-geographical classification of India
- Value of biodiversity: Consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, national and local levels
- India as a mega-diversity nation, Hot-spots of biodiversity, Threats to biodiversity, habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India
- Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity

5) UNIT 5: ENVIRONMENTAL POLLUTION

- Definition, Causes, effects and control measures of:
- Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards
- Solid waste management, causes, effects and control measures of urban and industrial wastes
- Role of an individual in prevention of pollution, Pollution case studies
- Disaster management: floods, earthquake, cyclone and landslides

6) UNIT 6: **SOCIAL ISSUES AND THE ENVIRONMENT**

- From unsustainable to sustainable development, Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people: its problems and concerns. Case studies
- Environmental ethics: Issues and possible solutions
- Climate change: Global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.
- Case studies
- Wasteland reclamation, Consumerism and waste products
- Environment Protection Act: Air (Prevention and Control of Pollution) Act, Water (Prevention &Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act
- Issues involved in enforcement of environmental legislation
- Public awareness

7) UNIT-7: HUMAN POLLUTION AND THE ENVIRONMENT

- Population growth, variation among nations, population explosion, Family Welfare Program, environment and human health, human rights, Value education

- HIV/AIDS, Women and Child Welfare, Role of Information Technology in Environmental and human health

8) UNIT-8: FIELD WORK

- Visit to a local area to document environmental assets (river/forest/grassland/hill/mountain)
- Visit to a local polluted site - Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds
- Study of simple ecosystems – pond, river, hill, slopes etc.

[C] LEARNING OUTCOMES

After completion of this course students will be able to understand:

- The meaning of environment, ecology, ecosystems, biotic & abiotic components, food chains & webs
- Natural resources, biodiversity, hotspots, threats to biodiversity
- Factors causing environmental pollution, prevention of pollution, role of an individual in pollution control & abatement and disaster management
- Social issues related to environmental science, water conservation, rain water harvesting, environmental ethics, climate change, wasteland reclamation, consumerism and waste products, environment protection act and public awareness
- Issues of population growth, population explosion, human health and rights
- Field work related to ecosystems, polluted sites, and species

[D] RECOMMENDED TEXTBOOKS

1) Erach Bharucha Textbook of Environmental Studies; Second Edition, Universities Press: Hyderabad, 2013.
2) Poonia, M. P.; Sharma, S. C. Environmental studies; Khanna Publishing House: New Delhi, 2017.
3) Rajagopalan, R. Environmental Studies; Oxford University Press: India, 2015.

[E] REFERENCE BOOKS

1) Varandani, N. S. Basics of Environmental studies; Lambert Academic Publishing: Germany, 2013.
2) Basak, A. Environmental Studies; Dorling Kindersley: India, 2009.
3) Dhameja, S. K. Environmental studies; S. K. Kataria and Sons: New Delhi, 2007.
4) Rao, C. S. Environmental Pollution Control Engineering; Wiley publishers: New Delhi, 2006.
5) Brunner, R. C. Hazardous Waste Incineration; McGraw Hill: Michigan, 1989.
6) Clark, R. S. Marine Pollution; Clanderson Press Oxford: Bath, 2001.
7) Trivedy, R. K. Handbook of Environmental Laws, Acts, Guidelines, Compliances & standards; B. S. publications: Hyderabad, 2005 .
8) Jadhav, H.; Bhosale, V. M. Environmental Protection and Laws; Himalaya Pub. House: Delhi, 1995.
9) Agarwal, K. C. Environmental Biology; Nidi Publ.: Bikaner, 2001.

10) Bharucha, E. The Biodiversity of India; Mapin Publishing: Ahmedabad, India, 2002.
11) Cunningham, W.P.; Cooper; Gorhani, T. H. E.; Hepworth, M.T., Environmental Encyclopedia; Jaico Publ. House: Mumbai, 2001.
12) De, A. K. Environmental Chemistry; Wiley Eastern: New Delhi, 2006.
13) Gleick, H. P. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security; Stockholm Env. Institute Oxford Univ. Press: New York, 1993.
14) Hawkins, R.E., Encyclopedia of Indian Natural History; Bombay Natural History Society: Bombay, 1987.
15) Heywood, V. H.; Waston, R. T. Global Biodiversity Assessment; Cambridge Univ. Press: Cambridge, 1995.
16) Mckinney, M.L.; School, R.M. Environmental Science systems & Solutions; Web enhanced edition: USA, 1996.
17) Miller, T.G. Jr.; Spoolman, S. E. Environmental Science; Cengage learning: Wadsworth, 2014.
18) Odum, E.P. Fundamentals of Ecology; W.B. Saunders: USA, 1971.
19) Rao, M. N.; Datta, A.K. Waste Water treatment; Oxford & IBH Publ.: New Delhi, 1987.
20) Sharma, B. K., Environmental Chemistry; Goel Publ. House: Meerut, 2001.
21) Townsend, C., Harper, J.; Michael, B. Essentials of Ecology; Blackwell: Oxford, 2008.
22) Trivedi, R. K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards, Vol I and II; B. S. Publications, Hyderabad, 2010.
23) Trivedi, R. K.; Goel, P. K. Introduction to air pollution; ABD Publishers: Jaipur, 2003.
24) Wanger, K. D., Environmental Management; W.B. Saunders Co. Philadelphia, USA, 1998.

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

- Students will be required submit assignment based on field work related to biodiversity of the ecosystems, waste management, environmental pollution, and social issues of environment.

AF 201 – MATHEMATICS - II
SEM-II (1st Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	--	4	--	4	60	40	--	--	100

[A] OBJECTIVES OF THE COURSE

- Ability to analyze and solve problems in both familiar and unfamiliar situations including those in real-life contexts with better accuracy.
- Able to apply knowledge of key theories, concepts, tools and techniques of Mathematics to solve structured and unstructured Engineering problems.
- Understand and be able to use the language, symbols and notation of mathematics
- Use different forms of mathematical representation (formulae, diagrams, tables, charts, graphs and models)
- Generate and/or analyze information, find relationships and patterns, describe these mathematically as general rules, and justify or prove them.

[B] DETAILED SYLLABUS

1) PARTIAL DIFFERENTIATION & ITS APPLICATIONS

Partial derivatives, Homogenous functions Euler's theorem, Total Derivatives-Differentiation of implicit functions, Change of variables, errors and approximations, Maxima & Minima of functions of two variables, Lagrange's method of undetermined multipliers.

2) MULTIPLE INTEGRALS & THEIR APPLICATIONS

Double integrals, definition evaluation, change of order of integration, double integrals in polar co-ordinates, area enclosed by plane curves, Triple integrals, change of variables, volume of solids.

3) INFINITE SERIES

Introduction, Definitions, Convergence, divergence and Oscillation of a series, P-test, Comparison test, Ratio test, Root test, Higher ratio test, Rabbe's test, Log test, Alternating Series, Leibnitz's rule.

4) COMPLEX NUMBER

Definition, elementary operations, Argan's diagram, De-Moivre's theorem, and its applications to expand Sin $n\theta$, Cos nθ in powers of sin θ,

cos θ respectively. To expand $\sin^n \theta$, $\cos^n \theta$ and $\sin^m \theta \cos^n \theta$ in a series of Sines or Cosines of multiples of θ, Hyperbolic functions, Formulae of hyperbolic functions, Inverse hyperbolic functions, Logarithm of complex quantities. Separation of real and imaginary parts. C + is method.

5) LAPLACE TRANSFORMS

Introduction, Definition Transforms of elementary functions, properties of Laplace transforms, Inverse transforms, note on partial fractions, transforms of derivatives, Transforms of integrals. Multiplication and division by t, convolution theorem.

[C] LEARNING OUTCOMES

At the end of the course student should be able to

- Obtain Laplace transform of standard Mathematical functions.
- Evaluate Partial Derivatives and apply the knowledge to solve some practical problems such has constrained optimization problems and other problems involving Partial Differentiation.
- Understand the concept of Multiple Integration and its applications viz. Area and Volume. Obtain the behavior of Infinite series.
- Evaluate Exponential, Trigonometric and Hyperbolic Functions of a complex number

[D] RECOMMENDED TEXTBOOKS

1) Higher Engineering Mathematics By: Dr. B.S. Grewal, Khanna publishers, Delhi.

[E] REFERENCE BOOKS

1) Applied Mathematics for Engineers and Physicists. By: Pipes & Harvill,Mc-Graw Hill Kogakusha Ltd.
2) Applied Mathematics By: P.N. & J.N. Wartikar

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

Not applicable

AF 212 – ELECTRONICS PRINCIPLES
SEM-II (1st Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

- To present a perceptive understanding of the fundamentals of a bipolar junction transistor and its application. Further, nurturing the ability to design and analyze the performance of transistor amplifier using different types of biasing techniques. Expose the students to the concepts of various types of digital circuit as well as concept of signal and systems.

[B] DETAILED SYLLABUS

1) BIPOLAR JUNCTION TRANSISTOR
The unbiased transistor, The biased transistor, Forward-reverse bias, The CE connection, Transistor characteristics, The Base and Collector curves.

2) TRANSISTOR FUNDAMENTALS
DC load lines, Base bias, Emitter bias, The Operating Point, The Transistor switch.

3) TRANSISTOR BIASING
Voltage divider bias, VDB analysis, VDB load line, Two-supply emitter bias, other types of bias, PNP Transistors.

4) AC MODELS
Base biased amplifier, Coupling and bypass capacitors, The superposition theorem for amplifiers, AC resistance of the emitter diode, AC beta, The grounded emitter amplifier, The AC model of a CE stage, Introduction to h - Parameters & Comparison with T & PI models.

5) VOLTAGE AMPLIFIERS
Voltage gain, The loading effect of input impedance, Multistage amplifiers, Swamped amplifier.

6) CC AND CB AMPLIFIERS
The CC amplifier, the AC model of an Emitter Follower, Types of coupling, Direct coupling, Darlington connections.

7) CLASS A AND B POWER AMPLIFIERS
The AC load line of a CE amplifier, AC load lines of other amplifier, Class A operation.

8) OSCILLATORS
Theory of sinusoidal oscillation.

9) FREQUENCY DOMAIN
The Fourier series, The spectrum of a signal, Frequency spectrum of periodic signal

10) FREQUENCY MIXING
Nonlinearity, Medium-signal, operation with one sine wave, Medium signal operation with Two sine waves.

11) AMPLITUDE MODULATION
Basic idea, Percent modulation, AM spectrum, the envelope detector, the super heterodyne Receiver.

12) DIGITAL CIRCUITS
Number systems, Complements, Error detecting codes, Boolean algebra, Logic gate ICs, RTL & DTL logic circuits, and Simple Combinational circuits, Half adder, Full adder

[C] LEARNING OUTCOMES

At the completion of the course, students will be able to

- Analyse and designing of the various transistor amplifier circuits.
- Understand the importance of R E, R C, C B and C E in transistor circuit.
- Compare various biasing techniques and its importance in design of circuit.
- Understand significance of feedback in amplifier circuit.
- Build their notion about the digital electronics circuit and its applications.
- Gain insight of the signal and its frequency spectrum for random signal.
- Understand the concept of the modulation and its application in wireless communication.

[D] RECOMMENDED TEXTBOOKS

1) Electronic Principles, by: Albert Malvino and David Bates, 7th Edition, Tata McGraw Hill
2) Digital Electronics, by: Morris Mano, 3rd Edition, Prentice Hall of India

[E] REFERENCE BOOKS

1) Electronic Devices and Circuit Theory, by: Robert Boylestad and Louis Nashelsky, 7th Edition, Prentice Hall of India
2) Digital Electronics, by: Anand Kumar, 1st Edition, Prentice Hall of India

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1) Study and performance of different types of logic gates.
2) Performance verification of NAND and NOR as universal gate.
3) Application of transistor as a switch.
4) Computation of voltage gain in transistor as an amplifier.
5) Resistance (RE) and Collector Resistance (RC) on voltage gain of CE amplifier.
6) Multistage amplifier using BJT.
7) Study loading effect on multistage amplifier using emitter follower as a buffer.
8) Analysis of common base configuration of transistor amplifier.
9) Binary to Gray code and Gray to Binary code conversion using combinational circuit.
10) Performance analysis of Half adder and Full adder using basic logic gates.
11) Combinational circuit analysis of half and full subs tractor using basic logic gates.
12) Study of amplitude modulation for different modulation index.

AF 214 – MECHANICS OF SOLIDS
SEM-II (1st Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
3	--	2	3	1	4	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

- The objective of this course is to make the students understand the concept of stress and strain under different type loading conditions and different types of structures.
- Understanding of basic knowledge of maths and physics to solve real-world problems and to analyse simple problems in solid mechanics

[B] DETAILED SYLLABUS

1) SIMPLE STRESSES AND STRAINS

Introduction, stress, strain, tensile, compressive and shear stresses, Elastic limit, Hooke's law, Poisson's Ratio, Modulus of Elasticity, Modulus of Rigidity, Bulk Modulus, Bars of Varying sections, Extension of tapering rods, Bars of uniform strength, temperature stresses, Hoop stress, stress on oblique sections, State of simple shear, Relation between Elastic constants.

2) MECHANICAL PROPERTIES OF MATERIALS

Ductility, Brittleness, Toughness, Malleability, Behavior of ferrous and nonferrous metals in tension and compression, shear and bending tests, Standard test pieces, influence of various parameters on test results, True and nominal stress, Modes of failure, Characteristic stress-strain curves, Strain hardening, Hardness, Different methods of measurement, Izod, Charpy and tension impact tests, Fatigue, Creep, Correlation between different mechanical properties, Effect of temperature. Testing machines and special features, Different types of extensometers and compress meters, Measurement of strain by electrical resistance strain gauges.

3) BENDING MOMENT AND SHEAR FORCE

Bending moment, shear force in statically determinate beams subjected to uniformly distributed, concentrated and varying loads. Relation between bending moment, shear force and rate of loading.

4) MOMENT OF INERTIA

Concept of moment of inertia, Moment of inertia of plane areas, polar moment of Inertia, Radius of gyration of an area, Parallel Axis theorem, Moment of Inertia of composite Areas, product of inertia, Principal axes and principal Moments of inertia.

5) STRESSESIN BEAMS

Theory of simple bending, bending stresses, moment of resistance, modulus of section, built up and composite beam section, Beams of uniform strength, Distribution of shear stress in different sections.

6) TORSION

Torsion of circular. Solid and hollow section shafts, shear stress angle of twist, torsional moment of resistance, power tran smitted by a shaft, keys and couplings, combined bending and torsion, close coiled helical spring

7) PRINCIPLE STRESSES AND STRAINS

Compound stresses, principal planes and principal stresses, Mohr's circle of stress, principal strains, Angle of obliquity of resultant stresses, principal stresses in beams, principal stresses in shafts subjected to bending, torsion and axial force.

[C] LEARNING OUTCOMES

[D] RECOMMENDED TEXTBOOKS

1) Strength of Materials, by: Timoshanko (Vol.1 & 2)
2) Strength of Material, by: Popov
3) Mechanics of structure, by: Junnarkar S.B.
4) Strength of Materials, by: S. Ramamrutham

[E] REFERENCE BOOKS

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

- This will consist of experiments and solution of problems based on syllabus.

AF 215 – HEAT POWER
SEM-II (1st Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

- Students belonging to all branches of engineering are made to learn certain fundamental topics related to mechanical engineering so that they will have a minimum understanding of mechanical processes and basic equipment like boilers, compressors, I.C. engines, refrigeration and air conditioning etc.

[B] DETAILED SYLLABUS

1) PROPERTIES OF STEAM
Distinction between gas and vapor, sensible heat, latent heat, total heat and super heat of steam, condition of steam, dryness fraction, methods of determination of dryness fraction, internal energy of steam, specific volume, critical pressure and temperature.

2) PROPERTIES OF GASES
Zeroth, first and second laws of thermodynamics, laws of perfect gases (Boyle's law, Charle's law, Regnault's law, Joule's law), Characteristic equation of gas, gas constants, internal energy, specific heat at constant pressure and specific heat at constant volume, relationship between specific heats, thermodynamic processes of perfect gases

3) FUELS & COMBUSTION
Solid, liquid and gaseous fuels used for boilers and I.C. engines, combustion of fuels, air required, products of combustion of fuel, analysis of flue gases, calorific value of fuels and its determination

4) BOILERS
Classification of boilers, Cochran & Babcock-wilcox boiler, boiler mountings and accessories, draught (Natural & Artificial)

5) I. C. ENGINES
Prime movers, classification of prime movers with examples of each classes, advantages of I.C. engines over E.C. engines, classification of I.C. engines, thermodynamic air cycles (Carnot cycle, Constant volume auto cycle, Constant pressure Joule cycle, Diesel cycle), Air standard

efficiency, construction and working of 2-stroke and 4-stroke cycle engines, P-v diagrams, determination of I.P., B.P., fuel supply in LC. engines, ignition system of I.C. engines, Cooling of J.C. engines,
Lubrication &. governing of I.C. engines

6) SOLAR ENERGY
Introduction to solar energy systems

[C] LEARNING OUTCOMES

[D] RECOMMENDED TEXTBOOKS

1) Elements of Heat Engines (S.I. Units) Vol. 1 by: R. C. Patel & C. J. Karamchandani, Acharya Book Depot, Vadodara
2) Elements of Heat Engines (S.I. Units) by: N. C. Pandya & C. S. Shah, Charotar publishing house, Anand

[E] REFERENCE BOOKS

1) Heat Engine By: P. L. Ballaney
2) A course in thermodynamics and heat engines by: Kothandraman

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

- Term - work shall be based on the above syllabus

AM 210 – ENGINEERING ECONOMICS AND PRINCIPLES OF MANAGEMENT
SEM-II (1st Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
3	--	--	3	--	3	60	--	40	--	100

[A] OBJECTIVES OF THE COURSE

- The need to understand the basics concepts of economics & management are important for the allocation of scarce resources of economy and proper utilization to generate the required products and services.
- Demand analysis and consumer behaviour are the factors which teach about the equilibrium price. Types of markets, product pricing and factor pricing leads to a better understanding of a particular product or service demanded by the consumers.
- Production cost and revenue analysis is important for operation of a profitable business. Monetary & fiscal policies are important for the understanding of consumption, government expenditure, investment, exports and imports. It also educates us about the ways in which the government generates revenue and handles its expenditure for a stable economy.

[B] DETAILED SYLLABUS

- **ECONOMICS**

1) BASIC CONCEPTS AND DEFINITIONS
Marshall, Robbins and Samuelsons' Definition of Economics. Positive and Normative Economics. Micro and Macro Economics. Utility, goods and services. Money and wealth. Consumer Surplus and producer's surplus.

2) DEMAND ANALYSIS AND CONSUMER BEHAVIOR
Demand Function, law of demand, elasticity of demand and its types, price, income and cross elasticity. Measures of demand elasticity Factors of production. Advertising elasticity. law of supply, equilibrium between demand & supply Elasticity.

3) MARKETS, PRODUCT PRICING AND FACTOR PRICING
Concept of perfect competition, monopoly and monopolistic competition (meaning and characteristics). Control of monopoly. Price discrimination and dumping. Concept of Duopoly and Oligopoly. Kinky demand curve (price leadership model with reference to oligopoly).

4) PRODUCTION, COST AND REVENUE ANALYSIS
Production and production function, short run and long run production function. Cost analysis, various concepts of cost. Total fixed cost,

total variable cost, total cost, average fixed cost, average variable cost, average cost and marginal cost. Opportunity cost. Basic concepts of revenue. Relationship between average revenue and marginal revenue. Break even analysis; meaning, explanation.

5) MONEY

Meaning, functions, types, Monetary policy- meaning, objectives, tools, fiscal policy-meaning, objectives, tools Banking; meaning, types, functions, Central Bank- RBI; its functions, concepts; CRR, bank rate, repo rate, reverse repo rate, SLR. Functions of central and commercial banks Inflation, Deflation, Stagflation, Monetary and cycles, new economic policy, Liberalization, Globalization, privatization, fiscal policy of the government.

- **MANAGEMENT**

1) NATURE OF MANAGEMENT

Concept of Management
Management and Administration
Importance of Management
Nature of Management
Management: Science or Art
Management as Profession
Professionalization of Management in India
Universality of Management
Applying Management Theory in Practice
Role of Management Principles
Effective Management

2) MANAGEMENT FUNCTIONS AND SKILLS

Management Function
Nature of Management Functions
Management Role
Functions at Various level of Management
Top Management
Functions of Board of Directors
Functions of Chief Executive
Middle Management
Supervisory Management
Functional Areas of Management
Management Skills
Top Management Skills
Middle Management Skills

Supervisory Management Skills

3) FUNDAMENTAL OF PLANNING

Concept of Planning
Nature of Planning
Importance of Planning
Steps in Planning
Types of Planning
Corporate and Functional Planning
Strategic and Operational Planning
Long term and Short-term Planning
Proactive and Reactive Planning
Formal and Informal Planning
Types of Plans
Barriers to Effective Planning
Making Planning Effective
Planning in Indian Organizations

4) FUNDAMENTAL OF ORGANIZING

Concept of Organization and Organizing
Organization Theory
Classical Organization Theory
Modern Organization Theory: Systems Approach
Modern Organization Theory: Contingency Approach
Factors Affecting Organization Structure
Environment
Strategy
Technology
Size of Organization
People

5) FUNDAMENTAL OF DIRECTING

Concept of Direction
Principles of Direction
Direction and Supervision
Effective Supervision
Order Giving

Technique of Direction
Directing and Human Factor
Managerial Models

6) MOTIVATION THEORIES

Concept of Motivation
Theories of Motivation
Maslow's Need Hierarchy
Herzberg's Motivation-hygiene Theory
McClelland's Needs Theory
McGregor's Theory X and Theory Y
Contingency Approach of Motivation
Motivational Pattern in Indian Organizations

7) CONTROLLING

Concept of Controlling
Controlling and Other Functions
Steps in Controlling
Types of Control
Control Areas
Controlling and Management by Exception
Benefits of Management by Exception
Design of Effective Control System

[C] LEARNING OUTCOMES

[D] RECOMMENDED TEXTBOOKS

1) Modem Economics by H.L. Ahuja.
2) Modem Economic Theory by K.K. Dewett.
3) Monetary Economics by M.L. Seth.

[E] REFERENCE BOOKS

- **ECONOMICS**

1) Engineering Economics, R. Paneerselvam, PHI publication
2) Fundamentals of Management: Essential Concepts and Applications, Pearson Education, Robbins S. P. and Decenzo DavidA.

3) Economics: Principles of Economics, N Gregory Mankiw, CengageLearning
4) Modern Economic Theory, By Dr. K. K. Dewett& M. H. Navalur, S. ChandPublications
5) Introduction to Economics – Caiseneross
6) Managerial Economics – Jean

- **MANAGEMENT**

7) Principles and Practice of Management by L. M. Prasad
8) Stoner James A. F., Freeman R Edward & Gilbert Jr. Daniel R. "Management" New Delhi Prentice-Hall of India
9) Koontz Harold &Weihrich Heinz "Essential of Management" New Delhi Tata McGraw Hill
10) Burton Gene & Manab Thakur "Management Today" New Delhi Tata McGraw Hill
11) Robbins Stephen P. & Coulter Mary "Management" New Delhi Prentice-Hall of India

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

Not applicable

CT 215 – C PROGRAMMING - II
SEM-II (1st Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

- To develop programming skills using the fundamentals and basics of C Language.
- To teach effective usage of arrays, structures, functions, pointers and to implement the memory management concepts and preprocessor.
- To teach how the files are managed through programming and usage of file systems.

[B] DETAILED SYLLABUS

1) ARRAYS
One-dimensional arrays, multi-dimensional arrays, Dynamic arrays

2) CHARACTER ARRAYS AND STRINGS
String variables, Arithmetic Operations on Characters, Comparison of Strings, String handling functions, Table of Strings

3) USER-DEFINED FUNCTIONS
Need for user defined functions, A multi-function program, Elements of user defined function, Definition of functions, return values and their types, Function calls, Function declarations, Functions with arguments, Function with multiple return values, Nesting of functions, Recursion, Passing arrays to functions

4) STRUCTURES AND UNIONS
Introduction, Structure's definition, Giving values to members, Structure initialization, Comparison of structure variables, Arrays of structures, Arrays within structure, Structure and function, Unions, Size of structures, Bit fields.

5) POINTERS
Introduction, understanding of pointers, Accessing the address of a variable, Declaring and initializing pointers, accessing a variable through its pointers, Pointer's expressions, Pointer increments and scale factor, Pointers and arrays, Pointers and character strings, Pointers on

pointers, Pointer as function argument, Functions returning pointer, Pointers to functions, Pointers and structures.

6) FILE MANAGEMENT IN C
Introduction, Defining and opening a file, Closing a file, Input/output operations on files, Error handling during I/0 operations, Random access to files, Command line arguments.

7) DYNAMIC MEMORY ALLOCATION
Allocating memory, Releasing the used space, Altering size of a block

8) THE PREPROCESSOR
Macro substitution, File Inclusion, Compiler control directives

[C] LEARNING OUTCOMES

- Students can develop programs using the basic elements like control statements, Arrays and Strings.
- They will learn to solve the memory access problems by using pointers also they understand about the dynamic memory allocation using pointers which is essential for utilizing memory.
- Students will understand the code reusability with the help of user defined functions.
- To develop advanced applications using enumerated data types, function pointers and nested structures.
- They learn the basics of file handling mechanism that is essential for understanding the concepts in database management systems.
- To implement the concepts in data structure like linked lists also to understand the uses of preprocessors and various header file directives.

[D] RECOMMENDED TEXTBOOKS

1) Programming in ANSI C by: Balagurusamy, 5th Ed., Tata McGraw Hill

[E] REFERENCE BOOKS

1) Let Us c by: Yashvant Kanetkar, 12th Ed., BPB Publication
2) Programming in C by: Ashok N. Kamthane, 2nd Ed., Pearson Education
3) The C Programming Language by: Kernighan and Ritchie, 2nd Ed., PHILearning

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1) Implement the programs of Arrays
2) Implement the programs of Character Array
3) Implement the programs using Functions

4) Implement programs using Recursive function & Arrays as arguments to function
5) Implement the programs using Structures
6) Implement the programs using Union
7) Implement the programs using Pointers
8) Implement programs for Files & Command line arguments
9) Implement programs for Dynamic Memory allocation
10) Implement programs using Link List concept
11) Implement the program for Pre-Processor

CT 217 – ELECTRONICS WORKSHOP
SEM-II (1st Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
--	--	2	--	1	1	--	--	--	50	50

[A] OBJECTIVES OF THE COURSE

- To understand the basic components of electrical and electronic circuit. To understand the various electronics software and its application.

[B] DETAILED SYLLABUS

[C] LEARNING OUTCOMES

[D] RECOMMENDED TEXTBOOKS

[E] REFERENCE BOOKS

1) Electronic Principles, by: Albert Malvino and David J. Bates, Mc. Graw Hill (7th edition)
2) Electronic Devices, by: Thomas L. Floyed, Person (7th edition)

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1) Introduction to Electrical Components: switches, MCB, ELCB, Tube light, bulb, parallel connection of electrical components, wiring in fan and motor.
2) Introduction to Electronic Components: active and passive components.
3) Use of basic source & measuring instruments (Power supply, function generator, CRO, DMM)
4) Measure voltage, current, frequency, phase difference, poweT/ power factor for single and three phase supply.
5) Identify various types of ports, cables and connectors.
6) Linux installation
7) Network Cabling and Crimping for wired and wireless network.
8) PCB Layout design (like proteus) Software installation and layout design using the same.
9) PCB layout design and manufacturing process. Solder and de-solder electronic components on PCB. Identify and rectify open circuit and short circuit faults in PCB/system.

10) Test assembled electronic circuit for various parameters and faults.

- **MINI PROJECT**

Apart from above experiments a group of students has to undertake a mini project. Following are some examples for the same.

1) To design a device for charging small battery during door opening and closing.
2) To design a mobile charger using solar PV cell panel for offices and house hold.
3) To design/develop an electronic weighing machine.
4) To design/develop an electronic lock for house in the workshop.
5) To design/develop an innovative electrical bell using electronics components.

AF 301 – MATHEMATICS - III
SEM-III (2nd Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	--	4	--	4	60	40	--	--	100

[A] OBJECTIVES OF THE COURSE

- Ability to analyze and solve problems in both familiar and unfamiliar situations including those in real-life contexts with better accuracy.
- Able to apply knowledge of key theories, concepts, tools and techniques of Mathematics to solve structured and unstructured Engineering problems.
- Understand and be able to use the language, symbols and notation of mathematics
- Use different forms of mathematical representation (formulae, diagrams, tables, charts, graphs and models)
- Generate and/or analyze information, find relationships and patterns, describe these mathematically as general rules, and justify or prove them.

[B] DETAILED SYLLABUS

1) FOURIER SERIES

Euler's Formulae, condition for a Fourier expansion, functions having points of discontinuity, change of interval, odd & even functions, Expansion of odd & even periodic functions, Half range series.

2) MATRICES

Fundamental concepts, operations, associated with matrices, matrix method of solution of simultaneous equations, Rank of Matrix, Linear dependence of vectors, consistency of a system of linear equations, characteristic equations, Eigen vectors and Eigen roots, Cayley Hamilton theorem.

3) ORDINARY DIFFERENTIAL EQUATIONS

Linear differential equations of higher order with constant coefficients, equations reducible to linear equations with constant coefficients, Simultaneous linear equations with constant coefficients. Application to engineering problems.

4) PARTIAL DIFFERENTIAL EQUATIONS

Introduction, formation, linear equation of first order, non-linear equations of first order- Charpit's method, homogenous linear equations with constant coefficient to find the complementary functions & the particular integral, non-homogenous linear equations with constant coefficients. Method of separation of variables - vibrating string problem, Heat flow equation etc.

5) LAPLACE TRANSFORMS

Application to differential equation, simultaneous linear equation with constant coefficients.

[C] LEARNING OUTCOMES

At the end of the course students are able to

- Obtain Fourier series of a periodic function into the sum of a (possibly infinite) set of simple oscillating functions, namely sines and cosines.
- Able to apply the method of solving linear system of equations, linear transformation and Eigen value problem as they arise, for instance from electrical networks, framework in mechanics, curve fitting, other optimization problems and processes in statistics.
- Model physical processes using partial and ordinary differential equation and same can be solved analytically as well numeric ally.
- Solve basic initial value problems, directly without determining a general solution with the help of Laplace Transformation.
- Characterize the solutions of a differential equation with respect to initial values and analyze the behavior of solutions.
- Solve wave and heat equation.

[D] RECOMMENDED TEXTBOOKS

1) Higher Engineering Mathematics, Dr. B. S. Grewal

[E] REFERENCE BOOKS

1) A Text Book of Applied Mathematics, by: P. N. & J. N. Wartikar
2) Mathematics for Engineering, by: Chandrika Prasad
3) A Text Book of engineering Mathematics, by: Dr. K. N. Srivastva & G. K. Dhawan

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

IT 301 – DESIGN OF DIGITAL CIRCUITS
SEM-III (2nd Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

- The subject design of digital circuits aims to provide the basic knowledge of digital logic levels and its applications. The objective of this course is to familiarize the student with fundamental principles of digital design. It provides the capability to analyze and design the digital circuits for both combinational and sequential logic.

[B] DETAILED SYLLABUS

1) BINARY SYSTEMS
Introduction to Digital Computers and Digital Systems, Binary Numbers, Number Base Conversion, Octal and Hexadecimal Numbers, complements, binary Codes, Binary Storage and Registers, Binary Logic, Integrated Circuits.

2) BOOLEAN ALGEBRA AND LOGIC GATES
Basic Definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates, IC Digital Logic Families.

3) SIMPLIFICATION OF BOOLEAN FUNCTIONS
The Map Method, Two and Three Variable Maps, Four-Variable Map, Five and Six Variable Maps, Product of Sums Simplification, NAND and NOR Implementations, Don't-Care Conditions, The Tabulation Method, Determination of Prime- Implicants, Selection of Prime-implicants, Concluding Remarks.

4) COMBINATIONAL LOGIC
Introduction, Design Procedure, Adders, Subtractors, Code Conversion, Analysis Procedure, Multilevel NAND Circuits, Multilevel NOR Circuits, Exclusive OR and Equivalence Functions.

5) COMBINATIONAL LOGIC WITH MSI AND LSI

Introduction, Binary Parallel Adder, Decimal Adder, Magnitude Comparator, Decoders, Multiplexers, Read-Only Memory (ROM), Programmable Logic Array (PLA), Concluding Remarks.

6) SEQUENTIAL LOGIC

Introduction, Flip-Flops, Triggering of Flip-Flops, Analysis of Clocked Sequential Circuits, State Reduction and Assignment, Flip-Flop Excitation Tables, Design Procedure, Design of Counters, Design with State Equations.

7) REGISTERS, COUNTERS AND THE MEMORY UNIT

Introduction, Registers, Shift Registers, Ripple Counters, Synchronous Counters, Timing Sequences, The Memory Unit, Examples of Random-Access Memories.

8) DIGITAL INTEGRATED CIRCUITS

Introduction, Bipolar Transistor Characteristics, RTL and DTL Circuits, Integrated-Injection Logic, Transistor-Transistor Logic, Emitter-Coupled logic, Metal-Oxide Semiconductor, Complementary MOS.

[C] LEARNING OUTCOMES

- Students will understand the fundamental concepts and techniques used in digital circuits. They will learn the structure of various number systems and its application in digital design, the ability to understand, analyze, and design various combinational and sequential circuits. They will have ability to identify the basic requirements for a design application and propose a cost-effective solution. Also, they will develop skill to build, and troubleshoot digital circuits.

[D] RECOMMENDED TEXTBOOKS

1) Digital Logic and Computer Design by: M. Morris Mano

[E] REFERENCE BOOKS

1) Microelectronics by: Jacob Millman & Arvin Grabel, Second Edition McGraw - Hill International Edition

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1) To verify basic logic gates.
2) To verify universal gates NAND and NOR.
3) To implement half adder and full adder circuits.

4) To implement circuit that converts binary to gray and gray to binary.
5) (A) To implement 3X8 decoder
(B) Using 3X8 decoder implements 4X16 decoder.
6) To implement 8X1 Multiplexer.
7) (A) To implement 4-bit comparator.
(B) Using 4-bit comparator implements 8-bit comparator.
8) To verify various flip-flops like D, T, JK.
9) To implement 3-bit and 4-bit binary counters.
10) To implement BCD counter.

IT 302 – COMPUTER PERIPHERALS
SEM-III (2nd Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
--	--	2	--	1	1	--	--	25	25	50

[A] OBJECTIVES OF THE COURSE

- The main objective of this course is to introduce PC maintenance, upgrading, repairing. To that end, this course helps to fully understand the family of computers that has grown from the original IBM PC, including all PC-compatible systems.
- This course discusses most areas of system improvements, such as motherboards, processors, memory, and even case and power supply improvements. Also, this course discuses proper system and component care, specifies the most failure-prone items in various PC systems, and tells the student how to locate and identify a failing component.
- Students will learn about powerful diagnostics hardware and software that enable a system to help them determine the cause of a problem and how to repair it.

[B] DETAILED SYLLABUS

1) ASSEMBLING OF COMPUTER
2) STUDY OF VARIOUS MOTHERBOARDS (8088/XT, 286, 386...P-III)
3) STUDY OF CMOS - SETUP OPTIONS
4) HARD DISK PARTITIONING
5) CREATION OF DOS AND WINDOWS-95/98 BOOTABLE DISK
6) INSTALLATION OF DOS AND WINDOWS - 95/98
7) INSTALLATION OF SOUND AND DISPLAY DRIVERS.
8) STUDY OF FLOPPY DISK DRIVE, (SHOW NORTON FORMAT), HARD DISK DRIVE
9) STUDY OF KEYBOARD, MONITOR, MOUSE AND PRINTER
10) STUDY OF IDE, DISPLAY AND NETWORK CARDS
11) STUDY OF VIRUS AND ANTI-VIRUS PACKAGES
12) STUDY OF NETWORK TOPOLOGIES & WIN98 PEER TO PEER NETWORKING

[C] LEARNING OUTCOMES

- After completion of this subject, students will able to understand computer systems with different components, slots, sockets and motherboards.
- Distinguish each type of RAM, Memory, Different CPU types, BIOS component, storage devices and related media, connector types and how to configure them.
- Understand different operating systems and how to install and configure for real time application.

[D] RECOMMENDED TEXTBOOKS

1) PC Upgrade and Maintenance, by: Mark Minasi

[E] REFERENCE BOOKS

1) IBM PC and clones, by: Govind Rajalu

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1) Assembling of Computer
2) Study of CMOS – Setup options
3) Study of Peripherals (Motherboards, HDD, RAM, I/O Cards)
4) Installation of OS (win-Xp)
5) Installation of OS (Linux)
6) Network Topologies & Cabling
7) Installation of Server OS (win 2003)
8) Configuration of Client (Win Xp)
9) User Management (win 2003)
10) Active Directory Service (win 2003)
11) Policy Settings (win 2003)
12) Network Printer Configuration

- **LABWORK BEYOND CURRICULA**

13) Study of Virtual Box
14) Study of Printers

IT 303 – OBJECT ORIENTED PROGRAMMING
SEM-III (2nd Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

- To provide fundamental concepts of object-oriented programming like abstraction, inheritance, virtual functions etc.
- To teach programmatic implementation of these concepts using c++ language.
- To give advantages of object-oriented programming over procedural programming.
- These concepts can be useful to learn the subjects like software engineering and object-oriented design & analysis.

[B] DETAILED SYLLABUS

1) PROGRAMMING IN C++

C++ programming basics, loops, structures, functions, arrays Output using cout, input with cin, manipulators, type conversion , Various loops: for, while and do-while, Decision making: if, if-else, switch statement and conditional Operator, Specifying the structure, accessing structures members, structures within structures, enumerated data types, Simple functions, passing arguments to functions, returning values from functions, reference arguments, overloaded functions, inline functions, default arguments, variables and storage classes, returning by reference

2) OBJECTS AND CLASSES, ARRAYS AND OPERATOR-OVERLOADING

Characteristics of Object-Oriented Languages, Objects, classes, constructor, destructor, returning objects from functions, structures and classes, static class data, Array fundamentals, arrays as class member data, arrays of objects, strings, overloading unary operators, overloading binary operators, data conversion.

3) INHERITANCE AND POINTERS

Derived class and base class, derived class constructors, overriding member functions, public private and public inheritance, multiple inheritance, containership, Addresses and pointers, pointers and arrays, pointers and functions, pointer and strings, memory management: new and delete, pointers to objects, pointers to pointers.

4) VIRTUAL FUNCTIONS, FILES AND STREAMS

Virtual functions, friend functions, static functions, assignment and copy initialization, this pointer, Streams, string I/O, character I/O, I/O with multiple objects, file pointers, Disk I/O with member functions, Error handling, Redirection, Command line arguments, overloading the extraction and insertion operators.

[C] LEARNING OUTCOMES

- Students can design the software application or system.
- Students can do implementation of the given object-oriented system.
- These concepts can be useful in higher semesters while learning subjects like Java.

[D] RECOMMENDED TEXTBOOKS

1) The waite group's Object-Oriented Programming in Turbo C++, by: Robert Lafore

[E] REFERENCE BOOKS

1) C++ Programming Design TMH publications, by: Davidson and Cohoon

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1) Write a program to generate student exam result using structures.
2) Scan mixed character string with space and count capital letter, lower case letters and Digits.
3) i) Write a program to exchange two variable values by functions (pass by value and pass by reference)
ii) Sum of Structure variable and returning structure variable
4) i) Employees Total Salary calculation using nested structures
ii) Room area calculation using structure and class.
5) Define class with constructor and destructor which will count no. of object created and destroyed.
6) i) Plus, operator overloading
ii) Minus operator overloading
iii) Study of friend function
7) Study of inheritance
8) Implement string as new data type
9) Stack with Virtual function
10) i) Write a program that writes 10 records in a file and display all the records.
ii) Store 10 integer nos. in file, in character and binary form.

IT 304 – DISCRETE MATHEMATICS
SEM-III (2nd Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

- Learn basic logic, set theory, permutations, combinations, and discrete probabilities.
- Learn concepts of relations and functions and proof techniques
- Learn core ideas in graph theory and tree and solving related problems
- Learn core concepts of Finite-state machines
- Learn how to perform Analysis of algorithms and how to form and solve Recurrence relations for given problems
- Learn to solve counting problems and use combinatorial mathematics
- Learn ideas of grouping and apply to solve practical problems
- Learn ordered structure such as lattices and learn abstract type of algebra: Boolean Algebra

[B] DETAILED SYLLABUS

- **MAJOR TOPICS:** Sets, propositions, permutations, combinations, discrete probabilities, relations, functions, graphs, trees and cut-sets, Finite-state machines, analysis of algorithms, computability and Formal languages, recurrence relations, generating functions, discrete numerical functions, group, rings, lattices and Boolean algebras.

- **COURSE CONTENTS**

1) SETS AND PROPOSITIONS
Combination, finite, uncountable infinite and infinite sets, mathematical induction, principles of inclusion and exclusion, propositions.

2) PERMUTATIONS, COMBINATIONS, DISCRETE PROBABILITIES
Rules of sums and products, permutations, combinations, generation, discrete probability, conditional probability, information.

3) RELATIONS AND FUNCTIONS

Relational model of data bases, properties of binary relations, equivalence relation, partitions, partial ordering, lattices, chains and antichains, functions and pigeon-hole principle.

4) GRAPHS

Basic terminology, multi- and weighted graphs, paths, circuits, shortest path, Eulerian path, Travelling Salesman problem, factors of a graph, planar graphs.

5) TREES

Trees, rooted trees, path length, prefix codes, binary search trees, spanning trees and cut-sets, minimum spanning trees, transport networks.

6) FINITE-STATE MACHINES

FSM as models of physical systems, equivalent machines, FSM as language recognizer.

7) ANALYSIS OF ALGORITHMS

Time complexity of algorithms, example of shortest path algorithm, complexity, tractable and non-tractable problems.

8) COMPUTABILITY AND FORMAL LANGUAGES

Russel's paradox and non- computability, ordered sets, languages, phrase structured grammars, types of grammars and languages.

9) RECURRENCE RELATIONS

Linear recurrence relations with constant coefficient, homogeneous, particular and total solutions, generating functions, sorting algorithms, matrix multiplication.

10) DISCRETE NUMERICAL FUNCTIONS

Manipulations of numerical functions, asymptotic behaviour, generating functions, combinatorial problems.

11) GROUP

Groups and sub-groups, generators, evaluation of powers, cossets, Lagrange's theorem, permutation group and Burnsides theorem, group codes, isomorphism, automorphism, homomorphism, normal subgroups, rings, integral domains and fields, ring homomorphism, polynomial rings and cyclic codes.

12) LATTICES AND BOOLEAN ALGEBRAS

Lattices and algebraic systems, principle of duality, properties of algebraic systems, distributive lattices, Boolean algebras, uniqueness, Boolean functions and expressions, propositional calculus.

[C] LEARNING OUTCOMES

- Students will learn how to apply logical reasoning to solve a variety of problems and how to apply the operations of sets and use Venn diagrams to solve practical problems
- Students will learn identifying types of relations and functions for given problems, how to construct correct direct and indirect (contradiction and contraposition) proofs and learn how to how to use Principle of Mathematical Induction to prove theorems
- Students will understand the notations and language of graphs and trees and will learn (i) how to determine if a given graph is simple or a multigraph, directed or undirected, cyclic or acyclic, and determine the connectivity of a graph and (ii) types of trees and methods for traversing trees
- Students will learn formulating FSM for given problem statements.
- Students will understand types of algorithms and the issue of efficiency of algorithms
- Students will learn which grouping techniques/theorems to apply for given practical problems
- Students will understand how to apply combinatorial ideas to real life problems
- Students will learn how to apply principle of duality and how to use Boolean algebras.

[D] RECOMMENDED TEXTBOOKS

1) Elements of Discrete Mathematic, by: C.L. Liu, 2nd Ed. McGraw-Hill

[E] REFERENCE BOOKS

1) Modern Applied Algebra, by: Birkoff and Bartee, McGraw-Hill, CBS.
2) Discrete Mathematics - A Unified Approach, by: Stephen A. Wiitala. Computer Science Series, McGraw-Hill.

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1) Write a program to find intersection set of two sets.
2) Write a program to find union set of two sets.
3) Write a program to find Compliment set of the given set.
4) Write a program to find difference set of two sets.
5) Write a program to find symmetric difference set of two sets.
6) Write a program to prove the D'Morgan's Laws of set theory.
7) Write a program to find the power set of the given set.
8) Write a program to find permutation of the set.
9) Write a program to implement Binary Search.
10) Find the cardinality of the set and prove $|A \cup B \cup C| = |A| + |B| + |C| - |A \cap B| - |B \cap C| - |A \cap C| + |A \cap B \cap C|$

IT 305 – COMMUNICATION SYSTEMS
SEM-III (2nd Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

- To provide an understanding and in-depth knowledge of the main concepts, techniques and performance criteria used in the analysis of various signal operations (time domain and frequency domain), and design of analog and digital communication systems so as to correlate the concepts of Information Theory in context to their branch.

[B] DETAILED SYLLABUS

1) WAVEFORM SPECTRA
Introduction, Sinusoidal Waveform, General Periodic Waveforms Trigonometric Fourier Series for a Periodic Waveforms, Fourier Coefficients, Spectrum for the Trigonometric Fourier Series, Rectangular Waves, Sawtooth Waveform, Pulse Train, Some General Properties of Periodic Waveforms, Exponential Fourier Series, Approximate Formulas for the Fourier Coefficients, Energy Signals for Fourier Transform, Filtering of Signals, Power Signals, Bandwidth Requirements for Analog Information Signals

2) DIGITAL LINE WAVEFORMS
Symbols, Binits, Bits and Bauds, Functional notations for Pulses, Line codes and Waveforms, M ary Encoding, Inter Symbol Interference

3) AMPLITUDE MODULATION
Introduction, Amplitude Modulation, Amplitude Modulated Transmitters, AM Receivers

4) SINGLE SIDEBAND MODULATION
Introduction, Single Sideband Principles, The Balanced Modulator SSB Generation, SSB Reception, Modified SSB Systems.

5) ANGLE MODULATION
Introduction, Frequency Modulation, Phase Modulation, Equivalence between FM and PM, Angle Modulator Circuits, Angle Modulation Detectors

6) PULSE MODULATION

Pulse Amplitude Modulation, Pulse Code Modulation, Pulse Frequency Modulation, Pulse Time Modulation, Pulse Position Modulation, Pulse Width Modulation

7) DIGITAL COMMUNICATION

Synchronization, Asynchronous Transmission, Probability of Bit Error in Baseband Transmission, Matched Filters, Optimum Terminal Filters, Bit Timing Recovery, Eye Diagram, Digital Carrier System, Carrier Recovery Circuit, DPSK, Hard and Soft Decision, Error Control Coding

8) INTRODUCTION TO INFORMATION THEORY

Measure of Information, Source Encoding

[C] LEARNING OUTCOMES

At the completion of course, Students will be able to,

- Understand the various blocks that constitute an analog and digital communication system and understand how they interrelate.
- Students will be able carry out various signal operations in time domain and frequency Domain analysis.
- Students will be able to qualitatively and quantitatively analysis and evaluate analog as well as digital Communication systems.
- Recognizes the broad applicability of analog and digital communication systems in real world scenario.

[D] RECOMMENDED TEXTBOOKS

1) Electronic Communication (Fourth Edition), by: Dennis Roddy & John Coolen, Pearson education edition

[E] REFERENCE BOOKS

1) Modern Digital & Analog Communication Systems (Third Edition), by: B. P. Lathi, OXFORD
2) Electronic Communications, (Fourth Edition), by: George Kennedy, Tata McGraw Hill

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1) To study and perform Crystal Oscillator and observe output waveform and measure its frequency.
2) To set up communication link with the help of AM transmitter and receiver kits and observe output for standard AM, DSB-SC and SSB-SC modulations.
3) Perform Amplitude Demodulator using peak detector circuit.
4) To build and test additive mixer circuit for down conversion.

5) To study Frequency Modulation and Demodulation test bed.
6) Perform Pulse Amplitude Modulation and Demodulation.
7) Perform Pulse Width Modulation and Demodulation.
8) Perform Pulse Position Modulation and Demodulation.
9) Perform Pulse Code Modulation and Demodulation.
10) To study and perform various types of line codes and digital carrier systems.

AF 410 – FINANCIAL AND MANAGERIAL ACCOUNTING
SEM-IV (2nd Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
3	--	--	3	--	3	60	40	--	--	100

[A] OBJECTIVES OF THE COURSE

- To enable students to understand, interpret & analyze Accounting System, Accounting books I records Financial Statements & also understand & decide relevance of accounting information to Managerial Decisions
- To familiarize students with the basic elements of the Financial Management.
- To enable students to evaluate performance of various business concerns by use of technique of ratio analysis, cash flow statement

[B] DETAILED SYLLABUS

1) FINANCIAL ACCOUNTING

An Introduction: Introduction, Meaning of Accountancy, book-keeping and Accounting, Accounting Process, Objectives for accounting, Differences between book-keeping and accounting Users of accounting
information, Limitations of Accounting, Basic terminologies

2) ACCOUNTING CONCEPTS, PRINCIPLES, BASES AND POLICIES

Introduction, Accounting Concepts, Principles, Policies and Standards, Types of accounting concepts - Business Separate entity concept - Going concern concept - Money measurement concept - Periodicity concept - Accrual concept, Accounting Principles - Principle of Income recognition - Principle of expense - Principle of matching cost and revenue - Principle of Historical costs - Principle of full disclosure - Double aspect principle - Modifying Principle - Principle of materiality - Principle of consistency - Principle of conservatism or prudence Accounting Policies - Changes in Accounting Policies - Disclosure in case of changes in Accounting Policies, Accounting Standards - Scope and functions of Accounting Standards Board - International Financial Reporting System

3) DOUBLE ENTRY ACCOUNTING

Introduction, meaning of double entry accounting, Classification of accounts under Traditional approach, Classification of ac counts under Accounting Equation approach, Comparison of traditional approach with Modern approach equal approach, Accounting Trail, Transactions and events, Meaning and roles of debit and credit, accounting equation

4) SECONDARY BOOKS

Introduction, Secondary books, Purchases Book/Purchases Day book - Cash discount, Trade discount - Difference between cash discount and trade discount, Sales Book or Sales Day book - Purchase Returns Book - Sales Returns Book, bills receivable book- Bills payable book - Cashbook, Posting to Ledger accounts Posting to Ledger

5) TRIAL BALANCE

Introduction, Meaning, Objectives of preparing a trial balance, Methods of preparing a trial balance, Preparation of Trial balance, Adjusting Entries, Errors and their rectification, Errors disclosed by Trial Balance, Errors not disclosed by Trial Balance, Steps to locate the errors

6) FINAL ACCOUNTS

Introduction, Adjustments before preparing final accounts, Depreciation, Bad Debts and accounting treatment of bad debts, Provision for doubtful debts, Reserves for Discount on Debtors, Reserve for Discount on Creditors, Closing Stock, Trading Account, Profit and Loss Account, Balance Sheet

7) INTRODUCTION TO MANAGEMENT ACCOUNTING

Introduction. Meaning of Management accounting, The Role of Management Accounting, Management Accounting Framework, Functions of Management Accounting, Tools of Management Accounting, The Balanced Scorecard, Cost Management System, Value Added Concept, Merits of Management Accounting, Demerits of Management Accounting, Distinction between Management Accounting and Financial Accounting

8) FINANCIAL STATEMENT ANALYSIS

Introduction, Meaning of Ratio, Steps in Ratio Analysis, Classification of Ratios, Du Pont Chart, Solved Problems, Advantages of Ratio Analysis, Limitation of Ratio analysis

9) CASH FLOW ANALYSIS

Introduction, Meaning of Cash Flow Statement, Purpose of Cash Flow Statement, Preparation of Cash Flow Statement, Format of Cash Flow Statement (AS3: Revised Method), Cash Flow from Operating Activities, Cash Flow Statement under Direct Method, Different between Cash Flow Analysis and Fund Flow Analysis, Uses of Cash Flow Statement

10) MARGINAL COSTING AND BREAK-EVEN ANALYSIS

Introduction, Concept of Marginal Costing, Characteristics of Marginal Costing, Difference between Absorption Costing and Marginal Costing, Marginal Cost, Contribution, Cost Volume Profit (CVP) Analysis, Break Even Chart, Break Even Point, Profit Volume ratio or MCSR, Target profit, Margin of Safety, Application of Marginal cost, Limitations of Marginal cost, Solved Problems

11) BASICS OF FINANCIAL MANAGEMENT

Introduction of Financial Management, objectives of financial management, role of finance manager, functions of financial management, concept of time value of money, present value, future value, annuity concept, solved problems

[C] LEARNING OUTCOMES

- Students will gain understanding of various concepts of Accounting and Finance. They will learn how financial transaction are to be recognized and recorded in practical life. They will learn the concepts and principles governing final accounts and get practical exposure to make the analysis of the Final accounts of firms.

[D] RECOMMENDED TEXTBOOKS

1) Financial Accounting for Managers -Text book & cases - Third Revised edition by S.K. Bhattacharya, John Dearden Published by Vikash Publishing House Private Limited
2) Management Accounting - By Ravi M. Kishore - Publisher: Taxman

[E] REFERENCE BOOKS

1) Pandey I M, Financial Management, 10th edition, Vikas Publication, New Delhi.
2) Van home, "Fundamentals of Financial Management", Pearson Education,11th ed.
3) Brigham, "Financial Management", Cengage Publication.
4) Kewown, J. Arthur, Martin, John, Petty, William and Scott David, "Financial Management: Principles and Applications",10th Ed. Pearson.
5) Chandra Prassanna, 10th Edition,TMH, New Delhi
6) Cost Accounting by B K Bhar - Academic Publisher latest edition
7) Cost Accounting by Charles, Srikant and George – PHI latest edition

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

Not applicable

AF 411 – MATHEMATICS - IV
SEM-IV (2nd Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	--	4	--	4	60	40	--	--	100

[A] OBJECTIVES OF THE COURSE

- Ability to analyze and solve problems in both familiar and unfamiliar situations including those in real-life contexts with better accuracy.
- Able to apply knowledge of key theories, concepts, tools and techniques of Mathematics to solve structured and unstructured Engineering problems.
- Understand and be able to use the language, symbols and notation of mathematics
- Use different forms of mathematical representation (formulae, diagrams, tables, charts, graphs and models)
- Generate and/or analyze information, find relationships and patterns, describe these mathematically as general rules, and justify or prove them.

[B] DETAILED SYLLABUS

1) FUNCTIONS OF COMPLEX VARIABLE

Analytic functions, Cauchy-Rieman equations, Harmonic functions, orthogonal system, complex potential function, Determination of conjugate function, conformal transformation, some standard transformations, bilinear transformation, line integral, properties of complex integration, Cauchy's theorem and Cauchy's integral formula.

2) NUMERICAL METHOD

Solution of algebraic and transcendental equations, by Newton - Raphson method, Direct iteration method, false position method, Solution of linear simultaneous equation :(1) Gauss - elimination (2) Gauss-jordan (3) Gauss-siedal method, Numerical methods to solve first order and first-degree ordinary differential equations by Picard's method &Taylor's series method, Modified Euler's Method, Milne's Method, Runge's method, Runge kutta method.

3) FINITE DIFFERENCES & DIFFERENCE EQUATIONS

Finite difference, Interpolation, Newton's forward and backward and central differences and Lagrange's formula, Strling & bessel's formula, Numerical differentiation & Integration, Trapezoidal rule, Simpson's (both) rules, Difference equations with constant coefficient.

4) VECTOR CALCULUS

Vector function of a single scalar variable, Differentiation of vectors, simple applications to plane, motion, scalar and vector point functions, Del applied to scalar point function (gradient) Divergence of a vector point function, curl of a vector, second order expressions, line integrals, surface integrals, Gauss theorem and stoke's theorem.

5) STATISTICAL METHODS

Binomial distribution, poission distribution, normal distribution, calculation of errors, probable errors, standard error, coefficient of correlation, lines of regression.

[C] LEARNING OUTCOMES

- Proficient to apply the theory and concepts of vector differential calculus and vector integral calculus in problems related to fluid flow, heat flow, electro static and so on.
- Understanding concept of Complex numbers and Complex functions and able to check the analyticity based on Cauchy-Riemann equations.
- Able to evaluate the complex integration and real integrals of practical interest.
- Able to interpolate and extrapolate the data with the help of numerical methods.
- Use numerical methods to find an approximate solution of algebraic and transcendental equations using appropriate method.
- Able to handle data numerically or graphically, in order to see what properties data, have and what kind of information we can extract and if data influenced by chance student may apply the concepts and rules of probability theory.

[D] RECOMMENDED TEXTBOOKS

1) Higher Engineering Mathematics, by: Dr. B. S. Grewal

[E] REFERENCE BOOKS

1) A Text Book of Applied Mathematics, by: P.N. & J. N. Wartikar & Chandrika Prasad.

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE):

- Not applicable

IT 402 – COMPUTER ORGANISATION
SEM-IV (2nd Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

- This course will introduce students to the fundamental concepts underlying modern computer organization and architecture. Main objective of the course is to familiarize students about hardware design including logic design, basic structure and behavior of the various functional modules of the computer and how they interact to provide the processing needs of the user. It will cover machine level representation of data, instruction sets, computer arithmetic, CPU structure and functions, memory system organization and architecture, system input/output, multiprocessors, and digital logic. The emphasis is on studying and analyzing fundamental issues in architecture design and their impact on performance.

[B] DETAILED SYLLABUS

1) COMPUTING AND COMPUTERS
The nature of computing, The evolution of computers, The VLSI Era

2) DESIGN METHODOLOGY
The system design, Register level, The processor level

3) PROCESSOR BASICS
CPU organization, Data representation, Instruction sets

4) DATA PATH DESIGN
Fixed point arithmetic, Arithmetic logic units, Advanced topics

5) CONTROL DESIGN
Basic concepts, Micro programmed control, Pipeline control

6) MEMORY ORGANISATION
Memory technology, Memory systems, Caches

7) SYSTEM ORGANISATION
Communication methods, IO and system control, Parallel Processing

[C] LEARNING OUTCOMES

- Understand the basics of computer hardware and how software interacts with computer hardware
- Analyze and evaluate computer performance
- Understand how computers represent and manipulate data
- Understand computer arithmetic and convert between different number systems
- Understand basics of Instruction Set Architecture (ISA) – MIPS
- Assemble a simple computer with hardware design including data format, instruction format, instruction set, addressing modes, bus structure, input/output, memory, Arithmetic/Logic unit, control unit, and data, instruction and address flow
- Use Boolean algebra as related to designing computer logic, through simple combinational and sequential logic circuits

[D] RECOMMENDED TEXTBOOKS

1) Computer Architecture and Organisation, 3rd edition, by: JOHN.P. HAYES, Computer science series, McGRAW-HILL

[E] REFERENCE BOOKS

1) Computer System Architecture, by: Morris Mano, PHI.
2) Computer Organisation, 3rd edition, by: HMACHER, VRANESIC and ZAKY., Computer Science Series, McGRAW- HILL

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1) Study of Introduction to Verilog and installation.
2) Write a basic program of Verilog and understand the syntax.
3) Write a program to implement different logic gates in Verilog.
4) Write a program to implement half adder and full adder in Verilog.
5) Write a program to implement multiplexer in Verilog.
6) Write a program to implement D-flip-flop in Verilog.
7) Write a program to implement ring counter in Verilog.
8) Write a program to implement 8-bit ALU in Verilog.
9) Write a program to implement Booth's multiplication algorithm in C language.
10) To write and read data in RAM IC 6264.

IT 403 – MICROPROCESSOR ARCHITECTURE PROG. AND INTERFACING
SEM-IV (2nd Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

- Provides a balanced approach to learn about Intel 8085 microprocessor from two different disciplines: hardware concepts from electronics point of view and assembly language programming skills from computer science point of view.
- To introduce the basic concepts of microprocessor and its interfacing with memory and programmable peripheral chips involving system design.
- To develop an in-depth understanding of execution of instructions and how microprocessor communicates with memory and peripheral devices to be used for real time applications.

[B] DETAILED SYLLABUS

MICROPROCESSOR

1) INTRODUCTION
Microprocessor architecture & its operation, Memory, Input/Output, Microcomputer system, Interfacing devices.

2) 8085 MICROCOMPUTER ARCHITECTURE & MEMORY INTERFACING:
Block diagram, Address, Data, Control Bus, Generating control signals, Memory Map, Memory Interfacing.

3) INTERFACING I/O DEVICES:
Basic interfacing concepts, interfacing Input/Output devices, memory mapped I/O.

4) 8085 INSTRUCTIONS SET
The 8085 programming Model, Addressing Models, Data Format, Instruction classifications - Data transfer, Arithmetic, Logic, Branch operations, Assembly language program, Debugging.

5) PROGRAMMING TECHNIQUES
Looping, counting, Indexing, Counters & time delay. Stack & sub-routines, Code conversion, arithmetic operations.

6) BASIC INTERFACING TECHNIQUES
Interfacing memory, Interrupt processing, programming and interfacing of VLSI based peripheral Devices like 8253, 8251, 8255, 8259, 8279, 8257 etc., interfacing ADC/DAC.

MICROCONTROLLER

Basic concepts of Microcontroller and review of 8051 Architecture

[C] LEARNING OUTCOMES

- Providing a sound pedagogy - from basic concepts to applications - it fully prepares students to apply concepts learned to other microprocessors in higher level courses or may be useful during their minor/major project work or in their future jobs.
- Prepare the students to digest the concept of Operating System and Advance Microprocessor subjects in higher semesters.
- Gives clarity to understand some of the syntax used in 'C' language which allows students to write most optimized code.

[D] RECOMMENDED TEXTBOOKS

1) Architecture, Programming & applications with 8085/8080A by: R. S. Gaonker 4th ed.
2) The 8051 Microcontroller by Kenneth J. Ayala

[E] REFERENCE BOOKS

1) 8080A-8085 Assembly language programming by: Lance A. Leventhal

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1) (A) Introduction to Microprocessor Trainer Kit
(B) Addition of two 8-bit numbers.
2) Addition of ten 8-bit numbers stored in memory
3) (A) Find Larger of two Numbers stored in memory
(B) Find no. of negative elements in a block of data
(C) Find the largest element from a block of data
(D) 16-bit addition

4) Observing T-States, Machine cycles and instruction cycle on oscilloscope.
5) Sorting of numbers (Ascending/Descending)
6) Code Conversion: Binary to BCD
7) Working of RST 7.5 interrupt
8) Generate Square wave using 8255
9) To Transfer data serially between two kits. It will cover Study of 8253/8251/USART
10) Study of 8279 Programmable Keyboard/DisplayController
11) Study of ADC/DAC

- **LABWORK BEYOND CURRICULA**

12) Design a kit that can be used as software digital clock
13) Design a kit that can be used as voltmeter to measure voltmeter to measure 0 to 5 volt

IT 406 – DATA STRUCTURES AND ALGORITHMS
SEM-IV (2nd Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

- To learn different data structures and their operations.
- To teach selection of efficient data structure for improving efficiency (time complexity and space complexity) of the system.
- These concepts will be useful to students while learning subjects like Database Management System and Algorithm Analysis.
- To give the knowledge of real-world application of the data structures.

[B] DETAILED SYLLABUS

1) BASIC CONCEPTS
Algorithm Specification

2) ARRAYS
Array as an abstract Data type, Representation of Arrays

3) STACKS AND QUEUES
Stack as an abstract data type, Queue as an abstract type, Evaluation of Expressions

4) LINKED LISTS
Singly Linked Lists, Circular Lists, Linked Stacks and Queues, Polynomials, Doubly Linked Lists, Generalized Lists

5) TREES
Introduction, Binary Trees, Binary tree traversal and tree iterators, Additional Binary tree operations, threaded binary trees, heaps, binary search trees, forests, Huffman Algorithm

6) GRAPHS
Graph Abstract data type, Elementary Graph operations, Shortest path –Dijkstra's algorithm

7) SORTING
Insertion sort, quick sort, merge sort, heap sort, sorting on several keys, list and table sort, summary of internal sorting

8) HASHING
Static Hashing, linear probing, hash functions

9) SEARCH STRUCTURES
AVL Trees, 2-3 Trees, 2-3-4 Trees, Red-Black trees, B-trees, Digital Search Trees, Tries

[C] LEARNING OUTCOMES

- Students can do selection of efficient data structure for the given problem.
- Students can compare different data structures based on operations supported and their complexity.
- Students can do implementation of these data structures in object-oriented programming language.

[D] RECOMMENDED TEXTBOOKS

1) Fundamentals of Data Structures using C++ by: Horowitz, Sahni, Galgotia Pub. 1998 ed.

[E] REFERENCE BOOKS

1) Data Structures& Algorithms, by: Aho, Ullman, Addision Wesley
2) An Introduction to Data Strucures with applications, by: Tremblay, Sorenson, McGraw Hill.
3) The art of Computer Programming Vol. I & III, by: Kunth, Addision Wesley.
4) Data Structures using C and C++, by: Yedidyah Langsam, Tenenbaum

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1) Implement the Polynomial representation using an Array.
2) Implement the Application of Stack Infix to Postfix.
3) Make the basic operations of circular Queue.
4) Implement the Polynomial representation using a Link -List.
5) Implement the Doubly Link-List.

6) Implement the Binary Tree Traversal.
7) Find the Shortest Path using Diskstra's Algo.
8) Implement the Shorting using Quick Sort method.
9) Implement the Shorting using Merge Sort method.
10) Implement the Static Hashing using any one method.

IT 407 – COMPUTER AND COMMUNICATION NETWORKS
SEM-IV (2nd Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

At the end of the course, the students will be able to:

- Understand uses of computer network in daily life.
- Understand basics of network hardware and network software with understanding of protocol hierarchies and reference models.
- Identify services provided by each layer of OSI reference model.
- Flow control and error control at DLL (wired and wireless LAN) and devices at DLL
- IP addressing (IPV4), sub netting, super netting and routing algorithms and devices at Network Layer
- Quality of service and congestion control at network and transport layer
- Understand Application layer protocol and security in computer networks.

[B] DETAILED SYLLABUS

1) INTRODUCTION

Uses of computer Networks, Network Hardware-LAN, MAN, WAN, internetworks. Network Software – Design Issues, interfaces & Services, Connection Oriented & Connectionless services. Service primitives. Relationship of services to protocols. Reference Models - OSI & TCP/IP, their comparison & critiques.

2) THE PHYSICAL LAYER

Transmission Media – magnetic media, twisted pair, baseband & broadband, fiber optics. Wireless Transmission- radio, microwave, infrared & light wave. Narrowband ISDN, Broadband ISDN & ATM.

3) THE DATA LINK LAYER

DLL Design issues, Error Detection & Correction. Elementary Data link Protocols - Utopia, Stop N Wait and Automatic Repeat Request. Sliding Window Protocols 1-bit sliding window, Go Back N, Selective Repeat Protocols. Examples of Data link layer protocols HDLC, PPP

4) MEDIUM ACCESS SUB LAYER

Channel Allocation Problem - Static & Dynamic. Multiple Access protocols - ALOHA, CSMA, Collision Free Protocols, Limited contention protocols, WDMA protocol, wireless LAN protocols. IEEE-802.3(Ethernet),802.4(Token Bus) ,802.5(Token Ring) and FDDI. Bridges - From 802.x to 802.y, transparent Bridges, Spanning Tree, Source Routing Bridges, remote bridge. Introduction of Repeaters, Hub, bridges, switches, routers and gateways.

5) THE NETWORK LAYER

Network layer Design issues. Routing Algorithms. Congestion Control Algorithms - general policies, congestion prevention policies, traffic shaping, flow specifications, congestion control in VC subnets, Congestion controls in Data gram Subnets, load shedding, jitter control. Quality of services-requirements, techniques to achieving good quality of services-Leaky bucket algorithm. Token bucket algorithm, resource reservation, admission control, packet scheduling. Internetworking-How networks differ, how networks can be connected, concatenated virtual circuits, connectionless internetworking, tunneling, internetwork routing, fragmentation. The network layer in the internet - the IP protocol, IP addresses & subnets, Internet Control Protocols – ARP, RARP, OSPF & BGP

6) THE TRANSPORT LAYER

The Transport Service-services provided to upper layers, transport services primitives, Elements of Transport Protocols, The Internet Transport Protocols – TCP service model, TCP protocol, TCP Segment Header, TCP Connection Management, TCP Transmission Policy, TCP Congestion Policy. UDP & overview of Socket.

7) THE APPLICATION LAYER

Application Layer Protocols: File transfer protocol, Domain Name System, SMTP, HTTP

8) SECURITY & PERFORMANCE ISSUES IN COMPUTER NETWORKS

Data Encryption, Public Key Cryptography, Trusted System, Firewall, Network Performance measurement, Network baseline, Network Management & Documentations

[C] LEARNING OUTCOMES

After completing this course, the student must demonstrate the knowledge and ability to:

- Implement and identify basic network topologies.
- Identify the work of each layer and protocols available at that layer with possible algorithms.
- Identify the network devices and their functionality within the network.
- Build a simple network with use of sub netting, super netting and basic routing algorithm within the network.
- Implement a simple connection oriented and connection less service using service primitives.
- Troubleshoot basic network issues within network.

[D] RECOMMENDED TEXTBOOKS

1) Computer Networks, by: Andrew S. Tanenbaum, 4th Edition. Prentice-Hall of India (PHI).

[E] REFERENCE BOOKS

1) Data Communications and Networking, by: Behrouz A. Forouzan
2) Data & Computer Communications, by: William Stallings, 2ed, Maxell Macmillan Int.
3) Communication Networks, Fundamental Concepts & key Architectures, by: Leon-Garcia & Widjaja, Tata- McGraw Hill Edition.

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1) Write a program to transmit a character, a string and a file from one PC to another using RS-232 cable
2) Study of different types of Network cables and practically implement the cross-wired cable and straight through cable using clamping tool.
3) Write a program to implement bit stuffing and character stuffing.
4) Study of Network Devices in Detail
5) Study of network IP Classification of IP address Sub netting Super netting
6) Study of basic network command and Network configuration commands
7) Configure a Network topology using packet tracer software
8) Configure a Network using Distance Vector Routing protocol. RIP and IGRP
9) Configure Network using Link State Vector Routing protocol. OSPF
10) Write a program to implement TCP/IP protocol using socket programming using UNIX

- **LABWORK BEYOND CURRICULA**

11) Implement Bellman Ford's Algorithm
12) Connect the computers in Local Area Network

AF 501 – PROFESSIONAL COMMUNICATION - I
SEM-V (3rd Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
1	--	2	1	1	2	50	--	50	--	100

[A] OBJECTIVES OF THE COURSE

- To develop confidence in the students for communicating at workplace.
- Develop their Listening, Speaking, Reading, and Writing Skills.
- To give exposure of communicating with public.
- How to develop fluency in English Language.
- To prepare students for placement.
- To teach how to be effective at the job.

[B] DETAILED SYLLABUS

UNIT 1- INTRODUCTION TO PROFESSIONAL COMMUNICATION:
Importance
Methods and Manners
Need of Professional Communication
Objectives of Professional Communication
Skills required for Professional Communication
Employers' Expectations

UNIT 2- COMMUNICATION AND BARRIERS:
Introduction
Process
Principles
Components
Types of Communication
Main problems of Communication

Verbal Communication
- Oral Communication
- Written Communication
- Advantages of Verbal Communication
- Limitations of Verbal Communication

Non-Verbal Communication
- Importance of Non-Verbal
- Kinesics
- Proxemics
- Chronemics
- Haptics
- Oculesics
- Paralanguage

Barriers of Communication
- Intrapersonal
- Inter-Personal
- Organisational

Noises in Channel
- Physical
- Semantic
- Psychological
- Physiological

UNIT 3- LANGUAGE PROFICIENCY:

Introduction
Basic Grammar Rule
Vocabulary Building
Language Games

UNIT 4- FOUR SKILLS:

Introduction
Listening
- Process
- Types of Listening
- Six Stages of Listening
- Listening Criticism
- Characteristics of effective listening

Speaking
- Elements of speaking skills
- Pronunciation
- Speech art

Reading
- Skimming
- Scanning
- Intensive Reading
- Levels of Comprehension (Literal and Inferential)
- Techniques of Good Comprehension
- Improving Comprehension Skills

Writing
- Developing Writing skills
- Letter and E-mail writing

[C] LEARNING OUTCOMES

After completion of this course students will be able to understand:
- Communication Process and framework
- Obstacles in Communication
- Possible remedies to barriers of communication
- Effective Listening, Reading, Writing and speaking skills
- Implementation of Non-Verbal features in the presentation
- Ways and manners Presentations, Speech, Group talk and Interview
- Competence in writing and reading

[D] RECOMMENDED TEXT BOOKS

1) Meenakshi Raman, Sangeeta Sharma. *Technical Communication*: *Principles and Practice*; Oxford University press: New Delhi, 2004.
2) Meenakshi Raman, Prakash Singh. *Business Communication: Second edition;* Oxford University Press: New Delhi, 2012.
3) Steve Hart, Arvind R. Nair, Veena Bhambhani. *Embark: English for Undergraduates;* Cambridge University Press: Delhi, 2016.

[E] REFERENCE BOOKS

1) T M Farhathullah. *Communication Skills for Technical Students;* Orient Longman Private Ltd.: Chennai, 2002.

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE): Not Applicable

IT 502 – DATABASE MANAGEMENT SYSTEM
SEM-V (3rd Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

This course mainly enriches knowledge of

- Relational Data Models, Relational Algebra, Relational Database Design, Storage and File Structure, Transaction Concurrency, Recovery and Distributed databases.
- The objective of the course is on the designing and implementation of Database Management Systems.
- Main emphasis is placed on a sufficient semester long, DBMS project.

[B] DETAILED SYLLABUS

1) BASIC CONCEPTS

Purpose of database system, View of data, Database abstraction and Models, Database Languages, Transaction management, Storage management, Database administrator, Database users, Overall system structure.

2) ENTITY RELATIONSHIP MODEL

Entity sets, Relationship sets, Attributes, Constraints, Keys, Entity relationship diagrams, Weak entity sets, Generalization, Specialization, Aggregation, Design of an E-R database schema, Reduction of an E-R schema to tables.

3) RELATIONAL DATABASE MANAGEMENT SYSTEM

Relational Model Structure of database, Relational algebra, Extended relational algebra operation, tuple relational calculus, Domain relational calculus, Modification of database, Views. Structured Query Language Background, Basic structure. Integrity Constraints Domain constraints, Referential integrity, assertions, Triggers, Functional Dependencies. Database Design Pitfalls in relational database design, decomposition, Normalization, I, II, III normal Forms, Normalization using functional dependencies, Normalization using multi valued dependencies, Domain key normal form, Alternative approach to database design.

4) FILE SYSTEM STRUCTURE

Indexing & Hashing, File organization, Organization of records in files, Data dictionary storage, Basic concepts of indexing, Order indices, B- Tree index files, B+ -Tree index files, Static hashing & Dynamic Hashing.

5) QUERY PROCESSING

Overview, Catalog information for cost estimation, Measures of query cost, Selection operation, Sorting, Join operation, Other operations, Choice of evaluation plans.

6) TRANSACTION PROCESSING

Transaction concepts, Transaction state, Implementation of atomicity & durability, Concurrent executions, Serializability, Conflict serializability, View serializability, Testing of conflict and view serializability.

7) CONCURRENCY CONTROL

Lock based protocols, Time-stamp based protocol, Validation based protocol, Multiple granularity, Multi-version schemes, Deadlock handling, Insert & delete operations, Concurrency in index structures.

8) RECOVERY SYSTEM

Failure classification, Storage structure, Recovery & Atomicity, Log-based recovery, Shadow paging, Recovery with concurrent transactions, Buffer management, Failure with loss of non- volatile storage, Advance recovery techniques.

9) DISTRIBUTED DATA BASES

10) SECURITY AND INTEGRITY OF DATA BASE

[C] LEARNING OUTCOMES

Upon successful completion of course, a student will be able to:

- Understand database concepts and structures
- Understand terms related to database design and management
- Understands objectives of data and information management
- Get thorough with data modelling and database development process and actual construction and normalization of data models at practical level
- Use DBMS systems such as Oracle SQL Plus, MySQL and SQL Server.
- Understand the issues related to database performance and become proficient in using DBQL, i.e. SQL and PL/SQL.

[D] RECOMMENDED TEXTBOOKS

1) Database System Concepts, by: Henry F. Korth and A. Silberschatz. 2nd Ed. McGraw-Hill 1991.

[E] REFERENCE BOOKS

1) Fundamentals of Database Systems by: Shamkant Navathe

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1) Introduction to SQL, an exercise on data types in SQL & Data Definition Language commands.
2) Exercise on Data Manipulation Language and transaction control commands.
3) Exercise on Types of Data Constraints.
4) Exercise on Joins (single-table or multi-table) and using normalization.
5) Exercise on group-by clause and date arithmetic.
6) Exercise on different functions (aggregate, math and string).
7) Exercise on different types of sub queries.
8) Introduction to PL/SQL, Control Structures, Procedures and Functions, view.
9) Introduction to triggers and cursors.
10) Mini project on designing and implementing one database management system.

IT 506 – ADVANCED MICROPROCESSOR ARCHITECTURE (ELECTIVE – I)
SEM-V (3rd Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

- This course aims at teaching concept of programming with machine language. It also aims to train the student for automated sy stem design with the programming intelligence. The objective of this course is to become familiar with the architecture and the instruction set of an Intel microprocessor. The accompanying lab is designed to provide practical hands-on experience with turbo assembler software with assembly language programming. To identify the techniques to improve the speed and performance of computers – Parallelism in Instruction level – Hardware approaches -pipelining, dynamic scheduling, superscalar processors, and multiple issues of instructions.

[B] DETAILED SYLLABUS

1) **8086 FAMILY PROCESSOR ARCHITECTURE INCLUDING 80286 /80386 /80486 /PENTIUM. 8086 FAMILY MICROPROCESSOR OVERVIEW INTRODUCTIONS TO PROGRAMMING THE 8086**

2) **8086 FAMILY ASSEMBLY LANGUAGE PROGRAMMING**

3) **STRINGS, PROCEDURES AND MACROS**

4) **8086 INSTRUCTION DESCRIPTIONS AND ASSEMBLER DIRECTIVES**

5) **8086 SYSTEM TIMING AND INTERFACING MEMORY AND I/OS**

6) **8086 INTERRUPTS**

7) **WRITING PROGRAMS WHICH CONTAIN C AND ASSEMBLY LANGUAGE**

8) **MULTI USER/MULTITASKING OPERATING SYSTEM CONCEPTS, INTRODUCTION TO 80286/80386/80486/PENTIUM PROCESSORS, REAL ADDRESS MODE AND PROTECTED VIRTUAL ADDRESS MODE OF 80286 /80386 /80486 /PENTIUM**

PROCESSORS.

9) INSTRUCTION LEVEL PARALLEL PROCESSING
Pipelining of processing elements, Delays in pipeline execution, Difficulties in pipelining, Superscalar processors, Very Long Instruction Word (VLIW) Processor, Multithreaded Processors

[C] LEARNING OUTCOMES

At the end of the course, a student will be able to:

- State the internal organization of some popular microprocessors (80286 /80386 /80486/Pentium.
- Describe the operations of virtual memory
- Compare the performance of different CPU architecture.
- Design interfacing circuits of various devices with the microprocessor.
- Describe the operations of performance such as pipelines, dynamic scheduling branch predictions.
- Describe the modern architecture such as RISC, Scalar, VLIW Multi core and multi-CPU systems
- Conduct experiments in turbo assembler using assembly language programming.

[D] RECOMMENDED TEXTBOOKS

1) Microprocessors & Interfacing - Programming and Interfacing By: Dogulas v. Hall
2) Notes from INTEL
3) Parallel Computers – Architecture and Programming by: V. Rajaraman and C. Shiv Ram Murthy

[E] REFERENCE BOOKS

1) Programming The 80286, 80386, 80486 and Pentium-based personal Computer by: Barry B. Brey
2) Parellel Processing, by: V. Rajaraman and C. Siva Ram Murthy. Learning Materil Series, Indian Society for Technical Education, New Delhi, 1996.

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1) Study of DOS Debug Commands.
2) Study of Turbo Assembler
3) Study of string related instructions
4) To study multi module program within divide 32bits number by 16bits number
5) Study of the response of Type-0 interrupts

6) To study the interfacing of C module with assembly module and calling C library functions from assembly module
7) Study of DOS and BIOS function calls
8) Study of implementation of Recursion in assembly language.
9) Study of various methods of passing parameters to a procedure
10) Study of implementation of TSR.

IT 509 – DESIGN & ANALYSIS OF ALGORITHM
SEM-V (3rd Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

This course introduces students to the analysis and design of computer algorithms. Upon completion of this course, students will be able to do the following:

- Analyze the asymptotic performance of algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations.

[B] DETAILED SYLLABUS

1) INTRODUCTION TO ALGORITHMS

2) ELEMENTARY DATA STRUCTURES

3) METHODS FOR SOLVING RECURRENCE RELATIONS FOR FINDING TIME COMPLEXITY

4) OVERVIEW OF SEARCHING & SORTING TECHNIQUES

5) THE GREEDY METHODOLOGY

6) DYNAMIC PROGRAMMING

7) GRAPH TRAVERSAL & SEARCHING

8) BACKTRACKING TECHNIQUES

9) BRANCH & BOUND TECHNIQUES

10) LOWER BOUND THEORY

11) NP-HARD & NP-COMPLETE PROBLEMS

[C] LEARNING OUTCOMES

Students who complete the course will have demonstrated the ability to do the following:

- Argue the correctness of algorithms using inductive proofs and loop invariants.
- Analyze worst-case running times of algorithms using asymptotic analysis. Compare the asymptotic behaviors of functions obtained by elementary composition of polynomials, exponentials, and logarithmic functions. Describe the relative merits of worst-, average-, and best-case analysis.
- Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and conquer algorithms. Derive and solve recurrences describing the performance of divide and-conquer algorithms.
- Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms and analyze them.
- Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms and analyze them.
- Explain the major algorithms for sorting. Recite the analyses of these algorithms and the design strategies that the algorithms embody. Synthesize algorithms that employ sorting as a sub procedure. Derive lower bounds on the running time of comparison sorting algorithms and explain how these bounds can be overcome.
- Explain the major elementary data structures for implementing dynamic sets and the analyses of operations performed on them. Recite algorithms that employ data structures and how their performance depends on the choice of data structure. Synthesize new data structures by augmenting existing data structures. Synthesize algorithms that employ data structures as key components.
- Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate. Synthesize new graph algorithms and algorithms that employ graph computations as key components and analyze them.

[D] RECOMMENDED TEXTBOOKS

1) Fundamentals of Computer Algorithms by: Horowitz, Sahni, Galgotia Pub. 2001 ed.

[E] REFERENCE BOOKS

1) Fundamentals of Algorithms by: Brassard & Brately, PHI.

2) Introduction to Algorithms by: Coreman, Tata McGraw Hill.
3) Design & Analysis of Computer Algorithms, by: Aho, Ullman, Addision Wesley.
4) The art of Computer Programming Vol. I & III, by: Kunth, Addision Wesley.

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1) Introduction to gnu profiler tool.
2) a) Write a program that implements Tower of Hanoii.
b) Write a program that implements Fibonacii Series.
3) a) Write a program that implements Insertion Sort.
b) Write a program that implements Selection Sort.
4) a) Write a program that implements Heap Sort.
b) Write a program that implements Quick Sort.
c) Write a program that implements Merge Sort.
5) a) Write a program that implements Binary Search.
b) Write a program that implements Prim's Algorithm.
6) a) Write a program that implements Kruskal's Algorithm.
b) Write a program that implements String editing.
7) a) Write a program that implements Make a change using greedy.
b) Write a program that implements Knapsack using greedy.
8) a) Write a program that implements Dijkstra's Algorithm.
b) Write a program that implements Longest Common Subsequence.
9) Write a program that implements N-Queen Problem.
10) Write a program that implements Knapsack using backtracking.

IT 510 – CORE JAVA TECHNOLOGY
SEM-V (3rd Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	**TUTORIAL**	**PRACTICAL**	**L+T**	**P**	**TOTAL**	**THE.**	**SESS.**	**PRAC.**	**T/W**	**TOTAL**
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

- Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- Have the ability to write a computer program to solve specified problems.
- Be able to use the Java SDK environment to create, debug and run simple Java programs.
- Design and develop powerful GUI based components.
- Create Animation using Applet, Application, Thread and AWT controls.

[B] DETAILED SYLLABUS

1) INTRODUCTION TO JAVA

2) PRIMITIVE DATA TYPES

3) CONTROL STRUCTURES

4) METHODS

5) PROGRAMMING WITH OBJECTS AND CLASSES

6) CLASS INHERITANCE

7) ARRAY AND STRING

8) GETTING STARTED WITH GRAPHIC PROGRAMMING

9) CREATING USER INTERFACE

10) APPLETS AND ADVANCED GRAPHICS

11) EXCEPTION HANDLING

12) MULTITHREADING

13) INPUT AND OUTPUT

14) NETWORK PROGRAMMING

[C] LEARNING OUTCOMES

- Students can be able to program Java classes and methods using a subset of data types and using assignment, method calls, while loops, for loops, and conditionals.
- Students can learn how to use and manipulate several core data structures: Arrays, linked lists, trees, stacks, and queues.
- Students can be able to construct simple Java user interfaces and identify where data structures are appearing in those user interfaces.
- Students can develop GUI based application.

[D] RECOMMENDED TEXTBOOKS

1) "An Introduction to JAVA programming" By: Y. Daniel Liang Publisher: PHI

[E] REFERENCE BOOKS

1) "The Complete Reference Java 2" By: Herbert Schildt 5th edition Publisher: Tata McGraw-Hill

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1) Write the programs using the concept of nested for loops and recursion.
2) Write the programs using the concept of command line argument.
3) Write the programs using the concept of arrays and StringBuffer class.
4) Write the programs using the concept of Generic class, Inheritance, Interface and Package.

5) Write the program which creates the Frame and implements MouseListener.
6) Implementing a GUI based calculator application and drawing different figures on a Canvas.
7) Write an application to simulate traffic lights and calculator using GridbagLayout.
8) Write a program that uses the concept of Applet and Exception Handling.
9) Write the programs that uses the concept of Threads.
10) Write a program that uses the concept of File I/O.
11) Write a program that uses the concept of socket programming.

IT 511 – THEORY OF AUTOMATA & FORMAL LANGUAGE
SEM-V (3rd Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	--	4	--	4	60	40	--	--	100

[A] OBJECTIVES OF THE COURSE

- Introduce concepts in automata theory and theory of computation
- Identify different formal language classes and their relationships
- Design grammars and recognizers for different formal languages
- Determine the decidability and intractability of computational problems

[B] DETAILED SYLLABUS

MAJOR TOPICS

- Formal languages, Automata, Computability, introduction to computational complexity, NP-completeness.

COURSE CONTENTS

1) REVIEW OF MATHEMATICAL BACKGROUND
Sets, functions, logical statements, proofs, relations, languages, Mathematical induction, strong principle, Recursive definitions.

2) REGULAR LANGUAGES AND FINITE AUTOMATA
Regular expressions, regular languages, applications, Finite automata, memory requirement in a recognizer, definition, representation, extended notation, string recognition, union, intersection and complement of regular languages. Nondeterministic finite automata, lambda transitions, equivalence, algorithms, examples. Kleen's theorem. Minimization of Finite automata. Non-regular and regular languages, criterion, Pumping Lemma, decision problems and decision algorithms, Regular languages in relation to programming languages.

3) CONTEXT-FREE LANGUAGES AND PUSH-DOWN AUTOMATA
Context-free languages, definition, union, concatenation, examples etc. derivation tree and ambiguity. Simplified and Normal forms, Chomsky normal form.

Push-Down Automata, definition, examples, deterministic PDA, two types of acceptances and their equivalence. Equivalence of CFG and PDA. Introduction to parsing, top-down and bottom-up parsing. Non-CFL and CFL, Pumping Lemma for CFL, intersection and complement.

4) TURING MACHINES

Models of computation, TM definition, combining TMs, computing a function with TMs. variations on Turing Machines, double inf inite and more than one Tapes, non-deterministic and Universal TM, Recursively Enumerable languages, Unrestricted and context-sensitive grammars and their relation to TM, Linear Bounded Automata, Chomsky hierarchy, Unsolvable problems, Halting problem, Post's correspondence, applications to CFLs. Computability, Primitive recursive functions, computable functions, PR functions, bounded operations. Non-primitive recursive functions.

5) INTRODUCTION TO COMPUTATIONAL COMPLEXITY

Tractable problems, growth rate, time complexity of TM. NP-completeness.

[C] LEARNING OUTCOMES

- Understand basic properties of formal languages and formal grammars.
- Understand basic properties of deterministic and nondeterministic finite automata
- Understand the relation between types of languages and types of finite automata
- Understanding the Context free languages and grammars, and Normalizing CFG.
- Understanding the minimization of deterministic and nondeterministic finite automata
- Understand basic properties of Turing machines and computing with Turing machines.
- Understand the concept of Pushdown automata and its application.
- Know the concepts of tractability and decidability, the concepts of NP-completeness and NP-hard problem.

[D] RECOMMENDED TEXTBOOKS

1) "Introduction to Languages and Theory of Computation" by John C. Martin McGraw-Hill 1991.

[E] REFERENCE BOOKS

1) "Computation: Finite and Infinite" By Marvin L. Minsky, Prentice-Hall, 1967

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

Not applicable

IT 506A - EMBEDDED SYSTEM (ELECTIVE – I)
SEM-V (3rd Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

- Embedded systems are generally part of complex systems. An embedded system carries out the Computational subtasks of the main system. The computing systems within home appliances and Automobiles are examples of such systems. This course will cover the process of embedded system design under mainly cost, power, performance and several system-specific restrictions. Course being a practical oriented, the Arduino UNO development board which is a widely used and most popular open-source microcontroller board based on the ATmega328P microcontroller is chosen to teach the embedded system design concepts. It will provide the platform to students who would like to enter into IoT.
- To provide an understanding and in-depth knowledge of the main concepts, techniques and performance criteria used in the analysis of various signal operations (time domain and frequency domain), and design of analog and digital communication systems so as to correlate the concepts of Information Theory in context to their branch.

[B] DETAILED SYLLABUS

1) INTRODUCTION TO EMBEDDED SYSTEMS

History of embedded systems, Classification of embedded systems, Major application area of embedded systems, Purpose of embedded systems, Fundamental issues in hardware software co-design, Introduction to unified modeling language (UML).

2) TYPICAL EMBEDDED SYSTEMS

Core of the Embedded Systems, Memory, Sensors and actuators, Communication interface, Embedded firmware.

3) RISC MICROCONTROLLERS

RISC and CISC architectures, AVR microcontroller family architecture and pin functions, Arduino board specifications, Arduino programming in C, I/O interfacing: LED, multiplexed 7-segment, LCD, GLCD, sensors, keypad, relay, buzzer, Arduino interrupt programming in C, Arduino serial programming in C, Communication protocol: I2C protocol and RTC interfacing, SPI protocol and max7221 interfacing, Wi-Fi shield for internet

4) EMBEDDED PRODUCT DEVELOPMENT LIFE CYCLE
Objective of EDLC, Different phases of EDLC, Approaches (Modeling the EDLC)

[C] LEARNING OUTCOMES

At the completion of course, Students will be able to,

- Define what an embedded system is in terms of its interface
- Enumerate and describe the components of an embedded system
- Embedded System Design constraints
- Describe the interactions of embedded systems with the physical world
- Take IoT course.

[D] RECOMMENDED TEXT BOOKS

1) Introduction to Embedded Systems by shibu K V mcgraw hill
2) The AVR microcontroller and Embedded Systems by muhammad Ali Mazidi, SarmadNaimi, SepehrNaimi
3) Arduino Cookbook by Michael Margolis Published by O'Reiliy Media, Inc..

[E] REFERENCE BOOKS

1) System Design: A Unified Hardware/Software Introduction by Frank Vahid and Tony D. Givargis, Addison Wesley, 2002.
2) Computers as Components by Wayne Wolf, Morgan Kaufmann, 2001
3) Embedded C programming and the ATMEL AVR by Barnett, cox and o'cull, Thomson

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

CT 616 – SOFTWARE ENGINEERING
SEM-VI (3rd Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

- The objective of Software Engineering is to learn different phases of software development, different life cycle models, software project management, designing of models for software, application of design patterns. Apart from this to learn testing, quality assurance and maintenance, which is helpful for industrial job.

[B] DETAILED SYLLABUS

1) PHASES IN SOFTWARE DEVELOPMENT PROJECT

Overview, Need, Coverage of topics Project feasibility analysis, Software Process Models, Incremental Process Models, Evolutionary, Process Models, Component based development Model, Rapid Application Development Model, Unified Process, Agile Methodology (Agile Process Model). Software Project management. Cost Estimation. Loc based estimation. FP- based Estimation. COCOMO II. Project Scheduling Timeline Charts Earned value analysis Risk Management. Risk identification. Risk assessment & refinement, Risk mitigation, monitoring & management, RMMM plan, Change Management, Software configuration management, Software configuration process

2) REQUIREMENT ENGINEERING

Requirement engineering tasks, Initiating the requirement engineering Process, eliciting requirements, System Engineering, System analysis: SRS, Use cases

3) SYSTEM DESIGN

Design concepts and principles**,** Architectural design User interface design Component level design Object oriented design

4) SOFTWARE TESTING

Software Testing strategies Software Testing techniques White box testing**,** Basis path testing Control structure testing Black box testing**,** Object oriented testing

5) **SOFTWARE QUALITY ASSURANCE**
ISO CMM

6) **SOFTWARE RELIABILITY**

[C] LEARNING OUTCOMES

- After learning this subjects the student can learn the software development process (that covers the different life cycle models, design, testing, maintenance etc.) can be learned. The students can also learn the UML for the design purpose. Apart from that the software project management and the various quality standards such as ISO, CMM, Sixsigma etc. can be learned.

[D] RECOMMENDED TEXTBOOKS

1) Software Engineering - A practitioner's Approach by: Roger S. Pressman, McGraw Hill Pub.

[E] REFERENCE BOOKS

1) Fundamentals if software engineering by Rajib Mall, II ed.Prentice Hall, Indian
2) Software Engineering by Ian Sommerville, 6th ed., Pearson Edu.
3) UML Distilled: A brief guide to the standard object modeling language by Flower and Scott
4) SOFTWARE ENGINEERING: Principles and Practice by Waman S Jawadekar, Tata Mcgraw hill
5) Object-oriented Analysis and Design with Applications by Grady Booch; II ed., Pearson Edu.
6) Object oriented Analysis and Design by Andrew Haigh, Tata McGraw-Hill

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1) Phases in software development project, overview, need and coverage of topics
2) To assign the requirement engineering tasks
3) To perform the system analysis: Requirement analysis, SRS
4) To perform the function-oriented design: DFD and structured chart
5) To perform the user's view analysis: Use-case diagram
6) To draw the structural view diagram: Class diagram and object diagram
7) To draw the behavioral view diagram: Sequence diagram and collaboration diagram
8) To draw the behavioral view diagram: State-chart diagram and activity diagram
9) To draw the implementation view diagram: Component diagram
10) To draw the environmental view diagram: Deployment diagram
11) To perform the various techniques for testing using the testing tool: Unit testing and Integration testing

IT 607 – APPLIED OPERATING SYSTEM
SEM-VI (3rd Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

- Students should be able to use system calls for managing processes, memory and the file system. Students should understand the data structures and algorithms used to implement an OS.
- To understand the services provided by operating system.
- To understand the structure and organization of the file system.
- To understand about process how processes are synchronized and scheduled.
- To understand deadlock management in process.
- To understand different approaches to memory management.

[B] DETAILED SYLLABUS

1) INTRODUCTION
Role of an OS computer system, types of operating system.

2) OPERATING SYSTEM STRUCTURES
System documents, OS services, system calls, system structure, concept of virtual machines.

3) PROCESS MANAGEMENT
Process concept, process scheduling, cooperating processes, Inter process communication.

4) CPU SCHEDULING
Basic concept, scheduling criteria, scheduling algorithms.

5) PROCESS SYNCHRONIZATION
Critical section problem, synchronization hardware, semaphores, classical problems of synchronization, critical regions, monitors.

6) DEADLOCKS

Deadlock characteristics, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlocks, combined approach for deadlock handling.

7) MEMORY MANAGEMENT

Logical versus Physical Address space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging

8) VIRTUAL MEMORY

Demand Paging, Performance of Demand Paging, Page Replacement, Page replacement algorithms, Allocation of frames, Thrashing, Other Considerations, Demand segmentation

9) FILE-SYSTEM INTERFACE

File concept, Access methods, Directory Structure, Protection, Consistency

10) FILE-SYSTEM IMPLEMENTATION

File-System Structure, allocation methods, Free-space Management, Directory Implementation, Efficiency and performance

11) I/O SUBSYSTEMS

I/O Hardware, Application I/O interface

12) SECONDARY-STORAGE STRUCTURE

Disk Structure, Disk scheduling, Disk Management, Swap-space management

13) PROTECTION

Goals of protection, domain of protection, access matrix, implementation of access matrix, revocation of access rights, capability based systems, languages based protection.

14) SECURITY

The problem, authentication, one-time password program threats, system threats, threat monitoring, encryption, computer security classification.

15) CASE STUDIES (UNIX, LINUX, WIN NT)

[C] LEARNING OUTCOMES

Upon successful completion of this course you should be able to:

- Describe how computing resources (such as CPU and memory) are managed by the operating system,
- Describe the basic principles and structure used in the design of modern operating systems.
- Describe various file allocation method in file systems,
- Describe techniques for achieving synchronization and deadlock management in an operation system,
- Describe various memory management techniques

[D] RECOMMENDED TEXTBOOKS

1) Operating System Concept: Silbertschatz, Galvin, 5th ed.Addison Wesley.

[E] REFERENCE BOOKS

1) Operating system Concepts: Milan Malinkovic, TMH, 2nd ed.
2) Operating System: William Stallings, PHI, 2nd ed.

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1) Study of UNIX commands with all their important options
2) Program maintenance using make utility.
3) Study system calls related to process & process control
4) Study system calls related to file operations.
5) Study of functions related to threads (POSIX).
6) Inter process communication (POSIX-IPC) using pipe
7) Inter process communication (POSIX-IPC) using shared memory
8) Study system calls related to semaphore.
9) Simulation of Process scheduling algorithm: Feedback policy.
10) Simulation of I/O requests scheduling algorithm: Elevator algorithm
11) Simulation of deadlock handling algorithm: Banker's algorithm
12) Simulation of Memory management algorithm: LRU page replacement algorithm.

IT 608 – LANGUAGE TRANSLATOR
SEM-VI (3rd Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

This course mainly enriches knowledge of

- Concept areas of language translation and compiler design.
- To introduce Languages concepts of and Grammars, Parsing, Semantic Analysis, Intermediate code, Code Generation, Code optimization, Symbol Table management and Programming Paradigms.
- To extend the knowledge of parser by parsing LL parser and LR parser
- To provide practical programming skills necessary for constructing compiler.

[B] DETAILED SYLLABUS

1) LANGUAGE TRANSLATION OVERVIEW

Phases in language translation, overview of system software used during translation – language processors, linker, loader. Types of language processors –assembler, interpreter, compiler etc.

2) COMPILER STRUCTURE

Analysis-synthesis model of compilation, various phases of a compiler.

3) LEXICAL ANALYSIS

Interface with input, parser and symbol table, token, lexeme and patterns. Difficulties in lexical analysis. Error reporting. Implementation. Regular definition, Transition diagrams

4) SYNTAX ANALYSIS

CFGs, ambiguity, associativity, precedence, Top-down parsing-recursive descent parsing, **LL Parser**, transformation on the grammars **(Left recursion, left factoring)**, predictive parsing, Bottom-up parsing, operator precedence grammars, LR parsers (SLR, LR)

5) SYNTAX DIRECTED TRANSLATION
Inherited and synthesized attributes, L- and S-attributed definitions, semantic stacks in bottom- up compilation, action symbols in top-down

6) INTERMEDIATE CODE GENERATION
Intermediate languages, Issues in implementation.

7) RUN TIME SYSTEM
Storage organization, activation tree, activation record, parameter passing, symbol table, static, dynamic and heap storage allocation, garbage collection.

8) SYMBOL TABLE MANAGEMENT
Symbol table organizations for blocked and non-blocked languages.

9) CODE OPTIMIZATIONS
Machine dependent, machine independent optimizations

10) ERROR DETECTION AND RECOVERY

[C] LEARNING OUTCOMES

Upon successful completion of course, a student will be able to:

- To apply the knowledge of lex tool and yacc tool to develop scanner and parser.
- To acquire the knowledge of modern compiler and its feature.
- To use the knowledge of patterns, tokens and regular expression for solving a problem in field of data mining
- To improve performance of program by using code optimization techniques in terms of speed and space.
- To deal with different translators.

[D] RECOMMENDED TEXTBOOKS

1) The theory and practice of Compiler Writing by Jean Paul Tremblay and Paul G. Sorenson
2) Compilers: Principles, Techniques and Tools, By A. V. Aho, R. Sethi, and J. D. Ullman. Publisher Addison-Wesley.

[E] REFERENCE BOOKS

1) Compiler design in C by Allen Holup, Publisher-PHI
2) Compiler Construction by Dhamdhere, Publisher- McMillan India

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1) Study the translation process.
2) Study flex tool.
3) Using flex tool generate scanner for a language.
4) WAP for generating scanner s/w (w/o using any automated tools).
5) Study yacc tool.
6) Implement language processor, using yacc.
7) WAP for Left recursion problem Removal.
8) WAP for Left factoring problem Removal.
9) WAP for First and Follow set computation for LR parser.
10) WAP to implement predictive parser (RDP).

IT 619 – ADVANCE JAVA TECHNOLOGY
SEM-VI (3rd Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

- To construct a web application using Servlet and Java Server Pages
- Develop Database Application
- To construct an enterprise application using Java Beans
- Implement Server-side programming
- Create Network Based Application like RMI.
- Develop dynamic software components
- Develop well-structured Web Application that follows MVC design pattern.
- To deploy web-based applications.

[B] DETAILED SYLLABUS

1) INTRODUCTION TO MVC AND JAVA EE COMPONENTS FOR MVC

MVC Architecture: JavaBean/EJB as model, servlet as controller and JSP as view

2) JDBC

JDBC versus ODBC, JDBC driver types, JDBC URL, Drivers
Two-tier versus three tier models
API: DriverManager, Driver, Connection, Statement, ResultSet
Operations: Insert, Update, Delete, Create, Select
Mapping of SQL data types with Java data types
Scrollable Result Set: Record navigation operations
Updatable Result Set: Insert, Update, Delete
Callable Statement, Prepared Statement

Transaction and Save point mechanism
Enterprise JDBC (Support from Container): Enterprise Resource, DataSource, Connection pooling, JNDI
Introduction to Data Access Object (model)

3) SERVLETS

Introduction and use of Application server (Sun AS and Apache Tomcat).
Web application structure (.war), Deployment Descriptor, packaging, development and deployment
Servlet Life Cycle
Javax. servlet, Javax. servlet. http packages
Request, Response concepts and operations
Variable Scopes: application, session, request
Using JavaBean in Servlet
Parameters: Context, Init
Session Management and Cookies (HttpSession and Cookie objects)
Handling HTTP requests and responses, Handling GET/POST requests
Request Dispatcher
Status codes, errors, Response headers

4) ADVANCED SERVLETS: WEB APPLICATION SECURITY

Introduction to Authentication, Authorization, Confidentiality, and Integrity
Security realm
Declarative Security and configuration
Types of authentications, Implementation of BASIC and FORM based authentication
Implementation of authorization: Mapping of vendor neutral security-role and vendor specific role, define resource/method constraints using security-constraint, use of web-resource-collection, auth-constraint, and user-data-constraint
Introduction to Programmatic Security

5) ADVANCED SERVLETS: SERVLET FILTERS

Intercepting: processing before request and after request
Filter API: Filter, FilterChain, FilterConfig
Filter configuration

6) REMOTE OBJECTS- REMOTE METHOD INVOCATION

RMI concept
Stubs and Marshalling
Interfaces and IDL

IDL compiler – rmic
Naming, lookup, RMI registry and client server program deployment
Introduction and use of RMI security manager, policy files, Downloading of RMI stub files, Distributed Garbage Collection, Remote Callbacks

7) ENTERPRISE JAVA BEANS (2.X SESSION)

What is EJB, EJB architecture, Bean type
Component and Container architecture
Javax.ejb package: Remote and local interfaces and bean class: Home, Object and bean class
EJB structure(ejb.jar), packaging, development, deployment
Life cycle of Session (stateless and stateful)
Session bean (stateful and stateless) development and client development
Introduction to EJB Session bean 3.x.

8) JAVA SERVER PAGES

Syntax and semantics of: Standard action, expression, processing elements, Comments, scriptlets
JSP life-cycle, and Phases of JSP life-cycle
Collection and map management
Using JavaBean in JSP
EL expressions
JSTL
i. Introduction to JSTL concepts: taglib, uri, tld
ii. Core: set, out, redirect, url, import, param, control structures: if, forEach, forToken, choose, array, collection and map management
iii. Databse: setDataSource, query, update, param, transaction
Custom tag Development
i. Tag library structure
ii. Tag interface hierarchy
iii. Life cycle of SimpleTag, IterationTag and BodyTag.
iv. Tag development using SimpleTag, IterationTag and BodyTag. Tag attributes, body handling and manipulation,
v. Introduction to tag files.

[C] LEARNING OUTCOMES

- Java/J2EE to build scalable n-tiered web applications.
- Covers servlets, servlet security, servlet filter, JSP, JDBC database connectivity, Enterprise JavaBeans, and RMI Technologies.
- Develop distributed applications by applying the concept of RMI.

- Session management in Web Application.
- Intercepting requests
- Apply authentication and authorization on Web-application's resources
- Describe how servlets and Java Server Pages (JSP) fit into a Java-based web application architecture.
- Design reusable web application components using JavaBeans.
- Develop and deploy MVC based application.

[D] RECOMMENDED TEXTBOOKS

1) JSP and Servlets: A Comprehensive Study by: Mahesh P. Matha, Publisher: PHI

[E] REFERENCE BOOKS

1) J2EE Complete Reference By: Keogh, James Publication: McGraw-Hill
2) Head First Servlets & JSP, 2nd Edition By: Bryan Basham, Kathy Sierra, Bert Bates, Publication: O-reilly
3) Java Servlet & JSP Cookbook by Bruce W. Perry, Publisher: O'Reilly

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1) Create a GUI based application which can demonstrate the use of JDBC for Database Connectivity.
2) Create a GUI based application which can use for database modification using JDBC
3) Create user registration functionality for student using Servlet.
4) Write a program that demonstrates the use of session management.
5) Write a web application that demonstrates an implementation of servlet filtering.
6) Create a JSP based web application that demonstrates the use of the java bean.
7) Create a JSP based web application which allows the user to edit his/her database information.
8) Write a web application to provide security to web application.
9) Write a web application that demonstrates the use of JSP custom tags.
10) Create a RMI based client-server application.
11) Write a web application for income-tax calculation using session bean

IT 618 – DESIGN PATTERNS AND APPLICATION FRAMEWORKS
SEM-VI (3rd Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

- Students understand core design pattern concepts, which are used by industry in software and application developments
- Students get practical exposure to design pattern-based application development

[B] DETAILED SYLLABUS

1) DESIGN PRINCIPLES AND DESIGN PATTERNS

Design principles, Interface, Abstract class, Inheritance, Polymorphism, Abstract class versus interface, Object composition versus, inheritance, Generic, Types of design patterns, Creational design pattern, Structural design patterns, Behavioral design patterns, Design Patterns, Model View Controller, Singleton, Factory and Abstract Factory, Data Access Object, Prototype, Iterator and Composite, Decorator, Proxy, Adaptor and Facade, Interceptor, Front Controller, Observer and Strategy, Functional Programming

2) CLIENT-SIDE WEB APPLICATION FRAMEWORKS

Web scripting technologies, Device Independent GUI design, Client side "Model View Controller" framework, Asynchronous communication with server

3) SERVER-SIDE WEB APPLICATION FRAMEWORKS

Use of Object Relational Mapping, Server side "Model View Controller" framework, Aspect oriented computing, Inversion of Control, Dependency injection, Request intercepting, Request Filtering and Routing, Session access, Data access.

[C] LEARNING OUTCOMES

- Understanding of philosophy of design pattern (reusable solution pattern)
- Understanding of widely used design patterns
- Understanding and use of design patterns in applied application development frameworks

- Learn framework-based client-side web-application development
- Learn framework-based server-side web-application development

[D] RECOMMENDED TEXTBOOKS

1) Head First Design Patterns by: Eric Freeman
2) Learning JavaScript Design Patterns, by: Addy Osmani, Publisher: O'REILLY
3) Spring MVC Beginner's Guide, by: Amuthan G., Packt Publishing
4) Web Tutorials and e-materials

[E] REFERENCE BOOKS

1) Design Patterns Elements of Reusable Object-Oriented Software, by: Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, Addison-Wesley

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1) Implement programming solution that uses Abstract class, interface, Object composition, and inheritance
2) Implement programming solutions that use following design pattern
    a. Singleton
    b. AbstractFactory
    c. Prototype
3) Implement programming solutions that use following design pattern
    a. Composite
    b. Decorator
    c. Facade
4) Solving programming problems using Java-8 functional programming.
5) Designing and implementing web interface using JavaScript, and CSS
6) Designing and implementing web interface using Bootstrap and customizing CSS
7) Designing and implementing a single page web interface using Angular JS
8) Designing and implementing interactive web interface using AJAX
9) Implement data access in web page using Hibernate
10) Implement relational data access in web page using Hibernate
11) Implement form handling with data binding using SpringMVC
12) Implement form handling with form validation using SpringMVC

AF 601 - PROFESSIONAL COMMUNICATION - II
SEM-VI (3rd Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
1	--	2	1	1	2	50	--	50	--	100

[A] OBJECTIVES OF THE COURSE

- To develop confidence in the students for communicating at workplace.
- Develop their Listening, Speaking, Reading, and Writing Skills.
- To give exposure of communicating with public.
- How to develop fluency in English Language.
- To prepare students for placement.
- To teach how to be effective at the job.

[B] DETAILED SYLLABUS

1) Communication Skills
Intrapersonal Communication, Interpersonal Communication, Importance of Empathy in Communication, Psychological Dealings in Communication, Positive Attitude

2) Team Building
Introduction, Meaning and importance of team, Skills and qualities of a team member, Techniques to be a good team member, Working in Groups, Leadership Qualities, Negotiation Skills, Adjustment level and Flexibility, Understanding Team mates.

3) Effective Self Presentation through LSRW
Listening, active listening, Speaking, Indianism, Presentation, Reading, Speed Reading, Reading Practice, Levels of Comprehension (Evaluative and Applied), Comprehension practice, Writing, Minutes, Notice, Proposal, Report Writing.

[C] LEARNING OUTCOMES:

After completion of this course students will be able to understand:

- Psychological aspects in communication
- Developing Positive Attitude and empathy
- Importance of team and how to work in a team
- Effective Listening, Reading, Writing and speaking skills
- Corporate Communication
- Writing Minutes, Notice, Proposal and Report
- Competence in writing and reading

[D] RECOMMENDED TEXT BOOKS

1) Meenakshi Raman, Sangeeta Sharma. *Technical Communication*: *Principles and Practice*; Oxford University press: New Delhi, 2004.

2) Meenakshi Raman, Prakash Singh. *Business Communication: Second edition;* Oxford University Press: New Delhi, 2012.

3) Steve Hart, Arvind R. Nair, Veena Bhambhani. *Embark: English for Undergraduates;* Cambridge University Press: Delhi, 2016.

[E] REFERENCE BOOKS

1) T M Farhathullah., Communication Skills for Technical Students; Orient Longman Private Ltd.: Chennai, 2002.

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

Not applicable

IT 618A – (ELECTIVE - II) MOBILE COMPUTING
SEM-VI (3rd Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

[B] DETAILED SYLLABUS

1) Introduction to mobile computing. Convergence of Internet, digital communication and computer networks. Sharing of wireless channels: FDMA, TDMA, CDMA. MAC layer issues in wireless communication.

2) Impacts of mobility and portability in computational model and algorithms for mobile environment. Disconnected operation, handling handoffs. Analysis of algorithms and termination detection.

3) Types of Mobility. Mobility in cellular based wireless network: channel allocation, interferences, handoffs and location management. IP mobility: Mobile IP and IDMP

4) Wireless LAN-Infra red vs. radio transmission, infrastructure and ad hoc networks, IEEE 802.11 Personal Area Network: Bluetooth and ZigBee. Network layer issues ad hoc and sensor networks

5) Data delivery models: push and pull. Data dissemination in wireless channels. Broadcast disks. Effects of caching.

6) Indexing in Air, Mobile Databases and transaction

7) Mobile internet connectivity-WAP 1.1, Layers of WAP, Wireless Application Environment, WML and WML Script, wireless telephony application, WAP 2.0 architecture, XHTML-MP (Extensible Hypertext Markup Language Mobile profile)

8) Distributed file system for mobile environment

9) Mobile agents

[C] LEARNING OUTCOMES

[D] RECOMMENDED TEXT BOOKS

1) Wireless Communication: Principles and Practice, by: T. Rappaport, Publisher: Pearson Education.
2) Handbook of Mobile Middleware, by: Paolo Bellavista and Antonio Corradi (Eds.), Publisher: Auerbach Publication.
3) Mobile Computing Principles, by: Reza B'Far (Ed), Publisher: Cambridge University Press.

[E] REFERENCE BOOKS

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

IT 618B – (ELECTIVE - II) COMPUTER GRAPHICS
SEM-VI (3rd Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

[B] DETAILED SYLLABUS

1) **OVERVIEW OF COMPUTER GRAPHICS, GRAPHICS HARDWARE DEVICES, OPENGL.**

2) **BASIC CONCEPTS: COLOR MODELS, ANIMATION**

3) **FUNDAMENTAL MATHEMATICS FOR COMPUTER GRAPHICS**
   Lines and line representations, Vector and affine spaces, Polygons and polygon interiors, Dot and cross products, Planes and plane representations, Line-line and line-plane intersections, Homogeneous coordinates.

4) **ALGORITHMS FOR FUNDAMENTAL 2D GRAPHIC SHAPES; DOT, LINE, RECTANGLE, CIRCLE, ETC.**

5) **ALGORITHMS FOR FUNDAMENTAL 3D GRAPHIC SHAPES, WINDOWING AND 2D/3D CLIPPING.**

6) **2D AND 3D GEOMETRICAL TRANSFORMATIONS: SCALING, TRANSLATION, ROTATION, REFLECTION**

7) **VIEWING TRANSFORMATIONS: PARALLEL AND PERSPECTIVE PROJECTION**

8) **CURVES AND SURFACES: CUBIC SPLINES, BEZIER CURVES, B-SPLINES, PARAMETRIC SURFACES**

9) **FRACTAL PROGRAMMING**

[C] LEARNING OUTCOMES

[D] RECOMMENDED TEXT BOOKS

1) Interactive Computer Graphics: A Top-Down Approach with OpenGL, 5th edition, by: Edward Angel, Publisher: Addison-Wesley, 2008.

[E] REFERENCE BOOKS

1) OpenGL: A primer, 2nd edition, by: Edward Angel, Publisher: Addison-Wesley, 2005.
2) Computer Graphics: Principles & Practices, by: James D. Foley, Andries van Dam, Steven K. Feiner, John F. Hughes, Publisher: Addison Wesley, 2nd edition in C, 1995.

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE

IT 618C – (ELECTIVE - II) DIGITAL SWITCHING SYSTEMS
SEM-VI (3rd Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

[B] DETAILED SYLLABUS

1) Selector switching and dials.

2) Switching principle of step-by-step stronger system.

3) Telephone relays.

4) Subscriber's telephone set and its working.

5) Hunting and selecting circuits.

6) Traffic and trunking.

7) Digital switches.

8) The cellular concept - system design fundamentals.

9) Mobile radio propagation: Large-scale path loss.

10) Mobile radio propagation: Snall-scale fading and multipath.

11) Modulation techniques for mobile radio.

12) Speech coding.

13) Wireless systems and standards (GSM system).

[C] LEARNING OUTCOMES

[D] RECOMMENDED TEXT BOOKS

1) Automatic Telephony, by: P. N. Das, Publisher: D. C. Bose, Modern Book agency Pvt. Ltd.
2) Digital Telephony, by: John C. Bellamy, Publisher: John Wiley & Sons.
3) Wireless Communications Principles and Practice, by: Theodore S. Rappaport, Publisher: Prentice Hall PTR.

[E] REFERENCE BOOKS

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

IT 704 – DATA ANALYSIS & INFORMATION EXTRACTION
SEM-VII (4th Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

- This subject is useful in doing the data mining (extracting the information from the data) which can be used for deriving the information for various departments like sales, inventory management, promotions, productions etc. So that the maximum profit can be made.

[B] DETAILED SYLLABUS

1) INTRODUCTION
An Overview of data warehousing and data mining

1) A MULTI-DIMENSIONAL DATA MODEL
Multi-dimensional Data Cubes, Star, Star Flakes, & Fact Constellation Schema, Concept Hierarchies, OLAP

2) DATA WAREHOUSE ARCHITECTURE
Steps for design and construction of data warehouse, A 3-tier data warehouse architecture, ROLAP, MOLAP, HOLAP.

3) DATA PRE-PROCESSING
Overview, need for pre-processing, Issues related to efficient data handling (Extraction, Transformation, and updating of large databases (ADDED), Data Cleaning, Data Integration & Transformation, Data Reduction, Discretization & Concept Hierarchy Generation

4) DATA WAREHOUSE IMPLEMENTATION
Efficient Computation of Data Cubes, Indexing OLAP Data, Efficient Processing of OLAP Queries, Metadata, Data warehouse Backend Tools & Utilities

5) DATA MINING PRIMITIVES, LANGUAGE, & SYSTEM ARCHITECTURE
What defines a data mining task? A data mining Query Language Architecture of a Data mining System

6) CONCEPT DESCRIPTION: CHARACTERIZATION & COMPARISON

An Overview, Data Generalization & Summarization-Based Characterization Analytical Characterization: Analysis & Attribute Relevance Mining Class Comparisons, Mining Descriptive Statistical Measures, Concept Description & Its Mining

7) MINING ASSOCIATION RULES

Basic Concepts, Market Basket Analysis, mining single-dimensional Boolean Association Rules from transactional database, Mining Multi-level Association Rules from transaction database, Mining multi-dimensional association rules from relational databases and data warehouses. From Association Mining To correlation analysis

8) CLASSIFICATION & PREDICTION

An Overview & Basic Concepts Classification by decision tree induction Bayesian Classification, Classification by Back Propagation, Classification Based on concepts from Association Rules Mining, Other methods, such as Genetic Algorithm, Fuzzy Set Approach, Case Based Reasoning, Etc. Prediction, Classifier Accuracy

9) CLUSTER ANALYSIS

An overview & basic concepts partitioning methods hierarchical method, Density-Based methods, Grid-based methods, Model-based clustering methods, Outlier analysis

10) MINING COMPLEX TYPES OF DATA

Mining Time Series & Sequence Data, Mining Text Databases.

11) TIME SERIES ANALYSIS

Trend analysis Forecasting, Smoothing techniques, Cyclical variation, Seasonal variation, Uses of seasonal index, Irregular variation

[C] LEARNING OUTCOMES

- After learning this subject, the student will be able to learn how to mine the different kinds of data by using the mining algorithms. The information can be retrieved from the data and it can be used to take the managerial decisions. This subject can also be useful to the students in the industry job where one can work with the ETL (Extraction, transformation, load) tools.

[D] RECOMMENDED TEXT BOOKS

1) Data Mining – Concepts & Techniques, by: Jiawei Han & Micheline Kamber, Publisher: Morgan Kaufmann Publishers (2001)

[E] REFERENCE BOOKS

1) Data Warehousing in the Real World, by: Sam Ananory & Dennis Murray, Publisher: Addision-Wesley, (2000)
2) Information Retrieval: Data Structures & Algorithms, by: W. B. Frakes & R. Baeza - Yates, Publisher: Prentice-Hall, New Jersey, (1992).
3) Data mining techniques: For Marketing, Sales, Customer Support, by: Michael J. A. Berry, & Gordon Linoff, Publisher: John Wiley & Sons.
4) Data Mining, by: Pieter Adriaans, & Dolf Zantinge, Publisher: Pearson Education Asia (2001).
5) Statistics for Business & Economics, by: Jit S. Chandan, Publisher: Vikas Publishing. (1999)

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1) Introduction to python programming for data mining
2) To perform data pre-processing using pandas package in python
3) To perform statistical analysis and visualization of data using pandas and matplotlib in python. (mean, mod, median, standard deviation, variance, correlation, bar chart, line chart, pie graph, histogram, box plot, scatter plot)
4) To build multi-dimensional data warehouse model using relational database system (Generate sales fact table and item, location, and time dimension tables, add no. of units sold and total revenue as measures, Populate model with suitable database)
5) To perform various OLAP operations on data warehouse using SQL queries (slice, dice, roll up, drill down, pivot)
6) To perform association rule mining using orange and mlextend packages in python
7) To perform Decision Tree Classification (DCT) using sklearn package in python
8) To perform Navie Bayes and K-NN (k-nearest neighbor) classification using sklearn package in python
9) To perform KMeans and DBSCAN clustering using sklearn package in python
10) To perform text mining using textblob in python (TF-IDF generation, sentiment analysis, word-cloud, POS tagging)

LAB WORK BEYOND CURRICULA

11) To perform Classification using neural network with tensorflow package in python
12) To perform Hierarchical clustering using sklearn package in python.

IT 707 – SYSTEM DESIGN PRACTICE
SEM-VII (4th Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
--	--	2	--	1	1	--	--	25	25	50

- Students have to develop in-house mini project. This will help them to get prepare for their final semester project. They are supposed to prepare and submit a project report as a part of their term work.

- They are to be examined based on viva and/or demonstration.

IT 714 – KNOWLEDGE SYSTEM
SEM-VII (4th Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

At the end of the course, the students will be able to:

- Understand various AI searching techniques (uninformed (Blind), informed, heuristic, constraint satisfaction, Minimax algorithm, genetic algorithms).
- Understand the characteristics of the problems and their solutions.
- Apply knowledge representation, reasoning techniques to real-world problems.
- Deal with uncertain, fuzzy and probabilistic data.
- Understand work and purpose of expert system.
- Understand the work and role of each phase of Natural Language Processing.
- Use PROLOG programming language to implement expert systems.

[B] DETAILED SYLLABUS

1) INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Introduction problems, problem space, production systems, problem characteristics

2) PROBLEM SOLVING BY SEARCH

Uninformed search techniques (Breadth-first search, Depth-First search, Depth Limited Search, iterative deepening search), Heuristic search techniques (Generate and test, Hill climbing, Simulated annealing, Best first search A* algorithm, Constraint satisfaction, Means-end-analysis), Adversarial search techniques (Game playing, MINIMAX algorithm, alpha - Beta pruning)

3) KNOWLEDGE REPRESENTATIONS AND REASONING

Propositional Logic, predicate logic, Instance and is a relationship, representation in slot and filter systems: semantic net, frames, Conceptual dependency, scripts. Rule based system, procedure versus declarative knowledge, forward versus backward reasoning, unification, resolution, Knowledge representation in data processing & conventional database system, functional approach, Monotonic and Non-

Monotonic logic, theory of dealing with uncertainty.

4) FUZZY LOGIC

Definition, need fuzzy set, fuzzy operators, fuzzy control systems, limitations

5) NATURAL LANGUAGE PROCESSING

Introduction to NLP, NLU, phases of NLP (Morphological analysis, syntactic analysis, semantic analysis, discourse integration), introduction to Machine Translation.

6) EXPERT SYSTEM

ES architectures, representation and use of domain knowledge, expert system shells, knowledge acquisition.

7) KNOWLEDGE REPRESENTATIONS IN PROGRAMMING LANGUAGE: PROLOG

Facts and predicate, data types, goal finding, backtracking, simple object, compound objects, use of cut and fail predicates, recursion, lists, simple input/output, Static and dynamic database, arithmetic and string operations, file handling.

[C] LEARNING OUTCOMES

After completing this course, the student must demonstrate the knowledge and ability to:

- Understand the fundamentals of knowledge representation techniques (logicbased (Propositional and predicate), rule-based, frame-based, script- based, semantic nets), inference and theorem proving.
- Represent the real-world problem using difference knowledge representation techniques and finding solution using one of the search techniques with respect to the type of problem.
- Demonstrate working of reasoning in the presence of incomplete and/or uncertain information (data).
- Distinguish between backward and forward chaining.
- Use data structures and predicates provided by PROLOG.
- Know how to design rules for knowledge-based systems or Expert System and implement it in PROLOG by defining rules, clauses, and predicates.
- Use PROLOG as an artificial intelligence programming language to implement simple rule-based expert system.
- Design and implement a simple Fuzzy Control System.

[D] RECOMMENDED TEXT BOOKS

1) Artificial Intelligence by: Elaine Rich and Kevin Knight, Publisher: TMH
2) Introduction to Turbo PROLOG by: Carl Townsend, Publisher: BPB
3) Introduction to knowledge base systems by: R. A. Frost, Publisher: Macmillan

[E] REFERENCE BOOKS

1) Artificial Intelligence: A Modern Approach, by: Stuart Russell and Peter Norvig, Publisher: PHI
2) Artificial Intelligence and Expert System, by: D. W. Patterson, Publisher: PHI
3) Introduction to Applied Fuzzy Logic, by: Ahmad Ibrahim, Publisher: PHI
4) Introduction to Artificial Intelligence, by: Charniak and Mcdermott, Publisher: Addison-Wesley, 1985.
5) Essentials of Artificial Intelligence, by: Matt Ginsberg, Publisher: Morgan Kaufmann, 1993.
6) Artificial Intelligence, 3rd Edition, by: Winston, Publisher: Addison Wesley, 1992.
7) Artificial Intelligence: A Modern Approach, by: Stuart Russell and Peter Norving Publisher: Prentice Hall, 1995

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1) Study of Turbo Prolog features and format
2) WAP [write a program(s)] Using variables in Prolog.
3) WAP for Usage of rules in Prolog.
4) WAP for Using Input, Output and fail predicates in prolog.
5) Write programs for studying Usage of arithmetic operators in Prolog.
6) Write a program to study Usage of cut(!), not, fail predicates in prolog.
7) Write a program to study usage of recursion in prolog.
8) Write programs to study usage of logical, arithmetic and string operators in Prolog
9) Write programs to study Usage of compound object and lists in prolog.
10) WAP to study Usage of dynamic database in prolog

IT- 717 – DISTRIBUTED COMPUTING
SEM-VII (4th Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

- Students understand different paradigms to implement distributed applications, Service Oriented Architecture, Grid Computing and Grid Services, which are widely used by industry in software and application developments.
- Students get practical exposure to Distributed Paradigms, Service Oriented Architecture and CORBA.

[B] DETAILED SYLLABUS

1) TCP, UDP

2) Socket Programming on Unix Socket Options

3) Fundamentals of Distributed Computing

4) Event Synchronization

5) Distributed Computing Paradigms

6) Distributed Objects

7) Advanced Distributed Computing Paradigms

8) Value Of SOA, Characteristics Of SOA

9) SOA Concepts (XML Standards, Web Services Service Design Principles, SOAP, WSDL, UDDI, Security)

10) Basic SOA Architecture [SERVICES, BPEL, ESB, SOA Life Cycle, Open Standards]

11) Building SOA Applications

12) RESTFul web-services

13) Microservices

14) Data-intensive Computing (Hadoop Distributed File System, Map-Reduce Programming)

15) Message Driven Programming (Using JMS)

[C] LEARNING OUTCOMES

- Understanding of philosophy of Distributed Paradigms (reusable solutions to application development)
- Understanding of widely used Service Oriented Architecture, Web Services and Service composition.
- Understanding and use of different distributed paradigm in applied application development frameworks (Open Source).

[D] RECOMMENDED TEXT BOOKS

1) UNIX Network Programming, by: W. Richard Stevens, Publisher: Prentice Hall Publication
2) Distributed Computing: Concepts & Applications, by: M. L. Liu, Publisher: Addison Wiselly.
3) Distributed Computing in Java 9 by: Raja Malleswara Rao Pattamsetti, Publisher: Packt Publishing Limited.

[E] REFERENCE BOOKS

1) SOA: Principles of Service Design, by: Thomas Erl, Publisher: Prentice Hall.
2) Distributed Operating Systems: Concepts and Design, by: Pradeep K. Sinha, Publisher: PHI Publication.
3) Distributed Systems: Concepts and Design, 4th Ed., by: George Coulouris, Jean Dollimore and Tim Kindberg, Publisher: Addison Wesley.

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1) a) Implement concurrent echo client-server application
b) Implement concurrent day-time client-server application.
2) Configure following options on server socket and tests them: SO_KEEPALIVE, SO_LINGER, SO_SNDBUF, SO_RCVBUF, TCP_NODELAY
3) Data Representation and Data Validation: XML Schema and XML instance document, JSON
4) WSDL based webservice and its monitoring: Implement ArithmeticService that implements add and subtract operations / Java based: Implement TrigonometricService that implements sin, and cos operations. Monitor SOAP request and response packets. Analyze parts of it and compare them with the operations (java functions) headers.
5) Design and test BPEL module that composes ArithmeticService and TrignometricService.
6) Deployment of a HADOOP cluster and monitoring status of its components
7) Perform data intensive computing using map-reduce based programming on a HADOOP cluster.

8) Create Restful Webservice and test it using Postman
9) Create Microservice based application using Spring Boot
10) Implementation JMS based application using Publish-Subscribe paradigm

LAB WORK BEYOND CURRICULA

11) Test open source ESB using web service.
12) Implementing Stateful grid services using Globus WS-Core-4.0.3
13) Configuring reliability and security options.

IT 719 – WEB TECHNOLOGY
SEM-VII (4th Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

- Objectives of the course are to give understating of ASP.NET, C#.NET, MVC framework, .Net framework.

[B] DETAILED SYLLABUS

1) INTRODUCTION .NET PLATFORM
Featuring of .Net Platform Components of the .Net Platform

2) INTRODUCTION TO ASP.NET
Creating ASP.NET application Managing Application State, Using Applications Events during Http protocol request, configuring sessions, Store & retrieves data using a cookie, Pass user information between pages

3) INTRODUCTION C#.NET
Developing application using C#.NET, Partial class, Collection, Lists, Arrays, Strings, Events, Delegates, Threading, Exception handling, Networking, File I/O, Generic

4) SEPARATE CODE FROM CONTENT WITH HTML CONTROLS
Implement Post back Form, increase code separation with code-behind file, increase modularity with a user control, Creating a subscription post back form with a user control

5) WORKING WITH MASTER PAGE IN WEB APPLICATION
Building and consuming Xml Web services Transport protocols for Web services Overloading web methods**,** Caching web services for responses

6) ASP.NET SERVER CONTROLS
Server-side processing in ASP.NET Using HTML controls, Using ASP.NET Standard controls (BulletedList, Multiview and View,

ImageMap, Wizard, Substitution, HiddenField, FileUpload), Using ASP.NET and Login Controls Using ASP.NET Validation controls Using ASP.NET Navigation controls

7) DATA BINDING IN ASP.NET USING DATA SOURCE CONTROLS

Using bound list controls with data source controls, GridView, DetailView, FormView, DataList, DropDownList, TreeView, Menu, Adrotator

8) CONFIGURE AN ASP.NET APPLICATION

Debugging and Error handling Techniques for ASP.NET application, Common configuration settings like authentication, authorization, custom errors, connection strings

9) DATA MANAGEMENT WITH ADO.NET

Basic ADO.NET features, Using Connection, Command, DataReader, DataAdapter object Using Parameters, DataSet and DataTable, Display data from Database, Usage of Web control to access database Customize data bound result using style sections Modify data with SQL statements, Manipulating data within ADO.NET

10) CACHING

Cache page output, cache object data, Cache user control, Web Designing and Testing

11) PACKAGING AND DEPLOYING ASP.NET WEB APPLICATION

[C] LEARNING OUTCOMES

After completion of the course students should be able understand following

- Microsoft Framework Architecture
- OOP using C#.NET
- Create a web application using .NET
- Developing Website using MVC and three-tier architecture.
- Development of Web Service and Consume Web Service

[D] RECOMMENDED TEXT BOOKS

1) Professional ASP.NET 2.0, by: Bill evjen, Scott hanselman, Farhan muhammad, Srinivasa sivakumar, Devin rader, Publisher: Wrox Pub.
2) Complete Reference C#, by: Herbert Schildt, Publisher: McGraw-Hill Education

[E] REFERENCE BOOKS

1) Beginning ASP.NET 2.0 with Visual C#.NET 2005, by: Chris Hart, John Kauffman, David Sussman, and Chris Ullman, Publisher: Wrox Pub

2) Beginning ASP.NET 2.0 in C# 2005: From Novice to Professional, by: Matthew MacDonald, Publisher: Apress

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1) Create an application in which you are required to get the user profile information with help of standard asp.net server controls.

2) Extend the User profile Application which allow user to select the Material Status and Hobbies.

3) Implement the calculator with the help of the Command argument and command name properties of the button control.

4) Create Run time Table Control as per user requirement and display it on the page.

5) Create an Application which has Image, Image map and Image Button.

6) Extend the user Profile Application in which user is Allowed to select the Date of Birth from the Calendar Control.

7) Extend the User Profile Application where User must have to Pass All the validation.

8) (i) Create A master page and content Page Application for the University which enables user to see the faculty list according to department.
(ii) Create an application in which user is allowed to upload the file on the server.

9) Create an application in which user has to display records in the Grid View Control from Table created in access data base. (With the Help of Oledb Classes or AccessDataSource Control).

10) Create the Sign In, Sign Up and Update Application

11) Create Application in which user is able to Submit his Profile with help of the Wizard and Multi View Control.

12) (i) Use the Asp Nevigation control that allows user to navigation and selection facility the pages of Web site.
(ii) Create an application which display the advertisement through Ad rotator Server Contrl.

13) (i) Create cache application in which, there should be implementation of File-based dependency, key-based dependency, Time-based dependency.
(ii) Create application which uses Standard Login Control to The Web Application.

14) (i) Create the Application which gets the user profile from the user with the help of the user control.
(ii) Create An application which allows user to have Chat on two different pages.

15) (i) Create A simple windows Application.
(ii) Deploy a web site on Local IIS server.

IT -718 – (ELECTIVE- III) E-COMMERCE AND E-SECURITY
SEM-VII (4th Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

- The objective of this course is to learn what is ecommerce and how it works including e-commerce terminology and various security algorithms that to be use in practice of integrated tools for web development, database management, electronic signatures and encryption.

[B] DETAILED SYLLABUS

1) INTRODUCTION TO E-COMMERCE
Introduction to E-Commerce, Transactions on E-Commerce, Requirements of Security on E-Commerce

2) E-COMMERCE TERMINOLOGY, FRAMEWORK, PAYMENT SCHEME ETC.
Concept of terms related to commerce in general & E-commerce in particular Buyer seller market. Framework of B2B, B2C, C2C, E-Com models.

3) SECURITY POLICY AND SECURITY OVERVIEW.

4) CONVENTIONAL ENCRYPTION TECHNIQUES
Introduction, Basic encryption techniques, simplified DES, block cipher mode of operation, traffic confidentiality and key distribution, Random Number Generation.

5) PUBLIC KEY CRYPTOGRAPHY
RSA algorithm, Key management, Elliptic Curve Cryptography, Diffie-Hellman Key Exchange

6) MESSAGE AUTHENTICATION AND HASH FUNCTIONS
Authentication requirement, Functions, Message Authentication Code (MAC), Hash Functions (SHA-1), Digital signature standard DSS).

7) NETWORK SECURITY
Authentication Protocols Like Kerberos, X.509 Directory Authentication Services.

8) IP SECURITY E-MAIL SECURITY
IP security overview, architecture, authentication header, Encapsulation security payload, S/Mime, Web security, Firewall.

9) SAFE ELECTRONIC COMMERCE
Secure transport protocol, secure E-payment protocol, secure electronic transaction.

10) ELECTRONIC PAYMENT AND BANKING SYSTEM
Security Issues in E-commerce, Digital token based Electronics Payment System (EPS), Risks involved in designing EPS, Applications of Electronic Data Interchange (EDI) in Business, Introduction of Electronic Banking in Business (Definition of Electronic Banking, Types of Electronic Banking, Advantages and Drawbacks of Electronic Banking, Risks and Challenges of Electronic Banking), Emerging technologies in E-commerce (Block Chain).

[C] LEARNING OUTCOMES

- The student must be able to present an e-commerce project by creating a business plan and discuss about how different actors within electronic trade earn money and apply this within the own project. Students should handle technical aspects in the creation of electronic trade by using tools for electronic trade such as databases, platforms/frameworks for web applications and electronic signatures.

[D] RECOMMENDED TEXT BOOKS

1) Cryptography and Network Principles and Practice, by: William Stallings, Publisher: Pearson Edu. 2003
2) Web Commerce Technology Handbook, by: Daniel Minoli and Emma Minoli, Publisher: TMH (1999)

[E] REFERENCE BOOKS

1) E-commerce: Business, Technology, Society, by: Kenneth C. Laudon, Publisher: Pearson Edu. Asia
2) E-Commerce: A managerial Perspective, by: P. T. Joseph, Publisher: PHI (2003).
3) E-Commerce with Net. Commerce, by: Samantha Shurety, Publisher: Pearson Edu. Asia.
4) Current Trends of I. T. and Cyber Security by: Er. Kailash Aseri and Mr. O.P. Gera. Publisher: Horizon books.

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1) Implement Ceaser and mono alphabetic cipher
2) Implementation of Play Fair cipher

3) Implementation of Hill cipher.
4) Implementation of S-DES algorithm for data encryption along with key generation of S-DES
5) Write a program to generate and exchange keys using client server mechanism.
6) Perform Encryption, Authentication and both using RSA. (Use public key shared in above practical)
7) Write a program to implement Diffie-Hellman Key exchange algorithm and perform encryption and decryption
8) Write a program to authenticate a user with system using MD5 or SHA-1 Hashing technique.
9) Configure VPN using packet tracer and demonstrate the importance of IPSec
10) Create Self Signed Certificate and configure it for website.

LAB WORK BEYOND CURRICULA

11) Study of Kerberos protocol using Linux.
12) Study of HMCA hash function and implement the hash code using HMAC

IT 718A – (ELECTIVE- III) INTRODUCTION TO NEURAL NETWORKS
SEM-VII (4th Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

[B] DETAILED SYLLABUS

1) INTRODUCTION
Human brain and models of neuron, neural network architecture, knowledge representation, artificial intelligence and neural network.

2) LEARNING PROCESS
Introduction to machine learning, error correction, memory-based learning, Hebbien learning, competitive learning, Boltzmann, learning, self-learning, memory and adoption, statistical learning theory.

3) SINGLE LAYER PERCEPTION
Introduction adaptive filtering problem, unconstrained optimization techniques, perception, perception convergence theorem, relation between perception and Bays classifier for a Gaussian environment.

4) MULTILAYER PERCEPTION
Back propagation algorithm, output representations and decision rule, feature detection, back propagation and differentiation, Hessien matrix, accelerated convergence of back propagation learning, supervised learning, convolutional networks.

5) RADIAL BASIS FUNCTION NETWORKS
Cover's theorem and separability of patterns, interpolation problem, regularization networks, radial basis function (RBF) networks, comparison of RBF network and multi-layer perception.

6) SUPPORT VECTOR MACHINE
Optimal hyper plane linear separability patterns, optimal hyper plane for non-separable patterns, support vector machine for pattern recognition, e-insensitive loss function, support vector machine for nonlinear regression

7) SELF-ORGANIZATION MAPS

Two basic feature-mapping models, self-organization Map(SOM), SOM algorithms, linear vector quantization, hierarchical vector quantization.

8) STOCHASTIC MACHINES

Statistical mechanics, Markov chain, metropolis algorithm, simulated annealing, Gibbs sampling, Boltzmann machine, sigmoid belief networks, deterministic machines.

9) NEURAL NETWORK APPLICATIONS

Signature recognition, voice recognition, netALk etc.

[C] LEARNING OUTCOMES

[D] RECOMMENDED TEXT BOOKS

1) Neural Network, 2nd edition, by: Simon Haykin, Publisher: Pearson Edu.

[E] REFERENCE BOOKS

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

IT 718B – (ELECTIVE- III) DIGITAL IMAGE PROCESSING
SEM-VII (4th Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

[B] DETAILED SYLLABUS

1) INTRODUCTION
Fundamentals, Applications; Image processing system components, Image sensing and acquisition, Sampling and quantization, Neighbors of pixel adjacency connectivity, regions and boundaries; Distance measures

2) IMAGE ENHANCEMENT
Frequency and Spatial Domain, Contrast Stretching, Histogram Equalization, Low pass and High pass filtering.

3) IMAGE RESTORATION
Noise models, mean, order-statistics, adaptive filters. Band reject, Band pass and notch filters.

4) COLOUR IMAGE PROCESSING
Colour models; Pseudo colour, Image processing; colour transformation, segmentation.

5) WAVELETS AND MULTI-RESOLUTION PROCESSING
Image pyramids, sub-band coding, Harr transform; multi resolution expression, Wavelet transforms.

6) IMAGE COMPRESSION
Fundamentals; models; error free and lossy compression; standards.

7) MORPHOLOGICAL IMAGE PROCESSING
Boundary extraction; region filtering; connected component extraction; convex hull; Thinning; Thickening; skeletons; pruning;

8) IMAGE SEGMENTATION
Boundary detection-based techniques, Point, line detection, Edge detection, Edge linking, local processing, regional Processing

[C] LEARNING OUTCOMES

[D] RECOMMENDED TEXT BOOKS

1) Digital Image Processing, Second Edition, by: Rafel C. Gonzalez and Richard E. Woods, Publisher: Pearson Education

[E] REFERENCE BOOKS

1) Fundamentals of Digital Image Processing, by: A. K. Jain, Publisher: PHI

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

IT 718C – (ELECTIVE- III) CLOUD COMPUTING
SEM-VII (4th Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

- To understand and analyze the components of cloud computing.
- To introduce the various levels of services that can be achieved through cloud computing.
- To understand the concept of Virtualization and cloud data storage.
- To analyze the case studies to derive the best practice model to apply when developing and deploying cloud-based applications.

[B] DETAILED SYLLABUS

1) Unit - I

Overview of cloud computing

What is a cloud computing, Definition of cloud computing, characteristics of cloud computing, driving factors towards cloud computing, Comparing grid with cloud and other computing systems, workload patterns for the cloud, Benefits and drawbacks of cloud computing

Cloud computing concepts

Elasticity and scalability, Virtualization, Characteristics of virtualization, Benefits of virtualization, Virtualization in cloud computing, Hypervisors, Multitenancy, Types of tenancy, Billing and metering of services

Cloud service delivery

Infrastructure as a service (IaaS) architecture, Platform as a service (PaaS) architecture, Software as a service (SaaS) architecture. Examples of IaaS, Paas and SaaS applications. SLA Management in Cloud Computing, Service providers - Google App Engine, Amazon EC2, Microsoft Azure, Sales force.

Cloud deployment scenarios

Cloud deployment models, Private Cloud, Public cloud, Hybrid cloud, Community Cloud, Virtual private cloud, Economics of choosing a Cloud platform for an organization based on application requirements, economic constraints and business needs (e.g Amazon, Microsoft, Google, Salesforce.com, Ubuntu and Redhat), Benefits and drawbacks of each deployment model.

2) **Unit - II**

Server Virtualization

Basics of Virtual Machines, Process Virtual Machines, System Virtual Machines, Taxonomy of Virtual Machines; Virtualization Management; Hypervisor, Types of Hypervisors, Examples of Hypervisors, Full Virtualization, Para-virtualization, Hardware Assisted Virtualization. Virtual Machines Provisioning and Manageability, Virtual Machine Migration Services. Hypervisors – Xen, KVM, VMWare, Virtual Box, Hyper-V.

Network Virtualization

Understanding the role of Network Virtualization, Virtualization of NIC, VMware NSX, Microsoft Hyper V Network Virtualization, Open VSwitch (KVM)

Storage Virtualization

Architecture of storage, analysis and planning. Storage network design considerations; NAS and SAN, hybrid storage networking technologies (iSCSI, FCIP, FCoE), Global storage management locations, scalability, operational efficiency

3) **Unit - III**

Data Centre Design

Design for flexibility, scalability, environmental control, electrical power, flooring, fire protection, security, network infrastructure. Energy use and greenhouse gas emissions. Requirements for modern data centers. Data Centre Architectures: ToR, EoR.

Programming Model

Introduction to Hadoop Framework –HDFS and Mapreduce, Input splitting, map and reduce functions, specifying input and output parameters, configuring and running a job – Design of Hadoop file system

Cloud Economics

Metering, Monitoring and Pricing, Viability of Cloud.

Cloud Programming

Cloud programming frameworks, cloud interfaces, Interoperability and standards

Security in Cloud

Security Architecture Design, Identity and access management architecture, Isolation of users/VMs from each other, Data Security, Application Security, Virtual Machine Security, Virtualization System-Specific Attacks: Guest hopping, attacks on the VM (delete the VM, attack on the control of the VM, code or file injection into the virtualized file structure), VM migration attack, hyperjacking

4) **Unit - IV**

Case Study

Eucalyptus, Open Nebula, Open Stack and others.

[C] COURSE OUTCOME

- Understanding of different layers of cloud computing and the various deployment and service models of Cloud Computing.
- To provide insights into the virtualization technologies: Hypervisor, emulation, and application VM. Platform virtualization, storage

virtualization, and network virtualization.

- To understand security concerns of Cloud Computing
- To develop ability to create cloud computing environments.

[D] RECOMMENDED TEXT BOOKS

1) Cloud Computing Principles and Paradigms, by: Rajkumar Buyya, James Broberg, Andrzej Goscinski, Publisher: Wiley.
2) Cloud Computing: Implementation, Management, and Security, by: John W. Rittinghouse and James F. Ransome, Publisher: CRC Press.
3) Mastering Cloud Computing, by: Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi, Publisher: Tata McGraw Hill.
4) Virtualization: A Beginner's Guide, by: Danielle Ruest and Nelson Ruest, Publisher: McGraw Hill.
5) Cloud computing Black Book, by: Kailash Jayaswal, Jagannath Kallakurchi, Donald J. Houde, Deven Shah, Publisher: Dreamtech Publication.
6) Cloud Computing Bible, by: Barrie Sosinsky, Publisher: Wiley.
7) Enterprise Cloud Computing, by: Gautam Shroff, Publisher: Cambridge.

[E] REFERENCE BOOKS

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1) Study of Logical Volume Manager (LVM)
2) Study and Installation of Virtualization Software and its components Installation of KVM, VMWare, Oracle Virtualbox software
3) Study of Virtual Network and its types (Bridge Networking, Host Networking, Private Networking)
4) Study and installation of Storage as Service cloud computing environment (using FreeNAS/ownCloud).
5) User Management in SAAS Cloud Computing Environment (using ownCloud)
6) Private cloud Installation (OpenStack)
7) Private cloud Administration (OpenStack: IP Address configuration, Image Management, Security groups, Firewall)
8) Usage of private cloud (OpenStack)
9) Web Application Development and Testing in IAAS cloud environment (using putty, filezilla, SCP)
10) Study and Installation of Hadoop and its components
11) Case study on Amazon EC2 / Microsoft Azure / Google's App Engine

IT 718D – (ELECTIVE- III) MOBILE APP. DEVELOPMENT
SEM-VII (4th Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
4	--	2	4	1	5	60	40	25	25	150

[A] OBJECTIVES OF THE COURSE

- Learn application development for android platform using core android components, asynchronous communication, and other features.
- Learn creating android apps interacting with various external services
- Manage user data and multimedia on a mobile device via the Android framework libraries.
- Use the sensors available on mobile devices to enhance user interaction and feedback

[B] DETAILED SYLLABUS

1) ANDROID OS AND APPLICATION DEVELOPMENT ENVIRONMENT

Architecture of Android OS, Linux Kernel and processes, Display driver, keyboard driver, WiFi driver, Flash memory driver, Audio driver, Camera driver, Power management, Android OS & GUI architecture, Android Runtime, Android API and Java Interface, Android boot process, safe mode, recovery mode, Application Development Environment, Android SDK and components, Emulator, Android Studio, Gradle build, Android Project structure and files

2) BUILDING BASIC INTERACTIVE APPLICATION

Activity and Lifecycle, Resources, Basic User Interface, Layouts, Relative, Linear, Grid, Layout configuration parameter and units, GUI widgets, Event handling, Async tasks, multithreading, splash screen, etc.

3) ADVANCED GUI HANDLING

Menus, Data organization using Views and Adapters, List View, Grid View, Adapters, Modular design using Fragments, Fragment lifecycle, Various fragments, Layout, Other interaction Components, Action bars, Activity, Intent, and Application Navigation, Tabs, Dialog boxes, Android Services, Log, Toast messages, Notification

4) DATA PERSISTENCE: FILE, DATABASE

Database, SQLite, Storage of user data, Read/write files (internal storage, SD card), Preferences.

5) **GRAPHICS, IMAGE, AND MULTIMEDIA**
Graphics, Canvas and 2D drawing, Manipulating Graphics, Animation, Image & Video handling handling, Open resource using Intent, Access Camera, Create and Play image files, Play audio file, Create and Play video files

6) **USE OF DEVICES AND SENSORS**
GPS, Accelerometer, Compass, Wi-Fi, Bluetooth

7) **EXTERNAL SERVICES**
Barcode, QR code reading, GET, POST, Services, RESTful Web Services, JSON data, Single-Sign on, Maps, Email, SMS, USB Debugging, Android Debug Bridge (adb), App deployment on playstore

[C] COURSE OUTCOME

- Knowledge of (Android Studio) and Android Software Development Kit (SDK) for implementing Android applications.
- Understanding of lifecycle methods of Android application components, use of Components, and event handling.
- Understanding of graphics and multimedia support in Android.
- Understanding of how to interact with external devices and services.

[D] RECOMMENDED TEXT BOOKS

1) Head First Android Development, by: Dawn Griffiths and David Griffiths, Publisher: O′Reilly.
2) Beginning Android Programming with Android Studio, by: J F DiMarzio, Publisher: Wrox, Wiley Brand

[E] REFERENCE BOOKS

1) https://developer.android.com/training/index.html

[F] LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1) Installation, configuration, and study of android development environment and its required dependency components/software
2) Implement an app to demonstrate use of basic GUI widgets and event handling
3) Implement an app to demonstrate data organization using Views and Adapters
4) Implement an app to demonstrate use of fragments, application navigation, and toast messages
5) Implement an app to demonstrate use of SQLite and Preferences
6) Implement an app to demonstrate use of Graphics API, Camera access, and Gallery Intent
7) Implement an app to demonstrate use of splash screen, audio file, and Async task

8) Implement an app to demonstrate use of GPS and Wi-Fi devices
9) Implement an app to demonstrate use of Web Service using JSON data format
10) Perform debugging using Android Debug Bridge

AF 801 – PROJECT/INDUSTRIAL TRAINING
SEM-VIII (4th Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
--	--	28	--	14	14	--	--	300	100	400

[A] DETAILED SYLLABUS

The students will undertake project work for the period of full semester. They should design/develop a software system, which may involve integration with hardware also. They may also undertake project work involving study and analysis of existing systems in the industry and suggest and implement for improvement. The students may be sent to the industry for their project work. Students have to follow standard software devolvement process of software, which include phases such as requirements gathering, system analysis, system design, implementation, testing, user manual preparation and documentation. The faculty may arrange visits at the places where the students are performing their project work.

Students are supposed to prepare and submit a project report as a part of their term work and are required to give seminars on their work. Students have to timely report to the institute regarding monitoring and necessary guidance.

Students are to be examined based on viva and/or demonstration. Students should arrange for demonstration of the project work, if any.

AF 802 – SEMINAR
SEM-VIII (4th Year)

Department of Information Technology
Faculty of Technology, Dharmsinh Desai University

Teaching Scheme			Credit Structure			Exam Scheme				
LECTURE	TUTORIAL	PRACTICAL	L+T	P	TOTAL	THE.	SESS.	PRAC.	T/W	TOTAL
--	--	08	--	04	4	--	100	--	--	100

[A] DETAILED SYLLABUS

Students need to give seminars of their project/industrial training work.

B. TECH. SEMESTER – I (EC/CE/IT)
SUBJECT: MATHEMATICS – I

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	-	4	4	60	40	-	-	100

Reference Code:BSC102

A. COURSE OBJECTIVES

The objective of this course is to familiarize the prospective engineers with techniques in calculus, matrices, vector spaces and multivariable calculus

B. DETAILED SYLLABUS

Unit **Topic(s)**

[1] CALCULUS

Evolutes and involutes, Evaluation of definite and improper integrals; Beta and Gamma functions and their properties, Applications of definite integrals to evaluate surface areas and volumes of revolutions. Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin's theorems with remainders; Indeterminate forms and L'Hospital's rule, Maxima and minima.

[2] MATRICES

Matrices, Vectors: addition and scalar multiplication, matrix multiplication; Rank of a matrix, Linear systems of equations, Determinants, Cramer's Rule, Inverse of a matrix, Gauss Elimination and Gauss Jordan method.

[3] VECTOR SPACES

Eigenvalues, Eigenvectors, Symmetric, Skew-symmetric, and Orthogonal Matrices, Linear Independence of vectors, Diagonalization.

[4] MULTIVARIABLE CALCULUS (Differentiation)

Limit, Continuity and Partial derivatives, Directional derivatives, Total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Vector Differential Calculus; Gradient, curl and divergence.

C. RECOMMENDED TEXT/ REFERENCE BOOK

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 40th Edition, 2007.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.

3. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005
5. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
6. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
7. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxi Publications, Reprint, 2010.
8. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East–West press, Reprint 2005.

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Solve engineering problems involving calculus, matrices and vector space.
- Use mathematical tools to solve problems in calculus, matrices and vector space.

B. TECH. SEMESTER – I (EC/CE/IT)

SUBJECT: BASIC ELECTRICAL ENGINEERING

Teaching Scheme (Hours/Week)				Credit	Examination Scheme				
Lect	Tut	Prac	Total	s	Ext	Sess.	TW	Prac	Total
3	1	2	6	5	60	40	50*	-	150

Reference Code ESC104

*TW Marks include Viva based on TW

A. COURSE OBJECTIVES

The course imparts an in-depth understanding of the fundamental concepts with an objective to expose the students to the various types of electrical, electronic and magnetic circuits and their applications. This course is designed to provide knowledge of fundamentals and various laws in electromagnetic and magnetic circuits, and electrostatics.

B. DETAILED SYLLABUS

Unit **Topic(s)**

[1] DC CIRCUITS

Electrical circuit elements (R, L, and C), the impact of temperature, voltage, and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems; Time-domain analysis of first-order RL and RC circuits.

[2] AC CIRCUITS

Representation of sinusoidal waveforms, peak and RMS values, phasor representation, real power, reactive power, apparent power, power factor; Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance; Three-phase balanced circuits, voltage and current relations in star and delta connections.

[3] ELECTRO-MAGNETIC INDUCTION

Introduction, Magnetic effect of electric current, Current carrying conductor in the magnetic field, Law of electromagnetic induction, Induced emf, Self-Inductance (L), Mutual Inductance (M), and Coupling coefficient between two magnetically coupled circuits (K), Inductances in series and parallel.

[4] MAGNETIC CIRCUITS

Introduction, Definition of Magnetic quantities, Magnetic circuit, Leakage flux, Fringing effect, Comparison between magnetic and electric circuits.

[5] TRANSFORMERS

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation, and efficiency; Auto-transformer and three-phase transformer connections.

[6] ELECTRICAL MACHINES

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic; Loss components and efficiency, starting and speed control of induction motor; Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited DC motor; Construction and working of synchronous generators, Construction, Principles, and working theory and Types of DC Motors & Generators, 1-Ph & 3-Ph Induction Motor, AC Generator.

C. RECOMMENDED TEXT / REFERENCE BOOKS

1. Basic Electrical, Electronics, and Computer Engineering, R. Muthu Subramanian, S. Salvahanan, K. A. Muraleedharan, 2nd Edition, Tata McGraw Hill.
2. Electronics Principles, Albert Paul Malvino, 6th Edition, Tata McGraw Hill
3. Electrical Technology (Vol: II), B. L. Theraja, A. K. Theraja, 23rd Edition, R. Chand & Company
4. Basic Electrical Engineering, D.P. Kothari, I. J. Nagrath, 3rd Edition, Tata McGraw Hill
5. Introduction to VLSI Circuit & Systems, John P. Uyemura, 1st Edition, John Willey & Sons Inc.
6. Basic Electrical Engineering, D.C. Kulshreshtha, 1st Edition, Tata McGraw Hill
7. Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson
8. Electrical Engineering Fundamentals, V.D. Toro, 2nd Edition, Prentice Hall India
9. Fundamentals of Electrical Engineering, L.S. Bobrow, , Oxford University Press

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Apply basic circuital laws (KVL, KCL, and Ohm's) and Theorems (Thevenin's and Norton's) for simplifying the complex resistive network to compute node voltages and loop currents for given excitation.

- Analyze Single Phase AC Circuits, compute and demonstrate the waveforms and phasor diagram representation of alternating quantities.
- Design low pass, high pass, bandpass, and band elimination filter networks, and analyze the frequency response of circuits to show the correlation between time domain and frequency domain response specifications.
- Analyze the 3-Phase circuit (star-delta) and compute power for the balanced and unbalanced load.
- Predict the behavior of any electrical and magnetic circuits with an ability to identify, formulate, and solve magnetic circuit problems in electrical machines.
- Model the Equivalent Circuit of a Transformer for Performance Analysis
- Discriminate the constructional details, the principle of operation, and applications of AC and DC electrical machines.

B. TECH. SEMESTER – I (EC/CE/IT)

SUBJECT: PROGRAMMING FOR PROBLEM SOLVING - I

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	-	3	7	5.5	60	40	50*	-	150

Reference Code ESC105

*TW Marks include Viva based on TW

A. COURSE OBJECTIVES

The objectives of teaching this course are:

- To impart an in-depth understanding of fundamental programming concepts to build C programs.
- To explain conditional branching, iteration/looping, code reusability, and pointers using C Programming Language.
- To demonstrate and teach how to code, document, test, and implement a well-structured C program.

B. DETAILED SYLLABUS

Unit **Topic(s)**

[1] OVERVIEW OF C

Basic structure of C program; Compiling and running C program

[2] CONSTANTS, VARIABLES, AND DATA TYPES

Types of constants; Basic data types, Identifier, Variable, Enum, Symbolic constant, Typedef; Keywords, Overflow and Underflow

[3] OPERATORS AND EXPRESSIONS

Arithmetic, relational, logical, Assignment, bitwise, and sizeof operator; Operator precedence and associativity; Expression evaluation

[4] MANAGING INPUT AND OUTPUT OPERATIONS

getchar and putchar functions; Formatted I/O using printf and scanf.

[5] DECISION MAKING AND BRANCHING

if and if...else statement, Nested and ladder if...else, Conditional operator, switch statement, goto statement with a warning.

[6] DECISION MAKING AND LOOPING

while, do...while, for loops, nested loops, break and continue statements.

[7] ARRAYS AND STRINGS

Introduction to arrays; Declaration, initialization, and access of one-dimensional and two-dimensional arrays; Introduction to multi-dimensional and variable length arrays; Declaration and initialization of strings; Printing and scanning strings to/from standard

I/O; String handling functions, list of strings

[8] USER-DEFINED FUNCTIONS

Function prototype and function declaration, function definition, function call, actual and formal parameters/arguments; Return type and return statement; Nested function call, recursion; Scope, visibility, and lifetime of variables

[9] STRUCTURES AND UNIONS

Defining structure, declaring, and initializing structure variables, typedef; Accessing structure members; Copying and comparing structure variables; Nested structures, arrays, and structures; Structures and functions, unions

[10] POINTERS

Introduction, accessing address of a variable; Declaration and initialization of pointer variables; Accessing variable using pointer, chain of pointers; Scale factor and pointer expressions; Pointers and arrays, Pointer to array Vs array of pointers; Passing arrays and strings to the function; Array of pointers, pointers and functions, pointers and structures, const pointer vs pointer to const.

C. RECOMMENDED TEXT/REFERENCE BOOK

1. Programming in ANSI C by Balagurusamy, 8th Ed., Tata McGraw Hil
2. Programming with C by Byron Gottfried, 3rd Ed., McGraw Hill Education
3. The C Programming Language by Kernighan and Ritchie, 2nd Ed., PHI Learning
4. Expert C Programming: Deep C Secrets by Peter Van Der Linden, Pearson Education
5. Let Us C by Yashvant Kanetkar, 12th Ed., BPB Publication
6. Programming in C by Ashok N. Kamthane, 2nd Ed., Pearson Education

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Use and describe language syntax and concepts for C Programming.
- Comprehend and use C Programming concepts to solve algorithmic and logical problems.
- Analyze the given problem and formulate an appropriate C language solution based on definitive language concept(s).
- Design a flowchart or a diagram for a given problem and create C programs using decision making, branching, looping, user-defined function, array, structure, pointers, etc.
- Apply concepts to write, compile, debug, execute, and document C programs with different test cases using an appropriate tool(s).

B. TECH. SEMESTER – I (EC/CE/IT)

SUBJECT: ENGINEERING GRAPHICS & DESIGN

Teaching Scheme (Hours/Week)				Credit	Examination Scheme				
Lect	Tut	Prac	Total	s	Ext	Sess.	TW	Prac	Total
1	-	4	5	3	-	-	100*	-	100

Reference Code ESC106

*TW Marks includes Viva based on TW

A. COURSE OBJECTIVES

The objectives of this course are:

- To Understand the drawing importance in Engineering.
- To Describe the 3-Dimensional object in a different 2-Dimensional view.
- To Develop skills in Reading and Interpretation of Engineering Drawings.
- To enhance drawing skills through hands-on training in a CAD lab using engineering software.

B. DETAILED SYLLABUS

Unit **Topic(s)**

[1] **INTRODUCTION TO ENGINEERING DRAWING**

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloids, Hypocycloid and Involutes; Scales –Plain, Diagonal and Venire Scales;

[2] **ORTHOGRAPHIC PROJECTIONS**

Principles of Orthographic Projections-Conventions -Projections of Points and lines inclined to both planes; Projections of planes inclined Planes-Auxiliary Planes;

[3] **PROJECTIONS OF REGULAR SOLIDS**

Planes-Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.

[4] **SECTIONS AND SECTIONAL VIEWS OF RIGHT ANGULAR SOLIDS**

Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solid s, objects from industry and dwellings (foundation to slab only)

[5] **ISOMETRIC PROJECTIONS**

Principles of Isometric projection –Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice versa, Conventions;

[6] **OVERVIEW OF COMPUTER GRAPHICS**

Listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software

[7] **CUSTOMIZATION AND CAD DRAWING**

Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerance; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;

[8] **ANNOTATIONS, LAYERING, AND OTHER FUNCTIONS**

Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modelling of parts and assemblies. Parametric and non -parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory includes sketching of perspective, isometric, multi-view, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerance techniques; dimensioning and scale multi-views of dwelling;

C. RECOMMENDED TEXT/REFERENCE BOOKS

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Narayana, K.L. & P Kannaiah (2008), Textbook on Engineering Drawing, Scitech Publishers) (Corresponding set of) CAD Software Theory and User Manuals

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Understand and interpret engineering drawings so that concepts can be communicated graphically more effectively.
- Demonstrate correct usage of methods, concept, and theories to illustrate and solve problems of conics, lines, planes, solids, surfaces, and many more.
- Choose a suitable standard projection method, break down a complex 3D problem into various orthographic and sectional orthographic views, and highlight missing features.
- Practical Exposure to computer-aided software to generate isometric projection and compose standard components of different streams

B. TECH. SEMESTER – I (EC/CE/IT)

SUBJECT: SOFTWARE WORKSHOP

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
-	-	2	2	1	-	-	50*	-	50

Reference Code ESC107

*TW Marks include Viva based on TW

A. COURSE OBJECTIVES

The objective of the course is to familiarize students with various software tools and technology. The course aims at providing hands-on experience related to basic software installation, usage of Operating systems, and various essential software utilities.

B. DETAILED SYLLABUS

Unit **Topic(s)**

[1] **OPERATING SYSTEM**
Introduction to Operating System and Linux Architecture.

[2] **SOFTWARE**
Installation of open source/freeware software using the package manager for programming/simulation.

[3] **SHELL COMMANDS**
Linux usage, commands & shell scripting; Command structure, and general-purpose utility.

[4] **FILE HANDLING**
Basic file handling; The file system, Handling ordinary files, File attributes, and permission, file system details.

[5] **SHELL SCRIPTING**
Basic Shell commands, Looping and Branching; Various programs using Shell Scripting

[6] **SHELL UTILITIES**
Find command and shell, simple filters, advance filters.

[7] **EDITORS**
VI editor for basic text editing, LATEX for scientific documents, and report writing

**NOTE: Topics will be covered in experiments

C. RECOMMENDED TEXT/REFERENCE BOOKS

1. Unix: Concepts and Applications, Sumitabha Das, 4th Edition, Tata McGraw Hill

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Have knowledge of installation and maintenance of software
- Perform computational tasks using various utilities and commands related to operating systems.
- Manage and maintain software systems on a PC.

B. TECH. SEMESTER – II (EC/CE/IT)

SUBJECT: MATHEMATICS-II

Teaching Scheme (Hours/Week)				Credit	Examination Scheme				
Lect	Tut	Prac	Total	s	Ext	Sess.	TW	Prac	Total
3	1	-	4	4	60	50	-	-	100

Reference Code BSC301

A. COURSE OBJECTIVES

The objective of this course is to familiarize the prospective engineers with techniques in Differential Equations, and numerical methods and Laplace transform.

B. DETAILED SYLLABUS

Unit **Topic(s)**

[1] **FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS AND INTRODUCTION TO HIGHER ORDER DIFFERENTIAL EQUATIONS**

Exact, linear and Bernoulli's equations; Euler's equations; Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type, second-order linear differential equations with variable coefficients. Method of variation of parameters, Cauchy-Euler equation.

[2] **NUMERICAL METHODS**

Ordinary differential equations: Taylor's series, Euler and modified Euler's methods, Runge- Kutta method of fourth-order for solving first-order equations; Solution of algebraic and transcendental equations: Newton Raphson's Method, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.

[3] **MULTIVARIABLE CALCULUS (INTEGRATION)**

Multiple Integration: Double integrals (Cartesian), Change of the order of integration in double integrals, Change of variables (Cartesian to polar); Applications: areas and volumes; Triple integrals (Cartesian), Scalar line integrals, Vector line integrals, Scalar surface integrals, Vector surface integrals, theorems of Green, Gauss and Stoke's.

[4] **LAPLACE TRANSFORM**

Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions, Finding inverse Laplace transform by different methods, Convolution theorem; Evaluation of integrals by Laplace transform, Solving ODE by Laplace Transform method.

C. RECOMMENDED TEXT/REFERENCE BOOKS

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 40th Edition, 2007.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. W. E. Boyce and R. C. Di Prima, Elementary Differential Equations and Boundary Value Problems, 9th Edn., Wiley India, 2009.
5. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
6. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
7. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
8. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc- Graw Hill, 2004.
9. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2008

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Solve engineering problems involving differential equations, numerical methods, and Laplace transform.
- Use mathematical tools to solve problems in differential equations, numerical methods, and Laplace transform.

B. TECH. SEMESTER – II (EC/CE/IT)

SUBJECT: PROGRAMMING FOR PROBLEM SOLVING - II

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	-	3	7	5.5	60	40	50*	-	150

Reference Code ESC201

*TW Marks include Viva based on TW

A. COURSE OBJECTIVES

The objectives of teaching this course are:

- To provide fundamental concepts of object-oriented programming like abstraction, inheritance, polymorphism, etc. and explain differences between object-oriented programming and procedural programming
- To teach programmatic implementation of these concepts using C++ language.
- To explain the significance of these concepts to learn subjects like software engineering and object-oriented design and analysis.

B. DETAILED SYLLABUS

Unit **Topic(s)**

[1] BASICS OF C++

Overview, Program structure, keywords, identifiers, constants, data types; Symbolic constants, declaration of variables, operators, namespaces, control structures. Dynamic memory – C style - malloc, calloc, realloc, and free Vs C++ style; New and delete keywords, reference, and pointer.

[2] FUNCTIONS IN C++

Main function (variations in signature), function prototype, inline functions; Call and return by reference, default parameters, function overloading.

[3] INTRODUCTION TO OBJECT-ORIENTED PROGRAMMING

Procedural Vs Object-Oriented Programming; Principles of OOP, Benefits and applications of OOP.

[4] CLASSES AND OBJECTS – ENCAPSULATION AND ABSTRACTION

Introduction, private and public members, defining member functions, static members; Objects as function arguments and return type; Friend functions, const member functions, Constructors and their types, Destructor, Operator overloading, type conversion

[5] INTRODUCTION TO C++ STRING CLASS

[6] INHERITANCE

Introduction, types of inheritance – single, multiple, multilevel, hierarchical, and hybrid inheritance; Protected members, overriding, virtual base class.

[7] POLYMORPHISM

Introduction, Pointers, and Objects, this pointer, pointer to derived classes; virtual and pure virtual functions, dynamic binding.

[8] INPUT/OUTPUT

Introduction to streams, standard I/O stream objects; Stream classes, unformatted and formatted I/O, manipulators.

[9] EXCEPTION HANDLING

Basics of exception handling; Try-catch-throw, re-throwing exceptions, user-defined exceptions.

[10] TEMPLATES

Basics of class templates and function templates.

C. RECOMMENDED TEXT/REFERENCE BOOKS

1. Object-Oriented programming with C++, Seventh Edition, by E Balagurusamy, TMH publication
2. The C++ Programming Language, Fourth Edition, by Bjarne Stroustrup, Addison -Wesley publication
3. Object-Oriented Programming in C++, Fourth Edition, by Robert Lafore, SAMS publication
4. Accelerated C++: Practical Programming by Example, First Edition, by Andrew Koenig and Barbara E. Moo, Addison-Wesley publication
5. C++ Black Book, First edition, by Steven Holzner, Paraglyph Press
6. C++: The Complete Reference, Fourth Edition, by Herbert Schildt, McGraw Hill Education

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Use and describe language syntax and concepts for C++ Programming along with templates for class and function.
- Apply Object-Oriented Programming (OOP) concepts to solve algorithmic and logical problems.
- Identify the given problem and formulate an appropriate C++ language solution based on OOP Principle(s).
- Write C++ programs using Encapsulation, Abstraction, Inheritance, Polymorphism, Exception Handling, etc. to solve given problem(s).

- Apply concepts to write, compile and execute C++ programs with different test cases. Also be able to debug and document C++ programs.

B. TECH. SEMESTER – II (EC/CE/IT)

SUBJECT: PHYSICS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	2	6	5	60	40	50*	-	150

Reference Code BSC101

*TW Marks include Viva based on TW

A. COURSE OBJECTIVES

The course provides an in-depth understanding of the concepts associated with Semiconductor, Optoelectronics, Communication, Oscillators, and Basic Switching devices. It also serves the basic design ideas around rectification and amplification. The course focuses on modulation techniques and their components. The overall aspects of basic physics application in electronics with a practical approach are covered in this subject. This course also includes analog modulation & demodulation techniques (AM, FM, and PM) and digital modulation (ASK, FSK and PSK).

B. DETAILED SYLLABUS

Unit **Topic(s)**

[1] SEMICONDUCTORS

Intrinsic and extrinsic semiconductors, Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction, Metal-semiconductor junction (Ohmic and Schottky), Semiconductor materials of interest for optoelectronic & other devices.

[2] DIODE

Introduction to P-N junction Diode and V-I characteristics, Half wave and Full-wave rectifiers, capacitor filter; Zener diode and its characteristics, Zener diode as a voltage regulator, Special purpose diodes.

[3] LIGHT-SEMICONDUCTOR INTERACTION

Radiative transitions and optical absorption, LED and LASER, Photo detectors.

[4] ACTIVE COMPONENTS AND APPLICATIONS

BJT: Structure and input-output characteristics of a BJT, The Unbiased Transistor, Transistor Currents, Biased Transistor, a single stage voltage divider biasing, Emitter Bias, The CE Connections, The Base Curve, Collector curve, Transistor approximation Variation in current Gain, The Load Line, The Operating point, Recognizing Saturation, BJT as a switch & Amplifiers, LED Drivers.

[5] OSCILLATORS

General form of the oscillator, Sinusoidal oscillator, phase shift oscillator, and Crystal Oscillator.

[6] MOSFET

MOS physics and mode of operations, nFET current-voltage relationship, MOS pass characteristics, and CMOS inverter, Dynamic RAM (DRAM) 1T bit-cell.

[7] FIBER OPTICS

Fiber Optics and Optoelectronics, Historical Developments, A Fiber-Optic Communication System, Advantages of Fiber-Optic Systems, Ray Propagation in Optical Fibers, Fundamental Laws of Optics, Ray Propagation in Step-Index Fibers, Ray Propagation in Graded-Index Fibers.

[8] COMMUNICATION SYSTEMS

Communication system components, Analog modulation- AM, FM, PM; Digital modulation- ASK, FSK, PSK.

C. RECOMMENDED TEXT / REFERENCE BOOKS

1. Electronics Principles, Albert Paul Malvino, 6th Edition, Tata McGraw Hill
2. David Griffiths, Introduction to Electrodynamics
3. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley (2008).
4. R.P Khare, Fiber Optics and Optoelectronics, Oxford University Press
5. Sanjay Sharma, Communication Systems: Analog and Digital
6. Halliday and Resnick, Physics
7. W. Saslow, Electricity, magnetism and light
8. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc. (1995).
9. B. E. A. Saleh and M. C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc., (2007).
10. Yariv and P. Yeh, Photonics: Optical Electronics in Modern Communications, Oxford University Press, New York (2007).
11. P. Bhattacharya, Semiconductor Optoelectronic Devices, Prentice Hall of India (1997)
12. Behrouz A. Forouzan, Data communication, and Networking.
13. B. P lathi, Modern Digital and Analog Communication Systems, 3rd edition.

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Illustrate intrinsic and extrinsic semiconductors, their applications, and carrier generation and recombination with variations in doping density, temperature, and other regulations.
- Design half-wave, full-wave rectifier circuit, and voltage regulator circuit using Zener diode, PN diode, and NPN, PNP transistors.
- Implement a transistor as a switch and Analyse the Transistor input-output characteristics, biasing circuits, Compute load line and calculate the operating point.

- Analyze the structure of the oscillator. Discriminate Sinusoidal oscillator, Phase shift oscillator, and Crystal oscillator.
- Assess the performance & characteristics of Opto-electronic semiconductor devices like LED, LASER, and Photodetectors
- Devise the ray optics propagation in step-index and graded-index fiber and Synthesize the use of optoelectronic devices in fiber optic communications.
- Illustrate the pros and cons of analog and digital modulation techniques (AM, FM, PM, ASK, FSK, PSK) based on the need for system components.
- Justify the requirement of CMOS based on the fundamental study of nMOS and pMOS and describe the working of 1 bit DRAM cell.

B. TECH. SEMESTER – II (EC/CE/IT)

SUBJECT: HARDWARE WORKSHOP

Teaching Scheme (Hours/Week)				Credit	Examination Scheme				
Lect	Tut	Prac	Total	s	Ext	Sess.	TW	Prac	Total
-	-	4	4	2	-	-	100*	-	100

Reference Code ESC201

*TW Marks includes Viva based on TW

A. COURSE OBJECTIVES

The objective of the course is to familiarize students with various hardware tools and techniques. The course aims at imparting practical knowledge of various electronic components, computer hardware, and internet technology.

B. DETAILED SYLLABUS

Unit Topic(s)

[1] ELECTRONIC COMPONENTS

Study of Digital Multimeter, Power Supply, Function Generator, Cathode Ray Oscilloscope, Digital Oscilloscope, and their use; Study the Measurement of Phase Difference in single-phase circuit, Study of Various Electrical and Electronics component like LED, LDR, Photo-diode, MOSFET, MCB, and Relay.

[2] COMPUTER HARDWARE

Introduction to a personal computer and its basic peripherals, installation of Operating System, Software, and the required device drivers; Students are suggested to perform similar tasks on the laptop scenario wherever possible.

[3] PERIPHERALS

Programming of Computer Ports & Interfacing of Electronic Components, Cables, and Connectors like RJ45, RS232, and CRO probe.

[4] INTERNET

Introduction to Internet & World Wide Web modules, making a PC Internet ready; Introduction to Internet and TCP/IP, Ethernet Connection, WiFi connection, configure TCP/IP (IP, Gateway, DNS, and Proxy), and use of ping command; Information sharing and data transfer over Local Area Network and Internet.

[5] WEB INFRASTRUCTURE

Basic Components of Web Sites, Front end & back-end tools and technology; HTML & CSS, Developing, Configuring, and deploying a website.

[6] IOT BOARDS AND CIRCUIT SIMULATION

Introduction to IOT boards like Arduino, Raspberry Pie, etc.; Interfacing, Circuit designing, and PCB designing.

[7] MINI PROJECT

Student will develop a mini project related to the topics listed above.

**NOTE: Topics will be covered in experiments

C. RECOMMENDED TEXT/REFERENCE BOOKS

1. Electronic Components and Materials Principles, Dr. Madhuri A Joshi, 2nd Edition, Shroff Publishers & Distributors PVT. LTD.
2. A Textbook of Computer Hardware and Networking, Jyotika Deshmukh, D J Publications
3. Learning Web Design, Jennifer Robbins, 4th edition, O'Reilly Media

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Have knowledge of various electronics components and computer hardware..
- The students will be aware of Internet Technology infrastructure.

B. TECH. SEMESTER – II (EC/CE/IT)

SUBJECT: ENGLISH

Teaching Scheme (Hours/Week)				Credit	Examination Scheme				
Lect	Tut	Prac	Total	s	Ext	Sess.	TW	Prac	Total
2	-	2	4	3	40	-	50*	-	90

Reference Code HSMC201

*TW Marks include Viva based on TW

A. COURSE OBJECTIVES

The objective of the course is to provide basic knowledge of the English language to students coming from different backgrounds. The course aims to teach English Grammar and Communications skills which will be useful to engineers.

B. DETAILED SYLLABUS

Unit Topic(s)

[1] VOCABULARY BUILDING

The concept of Word Formation, Root words from foreign languages and their use in English, Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives, Synonyms, antonyms, and standard abbreviations.

[2] BASIC WRITING SKILLS

Sentence Structures, use of phrases and clauses in sentences, Importance of proper punctuation, creating coherence, organizing principles of paragraphs in documents, Techniques for writing precisely.

[3] IDENTIFYING COMMON ERRORS IN WRITING

Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Clichés.

[4] NATURE AND STYLE OF SENSIBLE WRITING

Describing, Defining, Classifying, providing examples or evidence, Writing introduction and conclusion.

[5] WRITING PRACTICES

Comprehension, Précis Writing, Essay Writing

[6] ORAL COMMUNICATION

Listening Comprehension, Pronunciation, Intonation, Stress and Rhythm, Common, Everyday Situations: Conversations and Dialogues, Communication at Workplace, Interviews, Formal Presentations (This unit involves interactive practice sessions in Language Lab).

C. RECOMMENDED TEXT/REFERENCE BOOK

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007
3. On Writing Well. William Zinsser. Harper Resource Book. 2001
4. Study Writing. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.
5. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Understand the vocabulary and their root forms to enhance vocabulary level
- Enhance their Writing in effective way
- Rectify common errors in their Speaking and Writing
- Develop efficiency in writing
- Be competent at Public Speaking and Interviews
- Acquire Proficiency in all four skills of Language

B. TECH. SEMESTER – II (EC/CE/IT)

SUBJECT: ENVIRONMENTAL STUDIES

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	-	-	2	0	40	-	-	-	40

Reference Code MC-II

A. COURSE OBJECTIVES

The objective of this course is to bring awareness about sustainable development is a key to the future of mankind. Understanding, analyzing, and proposing solutions to the contemporary environmental issues and problems of pollution, population explosion, solid waste disposal, environmental degradation, economic productivity, global warming, ozone layer depletion, and loss of biodiversity.

B. DETAILED SYLLABUS

Unit Topic(s)

[1] THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Definition, scope, and importance & need for public awareness.

[2] NATURAL RESOURCES

Renewable and non-renewable resource: Natural resources and associated problems; Forest resources: Use and over-exploitation, deforestation, case studies, Timber extraction, mining, dams, and their effects on forests and tribal people; Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts, over water, dams benefit and problems; Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies; Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies; Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies; Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of resources of sustainable lifestyles

[3] ECOSYSTEMS

Concept of an ecosystem, Structure and function of an ecosystem, producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem and Aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries)

[4] BIODIVERSITY AND ITS CONSERVATION

Introduction definition: Genetic, species and ecosystem diversity; Bio-geographical classification of India; Value of biodiversity: Consumptive use, productive use, social, ethical, aesthetic and option values; Biodiversity at global, national and local levels. India as a mega-diversity nation, Hot-spots of biodiversity, threats to biodiversity, habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India; Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity

[5] ENVIRONMENTAL POLLUTION

Definition, Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, nuclear hazards; Solid waste management, causes, effects and control measures of urban and industrial wastes; Role of an individual in prevention of pollution, Pollution case studies; Disaster management: floods, earthquake, cyclone, and landslides.

[6] SOCIAL ISSUES AND THE ENVIRONMENT

From unsustainable to sustainable development, urban problems related to energy Water conservation, rainwater harvesting, watershed management; Resettlement and rehabilitation of people: its problems and concerns, Case studies; Environmental ethics: Issues and possible solutions; Climate change: Global warming, acid rain, ozone layer depletion, nuclear accidents, and the holocaust. Case studies, Wasteland reclamation, Consumerism and waste products; Environment Protection Act: Air (Prevention and Control of Pollution) Act, Water (Prevention & Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act; Issues involved in the enforcement of environmental legislation Public awareness

[7] HUMAN POPULATION AND THE ENVIRONMENT

Population growth, variation among nations, population explosion, Family Welfare Program, Environment, and human health, human rights, Value education HIV/AIDS, Women and Child Welfare; Role of Information Technology in Environmental and human health Case studies.

[8] FIELD WORK

Visit to a local area to document environmental assets (river/forest/grassland/hill/mountain); Visit a local polluted site – Urban/Rural/Industrial/Agricultural; Study common plants, insects, birds. Study of simple ecosystems – pond, river, hill, slopes, etc.

C. RECOMMENDED TEXT/ REFERENCE BOOK

1. Erach Bharucha Textbook of Environmental Studies; Second Edition, Universities Press: Hyderabad, 2013
2. Poonia, M. P.; Sharma, S. C. Environmental studies; Khanna Publishing House: New Delhi, 2017
3. Rajagopalan, R. Environmental Studies; Oxford University Press: India, 2015
4. Varandani, N. S. Basics of Environmental studies; Lambert Academic Publishing: Germany, 2013.
5. Basak, A. Environmental Studies; Dorling Kindersley: India, 2009.
6. Dhameja, S. K. Environmental studies; S. K. Kataria and Sons: New Delhi, 2007.
7. Rao, C. S. Environmental Pollution Control Engineering; Wiley publishers: New Delhi, 2006.
8. Brunner, R. C. Hazardous Waste Incineration; McGraw Hill: Michigan, 1989.
9. Clark, R. S. Marine Pollution; Clanderson Press Oxford: Bath, 2001.
10. Trivedy, R. K. Handbook of Environmental Laws, Acts, Guidelines, Compliances & standards; B. S. publications: Hyderabad, 2005.
11. Jadhav, H.; Bhosale, V. M. Environmental Protection and Laws; Himalaya Pub. House: Delhi, 1995.
12. Agarwal, K. C. Environmental Biology; Nidi Publ.: Bikaner, 2001.

13. Bharucha, E. The Biodiversity of India; Mapin Publishing: Ahmedabad, India, 2002.
14. Cunningham, W.P.; Cooper; Gorhani, T. H. E.; Hepworth, M.T., Environmental Encyclopedia;Jaico Publ. House: Mumbai, 2001.
15. De, A. K. Environmental Chemistry; Wiley Eastern: New Delhi, 2006.
16. Gleick, H. P. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security; Stockholm Env. Institute Oxford Univ. Press: New York, 1993.
17. Hawkins, R.E., Encyclopedia of Indian Natural History; Bombay Natural History Society: Bombay, 1987.
18. Heywood, V. H.; Waston, R. T. Global Biodiversity Assessment; Cambridge Univ. Press: Cambridge, 1995.
19. Mckinney, M.L.; School, R.M. Environmental Science systems & Solutions; Web enhanced edition: USA, 1996.
20. Miller, T.G. Jr.; Spoolman, S. E. Environmental Science; Cengage learning: Wadsworth, 2014.
21. Odum, E.P. Fundamentals of Ecology; W.B. Saunders: USA, 1971.
22. Rao, M. N.; Datta, A.K. Waste Water treatment; Oxford & IBH Publ.: New Delhi, 1987.
23. Sharma, B. K., Environmental Chemistry; Goel Publ. House: Meerut, 2001.
24. Townsend, C., Harper, J.; Michael, B. Essentials of Ecology; Blackwell: Oxford, 2008.
25. Trivedi, R. K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards, Vol I and II; B. S. Publications, Hyderabad, 2010.
26. Trivedi, R. K.; Goel, P. K. Introduction to air pollution; ABD Publishers: Jaipur, 2003.
27. Wanger, K. D., Environmental Management; W.B. Saunders Co. Philadelphia, USA, 1998.

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Recall, understand and interpret the terminologies used in environmental studies correctly
- Relate the importance of natural resources, biodiversity, hotspots and deduce the threats to biodiversity.
- Analyze the factors causing environmental pollution, formulate the role of an individual in abatement and control of pollution, and improve disaster management techniques.
- Evaluate the social issues involved in climate change, water conservation, rainwater harvesting, wasteland reclamation, consumerism and waste generation, environmental ethics, environmental laws, and the requirement of public awareness.
- Understand the issues related to population, family welfare programs, human health, value education, and the role of IT in the environment.
- Make use of the fieldwork including visits to local areas to document environmental assets, assess the polluted sites, and study species and ecosystems in our surroundings.

B. TECH. SEMESTER – III (IT)

SUBJECT: PROBABILITY THEORY AND STATISTICS

Teaching Scheme (Hours/Week)				Credit	Examination Scheme				
Lect	Tut	Prac	Total	s	Ext	Sess.	TW	Prac	Total
3	1	-	4	4	60	40	-	-	100

Reference Code BSC3XX

A. COURSE OBJECTIVES

The objectives of teaching this course are:

- To provide an understanding of the basic concepts of probability, conditional probability, and independent events.
- To focus on the random variable, mathematical expectation and different types of distributions, sampling theory, and estimation theory.
- To demonstrate and teach the design of statistical hypothesis about the real-world problem and conduct appropriate tests for drawing valid inferences about the population characteristics
- To explain the significance of hypothesis testing for any research work

B. DETAILED SYLLABUS

Unit **Topic(s)**

[1] BASIC PROBABILITY

Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.

[2] CONTINUOUS PROBABILITY DISTRIBUTIONS

Continuous random variables and their properties, distribution functions and densities, normal, exponential, and gamma densities.

[3] BIVARIATE DISTRIBUTIONS

Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.

[4] BASIC STATISTICS

Measures of Central tendency: Moments, skewness, and Kurtosis - Probability distributions: Binomial, Poisson, and Normal - evaluation of statistical parameters for these three distributions, Correlation, and regression – Rank correlation.

[5] APPLIED STATISTICS

Curve fitting by the method of least squares- fitting of straight lines, second-degree parabolas, and more general curves; Test of significance: Large sample test for a single proportion, a difference of proportions, a single mean, difference of means, and difference of standard deviations.

[6] SMALL SAMPLES

Test for a single mean, a difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

C. RECOMMENDED TEXT/REFERENCE BOOK

1. Introduction to Probability and Statistics for Engineers and Scientists, Sheldon M. Ross, 4th edition1.
2. Head First Statistics, Dawn Griffiths, O'Reilly
3. Introduction to Probability Theory, P. G. Hoel, S. C. Port, and C. J. Stone, Universal Book Stall, 2003 (Reprint).
4. A First Course in Probability, S. Ross, 6th Ed., Pearson Education India, 2002.
5. An Introduction to Probability Theory and its Applications, W. Feller, Vol. 1, 3rd Ed., Wiley, 1968.

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Define and explain the different statistical distributions (e.g., Normal, Binomial, Poisson) and the typical phenomena that each distribution often describes.
- Apply key concepts of probability, including discrete and continuous random variables, probability distributions, conditioning, independence, expectations, and variances
- Apply the concepts of hypothesis testing and p-value.
- Evaluate correlation coefficient and estimate parameters of regression model using the method of least squares to estimate the parameters in a regression
- Analyse samples of the different populations using sampling theory.

B. TECH. SEMESTER – III (IT)

SUBJECT: COMMUNICATION SYSTEMS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	-	2	6	5	60	40	25	25	150

Reference Code ESC3XX

A. COURSE OBJECTIVES

To impart an in-depth understanding of the major concepts, techniques, and performance criteria used in the analysis of various signal operations (time domain and frequency domain), this course covers the Fourier analysis of the signals, provides knowledge of various blocks that constitute an analog and digital communication system and their interrelation and correlates the concepts of Information Theory with reference to analog & digital communication systems. This course also includes the analog modulation & demodulation techniques (AM, FM, and PM) and digital modulation & demodulation techniques (PCM, DPCM, and DM).

B. DETAILED SYLLABUS

Unit **Topic(s)**

[1] WAVEFORM SPECTRA

Introduction, Sinusoidal Waveform, General Periodic Waveforms Trigonometric Fourier Series for a Periodic Waveforms, Fourier Coefficients, Spectrum for the Trigonometric Fourier Series, Rectangular Waves, Sawtooth Waveform, Pulse Train, Some General Properties of Periodic Waveforms, Exponential Fourier Series, Approximate Formulas for the Fourier Coefficient, Energy Signals for Fourier Transform, Filtering of Signals, Power Signals, Bandwidth Requirements for Analog Information Signals.

[2] DIGITAL LINE WAVEFORMS

Symbols, Bits, Bits and Bauds, Functional notations for Pulses, Line codes and Waveforms, M-ary Encoding, Inter Symbol Interference.

[3] AMPLITUDE MODULATION

Introduction, Amplitude Modulation, Amplitude Modulated Transmitters, AM Receivers.

[4] SINGLE SIDEBAND MODULATION

Introduction, Single Sideband Principles, The Balanced Modulator SSB Generation, SSB Reception, Modified SSB Systems.

[5] ANGLE MODULATION

Introduction, Frequency Modulation, Phase Modulation, Equivalence between FM and PM, Angle Modulator Circuits, Angle Modulation Detectors.

[6] PULSE MODULATION

Pulse Amplitude Modulation, Pulse Code Modulation, Pulse Frequency Modulation, Pulse Time Modulation, Pulse Position Modulation, Pulse Width Modulation.

[7] DIGITAL COMMUNICATION

Synchronization, Asynchronous Transmission, Probability of Bit Error in Baseband Transmission, Matched Filters, Optimum Terminal Filters, Bit Timing Recovery, Eye Diagram, Digital Carrier System, Carrier Recovery Circuit, DPSK, Hard and Soft Decision, Error Control Coding.

[8] INTRODUCTION TO INFORMATION THEORY

Measure of Information, Source Encoding.

C. RECOMMENDED TEXT/REFERENCE BOOK

1. Modern Digital and Analog Communication System, B. P. Lathi, 2nd Edition, Oxford Publication
2. Communication Systems, Simon Haykin, 3rd Edition, John Wiley & sons.
3. Electronic Communication System-Fundamental through Advance, Tomas W., 3rd Edition, Wisley.
4. Communication System Analog & Digital, R. P. Singh, Tata McGraw-Hill.

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Analyse and understand the frequency domain representation of time-domain periodic and aperiodic signals.
- Interpret the differences between Polar, Unipolar, Manchester, and AMI line coding schemes and recognize channel encoding techniques.
- Discuss various types of amplitude modulation techniques along with calculation of modulation index, Single sideband principle, and its generation and reception.
- Calculate maximum bandwidth, average power, and deviation ratio for sinusoidal and non-sinusoidal Frequency modulation.
- Differentiate phase and frequency modulation techniques and calculate the modulation index and total power of the modulated signal.
- Describe PAM, PCM, PTM, and PFM pulse modulation techniques.
- Recognize the blocks of the digital communication system along with an illustration of error control, source encoding techniques, and calculation of BER and bit error probabilities for digital carrier schemes.

B. TECH. SEMESTER – III (IT)

SUBJECT: DESIGN OF DIGITAL CIRCUITS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	-	2	6	5	60	40	25	25	150

Reference Code ESC3XX

A. COURSE OBJECTIVES

The objectives of teaching this course are:

- The subject design of digital circuits aims to explain to the students about the basic knowledge of digital logic and circuit design.
- To familiarize the student with digital representations of information, Number systems, Logic gates, Boolean algebra, designing the circuits and their applications.
- To teach the student about fundamental principles of digital design using combinational and sequential logic to analyze and design digital circuits.

B. DETAILED SYLLABUS

Unit **Topic(s)**

[1] BINARY SYSTEMS

Introduction to Digital Computers and Digital Systems; Binary Numbers, Number Base Conversion, Octal and Hexadecimal Numbers; Complements, binary Codes; Binary Storage and Registers, Binary Logic; Integrated Circuits.

[2] BOOLEAN ALGEBRA AND LOGIC GATES

Basic Definitions, Axiomatic Definition of Boolean algebra; Basic Theorems and Properties of Boolean algebra; Boolean Functions; Canonical and Standard Forms, Other Logic Operations; Digital Logic Gates, IC Digital Logic Families.

[3] SIMPLIFICATION OF BOOLEAN FUNCTIONS

The Map Method; Two and Three Variable Maps, Four-Variable Map, Five and Six Variable Maps; Product of Sum simplification; NAND and NOR Implementations. Don't-Care Conditions; The Tabulation Method; Determination of Prime- Implicants, selection of Prime implicants.

[4] COMBINATIONAL LOGIC

Introduction, Design Procedure, Adders and Subtractors, Code Conversion, Analysis Procedure, Multilevel NAND Circuits, Multilevel NOR Circuits, Exclusive OR, and Equivalence Functions.

[5] COMBINATIONAL LOGIC WITH MSI AND LSI

Introduction, Binary Parallel Adder, Decimal Adder, Magnitude Comparator, Decoders, Multiplexers, Read-Only Memory (ROM), Programmable Logic Array (PLA).

[6] SEQUENTIAL LOGIC

Introduction, Flip-Flops, Triggering of Flip-Flops, Analysis of Clocked Sequential Circuits, State Reduction, and Assignment; Flip-Flop excitation Tables Design Procedure, Design of Counters, Design with State Equations.

[7] REGISTERS, COUNTERS AND THE MEMORY UNIT

Introduction, Registers, Shift Registers, Ripple Counters, Synchronous Counters, Timing Sequences, The Memory Unit, Examples of Random-Access Memories.

[8] DIGITAL INTEGRATED CIRCUITS

Introduction, Bipolar Transistor Characteristics, RTL and DTL Circuits, Integrated-Injection Logic, Transistor-Transistor Logic, Emitter Coupled logic, Metal-Oxide Semiconductor, Complementary MOS.

C. RECOMMENDED TEXT/ REFERENCE BOOKS

1. Digital Logic and Computer Design by: M. Morris Mano
2. Microelectronics by: Jacob Millman & Arvin Grabel, Second Edition McGraw Hill International Edition

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Describe the basic concepts of digital systems and circuits, the structure of various number systems, and the working and design process of different combinational and sequential circuits.
- Apply knowledge of mathematics to solve the given problem, Also be able to apply different minimization techniques to simplify the hardware requirements for designing the digital circuits.
- Analyze the given problem and be able to choose the appropriate technique(s) for designing the digital circuit.
- Design a solution for a given problem statement, implement it, and also design and apply it for real-time digital systems.
- Apply concepts to write, document, assemble and test the digital circuits.

B. TECH. SEMESTER – III (IT)

SUBJECT: EFFECTIVE TECHNICAL COMMUNICATION

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	-	-	3	3	50	-	50	-	100

Reference Code HSMC3XX

A. COURSE OBJECTIVES

The objectives of teaching this course are:

- To discuss and explain technical writing and professional communication along with the importance of Ethics, etiquette, and Values.
- To prepare students for effective public speaking, group discussion, and interviews.
- To explain how to study and validate various information sources such as websites, business documents, and professional journals.
- To teach how to carry out self development and self assessment.
- To prepare students to produce effective technical documents.

B. DETAILED SYLLABUS

Unit **Topic(s)**

[1] INFORMATION DESIGN AND DEVELOPMENT

Different kinds of technical documents, Information development life cycle, Organization structures, factors affecting information and document design, Strategies for organization, Information design and writing for print and for online media.

[2] TECHNICAL WRITING, GRAMMAR, AND EDITING

Technical writing process, forms of discourse, Writing drafts and revising Collaborative writing, creating indexes, technical writing style, and language; Basics of grammar, study of advanced grammar, editing strategies to achieve appropriate technical style; Introduction to advanced technical communication, Usability, Hunan factors, Managing technical communication projects, time estimation, Single sourcing, Localization

[3] SELF-DEVELOPMENT AND SELF-ASSESSMENT

Self-assessment, Awareness, Perception, and Attitudes, Values and belief, Personal goal setting, career planning, Self-esteem. Managing Time; Personal memory, Rapid reading, Taking notes; Complex problem solving; Creativity

[4] COMMUNICATION AND TECHNICAL WRITING

Public speaking, Group discussion, Oral; presentation, Interviews, Graphic presentation, Presentation aids, Personality Development. Writing reports, project proposals, brochures, newsletters, technical articles, manuals, official notes, business letters, memos, progress reports, minutes of meetings, and event report.

[5] ETHICS

Business ethics, Etiquettes in social and office settings, Email etiquettes, Telephone Etiquettes, Engineering ethics, Managing time, Role and responsibility of engineer, Work culture in jobs, Personal memory, Rapid reading, Taking notes, Complex problem solving, Creativity.

C. RECOMMENDED TEXT/REFERENCE BOOK

1. David F. Beer and David McMurrey, Guide to writing as an Engineer, John Willey. New York, 2004
2. Diane Hacker, Pocket Style Manual, Bedford Publication, New York, 2003. (ISBN 0312406843)
3. Shiv Khera, You Can Win, Macmillan Books, New York, 2003.

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Describe the basics of technical writing and professional communication
- Explain and Demonstrate Profession, Social and Business Ethics, Etiquette, and Values.
- Apply communication skills in an effective way in public speaking, group discussion, and interviews
- Analyze self-development and practice self-assessment in all aspects.
- Evaluate effectiveness and validity of information sources, such as websites, business documents, and professional journals
- Create/produce different documents, like reports, assignments, reviews, letters, applications, etc. by applying technical writing skills

B. TECH. SEMESTER – III (IT)

SUBJECT: OBJECT ORIENTED PROGRAMMING USING JAVA

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	-	2	6	5	60	40	25	25	150

Reference Code PCC3XX

A. COURSE OBJECTIVES

The objectives of teaching this course are:

- To teach fundamental knowledge of object-oriented programming principles including defining classes, polymorphism, inheritance, encapsulation, abstraction, and interface, and explain with examples how to represent the solution of a given problem in object oriented representation.
- To explain how to use library API such as String, Arrays, StringBuffer, StringTokenizer, and Math in framing solutions to problems.
- To impart knowledge of package, exception, and multithreading and show their usage in practical problems.
- To discuss concepts of making user interactive programs using GUI programming, Stream API, and Network Programming and demonstrate their use in solving problems.
- To demonstrate skills to write, debug, and execute java programs and enable them to create Java solutions for given problem statements.

B. DETAILED SYLLABUS

Unit **Topic(s)**

[1] INTRODUCTION TO PROGRAMMING LANGUAGE – JAVA

Java programming: History of Java Primitive data types, variables, constants, scope and lifetime of variables, Comments; Operators, operator hierarchy, expressions; Type conversion and casting.

[2] CONTROL STRUCTURE AND METHODS

Control flow statements and loops, Loops – for, while, do-while; Console input and output, formatting output; Constructors and methods, Overloading of methods and constructors, recursion, Parameter passing, static fields and methods, access control, this reference; Garbage collection.

[3] OBJECT ORIENTED PROGRAMMING PRINCIPLES

OOP Concepts, Classes, and objects, Data abstraction, encapsulation, inheritance, Polymorphism. Procedural and object-oriented programming paradigm; Object-Oriented Programming Using Java, Inheritance: Inheritance types, super and subclasses, member access rules, super keyword, preventing inheritance: final classes and methods, the object class and its methods; Polymorphism: dynamic binding, method overriding, abstract classes and methods; Interface: Interfaces vs Abstract classes, defining an interface, implement interfaces, accessing implementations through interface references, extending interface.

[4] ARRAYS, STRING, AND PACKAGES

Arrays: 1,2, N-dimension array, jagged array, arrays of objects; String: Exploring concepts of String, StringBuffer, and StringTokenizer classes; Packages: Defining, creating, and accessing a package, understanding CLASSPATH, importing packages, Exploring "Java.Util".

[5] EXCEPTION HANDLING

Exception Handling: Benefits of exception handling, the classification of exceptions; Exception hierarchy: Throwable, checked exceptions, and unchecked exceptions; Usage of try, catch, throw, throws, and finally; Re-throwing exceptions, exception specification, built in exceptions; Creating and using own/user-defined exception sub classes.

[6] MULTITHREADING

Multithreading: Multi-Threading and Multitasking; Thread Life Cycle, thread states, creating threads: Thread Priorities, Thread Groups, Daemon Threads, interrupting threads, thread priorities; Synchronizing threads, inter-thread communication.

[7] GETTING STARTED WITH GRAPHIC PROGRAMMING

The AWT class hierarchy, Containers: Frame, Dialog, Panel; Events: Event Sources, Event Classes, Event Listeners, Delegation Event Model; Handling Action, Mouse, Window, Keyboard Events; Adapter Classes

[8] CREATING USER INTERFACE AND ADVANCED GRAPHICS

The AWT Class Hierarchy; User Interface Components: Labels, Button, Canvas, Scrollbars, Text Components, Check Box, Check Box Groups, Choices, Lists; Panels: Scrollpane, Dialogs, Menubar, Graphics, Layout Manager; Layout Manager Types: Border, Grid, Flow, Card, Grid Bag, No layout, etc.

[9] INPUT AND OUTPUT

Input/Output classes. File management using file class Streams: Byte streams, character stream; Text input/output, binary input/output; Random access file operations

[10] NETWORK PROGRAMMING

Networking concepts: Introduction to TCP and UDP protocol; Socket programming classes: Socket, ServerSocket, InetAddress, URL, URL Connection; Client-server and multi-threaded application.

[11] JAVA UNIT TESTING – JUNIT

JUnit: Types of Testing, Test Driven Development, Assert class, Test cases.

C. RECOMMENDED TEXT/REFERENCE BOOKS

1. An Introduction to JAVA programming, Y. Daniel Liang, Publisher: PHI
2. The Complete Reference Java, Herbert Schildt, 5th edition Publisher: Tata McGraw-Hill

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Describe and use Java programming language concepts and API
- Apply the concepts of Java to solve the given problem on the console-based application or GUI based application.
- Analyze the given problem and be able to choose the appropriate concept(s) of Java language to solve the problem.
- Design a solution for a given problem statement and prepare required design diagrams, specifications, class/interface structures, etc. using Java concepts
- Apply concepts to write, document, debug, run, and test Java programs or applications.

B. TECH. SEMESTER – III (IT)

SUBJECT: DATA STRUCTURES AND ALGORITHMS

Teaching Scheme (Hours/Week)				Credit	Examination Scheme				
Lect	Tut	Prac	Total	s	Ext	Sess.	TW	Prac	Total
4	-	2	6	5	60	40	25	25	150

Reference Code PCC3XX

A. COURSE OBJECTIVES

The objectives of teaching this course are:

- To teach different data structures and their operations.
- To teach and demonstrate the selection of efficient data structure for improving the efficiency (time complexity and space complexity) of the system.
- To explain concepts that are useful to students to understand subjects like Database Management System and Design and Analysis of Algorithms.
- To impart the knowledge of real-world applications of the data structures.

B. DETAILED SYLLABUS

Unit **Topic(s)**

[1] BASIC CONCEPTS

System Life Cycle; Object-Oriented Design: Algorithm Decomposition versus OO Decomposition, Fundamental Definitions, and Concepts of OO programming; Data Abstraction and Encapsulations; Algorithm Specification: Introduction, Recursive Algorithms.

[2] ARRAYS

Abstract Data Types and the C++ Class; The Array as an Abstract Data Type; The Polynomial Abstract Data: Polynomial Representation, Polynomial Addition, Polynomial Multiplication, Disadvantages of Representing Polynomials by Arrays.

[3] STACK AND QUEUE

The Stack Abstract Data Type; The Queue Abstract Data Type; Evaluation of Expressions: Expressions, Postfix Notation, Infix to Postfix, Multiple Stacks, and Queues.

[4] LINKED LISTS

Singly Linked Lists; Representing Lists in C++: Defining a List Node in C++, Designing a List in C++, Pointer Manipulation in C++, List Manipulation Operations, Linked List Operations, Circular Lists, Linked Stacks and Queues; Polynomials: Polynomial Representation, Adding Polynomials; Doubly Linked Lists; Generalized Lists: Representation of Generalized Lists, Recursive Algorithms for Lists, Reference Counts, Shared and Recursive Lists.

[5] TREES

Introduction: Terminology, Representation of Trees; Binary Trees: The Abstract Data Type, Properties of Binary Trees, Binary Tree Representations; Binary Tree Traversal and Tree Iterators: Introduction, Inorder Traversal, Preorder Traversal, Postorder Traversal, Iterative Inorder Traversal, Level-Order Traversal; Additional Binary Tree Operations: Copying Binary Trees, Testing Equality, The Satisfiability Problem;

Threaded Binary Trees: Threads, Inorder Traversal of a Threaded Binary Tree, Inserting a Node into a Threaded Binary Tree. Heaps: Definitions, Insertion, and Deletion Of Max Heaps. Binary Search Trees: Definition, Searching a Binary Search Tree, Insertion and Deletion and Joining into a Binary Search Tree, Height of a Binary Search Tree.

[6] GRAPHS

The Graph Abstract Data Type: Introduction, Definitions, Graph Representations. Elementary Graph Operations: Depth First Search, Breadth-First Search, Connected Components, Spanning Trees, Biconnected Components. Shortest Paths and Transitive Closure: All-Pairs Shortest Paths.

[7] SORTING

Insertion Sort. Quick Sort. Merge Sort: Merging, Iterative Merge Sort, Recursive Merge Sort. Heap Sort. List and Table Sorts. Summary of Internal Sorting.

[8] HASHING

The Symbol Table Abstract Data Type. Static Hashing. Hash Tables. Hashing Functions. Overflow Handling.

[9] ADVANCED SEARCH STRUCTURES

AVL Trees. 2-3 Trees. 2-3-4 Trees. Red-Black Trees. B-Trees. Splay Trees. Digital Search Trees. Tries.

C. RECOMMENDED TEXT/REFERENCE BOOKS

1. Fundamentals of Data Structures using C++ by: Horowitz, Sahni, Galgotia Pub. 1998 ed.
2. Data Structures& Algorithms, by: Aho, Ullman, Addision Wesley
3. An Introduction to Data Strucures with applications, by: Tremblay, Sorenson, McGraw Hill.
4. The art of Computer Programming Vol. I & III, by: Kunth, Addision Wesley.
5. Data Structures using C and C++, by: YedidyahLangsam, Tenenbaum

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Describe and use the concepts of different data structures and algorithms with reusability.
- Apply the concepts of appropriate data structures to solve real-world problems.
- Analyze the given problem and be able to select appropriate data structures like an array, stack, queue, linked list, tree, graph, etc. to solve the problem to improve efficiency.
- Design a solution for a given problem statement and prepare an efficient algorithm using the appropriate data structure.
- Apply different data structures and algorithms to write, document, debug and run the programs.

B. TECH. SEMESTER – IV (IT)

SUBJECT: UNIVERSAL HUMAN VALUES - II

Teaching Scheme (Hours/Week)				Credit	Examination Scheme				
Lect	Tut	Prac	Total	s	Ext	Sess.	TW	Prac	Total
3	-	-	3	3	60	-	-	-	60

Reference Code HSMC4XX

A. COURSE OBJECTIVES

The objectives of teaching this course are:

- To help the students appreciate the essential complementarily between 'VALUES' and SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement toward value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior, and mutually enriching interaction with Nature.

B. DETAILED SYLLABUS

Unit **Topic(s)**

[1] **COURSE INTRODUCTION**

Need, Basic Guidelines, Content, and Process for Value Education Self Exploration–what is it? - it's content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration, Continuous Happiness, and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels

[2] **UNDERSTANDING HARMONY IN THE HUMAN BEING**

Harmony in Myself! Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha, Understanding the Body as an instrument of 'I' (I being the doer, seer, and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, the meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya.

[3] **UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY**

Harmony in Human-Human Relationship Understanding Harmony in the family – the basic unit of human interaction, Understanding values in human to human relationship; the meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Vishwas; Difference between intention and competence,

Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in a relationship, Understanding the harmony in the society (society being an extension of the family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha)- from family to world family.

[4] UNDERSTANDING HARMONY IN THE NATURE AND EXISTENCE

Whole existence as Co-existence: Understanding the harmony in the Nature, Interconnectedness, and mutual fulfillment among the four orders of nature-recyclability and self-regulation in nature, Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.

[5] IMPLICATIONS OF THE ABOVE HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics, Case studies of typical holistic technologies, management models and production systems, Strategy for the transition from the present state to Universal Human Order.

C. RECOMMENDED TEXT/REFERENCE BOOK

1. R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics, Excel books, New Delhi, 2010, ISBN 978-8-174-46781-2
2. JeevanVidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
3. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Start exploring themselves; get comfortable with each other and with the teacher; they start appreciating the need and relevance of the course.
- Note that the natural acceptance (intention) is always for living in harmony, only competence is lacking
- Present sustainable solutions to the problems in society and nature. They are also able to see that these solutions are practicable and draw roadmaps to achieve them.
- Grasp the right utilization of their knowledge in their streams of Technology/Engineering/Management/any other area of study to ensure mutual fulfillment. E.g. mutually enriching production system with the rest of nature.

B. TECH. SEMESTER – IV (IT)

SUBJECT: DISCRETE MATHEMATICS

Teaching Scheme (Hours/Week)				Credit	Examination Scheme				
Lect	Tut	Prac	Total	s	Ext	Sess.	TW	Prac	Total
3	1	-	4	4	60	40	-	-	100

Reference Code PCC4XX

A. COURSE OBJECTIVES

The objectives of teaching this course are:

- To impart an in-depth understanding of various concepts related to Discrete Mathematics, correct terminology, and notation.
- To teach how to construct correct direct and indirect proofs, the division into cases in a proof, use of counterexamples, etc.
- To explain Sets, Functions, Relations, Groups, Graphs, Trees, and their applications using real-world examples.
- Demonstrate and teach how to apply logical reasoning to solve a variety of problems.

B. DETAILED SYLLABUS

Unit **Topic(s)**

[1] **SETS AND PROPOSITIONS**
Combination of sets, finite, uncountable infinite, and infinite sets, mathematical induction, principles of inclusion, and exclusion, propositions.

[2] **PROPOSITIONAL LOGIC**
Propositional Logic, Applications of Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy.

[3] **PERMUTATIONS, COMBINATIONS, DISCRETE PROBABILITIES**
Rules of sums and products, permutations, combinations, generation, discrete probability, conditional probability, information.

[4] **RELATIONS AND FUNCTIONS**
Relational model of databases, properties of binary relations, equivalence relation, partitions, partial ordering, lattices, chains and antichains, functions, and pigeon-hole principle.

[5] **GRAPHS**
Basic terminology, multi- and weighted graphs, paths, circuits, shortest path, Eulerian path, Travelling Salesman problem, factors of a graph, planar graphs.

[6] **TREES**
Trees, rooted trees, path length, prefix codes, binary search trees, spanning trees and cut-sets, minimum spanning trees, transport networks.

[7] RECURRENCE RELATIONS

Linear recurrence relations with constant coefficient, homogeneous, particular and total solutions, generating functions, sorting algorithms, and matrix multiplication.

[8] DISCRETE NUMERICAL FUNCTIONS

Manipulations of numerical functions, asymptotic behavior, generating functions, combinatorial problems.

[9] GROUP

Groups and sub-groups, generators, evaluation of powers, cossets, Lagrange's theorem, permutation group and Burnsides theorem, group codes, isomorphism, automorphism, homomorphism, normal subgroups, rings, integral domains and fields, ring homomorphism, polynomial rings, and cyclic codes.

[10] LATTICES AND BOOLEAN ALGEBRAS

Lattices and algebraic systems, the principle of duality, properties of algebraic systems, distributive lattices, Boolean algebras, uniqueness, Boolean functions and expressions, propositional calculus.

C. RECOMMENDED TEXT/ REFERENCE BOOK

1. Discrete Mathematics Applications, Kenneth H. Rosen, 7th edition, Mc Graw Hill
2. Elements of Discrete Mathematics, by: C.L. Liu, 2nd Ed. McGraw-Hill
3. Modern Applied Algebra, by: Birkoff and Bartee, McGraw-Hill, CBS.
4. Discrete Mathematics - A Unified Approach, by: Stephen A. Wiitala. Computer Science Series, McGraw-Hill.

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Classify the algebraic structure of the given mathematical problem.
- Express terms of predicates, quantifiers, and logical connectives for the given logic sentence
- Derive the solution using deductive logic and prove the solution based on logical inference for the given problem.
- Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra
- Develop the given problem as graph networks and solve with techniques of graph theory.

B. TECH. SEMESTER – IV (IT)

SUBJECT: COMPUTER AND COMMUNICATION NETWORK

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	-	2	6	5	60	40	25	25	150

Reference Code PCC4XX

A. COURSE OBJECTIVES

The objectives of teaching this course are:

- To teach about network hardware, software, services, and protocols and explain the uses of computer networks in daily life.
- To explain the layered architecture of network software and compare OSI and TCP/IP model
- To explain the functionalities and working of different layers in TCP/IP protocol stack.
- To demonstrate and teach the usage of various network devices, their configurations, and setup

B. DETAILED SYLLABUS

Unit **Topic(s)**

[1] INTRODUCTION

Introduction and Applications of computer Networks; Network Hardware-LAN, MAN, WAN, internetworks; Network Software, Design Issues, Interfaces & Services, Connection-Oriented & Connectionless services, Service primitives, Relationship of services to protocols.

[2] STUDY OF REFERENCE MODELS

Introduction OSI & TCP/IP, their comparison & critiques.

[3] THE PHYSICAL LAYER

Guided Transmission Media: magnetic media, twisted pair, baseband & broadband, co-axial cable, fiber optics; Wireless Transmission: radio, microwave, infrared, lightwave.

[4] THE DATA LINK LAYER

DLL Design issues Error Detection & Correction; Elementary Data link Protocols: Simplex protocol, Stop and Wait, Automatic Repeat Request, Sliding Window Protocols (1-bit sliding window, Go Back N, Selective Repeat Protocols); Examples of Data link layer protocols: HDLC, PPP.

[5] MEDIUM ACCESS SUB LAYER

Channel Allocation Problem: Static & Dynamic, Multiple Access protocols (ALOHA, CSMA/CA AND CD, Collision Free Protocols, Limited contention protocols, WDMA, FDMA, TDMA, CDMA); Wireless LAN protocols, IEEE-802.3(Ethernet), 802.4(Token Bus), 802.5(Token Ring); Bridges: From 802.x to 802.y, transparent Bridges, Spanning Tree, Source Routing Bridges, remote bridge.

[6] THE NETWORK LAYER

Network layer Design issues; Internetworking-How networks differ, how networks can

be connected, concatenated virtual circuits, connectionless internetworking, and tunneling, internetwork routing; The network layer in the internet: the IP protocol, IPv4 Header, fragmentation, IP addresses & subnets, Internet Control Protocols – ARP, RARP, ICMP, IGMP; Routing Algorithms: Static Routing, Dynamic Routing, Intra-domain: Distance Vector Routing(RIP), Link-state (OSPF), Inter-domain Routing: Path vector (BGP).

[7] THE TRANSPORT LAYER

The Transport Service: services provided to upper layers, transport services primitives; Elements of Transport Protocols; The Internet Transport Protocols; TCP service model: TCP protocol, TCP Segment Header, TCP Connection Management, TCP Transmission Policy, TCP Congestion Policy; UDP & overview of Socket.

[8] CONGESTION CONTROL AND QUALITY OF SERVICE

Congestion control algorithm general policies, Congestion prevention policies, Traffic shaping, Flow specifications, Congestion control in VC subnets, Congestion controls in Datagram Subnets; Load shedding, jitter control, Quality of services-requirements, Techniques to achieve a good quality of services: Leaky bucket algorithm, Token bucket algorithm, Resource reservation, Admission control, Packet scheduling.

[9] **THE APPLICATION LAYER**

Application Layer Protocols: File transfer protocol, Domain Name System, Electronic mail (SMTP, IMAP, POP), HTTP

C. RECOMMENDED TEXT/ REFERENCE BOOKS

1. Data Communications and Networking by Behrouz A. Forouzan, 4th Edition, Tata- McGraw Hill Edition.
2. Computer Networks By Andrew S. Tanenbaum, 4th Edition. Prentice-Hall of India(PHI)
3. Data & Computer Communications - William Stallings, 2ed, Maxell Macmillan Int.
4. Communication Networks, Fundamental Concepts & key Architectures – Leon Garcia & Widjaja, Tata- McGraw Hill Edition.

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Describe the basics of concepts of networking, layered approach, responsibilities performed at each layer and basic of cryptography and network security.
- Analyze the working of various network protocols, and network devices and configure them.
- Apply concepts of IP addressing, routing algorithm and congestion control, and network programming techniques to resolve the problem in the existing network or system.
- Design a small to medium efficient LAN, WAN in CISCO Packet tracer and client-server paradigm for a given problem using the concepts of computer networks.

B. TECH. SEMESTER – IV (IT)
SUBJECT: DATABASE MANAGEMENT SYSTEM

Teaching Scheme (Hours/Week)				Credit	Examination Scheme				
Lect	Tut	Prac	Total	s	Ext	Sess.	TW	Prac	Total
4	-	2	6	5	60	40	25	25	150

Reference Code PCC4XX

A. COURSE OBJECTIVES

The objectives of teaching this course are:

- To explain basic database concepts, data models, schemas, instances, and applications of database systems.
- To demonstrate the use of constraints and relational algebra principles and operations.
- To describe the basics of SQL and construct queries using SQL / POSTGRESQL.
- To emphasize the importance of normalization in databases.
- To facilitate students in Database designing and implementation through projects.
- To familiarize issues of concurrency control and transaction management.

B. DETAILED SYLLABUS

Unit **Topic(s)**

[1] BASIC CONCEPTS

Purpose of the database system, View of data, Database abstraction and Models, Database Languages, Transaction management, Storage management, Database administrator, Database users, Overall system structure.

[2] ENTITY RELATIONSHIP MODEL

Entity sets, Relationship sets, Attributes, Constraints, Keys. Entity-relationship diagrams, Weak entity sets, Generalization, Specialization, Aggregation; Design of an E-R database schema. Reduction of an E-R schema to tables.

[3] RELATIONAL DATABASE MANAGEMENT SYSTEM

Relational Model Structure of database, Relational algebra, Extended relational algebra operation, tuple relational calculus, Domain relational calculus; Modification of database, Views. Structured Query Language Background; Constraints (i.e. Integrity Constraints, Domain constraints, Referential integrity), Assertions, Triggers, Functional Dependencies; Database Design Pitfalls in relational database design, Normalization, I, II, III normal Forms, Normalization using functional dependencies, Normalization using multi-valued dependencies, Domain key normal form; Alternative approach to database design.

[4] NOSQL

Introduction to NoSQL, Structure of NoSQL, NoSQL Queries.

[5] FILE SYSTEM STRUCTURE

Indexing & Hashing, File organization, Organization of records in files, Data dictionary storage; Basic concepts of indexing, Order indices, B- Tree index files, B+ -Tree index files, Static hashing & Dynamic Hashing.

[6] QUERY PROCESSING

Cost estimation, Measures of query cost: Selection operation, Sorting, Join operation. Choice of evaluation plans.

[7] TRANSACTION PROCESSING

Transaction concepts, Transaction state, Implementation of atomicity & durability, Concurrent executions, Serializability, Conflict serializability, View serializability; Testing of conflict and view serializability.

[8] CONCURRENCY CONTROL

Lock-based protocols, Time-stamp based protocol, Validation based protocol, Multiple granularities, Multi-version schemes, and Deadlock handling.

[9] RECOVERY SYSTEM

Failure classification, Storage structure, Recovery & Atomicity: Log-based recovery, Shadow paging, Recovery with concurrent transactions, Buffer management, Failure with loss of non-volatile storage, Advance recovery techniques.

[10] DISTRIBUTED DATABASES

Homogeneous and heterogeneous databases, Distributed Transactions

[11] SECURITY AND INTEGRITY OF DATABASE

Overview of Security Mechanisms, Recovery management system

C. RECOMMENDED TEXT / REFERENCE BOOK

1. Database System Concepts, by: Henry F. Korth and A. Silberschatz. 2nd Ed. McGraw-Hill 1991.
2. Fundamentals of Database Systems by: Shamkant Navathe

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Describe different types of keys, databases, transactions, concurrency control and requirement of database management systems
- Apply the concept of database design techniques to solve the given problem on different types of applications
- Analyse the given problem and be able to choose appropriate database concepts to create the normalized and optimized database.
- Design a solution for a variety of applications for given problem statements and prepare the required ER model, Relational Schema, Data Dictionary, and database diagram.
- Apply concepts to write, document, debug, run and test SQL, NO SQL, PLSQL, triggers and cursors for applications

B. TECH. SEMESTER – IV (IT)

SUBJECT: DESIGN AND ANALYSIS OF ALGORITHMS

Teaching Scheme (Hours/Week)				Credit	Examination Scheme				
Lect	Tut	Prac	Total	s	Ext	Sess.	TW	Prac	Total
4	-	2	6	5	60	40	25	25	150

Reference Code PCC4XX

A. COURSE OBJECTIVES

The objectives of teaching this course are:

- To explain the fundamental concepts of algorithms, performance analysis, and problem-solving paradigm in general.
- To demonstrate and teach various methods for performance analysis of different types of algorithms
- To make the students familiar with major algorithmic design paradigms and demonstrate their application using suitable examples.
- To guide students in applying appropriate algorithm design techniques to solve common engineering design requirements.

B. DETAILED SYLLABUS

Unit **Topic(s)**

[1] **INTRODUCTION TO ALGORITHMS**
Definition of the algorithm, Characteristic of algorithms, Types of algorithm design Paradigm, Recursive Algorithms, The Need for Analysis.

[2] **ANALYZING ALGORITHMS**
Analysis Techniques - Space and Time Complexity, Asymptotic Notations for analysis of algorithms - Omega, Theta, Big Oh, Little Oh, Little omega, Recurrence relations and Analysis of recursive algorithms, Homogeneous, In-homogeneous equations, Recurrence tree, Substitution method, the Master method.

[3] **DIVIDE AND CONQUER ALGORITHM DESIGN STRATEGY**
Introduction to Divide and Conquer, Binary search, Merge Sort, Quicksort.

[4] **GREEDY ALGORITHM DESIGN STRATEGY**
Introduction to Greedy Methods; Knapsack Problem, Minimum Cost Spanning Trees, Optimal Merge Patterns, Single-Source Shortest Paths.

[5] **DYNAMIC PROGRAMMING DESIGN STRATEGY**
Introduction to Dynamic Programming; Multistage Graphs, Matrix Chain Multiplication, Single-Source and All-Pairs Shortest Paths, Travelling Salesperson Problem, Longest Common Subsequence.

[6] **BACK TRACKING**
Graph Traversal using DFS/BFS; Articulation point in Graph; Introduction to Backtracking. N-Queens Problem, Graph Colouring, Hamiltonian Cycles.

[7] **BRANCH-AND-BOUND**

Introduction to Branch and Bound; Knapsack problem, Job assignment problem; Comparison of backtracking and branch and bound

[8] NP-HARD AND NP-COMPLETE

Definition of P and NP classes; Relation between complexity classes; Examples of problems in various classes.

C. RECOMMENDED TEXT / REFERENCE BOOKS

1. G. Brassard, P.Bratley, "Fundamentals of Algorithmics", (PHI).
2. T. H . Cormen, C . E . Leiserson, R. L . Rivest "Introduction to Algorithms", PHI.
3. Ellis Horowitz and Sartaj Sahani, "Fundamentals of Computer Algorithms", Computer Science Press.
4. Design & Analysis of Computer Algorithms, by: Aho, Ullman, Addison Wesley.
5. The art of Computer Programming Vol. I & III, by Kunth, Addison Wesley.

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Describe basic concepts of algorithms, performance analysis of algorithms, algorithm design techniques, tractable and intractable algorithms
- Evaluate the performance of the algorithm using appropriate techniques based on the structure and type of algorithm
- Apply the algorithm design techniques to solve the real-world problems from different domains like searching, sorting, graph theory, optimization, etc.,
- Analyze the given problem definition, understand the nature of the problem, and be able to choose appropriate algorithm design techniques to solve the given problem.
- Design a solution for a given problem statement and clearly mention the requirements, inputs, outputs, processes, models, algorithms, pseudo-code, test cases, etc.,
- Apply concepts to design, document, implement, debug, run, test, and do profiling, of algorithms for various problems from the diversified domains like graph theory, string/text processing, searching, sorting, optimizations, etc., using relevant tools.

B. TECH. SEMESTER – IV (IT)

SUBJECT: MICROPROCESSOR ARCHITECTURE PROGRAMMING AND INTERFACING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	-	2	6	5	60	40	25	25	150

Reference Code PCC4XX

A. COURSE OBJECTIVES

The objectives of teaching this course are:

- To explain the architecture and the instruction set of the Intel 8086/80286 and 80386 microprocessor family.
- To teach the basic concepts of microprocessor and its interfacing with memory and programmable peripheral chips involving system design.
- To impart knowledge about Interrupts and their applications.
- To demonstrate and teach assembly language programming using Turbo Assembler (TASM) software.

B. DETAILED SYLLABUS

Unit **Topic(s)**

[1] MICROPROCESSOR ARCHITECTURES

Introduction, Main features of 8086, 8086 Pin diagram, 8086 internal architecture, Machine cycle, and Instruction Cycle, Minimum and Maximum Mode, 8086 Memory System

[2] 8086 ASSEMBLY LANGUAGE PROGRAMMING

Program Development Steps, Constructing the Machine Codes for 8086 Instructions, Addressing Modes, Assembly Language Program Development Tools.

[3] 8086 INSTRUCTION SET AND ASSEMBLER DIRECTIVES

Assembler Directives, Data Transfer Instructions, Arithmetic Instructions, Logical Instructions, Shift and Rotate Instructions, Transfer or Branch Control Instructions, Looping or Iteration Control Instructions, String Instructions, Processor Control Instructions.

[4] STACKS, PROCEDURES, AND MACROS

Stack Instructions, Defining and Calling Procedure, Parameter Passing Methods, Working with Macros.

[5] 8086 INTERRUPTS AND I/O

The 8086 Interrupts, Interrupt types, Interrupt processing

[6] BASIC INTERFACING TECHNIQUES

Interfacing memory, Peripheral devices interfacing, programming and interfacing of VLSI based peripheral Devices like 8255, 8254, 8259, DMA Controller, etc.

[7] 80286/386/486 MICROPROCESSORS

Multi-User/Multitasking Operating System Concepts, Introduction to 80286/80386

/80486, The 80286386 Segments, Descriptor Tables and Selectors; Real Address Mode and Protected Virtual Address Mode of 80286/80386/80486, Multitasking and Exceptions.

[8] MODERN MICROPROCESSORS

The Pentium Architecture, Hyper-Threading and Multi-core Technologies, Study of latest microprocessors.

C. RECOMMENDED TEXT/ REFERENCE BOOKS

1. Microprocessors and Interfacing (Programming & Hardware), Douglas V. Hall, McGraw Hill
2. 8086 Programming and Advance Processor Architecture, M. T. Savaliya, WIND Series, 2012
3. Intel Microprocessors 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium And Pentium Pro Processor, by: Barry B. Brey

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Describe the architecture and organization of the Intel 8086,80286 and other advance microprocessors, interfacing of the processor with memory and I/O devices, understanding of interrupts and study of descriptors in 80286 & 80386.
- Relate various descriptors and operating modes of 80286/80386 processor.
- Analyze as well as design circuits using various interfacing techniques
- Develop interrupt service routines for specific problem statements.
- Develop, debug and run assembly language programs with the help of the 8086-instruction set and various addressing modes using TASM.