DHARMSINH DESAI UNIVERSITY

FACULTY OF TECHNOLOGY

Department of Civil Engineering

Course Structure for B.Tech (Civil Engineering) w.e.f. 2025-26 (as per NEP)

PROGRAM CREDITS 169.0

Sem	Subject	Teaching Scheme				Credit	Exam Scheme (Marks)				
		Lect	Tut	Prac	Total		Th.	Int.	TW	Prac.	Total
I	Mathematics-I	3	1	0	4	4.0	60	40	-	-	100
	Mechanics	3	1	0	4	4.0	60	40	-	-	100
	Computer Programming	3	0	2	5	4.0	60	40	50	-	150
	Applied Chemistry	3	0	0	3	3.0	60	40	-	-	100
	Elements of Mechnical Engg	3	0	2	5	4.0	60	40	50	-	150
	Environmental Science	2	0	0	2	2.0	40	40	-	-	80
	Workshop Practice-I	0	0	2	2	1.0	-	-	50	-	50
	TOTAL	17	2	6	25	22.0	340	240	150	0	730
II	Mathematics-II	3	1	0	4	4.0	60	40	-	-	100
	Engineering Graphics	2	1	2	5	4.0	60	40	50	-	150
	Electrical & Electronics Engineering	3	0	2	5	4.0	60	40	50	-	150
	Elements of Civil Engineering	3	0	0	3	3.0	60	40	-	-	100
	Mechanics of Solids	3	0	2	5	4.0	60	40	50	-	150
	Indian Knowledge System & Ancient Yoga	1	0	2	3	2.0	40	-	-	50	90
	TOTAL	15	2	8	25	21.0	340	200	150	50	740
	Domain Specific Skill based Course Mandatory for Exit										
	Modern Construction Materials	3	0	0	3	3.0	60	-	-	-	60
	Surveying Techniques	1	0	4	5	3.0	-	-	50	50	100

B. TECH. SEMESTER – I (CL)
SUBJECT: ENVIRONMENTAL SCIENCE

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	0	0	2	2	40	40	--	--	80

A. COURSE OBJECTIVE

The objective for this course is to bring awareness about sustainable development and environmental ethics. Evaluate the utilization and over-exploitation of natural resources and advantages of conserving biodiversity. Understanding, comprehending and analyzing solutions to the contemporary environmental issues and problems of pollution, Environmental degradation, global warming, ozone layer depletion and loss of biodiversity. Application of the knowledge about the environment for innovative solutions.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	**INTRODUCTION TO ECOLOGY AND ENVIRONMENTAL SCIENCE** Definition, scope and importance of Ecology and Environmental Science. Basic principle of ecosystem functioning, Biodiversity and its conservation.	2	CO1
[2]	**NATURAL RESOURCES** Renewable and non-renewable resource, Role of an individual in conservation of natural resources.	4	CO1
[3]	**ENVIRONMENTAL POLLUTION** Air pollution: Composition of air, Structure of atmosphere, Ambient Air Quality standards, Classification of air pollutants, Sources of common air pollutants like PM, CO, NOx, Sox. Effects of common air pollutant Water pollution: Sources and significance of water, Sources and types of water pollution, Impacts of water pollutants on eco system and human health. Noise pollution : Sources and types of noise pollution, Noise measurement, Impacts of noise pollution on human health, Solid waste management: Generation and Management of Solid Waste Bio-Medical Waste : Generation and Management of Bio-medical waste E-Waste : Generation and Management of E-waste	12	CO1,CO2, CO3
[4]	**GLOBAL ENVIRONMENTAL ISSUES** Sustainable development, Climate change, Global Warming and Green House Effect, Acid Rain, Depletion of Ozone Layer, Carbon Footprint, Cleaner Development Mechanism (CDM), International	5	CO3

	Environmental treaties and Protocols for mitigating Global Changes.		
[5]	**SOCIAL ISSUES AND THE ENVIRONMENT** Role of individual in prevention of environmental pollution, Environmental Ethics, Wasteland reclamation, Consumerism and waste products.	3	CO4
[6]	**CONCEPT OF 4R'S** Principles, Application of 4R's : Reduce, Reuse, Recycle, Recovery	2	CO4

C. TEXT BOOKS

1. Erach Bharucha, "Textbook of Environmental Studies", Universities Press: Hyderabad, Second Edition, 2013.

D. REFERENCE BOOKS

1. Varandani, N. S. "Basics of Environmental studies", Lambert Academic Publishing: Germany, 2013.
2. Basak, A. "Environmental Studies". Dorling Kindersley: India, 2009.
3. Dhameja, S. K. "Environmental studies", S. K. Kataria and Sons: New Delhi, 2007.
4. Rao, C. S. "Environmental Pollution Control Engineering", Wiley publishers: New Delhi, 2006.
5. Cunningham, W.P.; Cooper; Gorhani, T. H. E.; Hepworth, M.T., "Environmental Encyclopedia", Jaico Publ. House: Mumbai, 2001.

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understanding	Understand the scope and importance of ecology and environmental science and Relate the importance of natural resources,
CO2	Understanding, Analysis	Differentiate between various types of environmental pollution along with their impacts.
CO3	Understanding, Application	Understand the importance of global environmental issues.
CO4	Understanding, Evaluation	Develop ethical value for sustainable development and Inculcate the concepts of Reduce Reuse, Recycle and recovery.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	1	-	3	3	1	1	2	1	3	1	-	1
CO2	3	3	2	1	1	3	3	1	2	2	1	3	1	1	2
CO3	3	3	2	1	-	3	3	1	2	2	1	3	1	2	2
CO4	3	3	1	1	1	3	3	1	2	2	1	3	1	1	2
Avg															

B.TECH. SEMESTER - I (CL/IC/MH)
ELEMENTS OF MECHANICAL ENGINEERING

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	Tut	Prac	Theory	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	2	60	40	50	0	150	3	0	1	4

A. DETAILED SYLLABUS:

Sr. No.	Topic	Hrs.
1	**INTRODUCTION:** Prime movers and its types, concept of force, pressure, energy, work, power, system, heat, temperature, specific heat capacity, change of state, path, process, cycle, internal energy, enthalpy, statements of zeroth law and first law **Energy:** Introduction and applications of energy sources like fossil fuels, nuclear fuels, hydel, solar, wind, and bio-fuels, environmental issues like global warming and ozone depletion	06
2	**HEAT ENGINES AND STEAM BOILERS:** **Heat Engines:** Heat engine cycle and heat Engine, working substances, classification of heat engines, description and thermal efficiency of Carnot; Rankine, Otto cycle and Diesel cycles **Steam Boilers:** Introduction, classification, Cochran, Lancashire and Babcock and Wilcox boiler, functioning of different mountings and accessories	08
3	**INTERNAL COMBUSTION ENGINES:** **Internal Combustion Engines:** Introduction, classification, engine details, four-stroke/two-stroke cycle Petrol / Diesel engines, indicated power, brake power, efficiencies **Couplings, Clutches and Brakes:** Construction, working and applications of couplings, clutches and brakes **Transmission of Motion and Power:** shaft and axle, belt drive, chain drive, gear drive	12
4	**PUMPS AND COMPRESSORS:** **Pumps:** Types and operation of reciprocating, rotary and centrifugal pumps **Air Compressors:** Types and operation of reciprocating and rotary air compressors, significance of multi staging	08
5	**REFRIGERATION, AIR CONDITIOING AND HEAT EXCHANGERS:** **Refrigeration & Air Conditioning:** Refrigerant, vapor compression refrigeration system, vapor absorption refrigeration system, domestic refrigerator, window and split air conditioners **Heat exchangers:** Construction and working of Condensers, evaporators and heat exchangers	08
6	**ENGINEERING MATERIALS:** Types and applications of ferrous & non-ferrous metals, timber, abrasive material, silica, ceramics, glass, graphite, diamond, plastic and polymers	03
	Total Hours	**45**

B. REFERENCE BOOKS:

1. Elements of Mechanical Engineering by N M Bhatt and J R Mehta, Mahajan Publishing House
2. Basic Mechanical Engineering by Pravin Kumar, Pearson
3. Fundamental of Mechanical Engineering by G.S. Sawhney, PHI Publication New Delhi
4. Elements of Mechanical Engineering by Sadhu Singh S. Chand Publication
5. Introduction to Engineering Materials by B.K. Agrawal Tata Mcgraw Hill Publication, New Delhi

C. LIST OF EXPERIMENTS:

1. Construction and working of various types of boilers.
2. Construction and working of different boiler mountings and accessories.
3. Determine brake thermal efficiency of an I. C. Engine.
4. Construction and working of different types of air compressors.
5. Construction and working of different types of pumps.
6. To demonstrate vapor compression refrigeration cycle
7. Construction and working of four stroke petrol engines
8. Construction and working of four stroke diesel engines

D. COURSE OUTCOMES

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

CO1	To understand the fundamentals of mechanical systems and energy
CO2	To understand the functions of heat engines and steam boilers
CO3	To understand the fundamentals of I.C. Engines and its components including brakes, clutches and power transmission systems
CO4	To understand the fundamentals of pumps and compressors and industrial their applications
CO5	To understand the fundamentals of R&AC, heat exchangers,
CO6	To understand the fundamentals of different engineering materials and their applications

E. COURSE ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	2	-	-	-	-	2	3	2	2
CO2	3	2	-	-	-	-	2	-	-	-	-	2	3	2	2
CO3	3	2	-	-	-	-	2	-	-	-	-	2	3	2	2
CO4	3	2	-	-	-	-	2	-	-	-	-	2	3	2	2
CO5	3	2	-	-	-	-	2	-	-	-	-	2	3	2	2
CO6	3	2	-	-	-	-	2	-	-	-	-	2	3	2	2

1-Slightly; 2-Moderately; 3-Substantially

B. TECH. SEMESTER – I

SUBJECT: MATHEMATICS [CH, CL, IC, MH]

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	0	4	4	60	40	0	0	100

Course Objectives – Mathematics-I (Semester I)

The course aims to:

1. Develop a strong foundational understanding of mathematical analysis for engineering applications, particularly through integral calculus and vector analysis.
2. Equip students with the ability to model and solve real-world problems using the principles of linear algebra, including vector spaces and linear transformations.
3. Introduce students to periodic function representation and prepare them to apply orthogonal expansions to signals and systems.
4. Enhance the students' capability to analyze and interpret functions of several variables and use differential techniques for optimization.
5. Foster analytical thinking through the application of vector calculus to physical systems, especially in fluid dynamics and electromagnetics.
6. Introduce fundamental concepts of probability to enable quantitative reasoning in uncertain environments relevant to engineering.

A. DETAILED SYLLABUS

1 **CALCULUS: INTEGRAL CALCULUS [8]** **CO1**

Evolutes and involutes, Applications of definite integrals to evaluate surface areas and volumes of revolutions. Rolle's Theorem, Langrage Mean value theorems, Cauchy's Mean value theorem

2 **LINEAR ALGEBRA MATRICES, VECTORS, DETERMINANTS, LINEAR SYSTEMS[10]** **CO2**

Matrices: Addition and Scalar Multiplication, Matrix Multiplication, Symmetric and Skew-symmetric matrix, Rank of a matrix, Consistency of a Linear System of equations: Existence and Uniqueness of solution, Inverse of a matrix by Gauss-Jordan method, Eigen values and eigen vectors, Linear Independence of vectors, Diagonalization of a matrix.

3 **FOURIER SERIES [7]** **CO3**

Introduction, Euler's Formulae, Functions having points of discontinuity, Change of interval, Expansion of even and odd functions, Half range sine and cosine series, Parseval's theorem.

4 MULTIVARIABLE CALCULUS (DIFFERENTIATION) [11] CO4

Partial derivatives: Functions of two or more variables, Chain Rule, Total derivative: Differentiation of Implicit and composite functions

APPLICATIONS OF PARTIAL DIFFERENTIATION CO5

Jacobians, Taylor and Maclaurin's series expansion for function of two variables, Maxima and minima of function of two variables, Lagrange's method of undetermined multipliers.

5 VECTOR DIFFERENTIAL CALCULUS [6] CO6

Scalar and vector point functions – Vector operator del, Del operator applied to scalar point functions – Gradient, Physical interpretation of gradient (normal to the surface), Directional derivatives, Del operator applied to vector point functions – divergence and curl, Physical interpretation of div $F\rightarrow$ and Curl $F\rightarrow$,

6. PROBABILITY[7] CO6

Probability, Independent and dependent events, Permutations and Combination, Conditional probability, Baye's theorem

B. RECOMMENDED TEXT / REFERENCE BOOKS

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 40th Edition, 2007.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Ed. Pearson, 2002.Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
4. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
5. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 2010.
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
7. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East–West press, Reprint 2005.

Mathematics-I (Semester I) – Course Outcomes

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

1. **CO1:** Demonstrate the ability to model and solve problems involving the computation of geometrical quantities such as area and volume using definite integrals in a variety of coordinate systems.
2. **CO2:** Apply fundamental concepts of linear algebra to analyze the structure of vector spaces, determine the solvability of linear systems, and perform transformations using eigenstructure methods.
3. **CO3:** Represent periodic and piecewise-defined functions in terms of orthogonal series and utilize these representations to analyze convergence and energy content.
4. **CO4:** Analyze functions of multiple variables through differentiation, including computation of total derivatives, and apply expansion techniques for local approximations.
5. **CO5:** Investigate the behavior of multivariable functions to determine optimal points under constraints using advanced analytical techniques involving auxiliary functions.
6. **CO6:** Evaluate vector-valued functions and interpret physical phenomena by computing directional rates of change and characterizing field behavior using vector operators; also solve problems involving discrete and conditional probability.

COs \ Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1: Solve problems using definite integrals to compute geometric quantities	3	2		2							
CO2: Apply linear algebra for vector spaces and linear systems	3	3	1								
CO3: Use orthogonal series for function analysis	3	2									
CO4: Analyze multivariable functions using derivatives	3	2		2							
CO5: Find optimal points under constraints	3	2	2	2							
CO6: Evaluate vector functions and solve problems using vector calculus and probability	3	2		1							

3: High correlation

2: Moderate correlation

1: Low correlation

Blank: No significant correlation

B. TECH. SEMESTER – I (MH/IC/CH/CL)
SUBJECT: MECHANICS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	0	4	4	60	40	-	-	100

A. COURSE OVERVIEW

The primary purpose of the study of mechanics is to develop the capacity to predict the effects of force and motion while carrying out the creative design functions of engineering. The present course is aimed to offer a broad aspect of those areas of Mechanics which are specifically required as an essential background to all engineering students for their studies in higher semesters.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	Cos
[1]	Resultant force for 2D and 3D force system	10	CO1 CO2
[2]	Centroid and Centre of Gravity and Moment of Inertia	10	CO1 CO2
[3]	Equilibrium for concurrent forces, Moment of force about a point, Couples, Varignon's Theorem. and Equilibrium of Beams	06	CO1 CO2
[4]	Equilibrium of Beams: Types of beams, simple and compound beams, type of supports and reaction: Determination of reactions at supports for various types of loads on beams	06	CO1 CO2
[5]	Kinematics in a Coordinate System Rotating and Translating in a Plane, The concept of Instantaneous canter of rotation, Simple harmonic motion.	06	CO1 CO3
[6]	Kinetics of a Particle: Newton's Laws motion, Dependent motion	06	CO1 CO4
[7]	Kinetics of a Particle: Impact and collision, Law of conservation of momentum,	06	CO1 CO5

C. TEXT BOOKS

1. Vector Mechanics for Engineers-Statics -Vol-1-Dynamics Vol-2- F. P. Beer and E. R. Johnston-McGraw Hill Education-(New Delhi)-10th SI Edition 2017

D. REFERENCE BOOKS

1. Engineering Mechanics-Statics-Vol-1-Dynamics-Vol-2-J. L. Meriam and L. G. Kraige-Wiley (New Jersey)-5th Edition-2017
2. Engineering Mechanics-Statics & Dynamics-Irving H. Shames- Prentice Hall (New Jersey)-4th Edition- -2005

3. Engineering Mechanics-M. K. Harbola-Cengage Learning (New Delhi)-2nd Edition-2012
4. Theory of Vibrations with Applications-W. T. Thomson-Pearson Education-(New Delhi)-5th Edition-2008

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand	applying fundamental principles of mechanics
CO2	Learn	Solve practical problems of engineering by Force system and Equilibrium condition. Student will be able to learn of the Center of Gravity and Moment of Inertia of any type of the section.
CO3	Learn	To develop the understanding of modeling dynamic systems of engineering
CO4	Develop	Application of Newton's laws to particles and learn the laws of motion.
CO5	Apply	To ability to analyses the collision of body and impact and momentum

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	2	1	2	3	1	2	3	3	3	3
CO2	3	3	3	3	2	2	1	1	3	1	3	3	3	3	3
CO3	3	3	2	3	3	1	2	2	3	1	2	3	3	3	2
CO4	3	3	2	3	2	2	1	1	3	1	3	3	3	3	3
CO5	3	3	3	2	2	1	1	2	3	1	3	3	3	2	3
Avg															

B. TECH. SEMESTER – II (MH/CL)
SUBJECT: MECHANICS OF SOLIDS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	0	2	5	5	60	40	50*	-	150

Reference Code BSC101

*TW Marks includes Viva based on TW

A. COURSE OVERVIEW

The objective is to learn the fundamental concepts of stress, strain, and deformation of solids with applications to bars, beams, and columns. The course builds on the fundamental concepts of deformation in solid body under the different type of forces. To enhance skills of utilizing materials of appropriate strength for civil engineering applications.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	Simple Stress and Strain analysis	04	CO1 CO2
[2]	Three Elastic Constant, Volumetric strain and temperature analysis	04	CO1 CO2
[3]	Shear force and bending moment diagrams for beams subjected to different types of loads	08	CO1 CO3
[4]	Bending stress and shear stress	08	CO1 CO3 CO4
[5]	Torsion	04	CO1 CO5
[6]	Principal stresses and strains and Mohr's Circle method	06	CO1 CO6
[7]	Mechanical properties, elasticity, plasticity, strain hardening, hardness, toughness, fatigue, Stress-strain relationship for ductile and brittle material.	02	CO1 CO2

C. TEXT BOOKS

1. Strength of Materials-Part– I and II-Stephen Timoshenko-CBS Publisher (USA)-3rd Edition-2002

D. REFERENCE BOOKS

1. Strength of Materials-Sadhu Singh-Khanna Book Publishing Company (New Delhi)-11th Edition-2016
2. Advanced Mechanics of Solid-L. S. Srinath-McGraw Hill Publication (New Delhi)-3rd Edition-2017
3. Engineering Mechanics of Solid-E P Popov-Pearson Education (New Delhi)-2nd Edition-2015
4. Mechanics of Materials-Russell Hibbeler-Pearson Education (New Delhi)-10th edition-2018

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Apply	Apply the fundamental concepts of force deformation and stress-strain relationships to basic engineering structures.
CO2	Understand	The student will have the basic understanding of stress, strain & Deformation, Bending, Bending Stress in members.
CO3	Apply	Ability to draw shear force diagram and banding moment for different types of beams
CO4	Evaluate	Solve practical problems of Bending, Bending Stress in members.
CO5	Analyse	To be able to determine the shear stress and twist in shafts subjected to torque
CO6	Analyse	Apply the concept of principal stresses and theories of failure to determine stresses on a 2-D element.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	2	1	2	3	1	2	3	3	3	3
CO2	3	3	3	3	2	2	1	1	3	1	3	3	3	3	2
CO3	3	2	3	2	1	1	2	2	3	2	3	3	3	2	3
CO4	3	3	3	3	2	2	2	1	3	1	3	3	3	3	3
CO5	3	3	3	3	2	1	1	1	3	2	3	3	3	2	3
CO6	3	3	2	3	2	1	1	1	3	2	3	3	3	2	3
Avg															

B. TECH. SEMESTER –II (CL)
SUBJECT : ELEMENTS OF CIVIL ENGINEERING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	0	0	3	3	60	40	0	0	100

A. COURSE OVERVIEW

To impart the basic understanding of civil engineering and to make aware about civil engineering materials, building planning and construction, and various civil engineering disciplines.

B. COURSE CONTENT

NO	TOPIC	L+T (hrs)	COs
[1]	**INTRODUCTION TO CIVIL ENGINEERING** Introduction, Branches and Scope of civil engineering, Role of Civil Engineer, Units of measurement, Unit conversion (Length, Area, Volume).	3	CO1
[2]	**CIVIL ENGINEERING MATERIAL** Introduction to Construction Materials, classification of Construction Material, Properties, Use and list of tests of materials like Stone, Bricks, Ceramic Materials, Cement, Aggregates, Mortar and Concrete, Timber, Paints, Varnishes and distempers and Metal.	13	CO1, CO2
[3]	**BUILDING PLANNING AND CONSTRUCTION** Concept of Building Plan and Building Drawing, Elementary principles and basic requirements for building planning, elevation and selection of residential building Classification of buildings, Types of building, Building components and their functions and nominal dimensions, types of load on building, load bearing and framed structure	8	CO1, CO3
[4]	**SURVEYING AND LEVELLING** Introduction, Basic Definitions (Surveying, levelling, Plans, Maps, Scales), Introduction to divisions of surveying, Classification of surveying, Fundamental principles of surveying, Measurement in Surveying	4	CO1, CO4
[5]	**TRANSPORTATION ENGINEERING** Role of Transportation in National development, Transportation Ways, Surface - Transportation and Aviation, Elements of Traffic Engineering and Traffic Control Devices	4	CO1, CO4
[6]	**WATER RESOURCE ENGINEERING** Sources of water, Water requirements and Conservation of water, Its Necessity, objective, benefits & measures, Basic Introduction of Hydraulic Structures of Storage	4	CO1, CO5
[7]	**STRUCTURAL AND GEOTECHNICAL ENGINEERING** Types of structures, analysis and design of structures, geotechnical investigation and design of foundation, repair and rehabilitation of structures.	4	CO1, CO5

C. TEXT BOOKS

1. M. Saharia, N. R. Velaga, Introduction to Civil Engineering, 1st ed.; AICTE, New Delhi, 2023

D. REFERENCE BOOKS

1. Dr. R. K. Jain and Dr. P. P. Lodha, Elements of Civil Engineering, 1st ed.; McGraw Hill Education, India Pvt. Ltd., New Delhi, 2014.
2. F.S.Umrigar and J.H.Patel, Basic Civil Engineering, 2nd ed.; Atul Prakashan, Ahmedabad, 2004.
3. Rajput R.K., Engineering Materials, 4th ed.'; S. Chand & Co. Ltd, New Delhi, 2014.
4. Dr. B.C. Punamia, Building Construction, 11th ed.; Laxmi Publication, New Delhi, 2008.
5. N. Kumaraswamy and A. Kameswara Rao, Building Planning and drawing, 7th ed., Charotar Publishing House Pvt. Ltd, Anand, 2013.
6. Dr. B. C. Punmia, Ashok kumar Jain, Arunkumar Jain, Surveying, Vol. I, 16th ed.; Laxmi Publication, New Delhi, 2005

E. COURSE OUTCOMES

CO Number	Skill	Statement
CO1	Understand	Explore the scope of various discipline in civil engineering
CO2	Understand	Get acquainted with construction materials.
CO3	Understand	Understand importance of building drawing and processes for building construction.
CO4	Understand	Get familiar with the field of surveying and transportation engineering
CO5	Understand	Learn about the disciplines of structural, geotechnical, and water resource engineering.

F. COURSE MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	1	-	1	1	1	1	1	-	1	-
CO2	1	1	-	-	-	2	1	1	1	1	-	1	-	1	1
CO3	1	1	-	-	-	1	1	1	1	2	-	1	-	1	1
CO4	1	-	-	-	-	1	-	1	-	-	-	1	1	1	-
CO5	1	-	-	-	-	1	-	1	-	-	-	1	1	1	-
Avg															

B.TECH. SEMESTER - II (CH/CL/IC/MH)
ENGINEERING GRAPHICS

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	**Tut**	**Prac**	**Theory**	**Sess.**	**TW**	**Prac**	**Total**	**Lect**	**Tut**	**Prac**	**Total**
2	1	2	60	40	50	---	150	2	1	2	4

A. DETAILED SYLLABUS:

Sr. No.	Contents	Hrs.
1	**ENGINEERING CURVES:** Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic section curves (Ellipse, Parabola, Hyperbola), Cycloidal Curves (Cycloid, Epicycloid, Hypocycloid), Involutes; Archimedean Spiral	**09**
2	**SOLID GEOMETRY:** Projection of points, projection of lines and their applications, projection of regular planes such as square, rectangle, triangle, circle, pentagon, hexagon, rhombus, projection of right and regular solids inclined to both the planes (prisms, pyramids, cylinder and cone)	**08**
3	**ORTHOGRAPHIC PROJECTIONS:** Concept of orthographic projections, first angle and third angle projection methods, conversion of pictorial views into orthographic projections with dimensioning, computer aided drawing of orthographic projection views	**04**
4	**SECTIONAL ORTHOGRAPHIC PROJECTIONS:** Concept of sectional orthographic projections, special sections, computer aided drawing of sectional orthographic projection views	**03**
5	**ISOMETRIC PROJECTIONS:** Principles of isometric projection, isometric scale, isometric projection and view, conversion of orthographic views to isometric projections and views	**03**
6	**DEVELOPMENT OF SURFACES:** Introduction, engineering applications of development of surfaces, methods of development, development of surfaces of right regular solids - prism, pyramid, cylinder and cone	**03**
	Total Hours	**30**

B. REFERENCE BOOKS:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
3. Shah P. J., (2014) Engineering Graphics, S. Chand Publishing
4. Luzadder W., Duff J., (1992), Fundamentals of Engineering Drawing, Peachpit Press
5. Gill P. S., (2009), Engineering Drawing, S. K. Kataria & Sons
6. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication

C. COURSE OUTCOME:

At the end of the course students will be able to;

CO1 understand primary concepts of Engineering Drawing, geometrical construction and various engineering curves

CO2 iillustrate correct usage of methods, concepts, and theories to solve problems of solid geometry

CO3 select an appropriate standard projection system, break down complex 3D problem into various orthographic views, understand and apply computer aided drawing software to solve orthographic projection problems

CO4 break down complex 3D problems into sectional orthographic views, understand apply computer aided drawing software to solve the problems of sectional orthographic projections

CO5 generate isometric projection from two-dimensional drawings

CO6 ccreate development of surfaces for various parts / components in real life situations

D. TERM WORK

Sheet No.	Title of the sheet	Exercises for sketchbook	Exercises for Sheet	Lab. Turns Allotted
0	Zero Sheet	As per given sheet	---	01
1	Engineering curves (Conics)	6	3	03
	Orthographic projection	2	1	
2	Projections of straight lines	3	2	03
	Projections of planes	4	2	
	Sectional orthographic projection	2	1	
3	Cycloidal curves	3	2	02
	Involutes	2	1	
	Projection of solids	2	1	
4	Isometric drawing / projection	2	1	03
	Archimedean spiral	2	1	
	Development of surfaces	4	2	
5	Introduction to Computer Aided Drawing, drawing of orthographic and sectional orthographic views	---	---	03

E. COURSE ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	1	1	1	2	1	1	1
CO2	3	1	1	1	-	-	-	-	1	1	1	2	2	2	1
CO3	3	2	1	1	-	-	-	-	1	1	1	2	2	1	1
CO4	3	2	1	1	2	-	-	-	1	1	1	2	2	2	2
CO5	3	2	1	1	2	-	-	-	1	2	1	2	2	2	2
CO6	3	2	1	1	-	-	-	-	1	2	1	2	2	2	1

1. Slightly; 2-Moderately; 3-Substantially

B. TECH. SEMESTER II (IC/CH/CL/MH)
SUBJECT: (NEW) ELECTRICAL & ELECTRONICS ENGINEERING (w. e. f. 2025-26)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW .	Pract.	Total
3	0	2	5	4	60	40	50*	-	150

*TW Marks includes Viva based on TW

COURSE OBJECTIVES

The course impart an in-depth understanding of the fundamental concepts associated with AC and DC circuit analysis used in electrical and electronic devices using basic circuital laws and Theorems. The course also focuses on the analyze relationship between electric and magnetic circuits. Understanding of electrical machines. Course also teach knowledge of semiconductor theory and digital logic circuits.

To expose the students to the concepts of various types of electrical, electronic and magnetic circuits and their applications.

DETAILED SYLLABUS

[1] DC CIRCUITS
Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems.

[2] AC CIRCUITS
Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-phase balanced circuits, voltage and current relations in star and delta connections.

[3] MAGNETIC CIRCUITS
Introduction, Definition of Magnetic quantities, Magnetic circuit, Leakage flux, Fringing effect, Comparison between magnetic and electric circuits.

[4] ELECTRO-MAGNETIC INDUCTION
Introduction, Magnetic effect of electric current, Current carrying conductor in magnetic field, Law of electromagnetic induction, Induced emf, Self-Inductance (L), Mutual Inductance (M), and Coupling coefficient between two magnetically coupled circuits (K), Inductances in series and parallel, Magnetic materials, BH characteristics,

[5] TRANSFORMERS & ELECTRICAL MACHINES
Construction, Working Principles, Types and losses of Transformer, DC Motors, Generators, Induction Motor, AC Generator.

[6] SEMICONDUCTOR THEORY, DIODES & DIGITAL LOGIC
Intrinsic and extrinsic semiconductors, Carrier generation and recombination, Carrier transport: diffusion and drift, Introduction to P-N Junction Diode and V-I characteristics, Half wave and Full-wave rectifiers, capacitor filter. Zener diode and its characteristics,

Zener diode as voltage regulator, Special purpose diodes. Number systems, Complements, Boolean algebra, Logic gate ICs and Simple Combinational circuits, Half adder, Full adder.

TEXT / REFERENCE BOOKS

1) Basic Electrical, Electronics and Computer Engineering, R. Muthu Subramanian, S. Salivahanan, K. A. Muraleedharan, 2nd Edition, Tata McGraw Hill
2) Electronics Principles, Albert Paul Malvino, 6th Edition, Tata McGraw Hill
3) Digital Electronics, Morris Mano, 3rd Edition, Prentice Hall of India
4) Electrical Technology (Vol: I & II), B. L. Theraja , A. K. Theraja, 23rd Edition, S. Chand & Company
5) Basic Electrical Engineering, D.P. Kothari, I. J. Nagrath, 3rd Edition, Tata McGraw Hill
6) Introduction to VLSI Circuit & Systems, John P. Uyemura, 1st Edition, John Willey & Sons Inc.
7) Basic Electrical Engineering, D.C. Kulshreshtha, 1st Edition, Tata McGraw Hill
8) Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson
9) Electrical Engineering Fundamentals, V.D. Toro, 2nd Edition, Prentice Hall India
10) Fundamentals of Electrical Engineering, L.S. Bobrow, , Oxford University Press

COURSE OUTCOMES

At the end of the course, students should be able to

CO1. To find DC Circuit parameters using KVL, KCL and Ohm's Laws in DC circuits
CO2. Apply various Network Theorems to solve DC networks and calculate time constant of R-L and R-C circuits.
CO3. Compute various parameters of AC circuits consists of R, Land C.
CO4. Compute various parameters of Magnetic Circuits.
CO5. Understand the operation of Transformer and Electrical Machines.
CO6. Understand semiconductor diodes and digital logic circuits.

COURSE MATRIX

Course Outcome (CO's)	**Program Outcomes (PO's)**												**Program Specific Outcomes (PSO's)**	
	Domain Specific (PO)					**Domain Independent (PO)**								
	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2	1	1	2	2	1	1	1	-	-	1	3	2
CO2	3	3	1	1	2	2	1	1	1	-	-	1	2	2
CO3	2	2	1	1	2	2	1	1	1	-	-	1	3	3
CO4	2	2	1	1	2	2	1	1	1	-	-	1	2	2
CO5	3	3	2	1	2	2	1	1	1	-	-	1	2	2
CO6	3	3	2	2	2	2	1	1	1	-	-	1	3	3
1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)														

B. TECH. SEMESTER II

SUBJECT: MATHEMATICS-II [CH, CL, IC, MH]

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	0	4	4	60	40	0	0	100

Course Objectives – Mathematics-II (Semester II)

The course aims to:

1. Provide students with the knowledge and techniques to model dynamic systems through ordinary and partial differential equations.
2. Enable students to understand and apply analytical methods for solving equations that describe spatial and temporal variations in physical processes.
3. Strengthen problem-solving abilities involving multiple integrals and coordinate transformations used in engineering design and analysis.
4. Introduce the concepts of vector integration and its application to physical laws governing conservation and field behavior.
5. Familiarize students with transform techniques to simplify complex differential models, particularly in linear time-invariant systems.
6. Train students to use inverse transformation methods to interpret system responses and analyze the behavior of engineering systems in the time domain.

A. DETAILED SYLLABUS

1 FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS AND INTRODUCTION TO HIGHER ORDER DIFFERENTIAL EQUATIONS [10] CO1

Exact, linear and Bernoulli's equations, Introduction to second order linear differential equations with variable coefficients, Method of variation of parameters, Cauchy-Euler equation.

2 PARTIAL DIFFERENTIAL EQUATIONS [12] CO2

Introduction, Solutions of partial differential equations: Equations solvable by direct integration, Lagrange's linear equation of first order, Non-linear equations of first order, Charpit's method, Homogenous linear equations with constant coefficients, Rules to find the complementary functions and the particular integral, Working procedure to solve homogeneous linear equations of any order, Non-homogenous linear equations with constant coefficients

Applications of partial differential equations

Method of separation of variables.

3 MULTIVARIABLE CALCULUS (INTEGRATION) [8] CO3

Multiple Integration: Double integrals (Cartesian), Change of order of integration in double integrals, Change of variables (Cartesian to polar).

4 VECTOR INTEGRAL CALCULUS[6] CO4

Vector line integrals – Circulation – Work, Surface integrals, Green's theorem in a plane, Gauss-Divergence theorem, and Stoke's theorem.

5 LAPLACE TRANSFORM [12] CO5

Introduction, Definition, Transform of elementary functions, Properties of Laplace transform: Linearity property, First shifting property, Change of scale property, Transforms of derivatives, Transforms of integrals, Multiplication by t^n, Division by t, Evaluation of integrals by Laplace transform.

Finding inverse Laplace transform by partial fraction, Convolution theorem **CO6**

Application of Laplace Transforms CO6

Solving ordinary differential equations using Laplace transform.

B. RECOMMENDED TEXT / REFERENCE BOOKS

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 40th Edition, 2007.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Ed. Pearson, 2002.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edn., Wiley India, 2009.

Mathematics-II (Semester II) – Course Outcomes

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

1. **CO1:** Develop and apply methods to find analytical solutions of scalar-valued functions defined through relations involving derivatives, including linear and nonlinear forms.
2. **CO2:** Formulate equations representing physical processes in multiple independent variables and solve them using direct, systematic, and characteristic-based approaches.
3. **CO3:** Evaluate integrals over regions in two or more dimensions using transformations and change of order, and apply them to solve engineering problems involving mass, charge, or fluid distribution.
4. **CO4:** Analyze and compute integrals over curves and surfaces in vector fields, and verify the validity of integral theorems by converting between differential and integral forms.
5. **CO5:** Transform time-domain mathematical models into an alternate domain to simplify the solution of initial value problems and apply operational techniques for system analysis.
6. **CO6:** Reverse transform expressions in the transformed domain back to the original domain using algebraic and integral methods, and interpret the results in the context of system dynamics.

COs \ POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1: Solve ODEs analytically (linear/nonlinear)	3	2									
CO2: Formulate and solve PDEs using appropriate methods	3	2	2	1							
CO3: Evaluate multivariable integrals using transformation	3	2		2							
CO4: Apply vector integral theorems in physical systems	3	2		2							
CO5: Apply Laplace transforms for solving initial value problems	3	2									
CO6: Use inverse transforms and interpret dynamic systems	3	2		1							

3: High correlation

2: Moderate correlation

1: Low correlation

Blank: No significant correlation

B.TECH. SEMESTER - II (EC/IC/CL/MH)
INDIAN KNOWLEDGE SYSTEM & ANCIENT YOGA (w.e.f. 2025-26)

Teaching Scheme (Hours)			Examination Scheme					Credit Structure			
Lect	**Tut**	**Prac**	**Theory**	**Sess.**	**TW**	**Prac**	**Total**	**Lect**	**Tut**	**Prac**	**Total**
1	0	2	40	0	50	0	90	1	0	2	2

A. DETAILED SYLLABUS:

Sr. No.	Contents	Hrs.
1	**INDIAN PHILOSOPHY AND ANCIENT LITERATURE:** Exploring Indian philosophical concepts like consciousness, perception, and the nature of reality, and their potential implications for technology advances using Artificial Intelligence. Vedic mathematical concepts and their relevance in modern computation and algorithms.	05
2	**INDIAN KNOWLEDGE SYSTEM IN ENGINEERING:** Study of Indian Knowledge System and its connection to modern technologies like hydraulics and mechanical systems, GPS and satellite communication, corrosion resistance, engineering metrology and measurements	05
3	**THE USE OF IKS FOR SUSTAINABLE DEVELOPMENT**: Living in harmony with nature, emphasizing community and social equity, promoting holistic well-being, encouraging local self-reliance, Fostering environmental stewardship. Traditional practices for sustainable resource management, water conservation, and climate resilience, case studies of ancient technologies inspiring modern design, the role of IKS in innovation and research, role of IKS in Industry 4.0 and smart manufacturing, Yoga for stress reduction & cognitive enhancement	05
	Total Hours	**15**

B. REFERENCE BOOKS:

1. Mahadevan, B., Bhat Vinayak Rajat, Nagendra Pavana R.N. (2022), "Introduction to Indian Knowledge System: Concepts and Applications", PHI Learning Private Ltd. Delhi.
2. Fundamentals of Indian Knowledge System, Kapil Kapoor, Avadhesh Kumar Singh, D. K. Printworld Pvt. Ltd., 2022 edition
3. Bag, A.K. (1997). History of Technology in India, Vol. I, Indian National Science Academy, New Delhi.
4. Maharshi Patanjali, Yog Darshan, Gita Press Gorakhpur Publication
5. Swami Ramdev, Yog: Its Philosophy and Practice, Divya Publication

C. PRACTICALS:

1. Kapalbhati, Anulom vilom, Pranayam, Omkar Pranayam, Bharmari, Pranayam, Body Roration, Shavasan, Suryanamaskar
2. Asans for Meditaion: Padmasan, Swastikasan, Siddhasan, Bhadrasan, Vajrasan, Makarasan, Savasan
3. Asans to be performed in Standing Position: Trikonasan, Pervatasan, Utkatukasan, Hastpadsan
4. Asans to be performed while lying in Supine position: Servangasan, Halasan, Savasan, Kosthavishramasan, Matshendrasan, Suptavajrasan
5. Asans to be performed while lying in Prone position: Uttanpadasan, Uttanadhasan, Serpasan, Bhujasan, Salabhasan, Dhanurasan, Makarasan
6. Asans to be performed in Sitting position: Pavanmuktasan, Hastapadasan, Vajrasan, Ardhamatshyendrasan, Shishuasan, Saptamudrasan, Gomukhasan
7. Yoga Mudras (Seven Types)
8. Pranayam (Seven Types)

D. COURSE OUTCOMES

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

CO1	understand basics of Indian Knowledge System
CO2	apply of Indian Knowledge System concepts to modern engineering
CO3	apply IKS for sustainable development, Yoga for stress reduction & cognitive enhancement

E. COURSE ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	0	0	1	3	2	2	1	2	0	2	3	2	0
CO2	3	2	0	0	1	3	2	2	0	2	0	2	3	2	0
CO3	2	0	0	0	0	2	2	3	0	1	0	2	2	0	0

1-Slightly; 2-Moderately; 3-Substantially