ANNEXURE II

XXXXX (Sub Code)	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS (III SEM FOR CIVIL & MECH)	L T P C 3 1 0 4

COURSE OBJECTIVES:

To make the student conversant with the

- ✓ Concept of PDE for solving standard partial differential equations.
- ✓ Concept of Fourier series and its properties.
- ✓ Effective mathematical tools for the solutions of partial differential equations that model several physical processes.
- ✓ Fourier series techniques in solving heat flow problems used in various situations.
- ✓ Develop the concept of Z-transform techniques for discrete time systems.
- ✓ Real-world case studies on transforms and partial differential equations.

UNIT - 1 PARTIAL DIFFERENTIAL EQUATIONS 10

Applications: *Space Weather Prediction, Traffic Flow Modeling, Control of Dynamic Systems.*

Solutions of standard types of first order partial differential equations - First order partial differential equations reducible to standard types - Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of homogeneous types.

UNIT - 2 FOURIER SERIES 10

Applications*: Image Smoothing, Denoising Ophthalmology, Image in painting.*

Dirichlet's conditions -Fourier series - Odd and even functions - Half range sine series and Half range cosine series - Root mean square value - Parseval's identity - Harmonic analysis.

UNIT - 3 APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 10

Applications*: Heat Conduction (Heat Equation), Wave Propagation (Wave Equation), Electromagnetism (Maxwell's Equations).*

Classification of PDE- Fourier series solutions of one dimensional wave equation - One dimensional equation of heat conduction - Steady state solution of two dimensional equation of heat conduction (Cartesian coordinates only).

UNIT - 4 FOURIER TRANSFORMS 10

Applications*: Diffusion of Chemicals, Crystal Growth Chemical Reactions.*

Fourier integral theorem (Statement only) - Fourier transform pair - Fourier sine transform and Fourier cosine transforms - Convolution theorem -Parseval's identity.

UNIT - 5 Z-TRANSFORMS AND DIFFERENCE EQUATIONS 10

Applications*: Orthogonal Frequency, Division Multiplexing (OFDM), Modulation and Demodulation Interest Rate Models.*

Z-transforms - Elementary properties - Convergence of Z-transforms - Initial and final value theorems -Inverse Z-transform using partial fraction and convolution theorem- Formation of difference equations - Solution of difference equations using Z - transforms.

UNIT - 6 **APPLICATIONS OF TRANSFORMS AND PDE IN REAL LIFE SCENARIO** 10

Comparison the free and forced vibrations in a string using partial differential equations – Analysis of the digital suspension and mechanical feedback control system using Z-transforms and difference equations – Calculation of the temperature, regulation of speed and precision matching using difference equations – Determining the heat flow in parallel pipes using one dimensional heat equation – Calculation of periodic vibrations in structural beam using Fourier series – Calculation of diffusion in chemicals and study of unstable crystal growth using Fourier transforms.

TOTAL: 60 PERIODS

OUTCOMES:

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

1. Solve the given first order and second order partial differential equations using Lagrange'smethod and analytical method.
2. Calculate the Fourier series, Half range Sine series and Half range Cosine series for a given function using the concept of odd and even function.
3. Solve problems based on one-dimensional heat equation and one-dimensional wave equation using Fourier series techniques.
4. Analyze Fourier transform, Fourier Sine transform and Fourier Cosine transform for a given function using convolution theorem and Parseval'sidenty.
5. Calculate Z transform of a given function and obtain the solution of difference equations byusing Z-transform techniques for discrete time systems.
6. Solve industrial case studies using Transforms and Partial Differential Equations.

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", 44thEdition, Khanna Publishers, New Delhi, 2018.
2. Kreyszig E, "Advanced Engineering Mathematics ", 10th Edition, John Wiley, New Delhi, India, 2018.
3. Kandaswamy, Thilagavathy and Gunavathy, " Engineering Mathematics ", 28th Edition, S.Chand and CO, New Delhi, 2020

REFERENCES:

1. "Integral Transforms and Engineering: Theory, Methods, and Applications" by AbdonAtangana and Ali Akgül, published in 2023.
2. Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 10th Edition, Laxmi Publications Pvt. Ltd, 2021
3. James. G., "Advanced Modern Engineering Mathematics", 4thEdition, Pearson Education, New Delhi, 2016.
4. "Advanced Mathematics for Engineering Students" by S. Narayanan, T.K. ManicavachagomPillay, and G. Ramanaiah are available in multiple volumes. Volume 3 was published on January 1, 2019.
5. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2018.

CO - PO MAPPING

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	-	-	-	-	-	-	1	-	-	1	-	-	-
2	3	3	-	-	-	-	-	-	1	-	-	1	-	-	-
3	3	3	-	-	-	-	-	-	1	-	-	1	-	-	-
4	3	3	-	-	-	-	-	-	1	-	-	1	-	-	-
5	3	3	-	-	-	-	-	-	1	-	-	1	-	-	-
6	3	3	-	-	-	-	-	-	1	-	-	1	-	-	-
LOW (1) ; MEDIUM (2) ; HIGH (3)															

XXXXX	STRENGTH OF MATERIALS	L T P C 3 1 0 4

COURSE OBJECTIVES:

The objectives of the course are to impart knowledge on

- ✓ Direct stresses and strains due to tension and compression.
- ✓ Bending stress and shear stress distribution across cross sections.
- ✓ Failure theories of materials and strain energy principles.

UNIT - 1 SIMPLE STRESSES AND STRAINS 10

Application: Stretching a rubber band, Thermal stresses in bridges and pavements, Tapering sections in roof trusses and aircraft wings, Pipelines for transporting fluids, pressure vessels for storing gases.

Mechanical properties of materials - Introduction to stress and Strain - Types of stress and strain Stress strain curve - Elastic constants and its relationship - Principle of superposition - Analysis of varying cross sections, Composite sections, Tapering section - Thermal stresses - Principal stress and principal Strains.

UNIT - 2 SHEAR FORCE AND BENDING MOMENT 10

Application: Design and safety assessment of high-rise buildings, industrial structures and bridges.

Types of loads, supports, beams - Shear force and bending moment for cantilever, Simply supported, Overhanging beams, Fixed, Continuous beams and propped beams - Theorem of three moments.

UNIT - 3 BENDING STRESSES, SHEAR STRESSES AND TORSION 10

Application: Bridge beams and girders, Propeller shafts in ships and automobiles, Crane hooks and lifting equipment.

Theory of simple bending - Neutral axis - Bending stress distribution across cross section - Stress variation along length - Effect of shape of cross section - Section modulus - Shear stress distribution across various cross sections - Torsion equation - Solid and hollow shafts - Combined bending and torsion - Closed and Open Coiled helical springs.

UNIT - 4 STRAIN ENERGY AND THEORIES OF FAILURE 10

Application: Designing thick-walled pressure vessels and pipelines in industries like nuclear, oil, and gas.

Strain energy due to Tension, Compression, Shear, Torsion and Bending - Thick cylinders - Thin cylindrical and spherical shells -Theories of elastic failure**.**

UNIT - 5 DEFLECTION OF BEAMS 10

Application: Designing floor systems in high-rise buildings and bridge beams.

Double integration method - Macaulay's method - Area moment method - Conjugate beam

method - Strain energy method for determinate beams.

UNIT - 6 COLUMNS 10

Application: Designing columns for buildings, bridges, and other structures to prevent catastrophic buckling failures.

Column classification, behavior - Equivalent Length - Euler's theory - Critical load for prismatic columns with different end conditions - Rankine-Gordon theory - Columns with eccentric load.

TOTAL: 60 PERIODS

OUTCOMES:

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

1. Calculate the stresses and strains in members under direct Tension and Compression.
2. Calculate the bending and torsion behavior in structural members, including stress distribution, section modulus, and shear stress variations for different cross-sections.
3. Evaluate strain energy under different loading conditions and apply theories of elastic failure to analyze the strength of thick cylinders.
4. Determine the shear force and bending moment in various types of beams under different loading and support conditions.
5. Determine beam deflection using various analytical methods.
6. Analyze column behavior, critical load, and stability using Euler's and Rankine-Gordon theories for different end conditions and eccentric loading.

TEXT BOOKS:

1. Rajput R.K. "Strength of Materials (Mechanics of Solids)", S.Chand & company Ltd., New Delhi, 2018.
2. Bansal. R.K., "A textbook on Strength of Materials", Laxmi Publications.
3. Subramanian. R, "Strength of Materials", Oxford University Press, Third edition

REFERENCES:

1. Punmia B.C., Ashok Kumar Jain and Arun Kumar Jain,"Theory of Structures" (SMTS) Vol - II, Laxmi Publishing Pvt Ltd, New Delhi 2017.
2. Vazirani.V.N, Ratwani.M.M, Duggal .S.K Analysis of Structures: Analysis, Design and Detailing of Structures-Vol.1, Khanna Publishers, New Delhi 2014.
3. Beer. F.P. &Johnston.E.R."Mechanics of Materials", Tata McGraw Hill, Sixth Edition, New Delhi, 2010.

CO, PO & PSO MAPPING

CO	PO											POS		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	3	2	1	-	-	-	-	-	-	-	2	2	2
2	3	3	2	1	-	-	-	-	-	-	-	2	2	2
3	3	3	2	1	-	-	-	-	-	-	-	2	2	2
4	3	3	2	1	-	-	-	-	-	-	-	2	2	2
5	3	3	2	1	-	-	-	-	-	-	-	2	2	2
6	3	3	2	1	-	-	-	-	-	-	-	2	2	2
Avg	**3**	**3**	**2**	**1**	-	-	-	-	-	-	-	2	2	2
LOW (1) ; MEDIUM (2) ; HIGH (3)														

XXXXX **MECHANICS OF FLUIDS**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- ✓ To introduce fundamental concepts of fluid mechanics, including fluid properties, fluid statics, kinematics, and dynamics.
- ✓ To develop analytical skills for solving fluid flow problems, covering pipe flow, dimensional analysis, and flow measurements.
- ✓ To explore industrial applications of fluid mechanics, including sustainability, digital transformation, and cost-effective fluid transport solutions.

UNIT - 1 **PROPERTIES OF FLUID** 6

Applications: *ship design, hydroelectric plants, refrigeration, food processing, jet engines and gas pipelines, efficiency in hydraulic and damping systems.*

Continuum concept - CGS, MKS and SI systems - Scope of fluid mechanics - Definitions of a fluid - Fluid properties: Density, Specific Weight, Specific Volume, Specific Gravity, Viscosity, Compressibility and Bulk Modulus, Surface Tension, Capillarity, Vapour Pressure, and Cavitation.

UNIT - 2 **FLUID STATICS AND KINEMATICS** 10

Applications: *Design of dam, ships, submarines, offshore platforms, and lifeboats, hot air balloons, underwater tunnels etc.*

Basic equation of fluid statics - Manometers - Hydrostatic force on plane - Vertical plane and Horizontal plane - Buoyancy, Stability of floating and submerged bodies. Classification and types of flows - Velocity and Acceleration of a fluid particle - Velocity potential function - Stream potential function - Stream line, streak-line, and path - lines - Flow nets.

UNIT - 3 **FLUID DYNAMICS** 7

Applications: *Pipeline Network design, Dams and Irrigation canals and hydroelectric Dams.*

Continuity Equation: One Dimension and Three Dimensions - Euler's equation - Bernoulli's equation - Practical application of Bernoulli's equation - Venturimeter, Orificemeter and Pitot tube - Notches/Weirs - Rectangular and Triangular.

UNIT - 4 **FLOW THROUGH PIPES** 7

Applications: *Water Distribution Networks, Oil and Gas pipeline transportation.*

Reynolds experiment - Laminar flow in pipes and between parallel plates - Hagen Poiseuille equation for flow through circular pipes - Darcy - Weisbach equation - Moody diagram - Major and Minor losses of flow in pipes - Pipes in series and parallel - Equivalent pipes.

UNIT - 5 **DIMENSIONAL ANALYSIS AND MODEL STUDIES** 8

Applications: *Designing hydraulic structures, vehicles, aircraft, ships, and industrial systems using scale models for accurate performance prediction.*

Fundamental dimensions - Dimensional homogeneity - Rayleigh's method and Buckingham Pi theorem - Dimensionless parameters - Similitude: geometric, Kinematic and dynamic similarity and model studies: Froude, Reynold, Weber, Euler and Mach laws, Distorted and undistorted models.

UNIT - 6 **CURRENT TRENDS IN FLUID MECHANICS** 7

Role of fluid mechanics in industrial applications - Strategic importance in sectors like oil & gas,

water management and transportation - Digital transformation in fluid systems: Automation and robotics in pipeline management - Sustainability and environmental impact: Eco-friendly pipeline materials and coatings and Carbon footprint reduction in fluid transportation - Business strategy and market trends (Cost-effective pipeline and transportation solution).

TOTAL: 45 PERIODS

OUTCOMES:

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

1. Describe the continuum concept and its fluid properties.
2. Solve problems on pressure, hydrostatic forces, buoyancy, and analyze fluid flow types.
3. Use continuity, Euler's, and Bernoulli's equations in engineering problems and explain the flow measurement devices.
4. Calculate pipeline losses for both laminar and turbulent flow conditions.
5. Compute flow parameters using dimensional analysis and similarity principles for fluid flow studies.
6. Explain sustainability practices, eco-friendly materials, carbon footprint reduction, and cost-effective pipeline solutions that influence market trends.

TEXT BOOKS:

1. Modi P. N and Seth, "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House, New Delhi, 20th edition, 2015.
2. Fox, R. W. McDonald, A.T., Mitchell, J.W., Introduction to Fluid Mechanics, 2020, Tenth Edition, John Wiley & Sons, USA.

REFERENCES:

1. Bansal R. K., "A Text book of Fluid Mechanics and Hydraulic Machines", Laxmi Publications, New Delhi, 2017.
2. Subramanya K., "Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Publishing Co. Ltd, 2002.
3. Rajput R. K., Fluid Mechanics and Hydraulic Machines, S. Chand, 2014.
4. https://nptel.ac.in/courses/112105269
5. https://nptel.ac.in/courses/105103095

CO – PO MAPPING

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	-	-	-	-	-	-	-	-	-	3	3	2
2	3	3	2	-	-	-	-	-	-	-	-	3	3	2
3	3	3	2	-	-	-	-	-	-	-	-	3	3	2
4	3	3	2	-	-	-	-	-	-	-	-	3	3	2
5	3	3	2	-	-	-	-	-	-	-	-	3	3	2
6	2	2	1	-	-	-	-	-	-	-	-	-	-	-
LOW (1) ; MEDIUM (2) ; HIGH (3)														

XXXX LIFE SKILL III – BASIC CONVERSATION SKILLS

L	T	P	C
0	0	2	1

COURSE OBJECTIVES:

- ✓ To develop effective professional communication skills, including greetings, polite conversations, and intervening in dialogues.
- ✓ To introduce and practice framing questions using model auxiliaries (can, could, would) and WH questions in a technical environment.
- ✓ To apply tone, intonation, and voice modulation effectively in two-way conversations to enhance communication clarity and impact.
- ✓ To practice essential one-on-one conversation techniques to communicate effectively in interview settings.
- ✓ To practice various discussion activities.
- ✓ To understand the do's and don’ts of group discussions and perform group discussions.

UNIT – 1 PROFESSIONAL COMMUNICATION 2

Creating conversation - Professional greetings and courtesies - Introduction to polite conversation techniques – Intervening when two people are conversing - Polite disagreement

Practice: Initial greeting, Transitioning between conversations, Practicing professional greetings using conversation and Courtesy vocabularies in different scenarios

Role-play: Conducting professional conversations

UNIT – 2 FRAMING QUESTIONS 2

Basics of framing questions using model auxiliaries (can, could, would, etc.) - WH questions and Yes/No questions in technical environment

Practice: Role - play exercises in question framing, Conducting Q&A sessions based on conversations, Effective questioning techniques in various settings

UNIT – 3 LISTENING TWO-WAY CONVERSATION 2

Understanding tone and intonation in conversations - Responding appropriately in two - way conversations, practicing real - life two - way conversations

Practices: Practicing two - way conversation with tone and intonation - Voice modulation

UNIT – 4 TWO-WAY CONVERSATION – BASICS 2

“Basic one and one techniques in interview”

Practice: Conversation tips for effective two-way dialogue - Common conversation pit falls

(how to avoid monotones, Long sentences and Breath control during conversation).

UNIT – 5 **DISCUSSION** 2

Techniques of discussion – Brainstorming questions, debate and argumentation, panel discussion

Practice: Asking brainstorming questions

UNIT – 6 **BASICS OF GROUP DISCUSSION** 2

Dos and Don'ts of group discussion – Evaluation process

Practice: Three group discussions

TOTAL: 12 PERIODS

OUTCOMES:

At the end of the course the students would be able to

1. Initiate and manage professional conversations with correct greetings and courtesies.
2. Demonstrate proficiency in asking clear and appropriate questions in professional and technical conversations.
3. Adjust their tone and intonation based on the context of the conversation.
4. Confidently navigate one-on-one interviews and other personal conversations.
5. Formulate and ask open-ended brainstorming questions.
6. Understand the importance and purpose of group discussions in professional and academic settings.

REFERENCES:

1. "Advanced Communication Skills" by Mathew Richardson, Charlie Creative Lab, 2020.
2. Andy Gillett, Using English for Academic purposes for students in higher Education. https://www.uefap.org/reading/
3. **R. K. Agnihotri and A. L. Khanna.** English for Academic and Professional Purposes. Macmillan India, 2008
4. **Swales, John M., and Christine B. Feak.** Academic Writing for Graduate Students: Essential Tasks and Skills. University of Michigan Press, 2012

CO – PO MAPPING

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	-	-	-	-	-	-	-	-	3	3	-	-	-	-
2	-	-	-	-	-	-	-	-	3	3	-	-	-	-
3	-	-	-	-	-	-	-	-	3	3	-	-	-	-
4	-	-	-	-	-	-	-	-	3	3	-	-	-	-
5	-	-	-	-	-	-	-	-	3	3	-	-	-	-
6	-	-	-	-	-	-	-	-	3	3	-	-	-	-
LOW (1) ; MEDIUM (2) ; HIGH (3)														

INVENTION – PRINCIPLES AND PRACTICES

Course Objectives:

1. Understand the fundamental concepts of invention, innovation, and creativity through historical case studies of engineering breakthroughs.
2. Learn the 40 Inventive Principles of TRIZ and their application in systematic engineering problem-solving.
3. Gain knowledge about patents, copyrights, trademarks, and the legal framework for protecting innovations.
4. Study various knowledge-sharing methods, reverse engineering, and product analysis techniques for innovation development.
5. Implement structured methodologies to approach problem-solving in engineering applications.
6. Foster creativity and critical thinking skills to develop innovative solutions for complex engineering challenges.

UNIT 1: Introduction to Inventive Principles 2 Hours

Definition of invention and innovation - creativity - History - Case studies of successful engineering innovations.

UNIT 2: TRIZ and Systematic Problem Solving 2 Hours

Inventive Principles of TRIZ - Engineering applications of TRIZ principles - Practical exercises and brainstorming

UNIT 3: Intellectual Property and Patent Laws 2 Hours

Introduction to patents - Types of patents(Utility Patents, Design Patents , Plant Patents , Provisional Patents , Non-Provisional Patents , Software Patents , Business Method Patents) - comparison - copyrights and trademarks - Patent filing process and IP rights

UNIT 4: Open-source innovation and knowledge sharing

Methods of problem identification, Reverse engineering and product analysis- Future Trends and Innovations

UNIT 5: Ethics in Engineering and Innovation 2 Hours

Importance of ethics in engineering - Professional codes of ethics (IEEE, ASME, ASCE, etc.)

Case studies of ethical dilemmas in engineering,

UNIT 6: Practical Implementation & Case Studies 2 Hours

Case studies of famous Patent and their impact analysis on industry, economy, and society

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Demonstrate an understanding of how engineering innovations emerge and their impact on society.
2. Utilize systematic TRIZ-based approaches to address engineering challenges effectively.
3. Understand the importance of intellectual property protection and the procedures involved in securing patents.
4. Apply open-source methodologies, reverse engineering, and product analysis for innovative problem-solving.
5. Evaluate past engineering innovations to extract key lessons and best practices.
6. Create and refine innovative ideas using structured methodologies like TRIZ and other inventive principles.

XXXXX	CONSTRUCTION MATERIALS	L T P C 3 0 2 4

COURSE OBJECTIVES:

- ✓ To impart knowledge on material properties and their applications in construction.
- ✓ To provide hands on experience on laboratory testing of different construction materials.

UNIT - 1 STONES, BRICKS AND LIME 8

Application: *Building Construction, Pavements & Drain Covers, Whitewashing, Soil Stabilization, Road Construction.*

Sources of stones - Criteria for selection - Tests on stones - Qualities of a good building stone - Deterioration and preservation of stone work - Bricks - Classification - Manufacturing of clay bricks - Qualities of good bricks - Fire-bricks - Fly-ash bricks - Concrete hollow blocks - Lightweight concrete blocks - Lime - I.S. classifications of lime - Preparation of lime mortar.

UNIT - 2 TIMBER AND STEEL 7

Application: *Structural beams, Planks, Doors and Window frames, Reinforcement bars, Railway tracks, Heavy machinery and Cutting tools.*

Timber - Processing of timber - Seasoning of timber - Market forms - Industrial timber - Plywood - Veneer - Steel - Properties of mild steel - Properties of hard steel - Market forms - Non-ferrous metals: Aluminium, Copper, Nickel - Their properties and uses.

UNIT - 3 FINISHES AND MODERN MATERIALS 8

Application: *Walls, Wood and metal surfaces, Windows, Interiors, Basements, Roofs and Wet areas.*

Paints - Varnishes - Distempers - Painting on different surfaces - Defects in painting - Composite materials - Shape memory alloys - Glass - Properties and Types - Modern floor finishing materials - Ceramics and Clay products - Polymer floor finishes - Water proofing materials.

UNIT - 4 CHEMICAL AND MINERAL ADMIXTURES 8

Application: *Construction projects such as buildings, Bridges, Roads, Dams and Water tanks.*

Accelerators - Retarders - Plasticizers - Super plasticizers - Waterproofers - Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and metakaolin - Their effects on concrete properties.

UNIT - 5 SUSTAINABLE CONSTRUCTION MATERIALS 9

Application: Residential, Commercial, Industrial and Infrastructure projects to promote eco-friendly building practices.

Definition - Classification and Properties of Sustainable Materials - Natural Sustainable Materials - Bamboo, Rammed earth, Cork, Straw bale - Engineered Sustainable Materials - Recycled Concrete, Engineered Wood - Bio-based materials - Hempcrete, Mycelium, Algae-Based Bricks.

UNIT - 6 BUSINESS STRATEGY AND RECENT TRENDS IN CONSTRUCTION MATERIALS 5

SWOT and PESTLE Analysis in Construction Materials Business - Pricing Strategies for Construction Materials - Investment Strategies in Material Production and Distribution - Case Studies of Leading Construction Material Companies.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

1. Infer the properties and testing methods for stones, bricks and lime.
2. Classify the properties of timber and steel.
3. Describe the properties of finishes and modern materials.
4. Interpret the usage of admixtures in concrete.
5. Summarize the existing sustainable construction materials.
6. Illustrate the recent trends and business strategy in the construction industry.

TEXT BOOKS:

1. Rangwala, "Engineering Materials", Charotar Publishing House Pvt. Ltd., 43rd Edition, 2019.
2. Rajput. R. K., "Engineering Materials", S. Chand and Company Ltd., 2008.
3. Varghese. P. C, "Building Materials", PHI Learning Pvt. Ltd, New Delhi, 2015.
4. Duggal. S. K. "Building Materials", 5th Edition, New Age International, 2019.
5. Jason F. McLennan, "The Philosophy of Sustainable Design" , Ecotone Publishing Co., 2004.

REFERENCES:

1. Gambhir. M.L., & Neha Jamwal., "Building Materials, products, properties and systems", Tata McGraw Hill Educations Pvt. Ltd, New Delhi, 2012.
2. Jagadish. K. S, "Alternative Building Materials Technology", New Age International, 2017.
3. IS 383 - 1970: Indian Standard specification for coarse and fine aggregate from natural sources for concrete, 2011.
4. IS 1141:1993 Seasoning of timber.
5. IS 1786:1985 Specification for high strength deformed steel bars and wires for concrete reinforcement.
6. IS 15489: 2004 - Paint, Plastic emulsion.
7. IS 1077: 1992 - Common Burnt Clay Building Bricks.
8. Regina Leffers, "Sustainable Construction and Design", Prentice Hall, 2009.

LABORATORY

LIST OF EXPERIMENTS:

1. Determination of specific gravity of cement.
2. Determination of fineness of cement.
3. Determination of consistency of cement.
4. Determination of initial and final setting time of cement.
5. Determination of flakiness index of coarse aggregate.
6. Determination of elongation index of coarse aggregate.
7. Determination of specific gravity of fine aggregate and coarse aggregate.
8. Determination of water absorption of fine aggregate and coarse aggregate.
9. Determination of compressive strength of bricks.
10. Determination of water absorption of bricks.

TOTAL: 30 PERIODS

CO – PO MAPPING

CO	PO											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	-	-	-	-	-	-	-	-	-	-	3	1	1
2	3	-	-	-	-	-	-	-	-	-	-	3	1	1
3	3	-	-	-	-	-	-	-	-	-	-	3	1	1
4	3	-	-	-	-	-	-	-	-	-	-	3	1	1
5	3	-	-	-	-	-	-	-	-	-	-	3	1	1
6	3	-	-	-	-	-	-	-	-	-	-	3	1	1
LOW (1) ; MEDIUM (2) ; HIGH (3)														

XXXXX (Lab Code)	COMPUTER AIDED BUILDING DRAWING LABORATORY	L T P C 0 0 3 1.5

COURSE OBJECTIVES:

- ✓ To draft plan, elevation, sectional views, and structural layouts for both residential and industrial buildings in 2D.
- ✓ To draft essential structural elements, including beams and columns, for building plans in 2D.
- ✓ To prepare and integrate service layouts, ensuring compliance with local standards and building codes in 2D.

LIST OF EXERCISES: 45

1. Study of Building Bylaws rules and regulations and commands used for CAD.
   Draw the Plan, Elevation and Sectional view of single storey residential building.
2. Draw the Plan, Elevation and Sectional view of multi storey residential building.
3. Draw the Beam Layout for a given plan diagram.
4. Draw the Column Layout for a given building plan diagram.
5. Draw the Plumbing layout for a given building plan diagram.
6. Draw the Electrical Layout for a given building plan diagram.
7. Draw the Fire Fighting Layout for a given building plan diagram.
8. Draw the Plan and Sectional view of Septic Tank with soak pit.
9. Draw the components of an Industrial Truss.
10. Draw the plan for G+2 Residential building by considering all approval aspects.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course using Auto CAD the students will be able to

1. Create detailed drawings, including plans, elevations, sectional views, and structural layouts for residential and industrial buildings.
2. Design and draft essential building service layouts, such as plumbing, electrical, and fire-fighting systems, integrating them into building plans.
3. Apply building codes and regulations to prepare approval plans and design sanitation systems, such as septic tanks and soak pits, for residential and industrial structures.

CO – PO MAPPING

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
1	2	-	-	-	2	-	-	-	-	-	-	2	1	1
2	2	-	-	-	2	-	-	-	-	-	-	2	1	1
3	2	-	-	-	2	-	-	-	-	-	-	2	1	1
LOW (1) ; MEDIUM (2) ; HIGH (3)														

XXXXX **STRENGTH OF MATERIALS LABORATORY** L T P C
(Lab Code) 0 0 2 1

COURSE OBJECTIVES: By the end of the course, students should be able to

- ✓ Understand the fundamental concepts and principles of material behavior under different loading conditions.
- ✓ Conduct various mechanical tests on metals to evaluate their strength, hardness, and deformation characteristics.
- ✓ Develop practical skills in using testing equipment and measuring instruments for material testing.

LIST OF EXPERIMENTS: 45

1. Tension test on steel rod.
2. Torsion test on mild steel rod.
3. Deflection test on metal beam.
4. Double shear test on metal.
5. Impact test on metal specimen (Izod and Charpy).
6. Hardness test on metals (Rockwell and Brinell Hardness Tests).
7. Compression test on helical spring.
8. Deflection test on carriage spring.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course the students is expected to be able to

1. Demonstrate proficiency in performing mechanical testing on metals and interpreting the test results.
2. Evaluate the tensile, shear, and torsional strength of materials and apply the concepts of stress and strain.
3. Analyze the deflection of beams and springs under various loading conditions and relate the results to material properties.
4. Compare hardness values using different hardness testing methods (Rockwell, Brinell).

CO – PO MAPPING

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
1	3	3	2	-	-	-	-	-	-	-	-	3	2	2
2	3	3	3	-	-	-	-	-	-	-	-	3	2	2
3	3	3	3	-	-	-	-	-	-	-	-	3	2	2
4	3	3	3											
LOW (1) ; MEDIUM (2) ; HIGH (3)														