Detailed Syllabi Book

Detailed Syllabi for Under Graduate Course of
Mechanical Engineering,
Faculty of Technology,
Dharmsinh Desai University, Nadiad – 387001
Gujarat state, India.
Website: *http://www.ddu.ac.in*

Dharmsinh Desai University
Faculty of Technology
Department of Mechanical Engineering

TEACHING SCHEME FOR THE COURSE

B.TECH. (MECHANICAL ENGINEERING)

Semester-I

Course Title	Teaching Scheme					
	Th	Tut	Prac	L+T	P	Credits
MATHEMATICS – I	3	1	----	4	0	4.00
ENGINEERING MECHANICS	3	0	2	3	1	4.00
ENGINEERING GRAPHICS	4	0	3	4	1.5	5.50
WORK SHOP-I	----	----	2	0	1	1.00
ELEMENTS OF ELECTRICAL ENGINEERING	4	0	2	4	1	5.00
COMPUTER PROGRAMMING	4	0	2	4	1	5.00
ENGG. ECONOMICS & MANAGEMENT PRINCIPLES	3	0	0	3	0	3.00
	21	**1**	**11**			**27.50**

Semester-II

Course Title	Teaching Scheme					
	Th	Tut	Prac	L+T	P	Credits
MATHEMATICS – II	3	1	----	4	0	4.00
MECHANICS OF SOLIDS	3	0	2	3	1	4.00
WORK SHOP – II	----	----	2	0	1	1.00
BASIC ELECTRONICS	4	0	2	4	1	5.00
ELEMENTS OF MECHANICAL ENGINEERING	4	0	2	4	1	5.00
ADVANCED COMPUTER PROGRAMMING	4	0	2	4	1	5.00
ENVIRONMENT SCIENCES	3	0	0	3	0	3.00
	21	**1**	**10**			**27.00**

Semester-III

Course Title	Teaching Scheme					
	Th	Tut	Prac	L+T	P	Credits
MATHEMATICS-III	3	1	----	4	0	4.00
KINEMETICS OF MACHINES	4	----	2	4	1	5.00
ENGINEERING THERMODYNAMICS	4	----	----	4	0	4.00
MATERIAL SCIENCE & METALLURGY	4	----	2	4	1	5.00
ELECTRICAL MACHINES	4	0	2	4	1	5.00
MACHINE DRAWING & INDUSTRIAL DRAFTING	3	0	3	3	1.5	4.50
	22	**1**	**8**			**27.50**

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Semester-IV

Course Title	Teaching Scheme					
	Th	Tut	Prac	L+T	P	Credits
ADVANCED STRENGTH OF MATERIAL	4	----	0	4	0	4.00
NUMERICAL TECHNIQUES	3	----	2	3	1	4.00
MANUFACTURING TECHNOLOGY-I	4	----	3	4	1.5	5.50
DYNAMICS OF MACHINES	4	----	2	4	1	5.00
FLUID MECHANICS	4	----	2	4	1	5.00
FINANCIAL & MANAGERIAL ACCOUNTING	3	0	0	3	0	3.00
	22	**0**	**9**			**26.50**

Semester-V

Course Title	**Teaching Scheme**					
	Th	**Tut**	**Prac**	**L+T**	**P**	**Credits**
INTERNAL COMBUSTION ENGINES	4	----	2	4	1	5.00
MECHANICAL MEASUREMENT & METROLOGY	4	----	2	4	1	5.00
MANUFACTURING TECHNOLOGY-II	3	----	3	3	1.5	4.50
FLUID POWER ENGINEERING	4	----	2	4	1	5.00
HEAT & MASS TRANSFER	4	----	2	4	1	5.00
PROFESSIONAL COMMUNICATION – I	2	1	----	3	0	3.00
MACHINE DESIGN-I	4	----	2	4	1	5.00
	25	**1**	**13**			**32.5**

Semester-VI

Course Title	**Teaching Scheme**					
	Th	**Tut**	**Prac**	**L+T**	**P**	**Credits**
CONTROL ENGINEERING	4	----	2	4	1	5.00
MECHANICAL VIBRATIONS	3	0	2	3	1	4.00
POWER PLANT ENGINEERING	4	----	2	4	1	5.00
MACHINE DESIGN-II	4	0	2	4	1	5.00
PROFESSIONAL COMMUNICATION – II	2	1	----	3	0	3.00
SEMINAR	----	----	2	0	1	1.00
ELECTIVE I	4	----	----	4	0	4.00
ELECTIVE II	4	----	2	4	1	5.00
	25	**1**	**12**			**32**

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Semester-VII

Course Title	Teaching Scheme					
	Th	Tut	Prac	L+T	P	Credits
PRODUCTION TECHNOLOGY	4	----	2	4	1	5.00
REFRIGERATION & AIR CONDITIONING	4	----	2	4	1	5.00
CAD-CAM	4	----	2	4	1	5.00
AUTOMOBILE SYSTEMS	4	----	2	4	1	5.00
ELECTIVE III	4	----	2	4	1	5.00
ELECTIVE IV	4	----	2	4	1	5.00
PROJECT-I	----	----	2	0	1	1.00
	24	**0**	**14**			**31.00**

Semester-VIII

Course Title	Teaching Scheme					
	Th	Tut	Prac	L+T	P	Credits
PROJECT/INDUSTRIAL TRAINING	0	0	28	0	14	14.00
SEMINAR	0	4	0	4	0	4.00
	0	**4**	**28**			**18.00**

ELECTIVE-I
OPTIMIZATION TECHNIQUES
ALTERNATIVE ENERGY SOURCES
ENERGY CONSERVATION & MANAGEMENT

ELECTIVE-II
DESIGN OF PRESSURE VESSELS
PROGRAMMABLE LOGIC CONTROLLERS & SENSORICS
PRODUCTION PLANNING & CONTROL
GAS DYNAMICS & JET PROPULSION

ELECTIVE-III
ADVANCE MANUFACTURING PROCESSES
TRIBOLOGY
THERMAL SYSTEM DESIGN
HYDRAULICS & PNEUMATICS
DESIGN & ANALYSIS SOFTWARES FOR MECHANICAL ENGINEERS

ELECTIVE-IV
MACHINE TOOL DESIGN
FINITE ELEMENT METHODS
INDUSTRIAL AUTOMATION
QUALITY MANAGEMENT & RELIABILITY

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B.TECH. SEMESTER – I (ODD/ FIRST TERM OF THE YEAR)
SUBJECT: MATHEMATICS - I
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
3	1	0	60	40	0	0	100

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 Differentiation**
   Leibnitz's theorem, Maclaurin's theorem, Taylor's theorem, applications to obtain expansion of functions, indeterminate forms
3. **Integral Calculus**
   curve tracing, applications for finding area, length of arc, volume and surface area of solids of revolution, centre of gravity
4. **Reduction Formula for**

$$\int_0^{\frac{\pi}{2}} \sin^n x\,dx \quad \int_0^{\frac{\pi}{2}} \cos^n x\,dx \quad \int_0^{\frac{\pi}{2}} \sin^m x\,\cos^n x\,dx \quad \int_0^{\frac{\pi}{4}} \tan^n x\,dx \quad \int_0^{\frac{\pi}{4}} \cot^n x\,dx \text{ etc...}$$

5. **Beta and Gamma Functions**
   Definition, properties, relation between beta and gamma functions, use in evaluation of definite integrals, error and elliptic functions
6. **Ordinary Differential Equations**
   Formulation of differential equations, general and particular solutions, equations of first order and first degree of the type: variable separable, homogeneous, non-homogeneous, linear equations, exact equation and those reducible to these forms, Clairut's form, application to geometrical and physical problems

Text Books:

1. Engineering Mathematics - II by Shanti Narayan S. Chand & Co. Pvt. Ltd., Delhi
2. Higher Engineering Mathematics by Dr. B. S. Garewal Khanna Publishers, Delhi

Reference Books:

1. Applied Mathematics by P. N. Wartiker & J. N. Wartiker
2. Engineering Mathematics - I by I. B. Prasad

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B.TECH. SEMESTER – I (ODD/ FIRST TERM OF THE YEAR)
SUBJECT: ENGINEERING MECHANICS
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
3	0	2	60	40	25	25	150

SYLLABUS

1. Statics

Introduction, engineering & SI units, accuracy in engineering calculations, vectors – composition & resolution, concept of rigid bodies. 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 systems listed above.

Friction: friction on inclined plane, ladder friction, wedge fiction, screw friction, belt and rope drive.

Centre of gravity of: lines, plane figures volumes, bodies & Pappu's theorem, principle of virtual work & its applications.

Types of beams, types of supports, support reaction for statically determinate beams

2. Dynamics

Rectilinear motion, circular motion, projectiles, relative velocity, instantaneous centre in plane motion, laws of motion, motion along inclined plane, principle of conservation of momentum, mass moment of inertia in rotational motion, motion of connected bodies, impulse & momentum, impact, work, motion along smooth curve & super elevation

Term Work

1. Experiments based on theory
2. Problems based on theory

Text Book:

1. Mechanics for Engineers – Static by F. P. Beer & E. R. Johnston Jr.
2. Mechanics for Engineers – Dynamic by F. P. Beer & E. R. Johnston Jr.
3. Engineering Mechanics: Static & Dynamic by A. K. Tayal

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B.TECH. SEMESTER – I (ODD/ FIRST TERM OF THE YEAR)
SUBJECT: ENGINEERING GRAPHICS
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
4	0	3	60	40	0	50	150

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: Projection of Points & Straight Lines:**
   Projections of Points, Projections of Lines, construction for H.T. & V.T. Applications of projection of points and lines
3. **Projections of Planes:**
   Projections of regular planes such as square, rectangle, triangle, circle, pentagon, hexagon, rhombus, etc
4. **Projections of Solids:**
   Projections of Right & Regular Solids (Prisms, Pyramids, Cylinder and Cone)
5. **Orthographic Projections:**
   First angle projection method and third angle projection method. Dimensioning techniques and methods. Conversion of pictorial views into Orthographic Projections with dimensions. 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.
6. **Isometric Projections:**
   Conversion of Orthographic views into Isometric Projections and views
7. **Development of Surfaces:**
   Introduction, methods of development, Development of lateral surfaces of right regular solids (Prism, Cylinder, Pyramid & Cone)
8. **Computer Graphics:**
   Introduction to Computer Graphics.

TERM WORK:
The term work shall be based on the above syllabus.

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Text Books:

1. Engineering Drawing By: N. D. Bhatt
2. Engineering Drawing Vol.1 & Vol. 2.By: P.J. Shah

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

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B.TECH. SEMESTER – I (ODD/ FIRST TERM OF THE YEAR)
SUBJECT: WORK SHOP-I
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
0	0	2	0	0	0	50	50

1. **INTROUDCTION TO WORKSHOP:**
   Workshop layout, importance of various sections/shops of workshop, types of jobs done in each shop, General safety rules and work procedure of work shop
2. **TIN SMITHY (ONE JOB)**
   Tin smithy tools like hammers, stakes, scissors etc, sheet metal operations such as shearing , bending ,joining, safety precaution , demonstration of various operation
3. **CARPENTRY (ONE PRACTICE JOB AND ONE JOINT JOB)**
   Carpentry tools like saw, planner, chisels, hammers, pallet, making gauge, vice ,tee square, rule etc, carpentry operations such as marking ,sawing, planning, chiseling, grooving, boring, joining, types of woods and carpentry hardware, safety precaution, demonstration of various operations by using hardware.
4. **PIPE FITTING (ONE JOB)**
   Pipe fitting tools, pipe fitting operations such as marking, cutting bending threading, assembling, dismantling etc. Types of various spanners such as flat, fix, ring box adjustable etc, safety precautions, demonstration of various operation**.**

References:

Work familiarization : E Wilkinson
Work shop technology : A.K. Hajrachauchari & S. K. Hajrachaudhari
ITB Hand book : Engineering Industry training board
Work shop Technology Vol I- II : Gupta & Kaushik

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B.TECH. SEMESTER – I (ODD/ FIRST TERM OF THE YEAR)
SUBJECT: ELEMENTS OF ELECTRICAL ENGINEERING
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
0	0	2	0	0	0	50	50

SYLLABUS

1. **FUNDAMENTALS OF CURRENT ELECTRICITY AND DC CIRCUITS :**
   Introduction: Definition, Symbol and Unit of Quantities, Multiple and sub-multiple units, Computation of Resistance at constant temperature, Temperature dependence of resistance, Computation of resistance at different temperatures, Computations of at different temperatures, Ohm's law statement, Illustration and limitation, Unit work, power and energy (Electrical, Thermal and Mechanical), Circuits-Identifying the elements and the connected terminology., 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 questions, 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) ,Coupling coefficient between two magnetically coupled circuits(K).
4. **AC FUNDAMENTALS :**
   Introduction, Generation of alternating emf, Waveform terminology, Concept of 3-phase EMF Generation, Root mean square (RMS) ot 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, R-L series circuit, R-C series circuit, R-L-C series circuit, Admittance and its components, Simple method of solving parallel A.C. circuits, Resonance.
6. **ELECTRICAL MACHINES :**
   Introduction, D.C. generator, D.C. motor, Transformer, Three phase induction Motor, Applications of electrical machines.
7. **PASSIVE CIRCUIT COMPONENTS :**
   Constructional details of, Resistors, Capacitors, Inductors.

Text Books:

1. Basic Electrical, Electronics and Computer Engineering. By: R.Muthusubramanian, S.Dslivshsnsn ,K.A.Muraleedharan Tata McGrawHill Publishing Co Ltd (1994), New Delhi.

Reference Books:

1. Electrical Engineering. By: B. L. Thareja
2. Electrical Machines By: B. L. Thareja

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B.TECH. SEMESTER – I (ODD/ FIRST TERM OF THE YEAR)
SUBJECT: COMPUTER PROGRAMMING
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
4	0	2	60	40	25	25	150

SYLLABUS

1. **INTRODUCTION :**
   Introduction to Computer Hardware & OS, Introduction to DOS commands & languages, Introduction to Programming in C
2. **CONSTANTS, VARIABLES AND DATA TYPES :**
   Constants, Variables & Data types in C, Declaration & Initialization of C variable, Basic C programs , Defining symbolic constants
3. **OPERATORS AND EXPRESSIONS :**
   Operators in C, Operators in C & The ? : operator, Arithmetic Expressions & Precedence Rule, Type conversion in C, Mathematical Functions
4. **MANAGING INPUT AND OUTPUT OPERATORS :**
   Reading / Writing characters, Formatted Input operations, Formatted Output operations
5. **DECISION MAKING AND BRANCHING :**
   Decision making with If & If .. Else statements, If .. Else statements (Nested …. Ladder), The Switch & goto statements
6. **DECISION MAKING AND LOOPING:**
   The while statement, The break statement & The Do.. While loop, The FOR loop, Jump within loops – Programs
7. **ARRAYS :** Development of simple programs using loops, Introduction to one dimensional array, Array Programs

TERM WORK:
The laboratory and term work will be based on above topics.

Text Books:

1. PROGRAMMING IN ANSI C By E. BALAGURUSAMY 2nd Edition TMH Publications

Reference Books:

1. Let us C. By : Yashwant Kanitkar
2. Programming in C By: Venugopal

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B.TECH. SEMESTER – I (ODD/ FIRST TERM OF THE YEAR)
SUBJECT: ENGG. ECONOMICS & MANAGEMENT PRINCIPLES
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
3	0	0	60	40	0	0	100

SYLLABUS

Part-1 (ENGINEERING 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 behaviour**:
   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,.

Text Books:

1. Modem Economics by H.L. Ahuja.
2. Modem Economic Theory by K.K. Dewett.
3. Monetary Economics by M.L. Seth.

Reference Books:

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

Part-2 (PRINCIPLES OF MANAGEMENT)

1. **Nature of Management**
   a. Concept of Management
   b. Management and Administration
   c. Importance of Management
   d. Nature of Management
   e. Management: Science or Art
   f. Management as Profession
   g. Professionalization of Management in India
   h. Universality of Management
   i. Applying Management Theory in Practice
   j. Role of Management Principles
   k. Effective Management
2. **Management Functions and skills**
   a. Management Function
   b. Nature of Management Functions
   c. Management Role
   d. Functions at Various level of Management
   e. Top Management
   f. Functions of Board of Directors
   g. Functions of Chief Executive
   h. Middle Management
   i. Supervisory Management
   j. Functional Areas of Management
   k. Management Skills
   l. Top Management Skills
   m. Middle Management Skills
   n. Supervisory Management Skills
3. **Fundamental of Planning**
   a. Concept of Planning
   b. Nature of Planning
   c. Importance of Planning
   d. Steps in Planning
   e. Types of Planning

f. Corporate and Functional Planning
g. Strategic and Operational Planning
h. Long term and Short term Planning
i. Proactive and Reactive Planning
j. Formal and Informal Planning
k. Types of Plans
l. Barriers to Effective Planning
m. Making Planning Effective
n. Planning in Indian Organizations

4. **Fundamental of Organizing**
   a. Concept of Organization and Organizing
   b. Organization Theory
   c. Classical Organization Theory
   d. Modern Organization Theory: Systems Approach
   e. Modern Organization Theory: Contingency Approach
   f. Factors Affecting Organization Structure
   g. Environment
   h. Strategy
   i. Technology
   j. Size of Organization
   k. People
5. **Fundamental of Directing**
   a. Concept of Direction
   b. Principles of Direction
   c. Direction and Supervision
   d. Effective Supervision
   e. Order Giving
   f. Technique of Direction
   g. Directing and Human Factor
   h. Managerial Models
6. **Motivation Theories**
   a. Concept of Motivation
   b. Theories of Motivation
   c. Maslow's Need Hierarchy
   d. Herzberg's Motivation-hygiene Theory
   e. McClelland's Needs Theory
   f. McGregor's Theory X and Theory Y
   g. Contingency Approach of Motivation
   h. Motivational Pattern in Indian Organizations
7. **Controlling**
   a. Concept of Controlling
   b. Controlling and Other Functions
   c. Steps in Controlling

d. Types of Control
e. Control Areas
f. Controlling and Management by Exception
g. Benefits of Management by Exception
h. Design of Effective Control System

Reference Books:

1. Principles and Practice of Management By L M Prasad
2. Stoner James A F, Freeman R Edward & Gilbert Jr Daniel R " Management" New Delhi Prentice-Hall of India
3. Koontz Harold &Weihrich Heinz " Essential of Management" New Delhi Tata McGraw Hill
4. Burton Gene &Manab Thakur "Management Today" New Delhi Tata McGraw Hill
5. Robbins Stephen P & Coulter Mary "Management"New Delhi Prentice-Hall of India

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B.TECH. SEMESTER – II (EVEN/SECOND TERM OF THE YEAR)
SUBJECT: MATHEMATICS - II
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
3	1	0	60	40	0	0	100

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.
3. **INFINITE SERIES** :
   Introduction, Definitions, Convergence, divergence and Oscillation of a series, P-test, Comparison test, Ratio test, Root test, Higher rario test, Rabbe's test, Log test, Alternating Series, Leibnitz's rule.
4. **COMPLEX NUMBER** :
   De- Moivre's theorem, and its applications To expand $\sin n\theta, \cos n\theta$ in powers of $\sin\theta$, $\cos\theta$ 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.
5. **LAPLACE TRANSFORMS** :
   Laplace transforms, Inverse transforms, Note on partial fractions, Transforms of derivatives, Transforms of integrals. Multiplication and division by t.

Text Books :

1. Higher Engineering Mathematics By: Dr. B.S. Grewal (Khanna publisers,Delhi).

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,Vidhyarthi Grih Publications

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B.TECH. SEMESTER – II (EVEN/SECOND TERM OF THE YEAR)
SUBJECT: MECHANICS OF SOLIDS
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
3	1	2	60	40	25	25	150

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, Behaviour of ferrous and non ferrous 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 compressometers, 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 if 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. **STRESSES IN BEAMS** : Theory of simple bending, Bending stresses, moment of resistance, modulas 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 transmitted by a shaft, keys and couplings, combined bending and torsion, close coiled helical springs.
7. **PRINCIPLE STRESSES AND STRAINS** : Compound stresses, principle planes and principle stresses, Mohr's circle of stress, priciple strains, Angle of obliquity of resultant stresses, principle stresses in beams, principle stresses in shafts subjected to bending, torsion and axial force.

Text Books:

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.

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B.TECH. SEMESTER – II (EVEN/SECOND TERM OF THE YEAR)
SUBJECT: WORK SHOP - II
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
0	0	2	0	0	0	50	50

SYLLABUS

1. **FITTING (ONE JOB)**
   Fitting tools like files, vice, chisels, punch, scriber, hammers, surface plate, try square, calipers etc, fitting operations such as filling, grinding, sawing, marking, drilling, tapping, safety precaution, demonstration of various operations, preparation of male – female joints.
2. **COLD FORGING (ONE JOB)**
   Smithy tools like hammer, anvil, flatteners etc, smithy operations such as upsetting, drawing down, bending, setting down, fork cutting, punching and fullering etc, safety precautions.
3. **CARPENTRY/UTILITY (ONE JOINT JOB)**
   Carpentry tools like saw, planner, chisels, hammers, pallet, making gauge, vice, tee square, rule etc, Carpentry operations such as marking, sawing, planning, chiseling, grooving, boring, joining, types of woods and carpentry hardware, safety precaution, demonstration of various operation by using hardware. Adhesive bonding of laminated sheets
4. **WELDING (ONE JOB)**
   Electric arc welding. Welding machines, different types of electrodes, screen, fixers, hand gloves, demonstration of welding operation.

References Books:

1. Work familiarization : E Wilkinson
2. Work shop technology : A.K. Hajrachauchari & S. K. Hajrachaudhari
3. ITB Hand book : Engineering Industry training board
4. Work shop Technology : Vol 1- II: Gupta & Kaushik

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B.TECH. SEMESTER – II (EVEN/SECOND TERM OF THE YEAR)
SUBJECT: BASIC ELECTRONICS
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
4	0	2	60	40	25	25	150

SYLLABUS

1. **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, D.C. resistance of a diode.
2. **DIODE CIRCUITS :**
   The sine wave, The transformer, The half wave rectifier, The full wave rectifier, The bridge rectifier, The capacitor input filter.
3. **SPECIAL PURPOSE DIODES :**
   The zener diode, The zener regulator, Optoelectronic devices.
4. **BIPOLAR TRANSSISTOR :**
   Some basic ideas, Forward-reverse bias, The CE connection, Transistor characteristics, DC load lines, the transistor switch.
5. **TRANSISTOR BIASING CIRCUITS :**
   Base bias, Emitter-feedback bias, Collector-feedback, Voltage divider bias, Emitter bias, Moving ground around, PNP circuits.
6. **CE AMPLIFIERS :**
   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.
7. **CC AND CB AMPLIFIERS:** The CC amplifier, The ac model of an emitter follower, Types of coupling, Direct coupling.
8. **CLASS A AND B POWER AMPLIFIER :**
   The ac load line of a CE amplifier, AC load lines of other amplifier, Class A operation.
9. **OP-AMP CIRCUITS :**
   Non inverting voltage amplifiers, The inverting voltage amplifiers, The summing amplifier, Comparators.
10. **OSCILLATORS AND TIMERS :**
    Theory of sinusoidal oscillation, The wein-bridge oscillator.
11. **THYRISTORS :**
    The ideal latch, The four-layer diode, The silicon controlled rectifier.
12. **FREQUENCY DOMAIN :**
    The Fourier series, The spectrum of a signal.
13. **FREQUENCY MIXING :**
    Nonlinearity, Medium-signal, operation with one sine wave, Medium signal operation with two sine waves.

14. AMPLITUDE MODULATION :

Basic idea, Percent modulation, AM spectrum, The envelope detector, The super heterodyne receiver.

15. DIGITAL ICS :

Number system, Boolean algebra, Logic gates.

Text Books:

1. Electronic Principles (Third Edition) By : Albert Paul Malvino Tata McGraw Hill Publishing Co.Ltd,New Delhi.
2. Basic Electrical,Electronics & Computer Engg. By-R.Muthusubramanian, S.Salivahanan, K.A.Muraleedharan. Tata McGraw Hill Co,Ltd,New Delhi.

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B.TECH. SEMESTER – II (EVEN/SECOND TERM OF THE YEAR)
SUBJECT: ELEMENTS OF MECHANICAL ENGINEERING
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
4	0	2	60	40	25	25	150

SYLLABUS

1. **PROPERTIES OF STEAM** :
   Distinction between gas and vapour, sensible heat, latent heat, total heat and superheat of steam, conditions 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, gas constant, internal energy, specific heat at constant pressure and at constant volume, relation 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 fuel, air required, products of combustion of fuel, analysis of the flue gases, calorific value of fuel and its determination.
4. **BOILERS** :
   Classifications of boilers, cochran and Babcock & Wilcox boilers, Boiler mountings and accessories, Draught- natural and artificial.
5. **I.C.ENGINE** :
   Prime-movers, classification of prime-movers with examples of each class. Advantages of I.C. Engines over E.C. engines, classification of I.C. engines, Thermodynamic air cycles, Carnot cycle, constant volume Otto cycle, constant pressure Joule cycle, Diesel cycle, Air-standard efficiency, construction and working of two stroke and four stroke cycle engines, P-V diagrams, determination of I.P.,B.P., Mechanical thermal and relative efficiency , Scavenging of I.C. engines, fuel supply in I.C. engines, ignition systems of I.C. engines, cooling of I.C. engines, lubrication of I.C. engines and Governing of I.C. engine.
6. **SOLAR ENERGY** :
   Introduction, Solar energy systems.

Text Books :

1. Elements of Heat Engines (SI Units) Vol – I By : R.C.Patel & C.J.Karamchandani Acharya Book Depot, Baroda.
2. Elements of Heat Engines (SI Units) By : N.C.Pandya & C.S.Shah Charotar Publishing House, Anand.

Reference Books :

1. Heat Engine By : P.L.Ballaney 2. A Course in thermodynamics & heat engines. By : Kothandaraman

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B.TECH. SEMESTER – II (EVEN/SECOND TERM OF THE YEAR)
SUBJECT: ADVANCED COMPUTER PROGRAMMING
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
4	0	2	60	40	25	25	150

SYLLABUS

1. **STRUCTURES AND UNIONS :**
   Introduction, Structure definition, Giving values to members, Structure initialization, Comparison of structure variables, Arrays of structures, Arrays within structures, Structures within structures, Structures and functions, Unions, Size of structures, Bit fields, Case studies on structures and unions
2. **POINTERS :**
   Introduction, Understanding pointers, Accessing the address of a variable, Declaring and initializing pointers, Accessing a variable through its pointer, Pointer expressions, Pointer increments and scale factor, Pointers and arrays, Pointers and character strings, Pointers and functions, Pointers and structures, Pointers on pointers, Case studies on pointers
3. **FILE MANAGEMENT IN C :**
   Introduction, Defining and opening a file, Closing a file, Input/Output operations on Files, Error handling during i/o operations, Random access to files, Command line arguments, Case studies on file management
4. **DYNAMIC MEMORY ALLOCATION AND LINKED LISTS :**
   Introduction, Dynamic memory allocation, Concept of linked lists, Advantages of linked lists, Types of linked lists, Pointers revisited, Basic list operations, Application of linked lists, Case studies on Dynamic memory Allocation and linked lists.
5. **THE PREPROCESOR :**
   Introduction, Macro Substitutions, File inclusion, Compiler control directives, ANSI additions

Text Book :

1. Programming in ANSI C By : E. Balagurusamy TMH publications, second edition

Reference Books:

1. Let us C. By : Yashwant Kanitkar
2. Programming inC By: Venugopal
3. Pointers in C. By : Yashwant Kanitkar

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B.TECH. SEMESTER – II (EVEN/SECOND TERM OF THE YEAR)
SUBJECT: ENVIRONMENT SCIENCES
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
3	0	0	60	40	0	0	100

SYLLABUS

1. **THE MULTIDISCIPLINARY NATURE OF ENVIORNMENTAL STUDIES**: Definition, scope and importance, Need for public awareness.
2. **NATURAL RESOURCES:**

   Renewable and non-renewable resources : Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies e) Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies. f) 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. **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 :
     a) Forest ecosystem
     b) Grassland ecosystem
     c) Desert ecosystem
     d) Aquatic ecosystems (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:
     a. Air pollution
     b. Water pollution
     c. Soil pollution
     d. Marine pollution
     e. Noise pollution
     f. Thermal pollution
     g. 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 and control of Pollution) Act
   - Wildlife Protection Act
   - Forest Conservation Act
   - Issues involved in enforcement of environmental legislation
   - Public awareness.
7. **HUMAN POLLUTION AND THE ENVIRONMENT**
   - Population growth, variation among nations.
   - Population explosion-Family Welfare Programme
   - Environment and Human Health
   - Human Rights
   - Value Education
   - HIV/AIDS
   - Women and Child Welfare
   - Role of Information Technology in Environment and human health
   - Case Studies

8. FIELD WORK

- Visit to local area to document environmental assets rivers/forest/grasslands/hill/mountains
- Visit to local polluted sites- Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds
- Study of simple ecosystems- pond, river, hill slopes etc.

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B.TECH. SEMESTER – III (ODD/ FIRST TERM OF THE YEAR)
SUBJECT: ENGINEERING MATHEMATICS – III
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
3	1	0	60	40	0	0	100

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. **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'smethod &Taylor's series method, Modified Euler's Method, Milne's Method, Runge's method, Runge kutta method
3. **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
5. **LAPLACE TRANSFORMS:**
   Application to differential equation

Text Book:

1. Higher Engineering Mathematics By : Dr. B.S.Grewal

Reference Books:

1. A Text Book of Applied Mathematics, P.N. & J.N. Wartikar, Vidhyarthi Grih Publications
2. Mathematics for Engineering, Chandrika Prasad, Prasad Publications, Allhabad
3. A Text Book of engineering Mathematics, Dr. K.N.Srivastva & G.K.Dhawan, Dhanpat Rao and sons, Delhi

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B.TECH. SEMESTER – III (ODD/ FIRST TERM OF THE YEAR)
SUBJECT: KINEMATICS OF MACHINES
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
4	0	2	60	40	25	25	150

A. OBJECTIVES OF THE COURSE

This course is included in the curriculum to fulfil following objectives;

- Students will learn about various types of mechanisms used in machines such as four bar mechanisms, slider crank mechanisms, pantograph, and straight line motion mechanisms.
- Students will become familiar with different types of motion and power transmission mechanisms like, belt drive, chain drive, gear drive, cam and follower, etc.
- Students will understand velocity and acceleration analysis as well as synthesis of mechanisms.

B. DETAILED SYLLABUS

1 SIMPLE MECHANISMS

Introduction to theory of machines, Machines, mechanisms and structures. Rigid and resistant bodies, Kinematic link, Types of links, Kinematic pair, Types of constrained motions, Classification of Kinematic pairs, Types of joints, Degrees of freedom, Kinematic Chain, Linkage, Mobility of mechanisms- Kutzback's criterion, Gruebler's criterion. Four bar chain and its inversions, Single and Double slider crank chain and their inversions.

2 MECHANISMS WITH LOWER PAIRS

Pantograph, Straight line motion mechanisms such as Paucellier mechanism, Hart's mechanism, Scott- Russell and Modified Scott- Russell mechanisms, Watt's mechanism, Robert's mechanism, Tchebicheff's mechanism, Grasshopper mechanism. Steering gear mechanisms- condition of correct steering, Davis and Ackermann Steering gear mechanisms. Hooke's Joint, Double Hooke's Joint.

3 VELOCITY ANALYSIS

Absolute and relative velocity of a moving body, Velocity vectors, Motion of a link- translation and rotation, Velocity analysis of various mechanisms by relative velocity method (graphical)- velocity diagram, linear velocities of the points and angular velocities of the links of the mechanism, velocity of rubbing, velocity image of ternary or quaternary link. Velocity analysis of various mechanisms by Instantaneous centre method- Instantaneous centre, centrode, Instantaneous axis, axode, Properties of instantaneous centres, types of Instantaneous centres and how to locate them. The Aronhold Kennedy's theorem, Angular velocity ratio theorem.

4 ACCELERATION ANALYSIS

Acceleration of a moving body, centripetal and tangential components of acceleration in a rotating link, Acceleration analysis of various mechanisms by relative acceleration method (Graphical)- acceleration diagram, acceleration image of ternary or quaternary link. The coriolis component of acceleration in a rotating-sliding link.

5 SYNTHESIS OF MECHANISMS

Introduction, Analytical and Graphical methods of synthesis of mechanisms, Freudenstein's method, Relative pole method- two position synthesis, three position synthesis etc.

6 BELTS, ROPES AND CHAINS

Introduction, Belt and rope drives, Types of belt drive- Open and crossed belt drives, simple and compound belt drive etc., Velocity ratio, Slip, Materials for belt and ropes, Types of pulleys, Law of belting, Length of open and crossed belt, Ratio of friction tensions, Power transmitted, Centrifugal effect on belts, Maximum power transmitted by a belt, Initial tension, Creep, Chain drive, Chain length, Angular speed ratio, Classification of chains.

7 GEARS AND GEAR TRAINS

Introduction, Classification of gears, Gear terminology, Law of gearing, Velocity of sliding, Forms of teeth, Cycloidal profile teeth, Involute profile Teeth, Comparison of cycloidal and involute tooth forms, Path of contact, Arc of contact, number of pairs of teeth in contact, Interference in involute gears, Minimum number of teeth, Interference between rack and pinion, Undercutting, Gear trains- simple, compound, reverted, epicyclic. Epicyclic gear train analysis by analytical and tabular methods.

8 CAMS AND FOLLOWERS

Introduction, Types of cams, Types of followers, Cam terminology, Displacement diagrams, Motions of the follower, Graphical construction of cam profile.

C. LEARNING OUTCOMES

Upon successfully completion of this course, the students will be able to;

- Determine mobility and constraints of various mechanisms.
- Perform kinematic analysis on various mechanisms for determination of displacement, velocity and acceleration of various links.
- Carry out motion synthesis of simple mechanisms like four bar mechanism.
- Construct different types of cam profile to impart specific motion to follower.

D. RECOMMENDED TEXTBOOKS

1. Rattan, S.S., “Theory of Machines”, Tata McGraw Hill publication, 2014.
2. Khurmi R. S. and Gupta J. K., “Theory of Machines”, S. Chand Publication, 2005.

E. REFERENCE BOOKS

1. Shigley J. E. and Uicker J.J., “Theory of Machines and Mechanisms”, Oxford University Press India, 2014.
2. Ghosh Amitabha and Mallik Asok kumar,”Theory of Mechanisms and Machines”, East-West Press Pvt. Ltd., 2006.
3. Ballaney P. L.,” Theory of Machines and Mechanisms”, Khanna Publications, 2003.
4. Rao J. S. and Dukkipati R.V., “Mechanism and Machine Theory”, Wiley Eastern, 1992.
5. Bevan Thomas, “Theory of Machines”, Pearson India, 2010.
6. Sadhu Singh, “Theory of machines: Kinematics and Dynamics”, Pearson India, 2011.

F. LIST OF EXPERIMENTS

1. Kinematic chains and their inversions
2. Mechanisms with lower pair
3. Slip phenomena in flat belt drive
4. Involute gear tooth profile generation
5. Velocity analysis
6. Acceleration analysis
7. Construction of cam profile
8. Epicyclic gear train
9. Cam analysis
10. Coriolis component of acceleration

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B.TECH. SEMESTER – III (ODD/ FIRST TERM OF THE YEAR)
SUBJECT: ENGINEERING THERMODYNAMICS
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
4	0	0	60	40	0	0	100

A. OBJECTIVES OF THE COURSE

The objectives of this course are;

- To introduce the basic principles of thermodynamics via real-world engineering examples to students
- To show students how thermodynamics is applied in engineering practice
- To explain basic thermodynamic laws and applications to students
- To explain concept of entropy and irreversibility to students
- To explain fuel combustion process and analysis of flue gases

B. DETAILED SYLLABUS

1 INTRODUCTION AND BASIC CONCEPTS
Thermodynamics and Energy, Systems and Control Volumes, Properties of a System, Continuum, Density and Specific Gravity, State and Equilibrium, Processes and Cycles, Zeroth Law of Thermodynamics, Pressure

2 ENERGY AND ENERGY TRANSFER
Forms of Energy, Energy Transfer by Heat, Energy Transfer by Work, Mechanical Forms of Work

3 FIRST LAW OF THERMODYNAMICS
Energy Balance, Energy Change of a System, Mechanisms of Energy Transfer.
Energy Balance for Closed Systems: Moving Boundary Work, Energy Balance for Closed Systems, Specific Heats, Internal Energy, Enthalpy, and Specific Heats of Ideal Gases, Internal Energy, Enthalpy, and Specific Heat of Solids and Liquids.
Mass and Energy Analysis of Control Volumes: Conservation of Mass, Flow Work and the Energy of a Flowing Fluid, Energy Analysis of Steady-Flow Systems, Some Steady-Flow Engineering Devices, energy analysis of unsteady flow processes.

4 SECOND LAW OF THERMODYNAMICS
Introduction to the Second Law, Thermal Energy Reservoirs, Heat Engines, Kelvin–Planck Statement, Refrigerators and Heat Pumps, Coefficient of Performance, Clausius Statement, Equivalence of the Two Statements, Perpetual-Motion Machines, Reversible and Irreversible Processes, The Carnot Cycle, The Carnot Principles, The Thermodynamic Temperature Scale, The Carnot Heat Engine

5 ENTROPY
Increase of Entropy Principle, Entropy Change of Pure Substances, Isentropic Processes, Property Diagrams Involving Entropy, What Is Entropy, The T-ds Relations, Entropy Change of Liquids and Solids, Entropy Change of Ideal Gases, Reversible Steady-Flow Work, Isentropic Efficiencies of Steady-Flow Devices, Entropy Balance, Exergy

6 EQUATION OF STATES FOR REAL GASES AND FLUIDS

Ideal gas equation, Van-der-Waal equation of state, Berthelot equation of state, Dietetic equation of state, Beattie-Bridgeman equation of state, law of corresponding states, virial equation, Compressibility factor. Compressibility chart

7 THERMODYNAMIC PROPERTY RELATION

Property relation, Maxwell relations, Clapeyron equation, , Helmholtz and Gibbs functions, General relations for change in internal energy, enthalpy and entropy, Specific heat relations, Joule-Thompson coefficient and their relation

8 PROPERTIES OF PURE SUBSTANCE:

Definition of pure substance, Phases of pure substance, phase change processes of pure substance, property diagrams for phase change processes, property table

9 FUELS AND COMBUSTION:

Definition of fuel, calorific values, theoretical determination of calorific value of fuel, Experimental determination of calorific value of fuel using bomb calorimeter, boy's calorimeter and Junker's gas calorimeter, Carbon value of fuels, Dry flue gas analysis by Orsat apparatus, Combustion of various fuel elements, Exercise on Flue gas analysis on mass basis and volume basis

C. LEARNING OUTCOMES

After completion of this course, student will be able to;

- Analyze the work and heat interactions associated with a prescribed process path, and to perform a first law analysis of a flow system
- Understand fundamentals of thermodynamics laws and their applications.
- Evaluate entropy changes in a wide range of processes and determine the reversibility or irreversibility of a process from such calculations.
- Understand the use of the Gibbs and Helmholtz free energies as equilibrium criteria.
- determine the equilibrium states of a wide range of systems,
- To determine minimum air required for complete combustion and analyze the products of combustion by mass and volume bases.

D. RECOMMENDED TEXTBOOKS

1. Engineering Thermodynamics by P. K. Nag, Tata McGraw Hill Publication
2. Thermodynamics An Engineering Approach by Yunus A. Cengel & Michael A. Boles, McGraw Hill Publication

E. REFERENCE BOOKS

1. Engineering Thermodynamics by R. K. Rajput, Laxmi Publication
2. Fundamentals of Thermodynamics by Claus Borgnakke, Richard E Sonntage ,Wiley publication
3. Fundamentals of Engineering Thermodynamics by Moran and Shapiro, John Wiley & sons publication
4. Advanced engineering thermodynamics by Adrian Bejan, Wiley publication

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B.TECH. SEMESTER – III (ODD/ FIRST TERM OF THE YEAR)
SUBJECT: MATERIAL SCIENCE AND METALLURGY
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
4	0	2	60	40	25	25	150

A. OBJECTIVES OF THE COURSE

- Expose students to different classes of materials, their properties, structures and imperfections present in them.
- To learn structure of material based on its atomic structure.
- To understand importance of phase diagrams which effects mechanical properties like strength, ductility, brittleness.
- Selection of material is always based on certain technical reasons. Those reasons can be easily understand
- To get required shape in material, it has to processes in specific manner. Such concepts can be easily understand by knowing material science.

B. DETAILED SYLLABUS

1 INTRODUCTION TO ENGINEERING MATERIALS

Classification of Engineering Materials, Engineering requirements of materials, Properties of engineering materials, Criteria for selection of materials for engineering applications

2 STRUCTURE OF MATERIALS

Crystalline structure of solids, Concept of unit cell and space lattice, lattice parameters, miller indices, Crystal structure of ferrous and nonferrous metals. Crystal imperfections, atomic packing factors for various cubic systems, crystalline materials, amorphous materials, structure of atoms, bonds, forces between particles, particle arrangements in solids, structure of metals, growth of metal crystals, slip, dislocation, movements of dislocation, Phase and phase equilibrium, solidification of pure metals and alloys, solid solution, phase diagrams, Lever rule, Gibb's solid phase rule, phase diagram of binary alloys, properties and phase diagrams.

3 STEELS AND HEAT TREATMENTS

Introduction, Allotropy of iron and Fe-C diagram. Various phases in Fe-Fe3c diagram. Property variation with microstructure, classification and application of steels, specifications of steels, transformation product of austenite, TTT and CCT curves, critical cooling rate, heat treatment of steels, cooling media, austenitic and ferritic grain size in steels. Introduction and purpose of heat treatment, classification of heat treatment processes, Introduction and applications of various case hardening and surface hardening treatments. Engineering alloys steel.

4 BEHAVIOUR OF MATERIAL

Elastic Behaviour, plastic deformation, strengthening Mechanisms, creep, mechanism of creep fracture, ductile, brittle, fracture toughness, ductile brittle transition, fracture mechanism maps, methods of protection against fracture, fatigue fracture.

5 ENGINEERING NON-FERROUS ALLOYS

Equilibrium diagram for non-ferrous alloys, copper and copper alloys, brasses, equivalent zinc in brasses, season cracking of brasses, aluminium bronzes, tin bronzes, beryllium bronzes, silicon bronzes, copper nickel alloys, aluminium and aluminum alloys, nickel and nickel alloys, lead and lead alloys, tin and tin alloys, bearing materials.

6 INTRODUCTION TO POLYMER, CERAMICS, COMPOSITE AND ADVANCED MATERIALS

Thermoplastics, Thermosets, elastomers, engineering ceramics, glasses, cement, fiber reinforced materials, particle reinforced materials, Dispersion strengthened metals, laminates, additive manufacturing methods

7 FERROUS EXTRACTIVE METALLURGY

Pig Iron, Manufacture of Pig Iron, Cast Iron and its production, Steel Making and various methods of making steel, crucible process, Bessemer converter process, Open hearth process, oxygen steel making, L-D process, LD-AD process, Electric furnaces, Spray refining processes

8 MATERIAL SELECTION: BASICS

Introduction, selection strategy, material indices, selection procedure, structural index.

9 POWDER METALLURGY

Concept, applications, advantages and limitations, blending, mixing, compacting, sintering

10 MATERIAL CHARACTERISATION TECHNIQUES

Introduction to Non-destructive testing, Radiography Testing, Dye Penetration Testing, Magnetic Particle Testing, Ultrasonic Testing, Jominy end quench test, Macro-examination, Spark Test, Macro-etching, Microscopic examinations, Electron Microscopy, Magnetic Testing, Chemical analysis of steel and Iron, Hardness test- Brinell Vickers Rockwell. Micro hardness test, Fatigue and creep test, concept of fracture toughness testing, Crystal structure determination by X-ray diffraction

C. LEARNING OUTCOMES

- By completing this course student will easily identify basic classification of materials surrounded by him.
- Students can easily identify various mechanical properties required in material in order to serve its function.
- Learning various destructive and non-destructive testing, it becomes easy for students how to develop defect free product in market.
- Importance of iron-iron carbide phase diagram's usefulness can be easy understand by knowing variety of steel available in industries.

D. RECOMMENDED TEXTBOOKS

1. Material Science and Engineering by V. Raghvan, Prentice Hall of India
2. Metallurgy for engineers by V. Raghvan
3. Material Science and Engineering by Callister

E. REFERENCE BOOKS

1. Material science and metallurgy for Engineers by Dr V. D. Kodgire
2. Introduction to Physical Metallurgy by Sidney Avner
3. Engineering Materials Technology by W. Bolten
4. The science and engineering of Materials by Donald Askland and Pradeep Phule
5. Material Selection in Mechanical Design by Michael F Ashby
6. Material Science and Metallurgy by O. P. Khanna

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F. LIST OF EXPERIMENTS

1. Study of Metallurgical Microscope
2. Specimen Preparation for Optical Microscope
3. Measurement of Indentation Hardness
4. To Study Behaviour of Metal
5. To Study Impact Test
6. Introduction to Various Heat Treatment Processes
7. Jominy End-Quench Test
8. Study of Liquid Penetrant Test
9. Study Magnetic Particle Inspection Test
10. Study of Ultrasonic Inspection Technique

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B.TECH. SEMESTER – III (ODD/ FIRST TERM OF THE YEAR)
SUBJECT: ELECTRICAL MACHINES
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
4	0	2	60	40	25	25	150

A. OBJECTIVES OF THE COURSE

- To improve knowledge of students about DC Generator & DC Motor
- To improve knowledge of students about Alternator & Induction Motor
- To enhance ability of student to calculate electrical consumption& electric bill of various machines
- To understand about power factor improvement
- To enhance drive design capability of student for Induction motor

B. DETAILED SYLLABUS

1 TRANSFORMERS
General aspects, Basic definition, working principle of transformer, Types of transformers, Transformer construction: core/shell/spiral transformers, Transformers on No load & on load, vector diagrams, Equivalent Circuit, Losses & condition for maximum efficiency, All day efficiency, Sumpner's Test, Conditions for parallel operation, Introduction to 3-phase transformer, Construction, Instrument transformers.

2 ALTERNATOR / SYNCHRONIZE MACHINE
Introduction, construction, details, exciters, Armature Winding, EMF equation, Factor affecting size of Alternator, Alternator operation on load, voltage regulation, losses & efficiency, parallel operation of alternators, Armature reaction, damper winding, V Curves, Synchronizing of Alternators.

3 DC GENERATOR
Classification, working principle of generator, construction of DC Machines, types of DC generator, open circuit characteristic, external characteristic and internal characteristic of DC generator. Efficiency &Power stage with example, Condition for maximum efficiency.

4 DC MOTORS
Construction, Types, Principle of operation, torque equation, losses and efficiency, speed torque characteristics of shunt, series and compound motor, D.C. shunt motor 3–point starter, speed control of D.C. shunt and series motors.

5 3-PHASE INDUCTION MOTOR
Construction, principle of operation, speed and slip, rotor current, relation between rotor copper loss and rotor input, torque of an induction motor, torque slip curve, Losses and Efficiency, starters for 3 phase induction motor, speed control.

6 SINGLE PHASE INDUCTION MOTOR
Production of magnetic field, comparison between three phase & single phase Induction motors, starting of single phase induction motor by capacitor and Stepper motor.

7 TARIFFS AND POWER FACTOR IMPROVEMENT

Types of Tariffs, Energy bill calculations, disadvantages of low power factor, causes of low power factor, power factor improvement, calculation of power factor correction, importance of power factor improvement, most economical power factor.

8 INTRODUCTION TO DRIVES

Introduction to Thyristor, Insulated Gate Bipolar transistors (IGBTs), Power MOSFET, Speed torque characteristics of Industrial Equipment, joint speed-torque characteristics, Stability of drives systems, Force and torque acting in Electric drives, Method of speed control for different drives, modes of operation, block diagram and DC drive examples.

9 INTRODUCTION TO SWITCH GEARS

Relay, Circuit Breaker and Isolator, Fuses, Bus-bar.

C. LEARNING OUTCOMES

After learning the course the students should be able to

- Understand working principle, operation, control & applications of AC & DC machines.
- Perform basic experiments on AC, DC machine & Transformer.
- Explain the construction and characteristics of Power semiconductor devices and fundamental of thyristors and family.
- Understand circuit behaviour & working of Drives used for Motors.

D. RECOMMENDED TEXTBOOKS

1. Power systems by V. K. Mehta
2. Principles of power systems by V.K. Mehta, S. Chand publication, 4th edition
3. Electrical Technology- Vol. II, by B. L. Theraja
4. M D Singh and K B Khanchandani, “Power electronics”, TMH, New Delhi, 2nd ed., 2007.

E. REFERENCE BOOKS

1. A Course in power systems by J. B. Gupta (S. K. Kataria Publication)
2. Electrical Power – BY S. L. Upal
3. A course in Electrical Power – BY Sony, Gupta & Bhatnagar
4. Theory & Performance of Electrical Machines – BY J. B. Gupta
5. P.S. Bimbhra, “Power Electronics”, Khanna Publishers, New Delhi, 2012.

F. LIST OF EXPERIMENTS

1. Transformer Open Circuit Test & Short Circuit Test
2. Load Test on Single Phase Transformer
3. Transformer Sumpner’s Test
4. To find out Regulation of Alternator by using Synchronous Impedance method.
5. Study of DC Generator
6. Load Test on DC Shunt Generator
7. Load Test on DC Series Generator
8. Load Test on DC Compound Generator
9. Study of DC & AC Starter
10. No load & Block rotor test on 3-phase Squirrel Cage Induction motor
11. Load Test on 3-phase Squirrel Cage Induction Motor

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B.TECH. SEMESTER – III (ODD/ FIRST TERM OF THE YEAR)
SUBJECT: MACHINE DRAWING AND INDUSTRIAL DRAFTING
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
3	0	3	60	40	25	25	150

A. OBJECTIVES OF THE COURSE

This course is included in the curriculum to fulfil following objectives.

- To impart fundamental knowledge about principles and methods related to projections of one, two and three dimensional objects to students
- To inculcate the imagination and mental visualization capabilities amongst students for interpreting the geometrical details of various mechanical engineering components like pulleys, gears, coupling, joints, shafts, fasteners, etc.
- Students should become familiar with different types of fasteners like threaded fasteners, permanent fasteners and how to designate them.
- Students should understand the systematic method of preparing detail drawing and assembly drawing of various machines, mechanisms and structures.
- Students will learn about design and production drawings and how to prepare them.
- Students will learn computer aided drafting using a drafting software.

B. DETAILED SYLLABUS

1 INTRODUCTION TO MACHINE DRAWING

Machine drawing, detail drawing and assembly drawing, design drawing and production drawing.

2 PRINCIPLES OF DRAWING

Drawing sheet: sizes and designations, title block, borders and frames, grid reference system, metric reference graduation, centre and trimming marks, etc. Scales: engineering scale and drawing scale, Designation, recommended scales, specifications, types of lines and their applications in drawing, lettering, Drawing views: orthographic, isometric and perspective views, sectional views, enlarged detail view, broken view etc., conventional representations of various machine elements, dimensioning, standard abbreviations, missing view representation

2 DETACHABLE FASTNERS

Screw threads, nomenclature of screw thread, forms of thread, Thread designation, representations of threads: normal, schematic and conventional, specifications. Threaded fasteners: bolts, nuts, screws, studs, foundation bolts, nut locking arrangements (Purposes, Classification, principles of operation, standard types and their proportions).

3 PERMANENT FASTNERS

Rivets (Standard forms and proportions), Riveted joints (Common types of joints, terminology, proportions and representations), Design of various types of riveted joints, efficiency of riveted joints.

Types of welds and welded joints, edge preparation, specifications and representation of welds on drawings, IS designation of weld symbols. stresses in butt and fillet welds, strength of butt, parallel and transverse fillet welds, axially loaded unsymmetrical welded joints, eccentric load in plane of welds, welded joints subjected to bending and torsional moments.

4 ASSEMBLY DRAWING

Review of sheet preparation, boundary lines, zones, title block, revision panel, parts list, numbering of components and associated detail drawing, bill of materials, assembly drawings of various machine sub-assemblies and assemblies from detail drawings, sketches and actual machine components.

5 PRODUCTION DRAWING

Introduction to limits, fits, dimensional tolerance, surface roughness and their drawing representation. Geometric dimensioning and Tolerancing: basic terminology, Tolerance frame, Tolerance characteristics and symbols, Modifiers, Indication of geometric tolerance in drawing.

C. LEARNING OUTCOMES

Upon successfully completion of this course, the students will be able to;

- Imagine, visualize and interpret various components by observing their drawings.
- Communicate creative design of mechanical systems with others.
- Prepare design and production drawing of various machines, mechanisms and structures.
- Design simple components and permanent fasteners.
- Prepare drawings using computer aided drafting software.

D. RECOMMENDED TEXTBOOKS

1. Machine Drawing – K. L. Narayana, P. Kannaiah, K. Venkata Reddy, 3rd edition, New age international (P) Ltd.
2. Machine Drawing – Basudeb Bhattacharyya, Oxford University Press
3. Machine Drawing – N. D. Junnarkar, Pearson Education Pvt. Ltd

E. REFERENCE BOOKS

1. Machine Drawing - P.S. Gill, S.K. Kataria & Sons New Delhi.
2. Machine Drawing – N. Sidheshwar, P. Kannaiah. McGraw-Hill India.
3. AutoCAD 2012–A problem solving approach – Sham Tickoo, Delmar Cengage Learning.
4. Design of Machine Elements - V. B. Bhandari, Tata McGraw-Hill Publishing Co. Ltd.
5. PSG Design data

F. LIST OF EXPERIMENTS

1. Introduction and basics about AutoCAD software various commands and their practice. (As per APPENDIX - A)
2. A2 size sheet based on detachable fasteners
3. A2 size sheet based on permanent fasteners
4. A2 size sheet on details of simple mechanical system such as vice, tool post, tailstock and valve. Sheet on Details must include dimensional as well as geometrical tolerances and surface finish requirements. (Using AutoCAD)
5. A2 size sheet on Assembly of simple mechanical system such as vice, tool post, tailstock and valve. (Using AutoCAD)

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APPENDIX – A

1 INTRODUCTION TO AutoCAD:

Starting with AutoCAD, AutoCAD dialog boxes, Co-ordinate Systems, drawing lines, circle, arcs, rectangle, ellipse, polygons, etc…

2 EDITING SKETCHED OBJECTS:

Editing sketches, moving, copying, pasting, offsetting, scaling, chamfering, trimming, mirroring. Filleting, sketched objects

3 BASIC DIMENSIONING:

Geometric dimensioning and Tolerance: Dimensioning AutoCAD, Creating linear, rotated, angular aligned base line Dimensions, Modifying dimensions

4 PLOTTING:

Plotting the drawings in AutoCAD, plotting drawing using the plot dialog box, adding plotters and using plot styles, plotting sheets

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B.TECH. SEMESTER – IV (EVEN/ SECOND TERM OF THE YEAR)
SUBJECT: ADVANCED STRENGTH OF MATERIALS
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
4	0	0	60	40	0	0	100

A. OBJECTIVES OF THE COURSE

- To explain fundamentals of stresses and strain in three dimension
- To explain various failure theories for static loading within elastic limit and explain how to apply these theories for predicting failure of mechanical components
- Explain the slope and deflection relations of beams using different methods.
- To explain the concepts of stresses developed in rotating parts
- To explain bending stresses setup in curved members

B. DETAILED SYLLABUS

1 STRESSES IN THREE DIMENSIONS
Concept of Continuum, Homogeneity and Isotropy, Types of forces on a body, State of stress at Equality of cross shear, Cauchy formula, principal stresses and planes, Stress invariants, Hydrost deviatoric stress tensor, Mohr's circle for general state of stress, stress transformations, Octahedral s Differential equation of equilibrium

2 STRAINS IN THREE DIMENSIONS
Types of strain, Strain displacement relationship, Shear strain, Rigid body rotation, Principle strain and axes, Strain deviator and invariants, Compatibility conditions, Concept of Plane stress and strain, Stress strain relationship

3 THEORIES OF ELASTIC FAILURE
Concept of factor of safety, Maximum principal stress theory, maximum shear stress theory, maximum principal strain theory, Maximum strain energy theory, maximum shear strain energy theory

4 THICK CYLINDERS
Cylinder Classification, design of thick cylinders, Lame's theory, Design based on various failure theories, cylinders subjected to external pressure, Methods of pre-stressing of cylinders, Analysis of compound cylinders

5 SLOPE AND DEFLECTION OF BEAMS
Introduction, Beam deflection, relation between slope, deflection and radius of curvature, slope and deflection at a section by various methods

6 COLUMNS AND STRUTS
Classification of columns, strength of columns, end conditions and equivalent length, Euler's formula, Rankine's hypothesis, columns subjected to eccentric loading, beam columns

7 STRESSES DUE TO ROTATION
Rotating ring, rotating thin solid and hollow disc, thin disc with a pin hole, disc of uniform strength, rotating long solid and hollow cylinders

8 BENDING OF CURVED BARS
Introduction, Stresses in curved bars (Winkler-Bach theory) (Rectangular section, Circular section, Triangular section, Trapezoidal section, T-Section)

C. LEARNING OUTCOMES

After successful completion of the course, student will be able to;

- Analyze the stresses and strain on mechanical components in three dimensions
- Evaluate elastic failure under static loading using different failure theories
- Design and analyse thick cylinders as well as compound cylinder subjected to internal and external pressure
- Analyze slope and deflection of beams subjected to various types of loads
- Analyze long and short columns and struts subjected to axial and transverse loads
- Evaluate stresses in rotating parts
- Analyze bending stresses in curved bars with different cross-sections

D. RECOMMENDED TEXTBOOKS

1. Advanced Mechanics of Solids – L. S. Srinath, Tata McGraw Hill
2. Strength of Materials – R. K. Rajput, S. Chand & Co. Ltd.

E. REFERENCE BOOKS

1. Solid Mechanics – S. M. A. Kazimi, Tata McGraw Hill
2. Strength of Materials – D. S. Bedi, Khanna book publishing co. Pvt ltd.

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B.TECH. SEMESTER – IV (EVEN/ SECOND TERM OF THE YEAR)
SUBJECT: NUMERICAL TECHNIQUES
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
3	0	2	60	40	25	25	150

A. OBJECTIVES OF THE COURSE

With present development of mechanical engineering, it is necessary to solve complicated mathematical formulation and to develop efficient algorithm. This course gives a complete procedure for solving different kinds of problems occur in engineering numerically.

B. DETAILED SYLLABUS

1 ERROR ANALYSIS:
Significant figures, accuracy and precision, error definitions, round of errors, truncation errors, error propagation, Taylor series, total numerical errors, formulation errors and data uncertainty

2 ROOTS OF EQUATIONS:
Roots of equations, bracketing methods–graphical, bisection and false position methods, Open methods–Newton Raphson methods, Secant methods, Computing methods for roots of polynomials

3 ALGEBRIC EQUATIONS:
Numerical solutions of Linear algebraic equations by Gauss elimination method, Numerical solution of nonlinear equations by Gauss Jordan method

4 MATRICES AND EIGEN VALUE IDENTIFICATION:
LU Decomposition and matrix inversion, special matrices, Cholesky decomposition, Gauss seidel method, Jacobi method

5 CURVE FITTING:
Linear regression, Polynomial regression, Nonlinear regression

6 INTERPOLATION:
Newton's forward and backward difference interpolation, Lagrange interpolation, Hermite interpolation, Inverse interpolation, Spline interpolation

7 NUMERICAL DIFFERENTIATION, NUMERICAL INTEGRATION AND SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS:
Overview of Numerical differentiation and integration methods, Overview of solution methods of Ordinary differential equations, boundary value problems, eigen value problems

8 PARTIAL DIFFERENTIAL EQUATIONS:
Finite difference methods for elliptic equations, parabolic equations & hyperbolic equations

9 STATISTICAL TECHNIQUES

C. LEARNING OUTCOMES

At the end of the course, Students would be acquainted with basic concept of numerical method and application to real life problem as follow:
Mathematical modelling and engineering problem solution, Error analysis, Roots of equations, Solution of system of linear equation, Curve fittings, Numerical differential and integration, Ordinary and partial differential equations. MATLAB programming for engineering problem solving.

D. RECOMMENDED TEXTBOOKS

1. Numerical Methods for Engineers – Steven C. Chapra, Raymond P. Canale, Tata McGraw Hill
2. Numerical Methods for Engineers – S. K. Gupta, New Age International Publishers

E. REFERENCE BOOKS

1. Applied Numerical Analysis – Curtis F. Gerald, Patrick O. Wheatley, Addison Wesley
2. Applied Numerical Methods with MATLAB for Engineers & Scientists, Tata McGraw Hill
3. Numerical Recipes in C–The Art of Scientific Computing - William H. Press, Saul A. Teukoksky, William T. Vetterling, Brian A. Flannery, Cambridge University Press

F. LIST OF EXPERIMENTS

1. Introduction to MATLAB solver
2. Program on Roots of equation methods
3. Program on Numerical Integration methods
4. Program on Simultaneous Equation methods
5. Curve fitting methods & curve fitting toolbox
6. Program on Ordinary Differential Equations
7. Partial Differential Equations & PDE toolbox
8. Program on application of Numerical method for Mechanical Engineering Problems

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B.TECH. SEMESTER – IV (EVEN/ SECOND TERM OF THE YEAR)
SUBJECT: MANUFACTURING TECHNOLOGY -I
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
4	0	3	60	40	25	25	150

A. OBJECTIVES OF THE COURSE

- The course focuses on understanding the basics of science and technology of manufacturing processes.
- Student will learn various aspects of different manufacturing techniques such as various casting methods and different conventional machine tools.
- One of basic purpose of this course is to provide a sound understanding of concepts and principles of machine tools and casting technology so as to enable them to be conversant with advances in these methods in the long run towards increasing the productivity of manufacturing industries.
- By preparation of jobs on various machine tools, students will be prepared for practical aspect of this course.

B. DETAILED SYLLABUS

1 INTRODUCTION TO MANUFACTURING PROCESSES

Importance of manufacturing processes as a fundamental discipline, classification of manufacturing processes. Examples and application of each Process.

2 METAL CASTING

Principal of casting process, casting terms- pattern, mould molding box, runner, riser, Sprue, gate, core, core print, advantages, application and limitation of casting process, sand mould procedure, steps involved in making a casting

3 PATTERNS, MOULDING MATERIALS AND CORE

Definition of pattern, difference between pattern and casting, different types of patterns, pattern materials, pattern allowances, Shrinkage allowance, machining allowance, draft allowance, Distortion allowance, shake allowance, Moulding sands and their essential properties, effect of grain size and shape on properties of sand binders additives. Moulding hand tools, testing moulding sand core definition and uses, types of core print, pattern colors, core boxes.

4 MOULDING PROCESS

Green sand Moulding methods of green sand Moulding, (Bedded in method, turn over method and open sand method) dry sand moulding, skin dried molding, CO2 moulding, shell moulding, advantages, disadvantages, applications of each moulding

5 SPECIAL CASTING PROCESSES

Gravity die casting, pressure die casting, Comparison of permanent mould casting with sand casting and applications, centrifugal casting true centrifugal casting semi centrifugal casting centrifuging. Continuous casting, vacuum casting, investment casting, squeeze casting, Advantages of special casting or conventional casting

6 FATTELING AND CASTING DEFECTS

Shake out operation, cleaning and finishing of casting, Casting surface finishing methods, Sand blasting, Shot blasting and Hydro blasting. Gas defects, shrinkage, cavities, moulding material defects, pouring metal defects, metallurgical defects, inspection of casting

7 GATING DESIGN AND RISERING DESIGN

Elements of Gating system, directional and progressive solidification, Types of gate, Choke and choke area, gating ratio, pouring time calculation, aspiration ratio, condition of aspiration, function and types of riser, requirement of riser, Cain's method, Modulus method , NRL Method/shape factor method, examples based on these topics.

8 LATHE

Function, Working Principle, Classification, Specifications, Main Parts, Feed Mechanism, Lathe Accessories, Lathe Operations, Cutting tool Materials, Tool geometry of Single Point cutting tool, Cutting Parameters: Speed, feed and Depth of Cut, Machining Time, Material Removal Rate (MRR), Example based on Machining time and MRR. Specification of Lathe Machine, Capstan and Turret Lathe, Working Principle, Parts.

9 SHAPING AND PLANNING

Function of Shaper, Working Principle, Classification, Main Parts, Driving mechanism of shaper, feed mechanism of shaper, different Operations on Shaper Machine, Cutting Parameters: Speed, feed and Depth of Cut, Machining Time, Specification of Shaper Machine, Working Principle of Planer, Classification, Difference between shaper and Planer, Planner Operations, Specification of Planner Machine.

10 DRILLING AND BORING

Function, Working Principle, Classification, Main Parts, Specification, Different Operations on Drilling, Twist Drill Nomenclature, Drill Size, Designation of Drill, Cutting Parameters : Speed, feed and Depth of Cut, Machining Time, Working Principle & Types of Boring Machines, Boring Tools

11 MILLING AND BROACHING

Working Principle, Main Parts, Classification of Milling Machines, Specification, Milling Machine Mechanism, Work Holding Devices, Cutter Holding Devices, Different Milling cutters, Tool Geometry of Plain Milling Cutter, Milling Operations, Cutting parameters, Machining Time, Milling attachments, Principle of Indexing, Types of Indexing, Working Principle, Classification, Advantages and Disadvantages of Broaching machines, Application of Broaching Machine.

12 GRINDING

Working Principle, Main Parts, Classification of Grinding Machines, Specification, Grinding Operations, Types of Grinding Wheels, Wheel Marking, Truing, Glazing, Loading, Balancing of Grinding Wheel, Wheel selection.

C. LEARNING OUTCOMES

Students will be able to;

- Understand the basic concept of machining operations and foundry technology.
- Analyze any conventional machining processes and select appropriate machine tool
- Interpret the various factors affecting casting & machining quality
- Perform practical work for machining processes

D. RECOMMENDED TEXTBOOKS

1. Foundry Technology by O. P. Khanna
2. "Workshop Technology", by Hajra Choudhary S.K. and Hajra Choudhary A.K. Media Promotors and Publishers
3. "A text book of production technology" vol-II by O.P. Khanna, Dhanpat Rai publishers

E. REFERENCE BOOKS

1. Production technology, by R.K. Jain, Khanna publishers.
2. Manufacturing Engg. And Technology by S. Kalpakajain, PHI/Pearson.
3. "Production Technology", by H.M.T, Tata McGraw Hill,
4. "Workshop Technology", by Bawa H.S., Tata McGraw Hill,
5. Arora B.D., "Workshop Technology", SatyaPrakashan,
6. "Manufacturing Processes for Engineering Materials"by Kalpakjain S. and Schmid Steven R., Pearson Publication.
7. Workshop Technology Vol. I, II & III by W.A.J. Chapman
8. Principles of Metal casting by R. W. Heine, P. C. Rosenthal McGraw Hill
9. Manufacturing Science by Amitabha Ghosh, East-west Press
10. Manufacturing Technology volume – I Foundry, Forming and Welding by P N Rao

F. LIST OF EXPERIMENTS

1. Introduction of the laboratory, safety rules, brief detail about jobs
2. Demonstration of lathe machine
3. Demonstration of job of lathe machine
4. Making of job on lathe machine
5. Milling machine demonstration
6. Milling operation demonstration
7. Making of job on milling machine
8. Demonstration of shaper machine and its operations.
9. Demonstration of Drilling machine and its operation
10. Demonstration of surface and cylindrical grinding machine and its operation.

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B.TECH. SEMESTER – IV (EVEN/ SECOND TERM OF THE YEAR)
SUBJECT: DYNAMICS OF MACHINES
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
4	0	2	60	40	25	25	150

A. OBJECTIVES OF THE COURSE

- To understand the force-motion relationship in components subjected to external forces and analysis of standard mechanism.
- To understand undesirable effects of unbalances resulting from prescribed motion of mechanism.
- To understand the principles in mechanism used for speed control and stability control.

B. DETAILED SYLLABUS

1 STATIC FORCE ANALYSIS

Introduction, conditions of static equilibrium, equilibrium of two and three force member, member subjected to force couple and torque, free body diagrams, principle of super position, static force analysis of various mechanism, principle of virtual work, static force analysis with friction.

2 DYNAMIC FORCE ANALYSIS

Introduction, D –Alembert's principle, equivalent offset inertia force, dynamic analysis of simple mechanisms, combined static and inertia force analysis of different mechanisms, Dynamic force analysis of reciprocating engine: Inertia of reciprocating mass and connecting rod, Dynamically equivalent system, Turning-moment diagrams, Fluctuation of energy, Flywheels, Dimensions of flywheel rims, Punching presses.

3 BALANCING

Introduction, static balancing, dynamic balancing of several masses in different planes, force balancing of linkages, balancing of reciprocating & rotary masses.

4 GOVERNORS

Introduction, analysis of different types of governors: mechanical type governor, spring-loaded type governor, various terminologies, effort and power of a governor, controlling force.

5 GYROSCOPE

Concept of gyroscope, angular velocity, angular acceleration, gyroscopic couple, gyroscopic effect on aviation, marine and automobiles.

6 FRICTION

Types of friction, laws of friction, coefficient of friction, pivots and collars, Friction clutches & its types, rolling friction, anti-friction bearings, greasy friction, greasy friction at journal, friction axis of a link, film friction, Mitchell thrust bearing

C. LEARNING OUTCOMES

Upon completion of this course, the students will be able to;

- Predict the force analysis in mechanical system
- Find unbalance force in rotary and reciprocating system
- Related gyroscopic effect on different system and able to solve the problem.

D. RECOMMENDED TEXTBOOKS

1. Rattan, S.S., "Theory of Machines", Tata McGraw Hill, 2005.
2. Grover,G.K.,"Mechanical Vibration", 7th Ed.,New Chand and Brothers,2003.

E. REFERENCE BOOKS

1. Shigley J. E. and Uicker J.J., "Theory of Machines and Mechanisms", McGraw Hill, 1995.
2. Amitabha Ghosh & Ashok Mallik,"Theory of Mechanisms & Machines",Affiliated East-West Press Pvt. Ltd.
3. Charles Wilson & J.peter Sadler, "Kinematics & Dynamics of Machinery", Pearson Education.
4. Dynamics of Machinery by Farazdak Haideri , Nirali Publication.
5. Rao J. S. and Dukkipati R.V., "Mechanism and Machine Theory", Wiley Eastern, 1992.
6. Thomas Bevan, "Theory of Machines", CBS Publishers, New Delhi, 1984.
7. Theory of Machines by Dr. Sadhu Singh, Pearson Education.
8. Mechanical Vibration by Schaum Series, Mc-Graw Hill

F. LIST OF EXPERIMENTS

1. Static force analysis of simple mechanisms using graphical method.
2. Dynamic force analysis of simple mechanisms using graphical method.
3. Determination of characteristic curve of a sleeve position against speed of rotation for watt governors.
4. Determination of characteristic curve of a sleeve position against speed of rotation for porter governors.
5. Determination of characteristic curve of a sleeve position against speed of rotation for proell governors.
6. Determination of characteristic curve of a sleeve position against speed of rotation for hartnell governors.
7. To study the direction & magnitude of gyroscopic couple in relation to precession and rotor spin direction.
8. To study dynamic balancing for rotary and reciprocating machinery.

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B.TECH. SEMESTER – IV (EVEN/ SECOND TERM OF THE YEAR)
SUBJECT: FLUID MECHANICS
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
4	0	2	60	40	25	25	150

A. OBJECTIVES OF THE COURSE

1. To teach basics – Fluid properties, Types of Fluid Flow and Forces acting in Fluid at rest and in motion
2. To teach conservation of mass, momentum and energy in different flow situations
3. To teach application of Bernoulli's theorem in practical situation
4. To teach kinematics and dynamics of flow.
5. To teach mathematical techniques like dimensional and model analysis, explaining significance of dimensionless numbers in analysis of real fluid problems. To teach about the losses and parameter affecting when there is fluid flow in different situations (Flow thorough pipes)

B. DETAILED SYLLABUS

1 FLUIDS AND THEIR PROPERTIES

Fluid Properties , Types of fluid, Newton's law of Viscosity, Newtonian and Non-Newtonian Fluid, continuum concept of a fluid, viscosity, Dimensional formula and units of viscosity, Causes of viscosity in fluids, Effect of temperature of Viscosity, Cohesion and adhesion, Surface tension, capillary, Vapour pressure, cavitation, compressibility and the bulk modulus.

2 PRESSURE AND ITS MEASUREMENT

Pressure, Pascal's law of pressure at a point, Hydrostatic law (fundamental law of fluid statics), Hydrostatic Paradox, Absolute and Gauge pressures, measurement of pressure, manometers: simple and differential manometers.

3 FLUID STATICS

Total Pressure force and Centre of Pressure, Hydrostatic Force on submerged surfaces - Horizontal, Inclined, Vertical and Curved surfaces, Buoyancy, Stability of Submerged Body, metacentre, Stability of Floating body, determination of metacentric height, Relative Equilibrium under Linear Acceleration : liquid in container subjected to uniform acceleration in horizontal and vertical directions.

4 FLUID KINEMATICS

Methods of Analysing fluid motion: Langrangian Method and Eulerian Method, Types of flow : Laminar Flow and turbulent flow, steady and unsteady flow, Uniform and non-uniform flow, Compressible and incompressible flow, One, Two and Three Dimensional Flows, Rotational and irrotational flows, Steam Lines and Stream Tubes, Path Lines, Streak Lines, Flow rate and continuity equation, Continuity equation in differential form for Cartesian coordinate and cylindrical coordinate system, Acceleration field of fluid : Local and convective acceleration, Translation, Rotation and Deformations, Circulation of fluid element, Rotational flow, rotation and Vorticity, Stream Function and Velocity Potential function, Stream lines and Equipotential lines, Relation between Stream Function and Velocity Potential, Flow nets.

5 FLUID DYNAMICS

Newton's Laws of Motion, Euler's Equation, Bernoulli's Equation, Static pressure, Dynamic pressure, Stagnation and Total pressure, Measurement of flow rates: venturimeter, Orifice meter and Pitot tube, Reynolds's Transport Theorem, Momentum equation, Application of momentum equation: Forces due to fluid flow in the bends, Moment of momentum equation, Vortex flow, Forced and Free Vortex flow, equation of motion for vortex flow, Equation of Forced and Free Vortex flow,

6 DIMENSIONAL AND MODEL ANALYSIS

Dimensional analysis, Basic and derived quantities, Dimensional Homogeneity , methods of Dimensional Analysis : Rayleigh's method, Buckingham π – theorem,

Model Analysis, Similitude, Geometrical, Kinematics and Dynamic Similarity, forces influencing hydraulic phenomenon, dimensionless parameters and their significance, Model Laws, Model testing.

7 LAMINAR AND TURBULENT FLOWS

Concepts of Laminar and Turbulent Flows, Reynolds number and Reynolds experiment, Navier-Stokes Equation, Exact solution of Navier -Stokes Equation for simple flows, Relation between shear stress and pressure gradient, concept of developing and fully developed flow, Flow of Viscous fluid in circular pipes - Hagen-Poiseuille law, Laminar Flow between Parallel Plates for Moving and Stationary plates, Flow through Concentric annulus, Power absorbed in bearings, loss of head due to fluid friction in pipes, Hydrodynamically smooth and rough boundaries, Boundary Layer and its characteristics, Boundary layer Thickness.

8 FLOW THROUGH PIPES

Loss of energy in pipes, Friction factor, Moody's Chart, Friction loss in pipe flow -Darcy Weisbach Equation, Chezy's Formula, Major and Minor losses in pipes, Hydraulic Gradient Lines and Total Energy line, Pipes connected in Series and Parallel, Equivalent pipe, Branched Pipes, Power Transmission Through Pipes, Syphon, Flow Through Orifices and Mouthpieces, Flow through open channel, Chezy's Formula in open channel, Uniform and Non Uniform flow, Hydraulic Jump.

9 FLOW AROUND SUBMERGED BODIES

Force exerted by flowing fluid on a body, Expression for Drag and Lift, Co-efficient of drag and life, streamlined and bluff bodies, Drag on different geometry, examples.

C. LEARNING OUTCOMES

Students who successfully complete this course will have an ability to:

1. Apply the basic equation of fluid statics to determine forces on planar and curved surfaces that are submerged in a static fluid, to manometers
2. Use of conservation laws in differential forms and apply them to determine velocities, pressures and acceleration in a moving fluid.
3. Use Euler's and Bernoulli's equations and the conservation of mass to determine velocities, pressures, and accelerations for incompressible and inviscid fluids.
4. Understand the concepts of rotational vs. irrotational flows, stream functions, velocity potentials. Laplace equation, vortex flows.
5. Apply principles of dimensional analysis and similitude to simple problems and use dimensionless parameters. g, j)
6. Determine flow rates, pressure changes, and minor and major head losses for viscous flows through pipes.
7. Understand the concepts of viscous boundary layer.
8. Understand the mechanics of viscous flow about immersed bodies, drag coefficients and the determination of drag co-efficient.

D. RECOMMENDED TEXTBOOKS

1. Fluid Mechanics and Hydraulic Machines by R.K. Bansal, Laxmi Prakashan.
2. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, S. K. Kataria & Sons
3. Fluid Mechanics by Yunus A. Cengel, McGraw Hill Publication

E. REFERENCE BOOKS

1. White F. M., "Fluids Mechanics", McGraw-Hill Inc., 3rd. Ed., New York, 1994.
2. A text Book on "Fluid Mechanics and Hydraulic Machines" by Sukumar Pati, McGraw-Hill Inc.
3. Som S K , Biswas G. , Introduction to Fluid Mechanics and Fluid Machines, Tata McGraw Hill Co. Pvt. Ltd., New Delhi, 2002.

F. LIST OF EXPERIMENTS

1. Redwood Viscometer
2. Study of Capillary Effect in Fluid
3. Reynolds Experiment
4. Metacentric Height
5. Flow through Orifices and Mouthpieces
6. Bernoulli's theorem
7. Flow Measurement by Venturimeter
8. Flow Measurement by Orifice meter
9. Pitot - static tube
10. Study of Losses in Pipe Flow - Major Losses and Minor Losses

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B.TECH. SEMESTER – V (ODD/ FIRST TERM OF THE YEAR)
SUBJECT: INTERNAL COMBUSTION ENGINES
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
4	0	2	60	40	25	25	150

SYLLABUS

1. **AIR STANDARD CYCLES:**
   Introduction, Air standard cycle parameters, Sterling cycle, Ericsson cycle, Lenoir cycle, Atkinson cycle, Joule or Brayton cycle, Dual combustion cycle, comparison between cycles.
2. **FUEL AND ACTUAL AIR CYCLE:**
   Theoretical and Actual (P-V) diagram for 4 stroke Petrol Engine, Valve timing diagrams for petrol engine. Theoretical and Actual (P-V) diagram for 4 stroke Diesel Engine, Valve timing diagrams for Diesel engine. P-V and port diagram for two stroke engines. Fuel Air cycles: effect of various factors on analysis of fuel- air cycles. Actual Cycles, losses in actual cycles.
3. **COMBUSTION IN IC ENGINES:**
   Introduction, Ignition limits, stages of combustion in SI engine, effect of engine variables on ignition lag, effect of engine variables on flame propagation, abnormal combustion: Detonation or knocking in SI engines, effect of engine variables on knock or detonation. Control of detonation, stages of combustion in CI engine, delay period and factors affecting delay period, diesel knock.
4. **FUEL SUPPLY SYSTEM FOR SI AND CI ENGINES:**
   Carburetion: Factors affecting carburetion, mixture requirement at different loads and speed. Requirement of good carburetor, simple carburetor, types of carburetors, analysis of single jet carburetor. Fuel supply systems and its components used in modern SI and CI engines.
5. **CONVENTIONAL AND ALTERNATIVE FUELS FOR ENGINES :**
   Desirable properties of I.C. engine fuels, required qualities of S.I and C.I engine fuels, rating of S.I and C.I. engine fuels, HUCR, dopes/additives for S.I. & C.I. engines, use of alternate fuels like CNG, LNG, LPG, vegetable oils, biodiesel, alcohol, bio-gas and hydrogen for IC engines.
6. **ENGINE FRICTION:**
   Introduction, total engine friction, Effect of engine variables on engine friction, Determination of engine friction.
7. **VARIOUS SYSTEMS OF IC ENGINES:**
   I) **LUBRICATION SYSTEM:**
   Introduction, lubrication systems used in IC engines, classification and properties of lubrication oils.
   II) **IGNITION SYSTEM:**
   Introduction, ignition requirements, Battery, Coil, magneto and electronic ignition systems.
   III) **COOLING SYSTEM:**
   Introduction, cooling systems used in IC engines: Air cooling and water/liquid cooling with intercooler.

IV) **GOVERNING SYSTEM:**
Introduction, Methods of governing: Hit and miss method, Quality governing and Quantity governing for different engines.

8. **SUPERCHARGING:**
Introduction, objective of supercharging, Objects, types of superchargers. Supercharging of SI and CI engines, effects of supercharging, supercharging limits, methods of supercharging, turbo Charging.
9. **ENGINE EMISSIONS:**
Emission of pollutants from SI & CI engines, control of emissions from SI and CI engines, measurement of pollutants in exhaust gases, effect of different pollutants on environment and health, Emission norms.
10. **TESTING AND PERFORMANCE:**
Introduction, performance parameters, measurement: measurement of speed, fuel consumption, air consumption, brake power, frictional power, indicated power.
11. **VARIABLE COMPRESSION RATIO ENGINE:**
Introduction, methods of obtaining variable compression ratio, two-stroke variable compression ratio engine, performance of variable compression ratio engines.

Text Books:

1. A course in internal combustion engines by V.M. Domkundwar, Dhanpatrai & Co.(p) ltd, New Delhi
2. Internal combustion engines by Mathur & Sharma , Dhanpatrai & sons, New Delhi.
3. Internal combustion engines by V.Ganeshan (Tata Mc Grawhill Pub. co. ltd., New Delhi)

Reference Books:

1. Internal combustion engines by Ramalingam (Scitech pub.india pvt. ltd., chennai)
2. Internal combustion engines by H.N. Gupta, PHI Learning, New Delhi.
3. Internal combustion engines by B.L..Singhal (Tech-max publications, Pune)
4. Internal combustion engines by S.S.Thipse. (Jaico Publishing house,Mumbai)
5. Fundamental of I.C. Engines by John Heywood (McGraw Hill Publication)

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B.TECH. SEMESTER – V (ODD/ FIRST TERM OF THE YEAR)
SUBJECT: MECHANICAL MEASUREMENT & METROLOGY
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
4	0	2	60	40	25	25	150

SYLLABUS

1. **BASIC CONCEPT OF MEASUREMENT:**
   What is measurement, Methods of measurement, Standards Calibration, General Measurement system, Operational description of a measurement system, Accuracy and precision , Types of errors, Sources of errors, , Statistical analysis of data.
2. **PERFORMANCE CHARACTERISTICS OF MEASURING INSTRUMENTS:**
   Introduction, Static performance characteristics, Dynamic performance characteristics, Input types, Instruments types, Transducers.
3. **PRESSURE MEASUREMENT :**
   Introduction, methods of measuring pressure, Dead weight gauge tester, McLeod gauge, Pressure measurement with elastic transducers, Electrical methods, Manometers, Measurement of Vacuum Pressure, Dynamics of Pressure Transducers, Pressure gauge calibration.
4. **TEMPERATURE MEASUREMENT:**
   Introduction, Expression of Temperature, Expansion of thermometer, Change of state thermometer, Electrical methods, Pyrometery, Optical pyrometer, Calibration of temperature measuring instruments.
5. **FLOW MEASUREMENT:**
   Introduction, Types of flow measuring Instruments, Quantity meter, Obstruction meters, Flow measurement by drag effect(Rotameter), Pitot tube, Hot wire anemometers, special methods, Measurement of mass flow rates, Flow visualization methods.
6. **MISCELLANEOUS MESUREMENTS:**
   Basic methods of force measurements, Torque measurement on rotating shaft, Poney brake and eddy current dynamometers, Stress and strain measurements, Types of strain gauges, Electrical resistant strain gauges, Wheatstone bridge, Gauge factor of strain gauge, Rosettes, Speedometer and stroboscope, Ballast circuit, Vibration measurement using accelerometer.
7. **LINEAR AND ANGULAR MEASUREMENT:**
   Introduction, Line Graduated Measuring Instruments , Steel Rule , Calipers , Surface plate , Angel plate , V block , Planner gauges , Radius gauges , Feeler gauges, Angel gauges , Vernier instruments , Micrometers, Slip gauges , Standards of Measurements, Vernier and Optical Bevel Protector , Sine Principle and Sine Bars, Dial gauges.
8. **LIMITS, FITS AND GAUGES:**
   Introduction, Tolerances, Interchange ability, Terminology, Selection of fits, Tolerances and Geometry (shape), Positional tolerance, Geometric Dimensioning and Tolerancing

9. **COMPARATORS:**
   Introduction, Characteristics of comparators, Uses of comparators, Advantage & Disadvantages of Various Types of Comparators, Mechanical optical Comparators, Pneumatic Comparators, Fluid Displacement Comparators, Optical Projector
10. **STRAIGHTNESS, FLATNESS, SQURENESS, PARALLELISM, CIRCULARITY AND ROTATION**
    Straightness, Test for straightness by using Spirit level and Auto- collimator , Flatness Testing, Mathematical treatment of determination of straightness and flatness of surface, Parallelism, Equidistance, Coincidence, Squareness, Measurement of circularity, Test for checking Rotation, Profile Measurement, Surface roughness measurement, Examples.
11. **METROLOGY OF GEAR AND SCREW THREAD**
    Introduction, Screw Thread Terminology, Effect of Pitch Error, Measurement of Various element of thread, Different types of Gears, Basic elements of gear, Involute function, Relations between different gear elements of spur and helical gears, virtual number of teeth, Use of gear tooth vernier for chordal and constant chordal measurement, Span measurement using Base tangent micrometers

Text Books:

1. Engineering Metrology by R.K.Jain, Khanna publishers
2. Mechanical Measurement by R.K.Jain, Khanna publishers
3. Mechanical Measurements and Control by D.S.Kumar, Metropolitan, New Delhi
4. Gupta, I.E.,"Engineering Metrology", Dhanpat Rai & Sons, New Delhi, 1994.

Reference Books:

1. Experimental methods for engineers by J.P.Holman, McGraw-Hill
2. Measurement system, Application Design by Doeblein E.O., McGraw Hill 1990
3. Mechanical measurements and instrumentation by A.K.Saehney & Puneet Sawhney, Dhanpat Rai & Co.
4. Mechanical measurement by R. S. Sirohi & H C Raha Krishna,Wiley Eastern Limited.
5. Humc, K.J." Engineering Metrology", MacDonald and Co., 1963.

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B.TECH. SEMESTER – V (ODD/ FIRST TERM OF THE YEAR)
SUBJECT: MANUFACTURING TECHNOLOGY-II
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
3	0	3	60	40	25	25	150

SYLLABUS

1. **WELDING PROCESSES**
   Fundamentals of welding system, Advantages & Disadvantages of welding, Classification of welding processes
   ARC WELDING PROCESSES
   Fundamentals of arc welding, Arc Welding Processes: Carbon Arc welding , Metal electrode welding, Tungsten Inert Gas welding, Metal Inert Gas welding, Metal Argon gas welding & Submerged arc welding. Welding Consumables: Welding Electrode and fluxes, Selection of electrodes, Electrode coating, Care & storage of welding electrode, Classification and coding of electrodes as per IS system. Welding equipments and its specification: Arc welding power sources (AC and DC type), Other accessories for arc welding.
2. **RESISTANCE WELDING PROCESSES**
   Fundamentals of Electric Resistance welding, Spot welding, Projection welding, Seam welding
3. **GAS WELDING**
   Oxyfuel Gas welding Processes Oxyacetylene welding: Principle, Methods, Applications Other Joining Processes, Gas cutting**,** Principles of gas cutting, Position of torch
   SOLDERING AND BRAZING
   Soldering, Brazing, Adhesive Bonding and application.
4. **WELDING DEFETS-**
   Causes and remedies, Inspection and Testing of welds
5. **ADVANCED WELDING PROCESSES**
   Introduction to Electron Beam welding, Electroslag welding, underwater welding, and Narrow gap welding.
6. **HOT WORKING AND COLD WORKING OF METALS**
   Plastic Deformation, Rolling, Extrusion, Pipe & tube manufacture, Merits and demerits of the hot working and cold working process, Wire drawing, Metal spinning, Rolling and Extrusion
7. **PRESS WORKING**
   Presses & drive mechanism for presses, Feed mechanism, Clearance and its importance, Press tool operations, Shearing, cutting off, parting, blanking, piercing, notching, slitting, slitting, Nibbling Trimming, Lancing, Bending & forming types of dies, die materials, stock layout, compound and progressive dies and punches, construction details of die set, auxiliary equipment, safety devices.
8. **SUPER FINISHING OPERATIONS:**
   Introduction, Grinding, Lapping, Horning, Buffing, Barrel Tumbling, Burnishing, Powder coating, Polishing

9. ADVANCES IN MANUFACTURING

Text Books:

1. Welding Technology by O.P. Khanna (Dhanpatrai Publications)
2. Production Technology vol-I by O.P. Khanna
3. Manufacturing Technology- Foundry, Forming and Welding, by P. N. Rao, Tata McGraw Hill

Reference Books:

1. W. A. J. Chapman, "Workshop Technology, Vol.1, 2, and 3
2. Introduction to Manufacturing Processes, by Schey J., Tata McGraw Hill
3. Production technology, by R.K. Jain, Khanna publishers
4. Welding Technology by Richard Little
5. Manufacturing Engg. And Technology By S. Kalpakajain, PHI/Pearson.
6. Materials and Processes in Manufacturing DeGarmo E. P., Black J. T. and Kohser R. A., Prentice Hall India

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B.TECH. SEMESTER – V (ODD/ FIRST TERM OF THE YEAR)
SUBJECT: FLUID POWER ENGINEERING
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
4	0	2	60	40	25	25	150

SYLLABUS

1. **Introduction:**
   Classification of Fluid Machinery, stage, stator, rotor, Cylindrical co-ordinate system, Moment of momentum, Concept of relative velocity, Velocity-vector equation, Velocity triangle, Performance indices like power, efficiency.
2. **Hydraulic Turbines:**
   Impulse Turbines:
   Impact of jets, Pelton wheel, its geometry and working; performance parameters; governing and governing techniques, brief description of a hydro power plant.
   Radial-flow reaction (Francis) turbine: geometry and working; flow at entry; velocity diagram, net head across a reaction turbine; draft tube; flow rate; performance parameters.
   Axial-flow reaction (propeller and Kaplan) turbine: geometry and working; velocity diagram; performance parameters. Draft tube and cavitation; net positive suction head (NPSH).
   Dimensional Analysis & Similitude: Dimensional Analysis; head, flow and power coefficient; non-dimensional specific speed, Similitude; geometric, kinematic and dynamic similarity.
3. **Rotodynamic Pumps:**
   Positive Displacement Pumps:
   Reciprocating pumps: Geometry and working; installation; pressure diagram; pump head and efficiency. Rotary Pumps: Gear pump; rotary vane pump; screw pump.
   Centrifugal pumps:
   Types; geometry and working; Velocity diagrams at entry and exit of the impeller; output and performance parameters – manometric head, manometric efficiency, overall efficiency; effect of blade angle on pump head. Pump performance curves; NPSH and cavitation; specific speed for pumps.
   Axial-flow and Mixed-flow Pumps:
   Specific speed and variation of shape; axial-flow pump theory.
   general Aspects:
   Pumps combined in parallel; multi-stage pumps.
4. **Compressors:**
   Reciprocating compressors – Overview of single-stage reciprocating compressor, multi staging, condition of minimum work for multi-staging, inter-stage cooling, heat rejected during compression and intercoolers, mean effective pressure, indicated power, mechanical efficiency, isothermal efficiency, advantages of multistage compression, demerits

Centrifugal compressor – Construction and operation, ideal energy transfer, velocity diagram, isentropic efficiency, stagnation and total temperatures, power input factor, slip and slip factor, pressure coefficient, pre-whirl, effect of blade shapes on performance, different losses, blade angles, surging and choking.

Axial flow compressors – Construction and operation, velocity diagram and work done factor, pressure ratio, static pressure rise, degree of reaction, selection, blade loading and flow coefficient, aerofoil blading, performance characteristics.

5. **Miscellaneous:**
   Constructional details, operation and application of hydraulic accumulator, intensifier, ram, Fluid coupling, Torque converter, Wind Turbine: Horizontal axis turbine, geometry and working.

Text Books:

1. "Fluid Mechanics and Fluid Power Engineering" by D.S. Kumar, S.K. Kataria & Sons
2. "Fluid Power Engineering" by R.N. Patel and V.L. Patel, Mahajan Publication.
3. "Fundamentals of Turbo machinery" by B.K.Venkanna , Prentice Hall of India.

Reference Books:

1. "Turbines, Compressors and Fans" by S.M. Yahya., Tata Mc Graw Hill Publishing Company Ltd.
2. "Fluid Flow Machines" by Govinda Rao NS, Tata Mc Graw Hill Publishing Company Ltd.
3. "Thermodynamics and Heat Engines", Vol. II and Vol. III by R. Yadav., Central Publishing House.
4. "Fluid Mechanics and Thermodynamics of Turbomachinery" by S.L.Dixon, Butterworth and Heinemann.

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B.TECH. SEMESTER – V (ODD/ FIRST TERM OF THE YEAR)
SUBJECT: HEAT & MASS TRANSFER
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
4	0	2	60	40	25	25	100

SYLLABUS

1. **INTRODUCTION:**
   Various modes of heat transfer, Fourier's, Newton's and Stefan Boltzman's Law. Combined modes of heat transfer, thermal diffusivity, overall heat transfer coefficient.
2. **CONDUCTION:**
   1. Thermal conductivity of solids, liquids and gases and the factors influencing their thermal conductivity. Fourier's law of heat conduction, generalized three dimensional of equation of heat conduction in Cartesian coordinates and its reduction to specific cases, overview of three dimensional heat conduction equations in cylindrical and spherical coordinates.
   2. One dimensional steady state conduction, heat conduction through plane and composite walls, hollow and composite cylinders, hollow and composite spheres, electrical analogy, overall heat transfer coefficient.
   3. Critical thickness of insulation, One dimensional unsteady state heat conduction
   4. Types of fin, heat flow through rectangular fin, infinitely long fin, fin insulated at the tip and fin losing heat at the tip of finite length, efficiency and effectiveness of fin, Biot number, Estimation of error in temperature measurement in a thermometer well.
3. **CONVECTION:**
   1. Newton's law of cooling, thermal and hydrodynamic boundary layer, Dimensional analysis applied to forced and free convection, dimensionless numbers and their physical significance, empirical correlations for free and forced convection, Continuity, momentum and energy equations.
   2. Laminar boundary layer equations on a flat plate and through a tube, laminar forced convection on a flat plate and in a tube, simple Reynold's analogy.
   3. Free Convection from a vertical flat plate, fundamentals of boiling & condensation heat transfer.
4. **RADIATION:**
   1. absorption and reflection of radiant energy, Emission, Radiosity and irradiation, Black and non black bodies, laws of radiation – Planck, Stefan-Boltzmann, Wein's displacement, Kirchoff, intensity of radiation and solid angle, Lambert's cosine law.
   2. Radiation heat exchange between black surface, geometric configuration factor, grey body radiation exchange between surfaces of unit configuration factors, electrical analogy to simple problems.
5. **HEAT EXCHANGERS:**
   1. Basic types of heat exchangers, fouling factors, LMTD, Effectiveness – NTU methods of design, introduction to heat pipe, compact heat exchangers.

2. Pool Boiling & its regimes, critical heat flux, film wise and drop wise condensation, film condensation on tubes, Nusselt's analysis.

6. **MASS TRANSFER**:
   Concentrations, velocities and fluxes, Fick's law, general equation of mass diffusion in stationary media, steady state diffusion through a plain membrane, steady state equimolar counter diffusion, isothermal evaporation of water into air from a surface, mass transfer coefficient, convective mass transfer.
   Term – work / practical shall be based on the above syllabus.

Text Books:

1. "Fundamentals of Heat and Mass transfer", by Kothandraman C.P. (New Age International)
2. "Heat & Mass Transfer", by B.K. Venkanna, PHI Learning, New Delhi.
3. "Heat Transfer", by S.P. Sukhatme, Universities Press (India)

Reference Books:

1. "Heat Transfer", by J.P. Holman, McGraw Hill.
2. "Heat & Mass Transfer", by P.K. Nag, Tata McGraw Hill, New Delhi.
3. "Heat & Mass Transfer", by R.K. Rajput, S. Chand & Co. New Delhi.

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B.TECH. SEMESTER – V (ODD/ FIRST TERM OF THE YEAR)
SUBJECT: MACHINE DESIGN-I
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
4	0	2	60	40	25	25	150

SYLLABUS

1. **INTRODUCTION:**
   Design engineering, basic requirements and procedure of design, design synthesis, selection of preferred sizes, aesthetic and ergonomic considerations in design, concurrent engineering
2. **DESIGN CONSIDERATIONS:**
   Selection of manufacturing method, design and manufacturing considerations of casting, forging, machining and welding, design for manufacture and assembly
3. **DESIGN AGAINST STATIC LOAD:**
   Modes of failure, factor of safety, types of loads and stresses, design of simple parts subjected to tension, compression, shear, bending, torsion and combined loads such as cotter joint, knuckle joint, levers, axle
4. **SCREWS AND THREADED FASTENERS:**
   Types of screw threads, Indian standard proportions, design of power screw, screw jack and C-clamp, bolt of uniform strength, bolt under tension, eccentrically loaded bolted joint in shear, eccentric load perpendicular and parallel to axis of bolt, selection of standard fasteners, design of turn buckle
5. **WELDED JOINTS:**
   Advantages and limitations of welded joints, butt and fillet welds, stresses in butt and fillet welds, strength of butt, parallel and transverse fillet welds, axially loaded unsymmetrical welded joints, eccentric load in plane of welds, welded joints subjected to bending and torsional moments, welded joints subjected to fluctuating loads
6. **RIVETED JOINTS:** Advantages and limitations of riveted joints, types of riveted joints, design of riveted joints, efficiency of riveted joints.
7. **SHAFTS, KEYS AND COUPLINGS:**
   Shafts: types of shaft, material for shaft, standard sizes, , shaft design based on strength and rigidity, A.S.M.E. code for shaft design, Castigliano's theorem Keys: types of keys, design of sunk, saddle, tangent, Kennedy and round keys, design of splines Couplings: types of couplings, design of rigid and flexible couplings
8. **MECHANICAL SPRINGS:**
   Types, applications and materials for springs, stress and deflection equations for helical compression springs, Wahl's factor and its use in spring design, end conditions, surge in spring, springs in series and parallel, concentric springs, design of helical torsion, spiral and leaf springs, shot pinning

9. **THIN AND THICK CYLINDERS:**
   Classification, design of thick cylinders, Lame, Clavarino and Birnie equations, autofretage, compound cylinders subjected to internal and external pressure

   Term Work:
   The term work shall be based on the topics mentioned above.

Text Books:

1. Design of Machine Elements - V. B. Bhandari, Tata McGraw-Hill Publishing Co. Ltd.
2. A text book of Machine Design - P. C. Sharma, D. K. Aggarwal, S. K. Kataria & Sons.

Reference Books:

1. Machine Design, An integral approach - Robert L. Norton, Pearson Education Inc.
2. Design of Machine Elements - M. F. Spott, T. E. Shoup, L. E. Hornberger, S. R. Jayram, C. V. Venkatesh, Pearson Education Inc.
3. Mechanical Engineering Design - J. E. Shigley, C. R. Mischke, McGraw-Hill Publishing Co. Ltd.,
4. Design Data (PSG College of Engg. & Tech.), DVP Printers

Dharmsinh Desai University
Faculty of Technology
Department of Mechanical Engineering

B.TECH. SEMESTER – VI (EVEN/ SECOND TERM OF THE YEAR)
SUBJECT: CONTROL ENGINEERING
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
4	0	2	60	40	25	25	150

SYLLABUS

1. **BASIC CONTROL SYSTEM:**
   System differential equation of electrical, mechanical, thermal, hydraulic and electromechanical network, analogy.
2. **THEORY OF AUTOMATIC CONTROL:**
   Concept of feedback referred to linear control systems in general, e.g. displacement and speed control, process control, definition and terminology, open loop and closed loop systems and its advantages. Block diagrams and single flow graph representation of a physical system, block diagram algebra, transfer function from a block diagram. Basic control actions and controllers – on – off. Proportional, derivative and integral controllers, steady – state analysis. Transient response of first order and second order systems to step, ramp and sinusoidal input, steady state errors, Applications of Laplace transform methods, Reuth's stability criteria and root locus methods improving system performance.
3. **HYDRAULIC CONTROL:**
   Characteristic of hydraulic components control valves, sources of hydraulic power hydraulic meters, pistons and transmission, elements of circuit design, Accumulation control circuit such as position control and speed control circuit.
4. **PNEUMATIC CONTROL:**
   Pneumatic power supply, Amplifiers with different controlling actions, Pneumatic valves and cylinders, theory of four way and pilot valves.
5. **ELECTRICAL CONTROL SYSTEMS:**
   Speed control of D.C. motors, Remote control positional servo mechanism (including effect of gearing between motor and load).
6. **PLC MICROPROCESSOR & FUZZY LOGIC BASED DIGITAL CONTROL:**
   State space analysis optional and adaptive control systems – Industrial logic control system – programmable logic controller and its applications. Concept of fuggy logic, basic notions, linguistic variables of fuggy control comparison of design methodology, examples and case study
7. **CONTROL COMPONENTS:**
   Pneumatic relays, control mechanisms for liquid level, boiler feed control, pressure regulation, throttle valve, temperature regulations and industrial process regulation.

Text Books:

1. Control Systems Engineering By Nagrath & Gopal, New Age International Publishers
2. Modern Control Engineering, By Ogata K, Pearson Education

Reference Books:

1. Automatic Control System by Kuo, Benjamin.C, Prentice Hall
2. Control Systems Engineering By Nise, Norman S John Wiley & Sons, New York
3. Control Systems Engineering By S K Bhattacharya, Pearson Education
4. Control Engineering By D. Ganesh Rao, K. Chennavenkatesh Pearson Education

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B.TECH. SEMESTER – VII (EVEN/ SECOND TERM OF THE YEAR)
SUBJECT: MECHANICAL VIBRATIONS
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
3	0	2	60	40	25	25	150

SYLLABUS

1. **INTRODUCTION:**
   Introduction, Overview of free undamped vibration, Damped free vibrations; under damped, critically damped and over damped systems, response curves for single degree of freedom system.
2. **FORCED VIBRATION:**
   Introduction, Forced vibration with constant harmonic excitation, Forced vibrations with and without damping in single degree of freedom, Force vibration with rotating and reciprocating unbalance and base excitations, vibration isolation and transmissibility, frequency measuring instruments.
3. **TWO DEGREE OF FREEDOM SYSTEMS:**
   Introduction, torsional vibrations, principle modes of vibration, system with damping, forced harmonic vibration, coordinate coupling, vibration absorbers, vibration isolation, Lagrange's equation.
4. **CRITICAL SPEED OF SHAFTS:**
   Introduction, Critical speed of a single disc with and without damping
5. **VIBRATION MEASURING INSTRUMENTS:**
   Vibrometer, velocity pick-ups, accelerometer and frequency measuring instruments.
6. **VIBRATION ANALYSIS BY NUMERICAL METHODS**

Text Books:

1. Mechanical Vibration by Grover, G.K., 7th Ed., New Chand and Brothers, 2003.
2. Mechanical Vibration by Singh, V.P., Dhanpat Rai & Co.
3. Theory Of Machines by S.S.Rattan , Tata Mc-Graw Hill

Reference Books:

1. Mechanical Vibration by Schaum Series, Mc-Graw Hill
2. Mechanical Vibrations by Shrikant Bhave, Pearson Publication
3. Principles of Vibration by Benson H. Tongue
4. Theory Of Machines & Mechanisms by P.L.Ballaney , Khanna Publishers, Delhi
5. Theory of Vibration with Applications" by Thomson, W.T , 3rd Ed.,CBS Publishers

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B.TECH. SEMESTER – VII (EVEN/ SECOND TERM OF THE YEAR)
SUBJECT: POWER PLANT ENGINEERING
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
4	0	2	60	40	25	25	150

SYLLABUS

1. **Introduction to Thermal Power Plant:**
   Introduction, General layout of thermal power plant, Criteria for Site selection, Presents status of power generation in India.
2. **Steam Generator:**
   Heat balance sheet for Boiler, High pressure boilers, supercritical, Supercharged and fluidized bed combustion boiler. Different types of super-heaters, Re-heaters, economizers, Air pre-heaters, Methods of superheat temperature control. Heat recovery steam generators (HRSG) with LP and HP evaporators.
3. **Fuel Handling Systems:**
   Fuel handling layout and its method, storage of coal handling and its equipments Stages in liquid and gaseous fuel handling
4. **Fuel Burning Equipments :**
   Introduction, stoker firing, Types of stokers their working, Pulverized fuel handling systems, Unit and central systems, Pulverized mills, Pulverized coal burners, Oil burners. Fluidized bed combustion systems.
5. **Ash Handling Systems:**
   Ash disposal managements and its utilization. Necessity of ash disposal, Mechanical, Hydraulic, pneumatic and steam jet ash handling system, Dust collection and its disposal, Mechanical dust collector, Electrostatic precipitator.
6. **Draught System:**
   Introduction and Estimation of height of chimney, Maximum discharge, Forced, Induced and balanced draught, Power requirement by fans.
7. **Condensers and Cooling Towers:**
   Types of condensers, sources of air in condenser, Effects of air leakage, Methods of obtaining maximum vacuum in condenser, Dalton's law of partial pressure, vacuum & condenser efficiency, Mass of cooling water required, Air pump Edward air pump. Necessity of cooling ponds and cooling towers, Condenser water cooling systems, Types of cooling towers, cooling ponds.
8. **Feed Water Treatment:**
   Introduction and Necessity of feed water treatment, Effect of impurities, pH & its role in corrosion and scale formation, Internal & external water treatment systems- hot lime soda process, Zeolite ion exchange process, Demineralization plants, Reverse osmosis process, Sea water treatment using reverse osmosis, De-aeration.

9. **Diesel and Hydro Power Plant:**
   Introduction and General layout of diesel and hydro power plant.
10. **Nuclear Power Plant :**
    Nuclear fusion and fission, Chain reaction, Nuclear fuels, Components of nuclear reactor, Classification of reactors, Pressurized water reactor, Boiling water reactor, Gas cooled reactor, CANDU reactor, Fast breeder reactor, Nuclear waste and its disposal, Nuclear power plants in India.
11. **Economics of Power Generation:**
    Load curves, Load duration curves, Connected load, Maximum load, Peak load, base load and peak load power plants, Load factor, Plant capacity factor, Plant use factor, Demand factor, Diversity factor, Cost of power plant, Performance and operating characteristics of power plant, Tariff for electric energy.
12. **Pollution and Its control.**
    Air pollution by thermal power plants and its control, Effect of different pollutants on human health, Water pollution by thermal power plants and its control.

Text Books:

1. Power Plant Engineering, Arora, S.C. and Domkundwar, S., Dhanpat Rai & Co. Delhi.
2. Power Plant Engineering, P.K. Nag, Tata McGrahill Co., Delhi

Reference Books:

1. Power Plant Engineering, R.K. Rajput, Laxmi Publication, Delhi
2. Wakil M. M., “Power Plant Technology”, McGraw Hill, 1985.
3. Power Plant Engg" .F.T.morse, Affiliated East-West Press Pvt. Ltd; New Delhi Madras. Verma Mahesh.

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B.TECH. SEMESTER – VII (EVEN/ SECOND TERM OF THE YEAR)
SUBJECT: MACHINE DESIGN-II
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
4	0	2	60	40	25	25	150

SYLLABUS

1. **DESIGN AGAINST FLUCTUATING LOAD:**
   Stress concentration – causes and remedies, stress concentration factors, fluctuating stresses, fatigue failure, S-N curve, endurance limit, notch sensitivity, design for finite and infinite life, Soderberg and Goodman lines, modified Goodman diagrams, Gerber equation, introduction to wear and creep failures
2. **ROLLING CONTACT BEARINGS:**
   Bearings, types of rolling contact bearings, selection of bearing type, static and dynamic load carrying capacity, equivalent bearing load, bearing life, load factor, design for cyclic loads and speeds, probability of survival, mounting, failure causes and remedies
3. **SLIDING CONTACT BEARINGS:**
   Basic modes of lubrication, bearing characteristic number, viscous flow through rectangular slot, design of hydrostatic bearing, design of hydrodynamic journal bearings, bearing materials, failure causes and remedies, comparison of rolling and sliding contact bearings
4. **BRAKES:**
   Design of block brake with shoe, pivoted block brake, internal expanding brake, simple and differential band brake, caliper disk brake, friction material lining and pressures
5. **SPUR GEARS:**
   Overview of gear drive terminology, standard systems of gear tooth, interference and undercutting, backlash, gear material selection, force analysis, minimum no. of teeth, estimation of module based on beam and wear strength for gears
6. **HELICAL GEARS:** Terminology, virtual number of teeth, force analysis, beam and wear strength, herringbone gear design, crossed helical gears
7. **BEVEL AND WORM GEARS:**
   Terminology, proportions of worm gears, force analysis, spiral bevel gears, friction in worm gears, material selection
8. **DESIGN OF GEAR BOXES:**
   Basic considerations in design of drives, determination of variable speed range, preliminary steps in the design of multi speed gear box, structure diagram, graphical representation of ray and speed diagram, rules and guidelines for layout.
9. **FLY WHEELS:**
   Flywheel material, torque analysis, co-efficient of fluctuation of energy and speed, design of solid disc and rimmed flywheels

10. FRICTION CLUTCHES:

Classification, torque transmission capacity of plate clutches, cone clutch and centrifugal clutch, friction material, thermal considerations in clutches

Term Work: Term work shall be based on above mentioned syllabus topics.

Text Books:

1. Design of Machine Elements - V. B. Bhandari, Tata McGraw-Hill Publishing Co. Ltd.
2. Machine Design – II, Farazdak Haideri, Nirali Prakashan

Reference Books:

1. Mechanical System Design, Farazdak Haideri, Nirali Prakashan
2. Machine Design, An integral approach - Robert L. Norton, Pearson Education Inc.
3. Design of Machine Elements - M. F. Spott, T. E. Shoup, L. E. Hornberger, S. R. Jayram, C. V. Venkatesh, Pearson Education Inc.
4. Design Data (PSG College of Engg. & Tech.), DPV Printers

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B.TECH. SEMESTER – VI (EVEN/ SECOND TERM OF THE YEAR)
SUBJECT: SEMINAR
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
0	0	2	0	0	0	50	50

The students are required to prepare/present seminar on given topic.
The students will undertake Seminar work for the period of full semester. They may opt for design/develop & fabricate small innovative product.
They are supposed to prepare and submit a seminar report as a part of their term work and give presentation on their work. The faculty should monitor the students for their seminar work regularly every week. They are to be examined based on viva and/or demonstration.

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B.TECH. SEMESTER – VII (ODD/ FIRST TERM OF THE YEAR)
SUBJECT: PRODUCTION TECHNOLOGY
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
4	0	2	60	40	25	25	150

SYLLABUS

1. **THEORY OF METAL CUTTING**:
   Principles of metal machining, cutting tools and tool materials, Carbide tools inserts, tool signature, mechanics of chip removal, cutting forces and parameters effecting it, cutting fluids, tool wear, tool life, economics of machining. Multi point cutting tools, temperature measurement at tool-work interface and its effects.
2. **GEAR AND THREADS MANUFACTURING:**
   Different types of Threads manufacturing methods, and tools involved, Different gear forming and generating methods with their special features, Gears finishing processes.
3. **JIGS & FIXTURES:**
   Definition, its usefulness in mass production, design principles, 3-2-1 location concepts, locating systems and types of locators & clamps, jig bushes, design of jigs and fixtures for various machining operations.
4. **NON-CONVENTIONAL MACHINING:**
   EDM, IBM, ECM, ECG, CM, AJM, wire cut EDM, USM, LBM process principle, process parameters and their applications.
5. **CONTROLS IN MACHINE TOOLS:**
   Machine tool drives, Machine tool structures, Machine tool spindles, Special purpose machines, Capstan and turret lathes, single spindle and multi spindle automats, bar type and chucking type machines, Design of cam for single spindle automat, Transfer Machines.

Text Books:

1. Production Technology - H.M.T. By HMT
2. Metal Cutting principles, by M C Shaw, Oxford University press 3. "A Textbook of Production Engineering", by Sharma P. C., S. Chand & Company 4. Jigs & Fixture by Kemster

Reference Books:

1. Pandey P. C., Shan H. S., “Modern Machining Processes” – Tata McGraw Hill
2. Ghosh A. and Mallik A. K., "Manufacturing Science", East West Press
3. Workshop Technology Vol.II by Raghuvanshi, Dhanpat rai Publication
4. Production Technology by R.K.Jain, Khanna Pub.
5. Machine tool design by N. K. Mehta
6. Production Technology by Huaster & Hurtz
7. Production Technology by Buthroid8. Jigs & Fixture by Joshi

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B.TECH. SEMESTER – VII (ODD/ FIRST TERM OF THE YEAR)
SUBJECT: REFRIGERATION & AIR CONDITIONING
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
4	0	2	60	40	25	25	150

SYLLABUS

1. **FUNDAMENTALS OF REFRIGERATION:**
   Refrigerating machines and reversed carnot cycle, maximum coefficient of performance.
2. **VAPOUR COMPRESSION SYSTEM:**
   factors affecting the performance of the system, actual cycle considering different losses, methods of improving COP.
   Single load system: single evaporator with multi expansion valves & flash chambers, compound compression system with flash intercooler with single expansion valve,
   Multi-load systems with single compressor: multi-evaporators working at the same temperature, multi-evaporators with back pressure valves and with multiple expansion valves without flash inter cooling, concept of VRV technology
3. **VAPOR ABSORPTION REFRIGERATION:**
   Electrolux refrigerator; ammonia absorption refrigeration system and its analysis, Li Br system, advantages of absorption system over compression refrigeration system
4. **STEAM JET REFRIGERATION SYSTEM:**
   Basic concept, steam jet refrigeration equipments, application, advantages and disadvantages.
5. **THERMAL INSULATION**:
   Desired properties and classification, thickness of insulation,
   Refrigerants: thermodynamic, chemical & physical requirements, different types of refrigerants including eco-friendly refrigerants
6. **NON-CONVENTIONAL REFRIGERATION SYSTEMS**:
   Thermo-electric refrigeration, Vortex tube refrigeration, Refrigerant mixtures
7. **PSYCHROMETRY & AIR-CONDITIONING:**
   psychrometry and psychrometric properties, psychrometric relations, Daltons law of partial pressure, psychrometric chart, psychrometric processes, requirements of industrial air conditioning & comfort air conditioning.
8. **COOLING LOAD CALCULATIONS AND DESIGN OF AIR-CONDITIONING SYSTEMS:**
   Heat sources causing sensible heat load & latent heat load, cooling load and air quantities, sensible heat factor (SHF), room sensible heat factor (RSHF), gross sensible heat factor (GSHF), Apparatus dew point (ADP), by- pass factor (BF)
9. **HEATING VENTILATION AND AIR CONDITIONING (HVAC):**
   Heating systems**:** Warm air heating, hot water heating, steam heating Ventilation systems: Mechanical systems, Extraction systems, combined systems fluid flow and pressure loss, rectangular sections equivalent to circular sections, equivalent length system for representing other losses, duct

design-equal friction loss method; static regain method; velocity reduction method; duct arrangement systems, energy efficiency.

10. **AIR-CONDITIONING SYSTEMS**:
    Classification, central air conditioning systems, unitary air conditioning, all air, all water, air-water systems.
11. **INTRODUCTION TO CRYOGENICS:**
    Introduction and applications**,** limitations of vapour compression refrigeration system for production of low temperature, Stirling refrigerator, pulse tube refrigeration, ,
    Adiabatic demagnetization

Term Work:
Term work shall be based on above mentioned syllabus topics.

Text Books:

1. Refrigeration and Air Conditioning‘, C.P Arora (Tata McGraw-Hill New Delhi)
2. A course in Refrigeration and Air-Conditioning‘, S.C. Arora & S. Domkundwar,(Dhanpat Rai & Co.)
3. Refrigeration and Air Conditioning‘, Manohar Prasad , (Wiley Eastern Ltd.)

Reference Books:

1. Refrigeration and Air Conditioning‘, W.F.Stocker and J.W.Jones, McGraw-Hill,
2. Principles of Refrigeration‘, Roy.J Dossat, Pearson Education.
3. Refrigeration & air conditioning technology‘, Whitman, W. C., Johnson, W. M., & Tomczyk, J. Delmar

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B.TECH. SEMESTER – VII (ODD/ FIRST TERM OF THE YEAR)
SUBJECT: CAD-CAM
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
4	0	2	60	40	25	25	150

SYLLABUS

1. **FUNDAMENTALS OF CAD:**
   Introduction, Reasons for implementing a CAD system, Computer Aided Process application, conventional design vs CAD. Benefits, Hardware, CAD softwares, Elements of Programming, CAD programming. Technical specification of CAD workstation, computer software-operating system
2. **COMPUTER GRAPHICS:**
   Scan conversions, DDA and Breshnham's algorithm for generation of various figure, 2D and 3D transformations: Scaling, Translation, Rotation, Mirroring, Homogeneous matrix
3. **GEOMETRIC MODELING** :
   Curves – introduction, Analytic curves, synthetic curves, Hermite cubic spline, Bezier curve, B-spline curve. Introduction to NURBS. Surfaces – introduction, surface entities, analytic surfaces, synthetic surfaces, such as Hermite cubic , Bezier , B-spline and coons. Solids – introduction, geometry and topology, solid entities, sweeps, solid manipulation, B-rep, CSG, faceted models i.e. STL, HSD (Hierarchical structural Decomposition) i.e. Octree Features & Feature based models
4. **GRAPHICS STANDARDS:**
   Standards for graphics programming, features of GKS, other graphics standards, PHIGS, IGES, PDES. Standards in CAD
5. **COMPUTER AIDED MANUFACTURING:**
   Introduction, historical background, role of computers in manufacturing, automation, Types of automation, Automation strategies
6. **NC/CNC MACHINES:**
   Numerical Controls, types, evolution of controllers, components of NC/CNC system, specification of CNC system. Classification of NC /CNC machines, transducers used, salient features, constructional details of CNC machines, axis designation, NC/CNC tooling. Fundamentals of manual part programming, types of format, word address format manual part Programming for drilling, lathe and milling machine operations, subroutines, do loops, canned Cycles, parametric sub routines, Automated Programmed Tools language- its types of statement, command and programming
7. **INTRODUCTION TO RECENT TECHNOLOGY IN CAM:**
   Group Technology and Cellular manufacturing: Introduction, Part families, parts classification and coding, production flow analysis, machine cell design, Computer aided process planning (CAPP): Types of process planning system, Advantages of CAP, FMS and CAQC

8. **INTEGRATION OF CAD AND CAM**

Text Books:

1. CAD,CAM and Automation by Farazdak Haideri, Nirali Prakashan
2. CNC Machines Pabla, BS & Adinathan, New Age publishers, New Delhi
3. Computer Aided Manufacturing- Rao, Tewari, Kundra, McGraw Hill

Reference Books:

1. Mastering CAD/CAM / Ibrahim Zeid / Mc Graw Hill international
2. Mathematical Elements of Computer Graphics: Roger and Adams, McGraw Hill, 1994
3. Computer Aided Design and Manufacturing by Sadhu Singh, Khanna Pub.
4. CAD/CAM by Zimmer And Groover, P , Prentice Hall of India
5. Sinha S. K., ―CNC Programming‖, Galgotia Publications

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B.TECH. SEMESTER – VII (ODD/ FIRST TERM OF THE YEAR)
SUBJECT: AUTOMOBILE SYSTEMS
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
4	0	2	60	40	25	25	150

SYLLABUS

1. **VEHICLE CLASSIFICATION AND LAYOUTS:**
   Study various vehicle layouts as front engine and front wheel drive, front engine & rear wheel drive, rear engine & rear wheel drive, Components of transmission system, Four wheel drives
2. **CHASSIS FRAMES AND BODY:**
   Types of Chassis frames & body, Material, Frameless construction
3. **PERFORMANCE OF VEHICLE:**
   Vehicle motion, Resistances during motion, Power required for acceleration and constant velocity motions, Tractive efforts and draw bar pull, Power required and engine characteristics, Gear ratio requirement
4. **CLUTCH:**
   Functions, Type of clutches, Single, Multiple, Centrifugal, Electromagnetic and hydraulic clutches, Lining material, Release mechanism, Fluid flywheel
5. **GEAR BOX:**
   Types of gear boxes, Sliding mesh, Constant mesh, Synchromesh, Epicyclic gear boxes, Gear ratios, Transfer case, Semi-automatic transmission system
6. **AUTOMATIC TRANSMISSION:**
   Requirements, types, Torque converter, Epicyclic gearbox, Continuously variable transmission, Overdrive
7. **DRIVE LINE AND AXLES:**
   Propellers shaft, Types of drive as torque tube and hotch kiss drive, Final drive types, Bevel, Hypoid, Worm and worm wheel, Type of drive axles & differential, Fully or semi floating and three quarter floating
8. **STEERING AND FRONT AXLE:**
   Steering requirements, Steering system and linkages, Steering gears, Steering geometry, Ackermann linkages, Wheel alignment, Toe-in, Toe out, Caster, Camber, king-pin inclination, Under steer and over steer conditions, Power steering, Types of front axle, Elliot & reverse elliot type
9. **SUSPENSION SYSTEM:**
   Purpose, Types of suspension system, Front and rear suspension, Coil spring, Leaf spring, Torsion bars, Shock absorbers, Air and rubber suspension, Plastic suspensions, Independent suspension, Antiroll bar or stabilizer

10. **BRAKES:**
    Function, Internal expanding brakes, Brake lining material, Properties, Hydraulic braking system, Brake oil, Bleeding of brakes, Pneumatic braking system, Vacuum brakes, Antilock braking system, Parking brake and braking efficiency
11. **WHEELS AND TYRES:** Types of wheel rims, Types of tyres, Cross ply, Radial & tubeless tyres, Specifications of tyres, wheel balancing
12. **BATTERY, LIGHTING SYSTEM , ACCESSORIES AND SAFETY SYSTEM:**
    Battery: Construction, working, methods of rating, charging methods, test, generator and cranking motor with drive purpose,
    Lighting system: Horns, Central locking, Power window, Wiring system, head lights, aiming of head lights, indicating lights
    Modern technique, Safety provisions, like air bags/ safety belts, Traction control system
    Tutorials:
    Tutorials shall be based on above mentioned syllabus topics.

Text Books:

1. Crause, W.H., ―Automobile Mechanics‖, Tata McGraw Hill, New Delhi
2. Dr. Kirpal Singh, ―Automobile Engineering Vol- I & II‖, Standard Pub & Dist

Reference Books:

1. Heinz Heisler, ―Vehicle and Engine Technology‖, Arnold, London
2. R.B.Gupta, ―Automobile Engineering‖, Satya Prakashan, New Delhi
3. Dr. N.K.Giri, ―Automobile Technology‖, Khanna Pub
4. Narang G.B.S., ―Automobile Engineering‖, Khanna Publishers, New Delhi.

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B.TECH. SEMESTER – VII (ODD/ FIRST TERM OF THE YEAR)
SUBJECT: PROJECT-1
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
0	0	2	0	0	0	100	100

The students are required to prepare term project on given topic.
The students will undertake project work for the period of full semester. They may opt for design/develop & fabricate small innovative product. They are supposed to prepare and submit a project report as a part of their term work and give presentation on their work. The faculty should monitor the students for their project work regularly every week. They are to be examined based on viva and/or demonstration.

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B.TECH. SEMESTER – VIII (EVEN/ SECOND TERM OF THE YEAR)
SUBJECT: PROJECT/INDUSTRIAL TRAINING
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
0	0	28	0	0	300	100	400

The students are required to prepare term project on given topic by industry.
The students will undertake project work for the period of full semester. They may opt for design/develop & fabricate small innovative product. They are supposed to prepare and submit a project report as a part of their term work and give presentation on their work. The faculty should monitor the students for their project work regularly every week. They are to be examined based on viva and/or demonstration.

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B.TECH. SEMESTER – VIII (EVEN/ SECOND TERM OF THE YEAR)
SUBJECT: SEMINAR
W.E.F.: 2016-17

Teaching Scheme(Hours/Week)			Examination Scheme (Marks)				
Lectures	Tutorial	Practical	Theory (3 hrs)	Sessional (1 hr)	Practical	T.W.	Total
0	0	4	0	0	0	100	100

The students are required to prepare/present seminar on given topic.
The students will undertake Seminar work for the period of full semester. They may opt for design/develop & fabricate small innovative product.
They are supposed to prepare and submit a seminar report as a part of their term work and give presentation on their work. The faculty should monitor the students for their seminar work regularly every week. They are to be examined based on viva and/or demonstration.