PSG INSTITUTE OF TECHNOLOGY AND APPLIED RESEARCH

COIMBATORE - 641 062

(Autonomous Institution Affiliated to Anna University)

2025 Regulations

Courses of Study, Scheme of Assessment and Syllabi

for

B.E. Civil Engineering

B.E. CIVIL ENGINEERING

Vision

To produce highly competent Civil Engineers through holistic education, multidisciplinary research, entrepreneurial training and technological services with societal focus.

Mission

- To provide quality education and learning pedagogy to prepare our students to become global leaders with emphasis on professional ethics and social commitment.
- To offer experiential learning facilities through Industry-Institute interactions and equip the students with cutting edge technologies.
- To provide conducive environment for research and innovation resulting in advancement of multi-disciplinary knowledge and practical applications.
- To provide a learning ambience that imparts good communication skills and leadership qualities and an opportunity to build entrepreneurial ability.

Program Education Objectives (PEOs)

PEO1: Graduates will become professionally competent in a highly ethical manner holding paramount the safety, health and welfare of the public.

PEO2: Graduates will exhibit expertise in orienting modern technological practices to promote applied research and improve technology transfer to civil engineering practices.

PEO3: Graduates will emerge as leaders in systems-level thinking and technological innovation that solve complex multidisciplinary problems at the interface of built, natural, and social environment.

PEO4: Graduates will provide solutions for diverse disciplines including socioeconomic, environmental, management, and financial knowledge/skills with life-long learning attributes.

Program Outcomes (POs)

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization (as specified in WK1 to WK4 respectively) to develop to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8)

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7)

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

Program Specific Outcomes (PSOs)

PSO1: Apply scientific and engineering principles to investigate, analyze, and design solutions for challenges across various civil engineering domains, integrating modern tools and technologies.

PSO2: Exhibit ethical, teamwork, and effective communication capabilities, alongside excellent managerial skills in developing civil engineering infrastructure while ensuring societal health, safety, and sustainability, with a commitment to lifelong learning.

B.E. CIVIL ENGINEERING

(Minimum No. of credits to be earned: 168)

S. No.	Course Code	Course Title	Hours / Week			C	Maximum Marks			CAT
			L	T	P		CA	ESE	Total	
SEMESTER I										
THEORY										
1	25MA101	Calculus and its Applications	3	1	0	4	40	60	100	BS
2	25PH101	Physics for Civil Engineering	3	0	0	3	40	60	100	BS
3	25CY101	Chemistry of Building Materials I	3	0	0	3	40	60	100	BS
4	25CE101	Engineering Geology	3	0	0	3	40	60	100	ES
5	25HS101	English Language Proficiency	3	1	0	4	40	60	100	HS
6	25HS102	தமிழர் மரபு / Heritage of Tamils	1	0	0	1	40	60	100	HS
PRACTICALS										
7	25BS111	Basic Sciences Laboratory I	0	0	4	2	60	40	100	BS
8	25CE111	Engineering Drawing	0	0	4	2	60	40	100	ES
9	25GE111	Design Thinking for Innovation	0	0	2	1	100	0	100	ES
MANDATORY COURSES										
10	25GEM01	Induction Programme**	-	-	-	-	-	-	-	MC
11	25HSO01/ 25HSO02	Physical Education/Yoga and Health	0	0	2	Grade	-	-	-	MC
Total 30 periods			**16**	**2**	**12**	**23**	**460**	**440**	**900**	

S. No.	Course Code	Course Title	Hours / Week			C	Maximum Marks			CAT
			L	T	P		CA	ESE	Total	
SEMESTER II										
THEORY										
1	25MA201	Complex Variables and Transforms	3	1	0	4	40	60	100	BS
2	25CE201	Engineering Statics and Dynamics	3	1	0	4	40	60	100	ES
3	25PH201	Applied Physics	3	0	0	3	40	60	100	BS
4	25CY201	Chemistry of Building Materials II	3	0	0	3	40	60	100	BS
5	25HS201	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	1	0	0	1	40	60	100	HS
PRACTICALS										
6	25HS21_ _	Language Elective	0	0	4	2	60	40	100	HS
7	25BS211	Basic Sciences Laboratory II	0	0	4	2	60	40	100	BS
8	25CE211	Engineering Practices Laboratory	0	0	2	1	60	40	100	ES
9	25CE212	Problem Solving using Python Programming Laboratory	0	0	4	2	60	40	100	ES
10	25EEC01	Workplace Communication Skills	0	0	2	-	100	0	100	EEC
MANDATORY COURSES										
11	25GEM02	Activity Point Programme I*	-	-	-	-	-	-	-	MC
12	25HSO01/ 25HSO02	Physical Education/Yoga and Health	0	0	2	Grade	-	-	-	MC
Total 33 periods			**13**	**2**	**18**	**22**	**540**	**460**	**1000**	

****As per AICTE Norms**

*** As per AICTE Norms; Total: 60 hrs.; Grade: Non-credit Course**

CAT - Category; BS - Basic Science; HS - Humanities and Social Sciences; ES - Engineering Sciences; PC - Professional Core; PE - Professional Elective; OE - Open Elective; EEC - Employability Enhancement Course; MC - Mandatory Course; CA - Continuous Assessment; ESE – End-Semester Examination

L-Lecture; T-Tutorial; P-Practical; C-Credits

S. No.	Course Code	Course Title	Hours / Week			C	Maximum Marks			CAT
			L	T	P		CA	ESE	Total	
SEMESTER III										
THEORY										
1	25MA304	Matrix Theory and Numerical Methods	3	1	0	4	40	60	100	BS
2	25CE301	Mechanics of Solids I	3	1	0	4	40	60	100	ES
3	25CE302	Construction Materials and Practices	3	0	0	3	40	60	100	PC
4	25CE303	Surveying	3	1	0	4	40	60	100	PC
5	25HS301	Project and Finance Management	3	0	0	3	40	60	100	HS
PRACTICALS										
6	25CE311	Strength of Materials Laboratory	0	0	2	1	60	40	100	ES
7	25CE312	Survey Practice	0	0	4	2	60	40	100	PC
8	25EEC02	Foundations of Problem Solving	0	0	2	1	100	0	100	EEC
MANDATORY COURSES										
9	25MC0_ _	Mandatory Course I	2	0	0	Grade	100	0	100	MC
10	25GEM03	Activity Point Programme II*	-	-	-	-	-	-	-	MC
Total 28 periods			**17**	**3**	**8**	**22**	**520**	**380**	**900**	

S. No.	Course Code	Course Title	Hours / Week			C	Maximum Marks			CAT
			L	T	P		CA	ESE	Total	
SEMESTER IV										
THEORY										
1	25CE401	Mechanics of Solids II	3	1	0	4	40	60	100	ES
2	25CE402	Hydraulic Engineering	3	1	0	4	40	60	100	ES
3	25CE403	Basic Structural Steel Design	3	1	0	4	40	60	100	PC
4	25CE404	Highway and Railway Engineering	3	0	0	3	40	60	100	PC
5	25_ _O_ _	Open Elective I	3	0	0	3	40	60	100	OE
PRACTICALS										
6	25CE411	Concrete Technology and Highway Laboratory	0	0	4	2	60	40	100	PC
7	25CEE01	Mini Project I	0	0	2	1	100	0	100	EEC
8	25EEC03	Problem Solving	0	0	2	1	100	0	100	EEC
MANDATORY COURSES										
9	25MC0_ _	Mandatory Course II	2	0	0	Grade	100	0	100	MC
10	25GEM04	Activity Point Programme III*	-	-	-	-	-	-	-	MC
Total 28 periods			**17**	**3**	**8**	**22**	**560**	**340**	**900**	

*** As per AICTE Norms; Total: 60 hrs.; Grade: Non-credit Course**

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L-Lecture; T-Tutorial; P-Practical; C-Credits

S. No.	Course Code	Course Title	Hours / Week			C	Maximum Marks			CAT
			L	T	P		CA	ESE	Total	
SEMESTER V										
THEORY										
1	25CE501	Structural Analysis I	3	1	0	4	40	60	100	PC
2	25CE502	Design of RC Elements	3	1	0	4	40	60	100	PC
3	25CE503	Mechanics of Soil	3	1	0	4	40	60	100	PC
4	25CE504	Water Supply Engineering	3	0	0	3	40	60	100	PC
5	25 _ _O_ _	Open Elective II	3	0	0	3	40	60	100	OE
PRACTICALS										
6	25CE511	Soil Mechanics Laboratory	0	0	2	1	60	40	100	PC
7	25CE512	Hydraulics and Hydraulic Machinery Laboratory	0	0	2	1	60	40	100	ES
8	25CEE02/ 25CEE03	Internship I / Community Project	0	0	0	1	100	0	100	EEC
9	25EEC04	Aptitude Skills	0	0	2	1	100	0	100	EEC
MANDATORY COURSES										
10	25GEM05	Activity Point Programme IV*	-	-	-	-	-	-	-	MC
Total 24 periods			**15**	**3**	**6**	**22**	**520**	**380**	**900**	

S. No.	Course Code	Course Title	Hours / Week			C	Maximum Marks			CAT
			L	T	P		CA	ESE	Total	
SEMESTER VI										
THEORY										
1	25CE601	Structural Analysis II	3	1	0	4	40	60	100	PC
2	25CE602	Construction Project Management	3	0	0	3	40	60	100	PC
3	25CE603	Waste Water Engineering	3	1	0	4	40	60	100	PC
4	25CE604	Foundation Engineering	3	0	0	3	40	60	100	PC
5	25CE605	Design of Steel Structures	3	1	0	4	40	60	100	PC
PRACTICALS										
6	25CE611	Environmental Engineering Laboratory	0	0	4	2	60	40	100	PC
7	25CE612	Building Planning and Drafting Laboratory	0	0	2	1	60	40	100	PC
8	25CEE04	Mini Project II	0	0	2	1	100	0	100	EEC
9	25EEC05	Enhancing Problem Solving Ability with Code	0	0	2	1	100	0	100	EEC
MANDATORY COURSES										
10	25GEM06	Activity Point Programme V*	-	-	-	-	-	-	-	MC
Total 28 periods			**15**	**3**	**10**	**23**	**520**	**380**	**900**	

***As per AICTE Norms; Total: 60 hrs.; Grade: Non-credit Course**

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L-Lecture; T-Tutorial; P-Practical; C-Credits

S. No.	Course Code	Course Title	Hours / Week			C	Maximum Marks			CAT
			L	T	P		CA	ESE	Total	
SEMESTER VII										
THEORY										
1	25CE701	Estimation and Costing	3	1	0	4	40	60	100	PC
2	25CEP_ _	Professional Elective I	3	0	0	3	40	60	100	PE
3	25CEP_ _	Professional Elective II	3	0	0	3	40	60	100	PE
4	25CEP_ _	Professional Elective III	3	0	0	3	40	60	100	PE
5	25CEP_ _	Professional Elective IV	3	0	0	3	40	60	100	PE
PRACTICALS										
6	25CE711	Design and Detailing of Structures	1	0	4	3	50	50	100	PC
7	25CE712	Computer Analysis and Design Laboratory	0	0	4	2	60	40	100	PC
8	25CEE05	Project Work I	0	0	4	2	100	0	100	EEC
9	25CEE06	Internship II	0	0	0	1	100	0	100	EEC
Total 29 periods			**16**	**1**	**12**	**24**	**510**	**390**	**900**	

S. No.	Course Code	Course Title	Hours / Week			C	Maximum Marks			CAT
			L	T	P		CA	ESE	Total	
SEMESTER VIII										
THEORY										
1	25CEP_ _	Professional Elective V	3	0	0	3	40	60	100	PE
2	25CEP_ _	Professional Elective VI	3	0	0	3	40	60	100	PE
PRACTICALS										
3	25CEE07	Project Work II	0	0	8	4	60	40	100	EEC
Total 14 periods			**6**	**0**	**8**	**10**	**140**	**160**	**300**	

SUMMARY OF CREDIT DISTRIBUTION

B.E. CIVIL ENGINEERING										
S. No.	Course Category	Credits Per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HS	5	3	3	0	0	0	0	0	11
2	BS	12	12	4	0	0	0	0	0	28
3	ES	6	7	5	8	1	0	0	0	27
4	PC	0	0	9	9	16	21	9	0	64
5	PE	0	0	0	0	0	0	12	6	18
6	OE	0	0	0	3	3	0	0	0	6
7	EEC	0	0	1	2	2	2	3	4	14
8	MC	-	-	-	-	-	-	-	-	-
TOTAL		**23**	**22**	**22**	**22**	**22**	**23**	**24**	**10**	**168**

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L-Lecture; T-Tutorial; P-Practical; C-Credits

LIST OF PROFESSIONAL ELECTIVE COURSES: VERTICALS

S. No.	Vertical - I (Structural Engineering and Construction Practices)	Vertical - II (Environmental and Water Resources Engineering)	Vertical - III (Geo-informatics and Geo-technical Engineering)	Vertical - IV (Diversified)
1	25CEP01 Prefabricated Structures	25CEP09 Air Pollution and Control Engineering	25CEP17 Ground Improvement Techniques	25CEP25 Airport Docks and Harbour Engineering
2	25CEP02 Finite Element Methods	25CEP10 Environmental Impact Assessment	25CEP18 Total Station and GPS Surveying	25CEP26 Housing Planning and Management
3	25CEP03 Structural Dynamics and Earthquake Resistant Design	25CEP11 Industrial Waste Management	25CEP19 Geographic Information Systems	25CEP27 Traffic Engineering, Safety and Management
4	25CEP04 Prestressed Concrete Structures	25CEP12 Hydrology and Water Resources Engineering	25CEP20 Remote Sensing Techniques and Applications	25CEP28 Smart City Planning and Development
5	25CEP05 Repair and Rehabilitation of Structures	25CEP13 Solid Waste Management	25CEP21 Geosynthetics in Civil Engineering	25CEP29 Design of Energy Efficient Buildings
6	25CEP06 Sustainable and Lean Construction	25CEP14 Irrigation Engineering	25CEP22 Pavement Engineering	25CEP30 Digital Construction Techniques
7	25CEP07 Advanced Reinforced Concrete Design	25CEP15 Watershed Conservation and Management	25CEP23 Disaster Management and Mitigation	25CEP31 Architecture for Civil Engineering
8	25CEP08 Advanced Concrete Technology	25CEP16 Groundwater Engineering	25CEP24 Cartography	25CEP32 Environment, Health and Safety

LIST OF OPEN ELECTIVE COURSES OFFERED BY CIVIL ENGINEERING DEPARTMENT

S. No.	Course Code	Course Title
1	25CEO01	Environmental Engineering and Sustainability
2	25CEO02	Waste Management for Circular Economy
3	25CEO03	Environmental and Social Impact Assessment
4	25CEO04	Green Building Concepts
5	25CEO05	Climate Change and its Impacts
6	25CEO06	Sustainable Construction Materials
7	25CEO07	Remote Sensing and GIS
8	25CEO08	Smart Cities

LIST OF ONE-CREDIT COURSES OFFERED BY CIVIL ENGINEERING DEPARTMENT

S. No.	Course Code	Course Title
1	25CE901	Green Building Audit
2	25CE902	Tender and Contract Document Preparation
3	25CE903	Building Bye-laws and Approval Drawing Preparation
4	25CE904	Quality Control at Site
5	25CE905	Building Information Modelling
6	25CE906	Modern Surveying Techniques
7	25CE907	Geo-spatial Mapping

LIST OF LANGUAGE ELECTIVE COURSES

S. No.	Course Code	Course Title
1	25HS211	Communication Skills for Engineers
2	25HS212	Basic German
3	25HS213	Basic Japanese

LIST OF MANDATORY COURSES

S. No.	Course Code	Course Title
1	25MC001	Environmental Science
2	25MC002	Indian Constitution
3	25MC003	Industrial Safety
4	25MC005	Indian Knowledge System for Sustainable Human Development
5	25MC006	Strategic Data Management and Governance
6	25MC007	Professional Ethics
7	25HSO01	Physical Education
8	25HSO02	Yoga and Health

SEMESTER I

25MA101 CALCULUS AND ITS APPLICATIONS
(Common to CIVIL, CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

3 1 0 4

DIFFERENTIAL CALCULUS: Functions of two variables, limits and continuity, partial derivatives, chain rule, extreme values and saddle points, Lagrange multipliers, Taylor's formula for two variables. **(9+3)**

INTEGRAL CALCULUS: Double and iterated integrals over rectangles, double integrals over general regions, Fubini's theorem, area and volume by double integration, reversing the order of integration, double integrals in polar form. **(9+3)**

FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS: Basic concepts, separable differential equations, exact differential equations, integrating factors, linear differential equations, modeling - mixing problems, Newton's law of cooling, decay and growth problems. **(9+3)**

SECOND ORDER LINEAR DIFFERENTIAL EQUATIONS: Homogeneous linear equations of second order, homogeneous linear ODEs with constant coefficients, Euler–Cauchy equations, solution by variation of parameters, free oscillations mass spring systems, electric circuits. **(9+3)**

VECTOR CALCULUS: Gradient and directional derivative of a scalar field, divergence and curl of a vector field. Integration in vector field – line integrals, path independence of line integrals, Green's theorem in the plane, divergence theorem of Gauss and Stokes' theorem. **(9+3)**

Total L: 45 + T: 15 = 60 periods

TEXT BOOKS

1. J. Hass, C. Heil, and D. W. Maurice, '*Thomas' Calculus'*. Pearson Education, New Delhi, 2018.
2. Erwin Kreyszig, '*Advanced Engineering Mathematics*'. Wiley India, New Delhi, 2018.

REFERENCES

1. H. Anton, I. Bivens, and S. Davis, '*Calculus*'. John Wiley and Sons, USA, 2016.
2. C. R. Wylie, and L.C. Barrett, '*Advanced Engineering Mathematics*'. Tata McGraw-Hill, New Delhi, 2019.
3. D. G. Michael, '*Foundations of Applied Mathematics*'. Dover Publications, New York, 2013.
4. Gilbert Strang, '*Calculus*'. Wellesley Cambridge Press, USA, 2017.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the concepts related to Calculus, Differential Equations and Vector Calculus.	**K2**
CO2	Apply the techniques of Calculus, Differential Equations and Vector Calculus to solve engineering problems.	**K3**
CO3	Analyze the solutions of engineering problems employing Calculus, Differential Equations and Vector Calculus.	**K4**
CO4	Use modern tools to solve engineering problems with the help of Calculus, Differential Equations and Vector Calculus.	**-**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3												
CO3		1											
CO4					1								
	3	**1**			**1**								

1-low, 2-medium, 3-high

25PH101 PHYSICS FOR CIVIL ENGINEERING

3 0 0 3

PROPAGATION OF ELASTIC WAVES: Simple harmonic motion. Velocity damping. Damping coefficient. Differential equation of SHM. Velocity and acceleration. Restoring force. Vibration of a spring and mass system. Frequency response, phase response and resonance. Definition of a plane progressive wave. Attenuation of waves. Differential equation of a plane progressive wave. Phase velocity. Phase and phase difference. Solution of the differential equation of a plane progressive wave. **(9)**

TESTING OF MATERIALS BY ELASTIC WAVE PROPAGATION: Impact echo method-determination of thickness of concrete and flaw detection. S, P and R waves and their dependence on elastic moduli. Ultrasonic flaw detection-Frequency and power. Pulse echo method of flaw detection. Single and phase-array transducers-waveform synthesis and scanning-A, B, C and S Scan. **(9)**

LASERS: Properties of laser radiation and their significance-wavelength, power, monochromaticity, coherence. Types of lasers-working media and their radiation characteristics-Power, wavelength and operational modes of He-Ne, Nd-YAG, Carbon-dioxide, diode lasers. Physical principles of Laser beam delivery systems. Applications-Ranging and survey, cutting and welding. **(9)**

FLUID PROPERTIES & DIMENSIONAL ANALYSIS: Dimensions and units - Fluid properties - Types of fluids - Hydrostatic law; Pascal's law - Atmospheric, Absolute, Gauge and Vacuum pressures - Measurement of pressure by various types of manometers and mechanical gauges. Methods of Dimensional Analysis - Rayleigh's method - Buckingham's theorem. **(9)**

THERMAL PROPERTIES: Specific heat capacity, thermal capacity. Coefficient of linear thermal expansion. Methods of measurement of thermal expansion. Thermal stresses in composite structures due to non-homogeneous thermal expansion. Applications -The bimetallic strip. Expansion gaps and rollers in engineering structures. **(9)**

Total L: 45 periods

TEXT BOOKS

1. M. N. Avadhanulu, and P. G. Kshirsagar, '*A Text Book of Engineering Physics'.* S. Chand and Company, New Delhi, 2018.
2. Ronald L Panton, '*Incompressible Flow'.* Wiley, 2024.
3. R. K. Bansal, '*A Textbook of Fluid Mechanics and Hydraulic Machines'.* Laxmi Publications, New Delhi, 2023.

REFERENCES

1. F. S. Crawford, Jr., '*Waves – Berkeley Physics Course'.* Tata McGraw-Hill, 2008.
2. James F. Shackelford, '*Introduction to Material Science for Engineers'.* Prentice Hall, 2019.
3. Raymond A. Serway, and John W. Jewett, '*Physics for Scientists and Engineers'.* Cengage Learning, 2019.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the basic principles of elastic wave propagation, laser properties, fluid dynamics, and thermal expansion in engineering systems.	**K2**
CO2	Apply mathematical and physical principles to calculate wave velocity, pressure, and thermal expansion, and interpret measurement techniques in material testing and laser-based engineering applications.	**K3**
CO3	Examine the effects of elastic wave propagation, fluid pressure, thermal expansion and laser-material interactions on material integrity using experimental data and analytical techniques.	**K4**
CO4	Prepare a report or presentation on the practical applications of wave testing, laser systems, thermal stress analysis, and fluid pressure measurement techniques in engineering materials	-

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3												
CO3		1											
CO4						1			1		1		
	3	**1**				**1**			**1**		**1**		

1-low, 2-medium, 3-high

25CY101 CHEMISTRY OF BUILDING MATERIALS I

3 0 0 3

MATERIALS FOR MAKING CONCRETE – I: Water - Hardness, Determination by EDTA method – Ion Exchange method of water softening. Water quality standards for construction. CEMENT: Chemical composition, manufacturing of Portland cement – dry and wet processes – reactions in rotary kiln. Setting and hardening of cement - hydration of cement- microstructure of cement paste. Types of Portland cements – rapid hardening cement, low heat cement, sulphate resisting cement, Super sulphated Portland cement, Pozzolana cement, Portland Slag cement. **(9)**

MATERIALS FOR MAKING CONCRETE – II: AGGREGATES - Classification and characteristics of aggregates – Strength, Stiffness, bond strength, specific gravity, bulk density, voids and porosity. Fine aggregate, Coarse aggregate, Cinder aggregate, alkali aggregate reaction – mechanism and factors affecting and control measures on alkali-aggregate reaction. Admixtures and Mineral Additives. **(9)**

POLYMERS: Classification, degree of polymerization, weight and number average molecular weights (Definition only). Polymerization reactions, step and chain mechanism. Compounding of plastics, polymer processing by injection, extrusion, compression and blow moulding techniques. Polymers in civil engineering-Reinforced Plastics – Glass Fibre Reinforced plastics, coating, polymer concretes. Thermal insulating foams. Plastic products – Floor tiles, floor finishes, PVA floor finish, Roofing – PVC and Glass fibre reinforced plastic corrugated roofing sheets. **(9)**

CORROSION AND ITS PREVENTION: Electrode potential – emf and galvanic series, corrosion rate expression, E/ pH diagram of iron, electrode polarization – passivation, polarization curves. Oxidation – mechanism, Pilling – Bedworth rule. Galvanic corrosion, differential aeration corrosion, atmospheric corrosion, pitting corrosion, waterline corrosion and soil corrosion. Factors influencing corrosion, corrosion of rebars in concrete. Corrosion control -cathodic protection, anodic protection, selection of materials and proper designing. **(9)**

PAINTS AND VARNISHES: PAINTS – Paints – constituents and their functions, types – Water paint, Aluminum paint, Bituminous paint, Cellulose paint, Cement paint, Graphite paint, Silicate paint. Defects in Painting. Varnishes – Characteristics and ingredients of a Varnish, types of varnish – Oil varnish, turpentine varnish, Sprit varnish. Coatings –Electroplating of metals – Cu, Ni, Cr and applications. **(9)**

Total L: 45 periods

TEXT BOOKS:

1. P. C. Jain, and M. Jain, '*Engineering Chemistry*'. Dhanpat Rai Publishing Company, New Delhi, 17th Edition, 2019.
2. U. K. Shrivastava, '*Building Materials Technology*'. Galgotia Publications Pvt Ltd, New Delhi, 1st Ed, 2012.

REFERENCES:

1. N. Jackson, and R. K. Dhir, '*Civil Engineering Materials*'. Brijbasi Art press Ltd., Noida, 2007.
2. S. Shan, '*Civil Engineering Materials*'. Pearson Education. Inc – Prentice Hall, New Delhi, 2012.
3. S. K. Duggal, '*Building Materials*'. New Age International Publishers, New Delhi, 5th Edition, 2019.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Understand the basic properties of materials for making concrete.	**K2**
CO2	Apply the suitable materials for developing civil engineering products.	**K3**
CO3	Analyze the strength of materials for building construction.	**K4**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3										3		
CO3								1	1				
	3							**1**	**1**		**3**		

1-low, 2-medium, 3-high

25CE101 ENGINEERING GEOLOGY

3 0 0 3

GENERAL GEOLOGY: Geology in Civil Engineering– Branches of geology–Earth Structures and composition – Elementary knowledge on continental drift and plate tectonics-Geological Time scale--Earth processes Weathering Types of soils – Work of rivers and wind and their engineering importance. Engineering Seismology –causes of earthquakes; seismic waves; magnitude, intensity and energy release, seismic zones of India-Earthquake belts in world. **(9)**

MINERALOGY: Elementary knowledge on symmetry elements of important crystallographic systems – physical properties of minerals – study of the following rock forming minerals – Quartz family. Feldspar family, Augite, Hornblende, Biotite, Muscovite, Calcite, Gypsum, Garnet – Identification of minerals - Properties, behaviour and engineering significance of clay minerals – Fundamentals of process of formation of ore minerals – Coal and petroleum – Their origin and occurrence in India. **(9)**

PETROLOGY: Classification of rocks – distinction between igneous, sedimentary and metamorphic rocks. Description, occurrence, engineering properties sand distribution of following rocks. Igneous rocks – Granite, Syenite, Diorite, Gabbro, Pegmatite, Dolerite and Basalt. Sedimentary rocks - Sandstone, Limestone, Shale, Conglomerate and Breccia. Metamorphic rocks - Quartzite, Marble, Slate, Charnockite, Phyllite, Gneiss and Schist– Identification of rocks and commercial granites and marbles - Testing on rock as a construction material. **(9)**

STRUCTURAL GEOLOGY AND GEOPHYSICAL METHOD: Attitude of beds–Outcrops-Introduction to Geological maps– Study of structures – Folds, faults and joints – Their bearing on engineering construction. Seismic and Electrical methods for Civil Engineering investigations – Clinometer - Brunton Compass - Geology of India-Types and occurrence of rock formation. **(9)**

GEOLOGICAL INVESTIGATIONS IN CIVIL ENGINEERING: Remote sensing techniques - Applications in Civil Engineering - Groundwater-occurrence–investigation, quality, recharge – importance in civil engineering. Geological conditions necessary for construction of Dams, Tunnels, Buildings, Road Cuttings-Landslides–Causes and prevention. Sea erosion and coastal protection. **(9)**

TOTAL L: 45 periods

TEXT BOOKS:

1. Parbin Singh, '*Engineering and General Geology*'. Katson Books, New Delhi, 2013.
2. Tony Waltham, '*Foundations of Engineering Geology*'. Spon Press, New York, 2009.

REFERENCES:

1. F. G. H. Blyth, and M. H. de Freitas, '*A Geology for Engineers*'. Edward Arnold, London, 2017.
2. Gokhale, '*Principles of Engineering Geology*'. BS Publications, Hyderabad, 2019.
3. F. G. Bell, '*Fundamentals of Engineering Geology*'. BS Publications, Hyderabad, 2020.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Elaborate the geological phenomenon in the earth and differentiate the various types of minerals, rocks and their sub groups based on the physiochemical properties.	**K2**
CO2	Interpret and Select the appropriate geophysical methods and modern techniques for surface and sub-surface explorations for mapping and construction of various civil engineering projects.	**K3**
CO3	Demonstrate the necessary geological conditions for investigating & executing different Civil Engineering applications through case study presentation.	**-**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3	2											
CO3								3	3				
	3	**2**						**3**	**3**				

1-low, 2-medium, 3-high

25HS101 ENGLISH LANGUAGE PROFICIENCY
(Common to CIVIL, CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

3 1 0 4

VOCABULARY: Etymology-Prefixes and suffixes–Synonyms–Antonyms–Guessing meanings from context–Word formation- Single-word substitutes- Different forms of a word–Phrasal verbs–Collocations. **(9+3)**

LISTENING AND SPEAKING: Understanding listening – Listening techniques - Introducing oneself and others –Seeking and sharing information– Description-Conversation skills– Extempore speaking– Speech practice in varied formal contexts. **(9+3)**

GRAMMAR: Wh-questions – Yes/no questions– Parts of speech – Articles– Prepositions–Gerunds–Conjunctions-Degrees of comparison– Tenses– Modal verbs – Adverbs - Direct and indirect questions. **(9+3)**

READING: Reading strategies: Skimming and scanning, predicting– Reading comprehension: techniques – Practice reading. **(9+3)**

WRITING: Discourse markers – Dialogue writing - Completing sentences – Jumbled sentences – Paragraph writing –Writing compare & contrast paragraphs – Letter writing. **(9+3)**

Total L: 45 + T: 15 = 60 periods

TEXTBOOKS:

1. K. N. Shoba, and Lourdes Joavani Rayen, '*Communicative English*'. Cambridge University Press, Cambridge, 2021.
2. Raymond Murphy, '*Intermediate English Grammar*'. Cambridge University Press, New Delhi, 2020.
3. Dr. M. Sambaiah, '*Technical English an integrated text book*'. Wiley India Pvt. Ltd., 2025.

REFERENCES:

1. Raymond Murphy, '*English Grammar in Use*'. Cambridge University Press, New Delhi 2020.
2. N. P. Sudharshana, and C. Savitha, '*English for Engineers*'. Cambridge University Press, New York, 2018.
3. Helen Naylor with Raymond Murphy, '*Essential English Grammar*'. Cambridge University Press, New Delhi, 2019.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Demonstrate the ability to recognize and use a wide range of vocabulary and key grammatical structures accurately, while developing inferential reading skills to comprehend, interpret, and analyze written texts across diverse contexts.	**K2**
CO2	Organize their ideas logically in essay writing, develop paragraphs with clear topic sentences and adapt their letter-writing skills to various real-world scenarios.	**K3**
CO3	Develop and demonstrate clear and confident speaking skills in formal and informal contexts.	**-**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1										3			
CO2										3			
CO3										1			
										3			

1-low, 2-medium, 3-high

25HS102 *தமிழர் மரபு*
(Common to all B.E./B.Tech./B.Des. Degree Programmes)

1 0 0 1

மொழி மற்றும் இலக்கியம்: *இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் – சங்க இலக்கியத்தின் சமயச்சார் பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழ்க்காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் – பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.* **(3)**

மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக்கலை: *நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள் – பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரி முனையில் திருவள்ளுவர் சிலை – இசைக்கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வியல் கோவில்களின் பங்கு.* **(3)**

நாட்டுப்புறக்கலைகள் மற்றும் வீரவிளையாட்டுகள்: *தெருக்கூத்து, கரகாட்டம், வில்லுப் பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.* **(3)**

தமிழர்களின் திணைக்கோட்பாடுகள்: *தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக்கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்க காலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்க கால நகரங்களும் துறைமுகங்களும் – சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி.* **(3)**

இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு: *இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப் பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப் படிகள் – தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.* **(3)**

Total L: 15 Periods

25HS102 HERITAGE OF TAMILS
(Common to all B.E./B.Tech./B.Des. Degree Programmes)

1 0 0 1

LANGUAGE AND LITERATURE: Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan. **(3)**

HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE: Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils. **(3)**

FOLK AND MARTIAL ARTS: Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamil. **(3)**

THINAI CONCEPT OF TAMILS: Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Chola. **(3)**

CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE: Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books. **(3)**

Total L: 15 Period

TEXT – CUM – REFERENCE BOOKS:

1. கே. கே. பிள்ளை, 'தமிழக வரலாறு - மக்களும் பண்பாடும்'. தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்.
2. முனைவர் இல. சுந்தரம், 'கணினித்தமிழ்'. விகடன் பிரசுரம்
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம், தொல்லியல் துறை வெளியீடு
4. பொருநை - ஆற்றங்கரை நாகரிகம், தொல்லியல் துறை வெளியீடு
5. Dr. K.K. Pillay, '*Social Life of Tamils*'. A joint publication of TNTB, ESC and RMRL
6. Dr. S. Singaravelu, '*Social Life of the Tamils – The Classical Period*'. International Institute of Tamil Studies.
7. Dr. S.V. Subaramanian and Dr. K.D. Thirunavukkarasu, '*Historical Heritage of the Tamils*'. International Institute of Tamil Studies
8. Dr. M. Valarmathi, '*The Contributions of the Tamils to Indian Culture*'. International Institute of Tamil Studies.
9. Keeladi – Sangam '*City Civilization on the banks of river Vaigai*'. Department of Archaeology, Tamilnadu Text Book and Educational Services Corporation, Tamilnadu
10. Dr. K.K. Pillay, Studies in the History of India with Special Reference to Tamilnadu
11. '*Porunai Civilization*'. Department of Archaeology, Tamil Nadu Text Book and Educational Services Corporation, Tamilnadu
12. R. Balakrishnan, '*Journey of Civilization Indus to Vaigai*'. RMRL, Tamilnadu

COURSE OUTCOMES:

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Describe the Dravidian language family, outline the features of Tamil classical literature, and explain the development of Tamil art, sculpture, and temple-related traditions in a historical context.	**K2**
CO2	Demonstrate the cultural relevance of Tamil folk and martial arts, apply the concepts of Sangam landscape classification to social contexts, and relate Tamil contributions to India's freedom struggle, cultural legacy, and Siddha medicine.	**K3**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1							3				3		
CO2							3				3		
							3				**3**		

1-Low, 2-Medium, 3-High

25BS111 BASIC SCIENCES LABORATORY I

0 0 4 2

Physics (Any eight experiments)

1. Determination of rigidity modulus of a wire and moment of inertia of irregular objects – Torsional Pendulum.
2. Determination of Young's modulus of the material - Non-Uniform Bending.
3. Measurement of hall coefficient of a semiconductor using Hall Effect setup.
4. Determination of electrical resistivity of a given material using four probe setups.
5. Determination of wavelength of laser using diffraction grating -LASER.
6. Determination of Thickness of a thin wire – Air wedge method.
7. Study of I-V characteristics of solar cells and determination of its efficiency.
8. Determination of velocity of sound and compressibility of liquid - Ultrasonic Interferometer.
9. Determination of Planck's constant and work function of a metal - Photoelectric Effect.
10. Determination of bandgap of a semiconductor – Post office box.
11. Determination of specific heat capacity of a metal object.
12. Verification of Hooke's Law and calculating Spring Potential Energy.

Demonstration:

1. Determination of Numerical Aperture and Acceptance angle - Optical Fiber.
2. Determination of vibration frequency by Melde's Apparatus.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Relate the scientific principles, compare the experimental results with theoretical calculations, and apply graphical analysis to visualise the importance of precise measurements.	**K3**
CO2	Analyse the experimental result outcomes using analytical and experimental skills for various engineering materials and applications.	**K4**

Chemistry (Any seven experiments)

1. Determination of total, temporary & permanent hardness of water by EDTA method.
2. Determination of alkalinity in water sample.
3. Determination of strength of acids in a mixture of acids using conductivity meter.
4. Determination of strength of given hydrochloric acid using pH meter.
5. Electroplating of nickel /copper and determination of coulombic efficiency.
6. Estimation of combined ferric oxide and alumina in Portland cement.
7. Determination of Chloride in Hardened Portland Cement Concrete.
8. Photo-colorimetric estimation of Ferric ion in a water sample.

Total P: 60 periods

REFERENCES:

1. Department of Physics, '*Physics Laboratory Observation*'. 2025.
2. Jerry D Wilson, A. Cecilia, and Hernandez Hall, '*Physics Laboratory Experiments*'. Boston, MA: Cengage Learning, 2016.
3. J Mendham, Vogel's, '*Textbook of Quantitative Chemical Analysis 6th Ed*'. Pearson Education 2009

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO3	Demonstrate the measurement of water quality parameters in the given water sample.	**K3**
CO4	Analyze the properties of materials for Engineering applications.	**K4**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3												
CO2		2											
CO3	3								3		3		
CO4				3				3					
	3	**2**		**3**				**3**	**3**		**3**		

1-low, 2-medium, 3-High

25CE111 ENGINEERING DRAWING

0 0 4 2

INTRODUCTION TO ENGINEERING GRAPHICS (2)

1. Introduction to Engineering Graphics.
2. Lettering and Dimensioning as per BIS.

SCALES (4)

1. Construction of Diagonal and Vernier scales.

ORTHOGRAPHIC PROJECTIONS (30)

1. Introduction to Orthographic Projections.
2. Drawing multiple views from pictorial views of objects.
3. Projection of points.
4. Projection of straight lines (only First angle projections) inclined to both the principal planes.
5. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.
6. Projection of simple solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method.

SECTION OF SOLIDS (8)

1. Section of simple solids in simple vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other and obtaining true shape of section.

ISOMETRIC PROJECTIONS (8)

1. Isometric projection of simple solids in simple vertical positions.

BUILDING DRAWING USING AUTOCAD (8)

1. Introduction to AutoCAD basic commands.
2. Plan and Elevation of Residential building using AutoCAD.

Total P: 60 periods

TEXT BOOKS:

1. N. D. Bhatt, '*Engineering Drawing*'. Charotar Publishing House Pvt. Ltd., 55th Edition, 2025.
2. K. C. John, '*Engineering Graphics for Degree*'. Prentice Hall India Publishers, 2009.
3. K. V. Natarajan, '*A Text book of Engineering Graphics*'. Dhanalakshmi Publications, 34th Refined Edition, 2021.

REFERENCES:

1. K. Venugopal, and V. Prabhu Raja, '*Engineering Drawing + AutoCAD and Building Drawing*'. New Age International Publishers, 7th Edition, 2026.
2. Bureau of Indian Standards, '*Engineering Drawing Practices for Schools and Colleges SP 46-2003*'. BIS, New Delhi, 2003

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Use the BIS standards and specifications for drawing the engineering components and structures.	**K2**
CO2	Apply orthographic and pictorial projection principles to draw projections of points, lines, planes, solids, sectioned solids, development of lateral surfaces of regular and truncated solids, and isometric views engineering components and 3D objects.	**K3**
CO3	Develop models of typical engineering components and 3D objects manually and using software.	**K4**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3												
CO3					1								
	3				**1**								

1-low, 2-medium, 3-high

25GE111 DESIGN THINKING FOR INNOVATION
(Common to CIVIL, CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

0 0 2 1

Foundations of Design Thinking: History & Origins: Roots in Creative Problem Solving: Traces back to mid-20th century practices in architecture, engineering, and psychology. Herbert Simon's "Sciences of the Artificial" (1969): Introduced design as a way of thinking distinct from scientific inquiry. IDEO and the Rise of Human-Centered Design: Popularized design thinking as a repeatable, user-focused innovation process. Stanford school's Influence: Helped institutionalize design thinking in education and entrepreneurship.

Variations of Design Thinking Phases: IDEO's 3-Phase Model: Inspiration, Ideation, Implementation A flexible, non-linear approach emphasizing creativity and action. Stanford school's 5-Phase Model: Empathize, Define, Ideate, Prototype, Test A structured yet iterative framework centered on user empathy. Double Diamond Model (Design Council UK): Divides the process into Discover, Define, Develop, and Deliver—highlighting divergent and convergent thinking.

Related Concepts & Frameworks: Human-Centered Design (HCD): Focuses on designing solutions that deeply resonate with users' needs and contexts. Systems Thinking: Encourages understanding the broader ecosystem and interdependencies within a problem space. Agile & Lean UX: Integrates design thinking with iterative development and minimal viable experimentation. Service Design: Applies design thinking to orchestrate holistic user experiences across touchpoints. Participatory Design: Involves stakeholders directly in the design process to ensure relevance and inclusivity.

EMPATHIZE: Apply Human-Centric Design Principles: Focus on designing solutions that prioritize user needs, experiences, and values throughout the process. Consult Experts: Engage with subject matter experts to gain foundational knowledge about the problem space. Competitive Analysis: Identify & studying similar products or services to identify gaps and opportunities. Stakeholder Interviews: Engaging with people who influence or are affected by the product or service. Conduct Observations: Observe users in their natural environment to understand behaviors, challenges, and interactions. Engage with Users: Use interviews, conversations, and other methods to connect with users and hear their stories. Immerse Yourself: Step into the users' context to experience their environment and challenges firsthand. Create Empathy Maps: Visualize what users say, think, feel, and do to synthesize insights. Identify User Needs and Pain Points: Extract meaningful patterns and needs from user interactions and observations. Set Aside Assumptions: Approach the research with an open mind, suspending personal biases and preconceptions. Document Insights: Capture quotes, observations, and emotional cues to inform the next stage (Define). **(6)**

DEFINE: Organize Research Findings: Review and structure the data collected during the Empathize stage. Analyze Observations: Identify patterns, themes, and insights from user interactions and behaviors. Craft a Human-Centered Problem Statement: Frame the problem from the user's perspective, focusing on their needs—not business goals. Avoid Business-Centric Framing: Refrain from defining problems based on company objectives alone (e.g., market share). Persona Development: Synthesizing research into user personas to guide design decisions. Use Empathy to Guide Definition: Ensure the problem statement reflects real user challenges and motivations. Develop Point-of-View Statements: Create concise summaries that capture who the user is, what they need, and why. Prepare for Ideation: Formulate "How Might We" questions to spark creative thinking in the next phase. **(6)**

IDEATE: Review the Problem Statement: Revisit the user-centric problem defined in the previous stage to guide ideation. Explore Multiple Perspectives: Encourage diverse viewpoints to broaden the range of potential solutions. Use Ideation Techniques: Apply methods like Brainstorming, Brain writing, SCAMPER, and Worst Possible Idea to spark creativity. Encourage Free Thinking: Create a judgment-free space to generate as many ideas as possible without filtering. Expand the Problem Space Push boundaries and explore unconventional or extreme ideas to uncover hidden opportunities. Refine and Select Ideas: Use evaluation techniques to identify promising concepts that address user needs effectively. Prepare for Prototyping: Choose ideas that are feasible and impactful to develop into tangible prototypes in the next stage. **(6)**

PROTOTYPE: Build Low-Cost Prototypes: Create simple, scaled-down versions of the product or its features to explore ideas. Experiment with Solutions: Implement different solutions from the Ideate stage into prototypes for testing. Test Internally and Externally: Share prototypes with team members, other departments, or a small group of users. Observe User Interactions: Watch how users engage with the prototypes to uncover usability issues and insights. Evaluate and Iterate: Accept, refine, or discard prototypes based on user feedback and performance. Identify Limitations: Discover constraints and challenges in the proposed solutions through hands-on testing. Gain Deeper User Understanding: Learn how users think, feel, and behave when interacting with the product. **(6)**

TEST: Conduct Rigorous Testing: Evaluate the complete product using the most promising prototypes. Observe Real User Interactions: Study how users behave, think, and feel while using the product. Gather Feedback and Insights: Collect qualitative and quantitative data to assess usability and effectiveness. Identify Remaining Issues: Detect limitations, pain points, and areas for improvement. Refine and Iterate: Use test results to improve the product and revisit earlier stages if needed. Redefine Problems if Necessary: Reframe or adjust problem statements based on new insights. Enhance Understanding of Users: Deepen empathy and knowledge of user needs through real-world testing. **(6)**

Design Thinking & Customer Centricity: A human-centered approach that blends empathy and innovation to create solutions that truly resonate with customer needs. Practical Examples of Customer Challenges: Real-world scenarios where customers face friction, unmet needs, or emotional disconnects in their product or service journey. Use of Design Thinking to Enhance Customer Experience: Applying iterative problem-solving and user insights to craft experiences that are intuitive, delightful, and deeply relevant. Parameters of Product Experience: Key dimensions like usability, accessibility, emotional impact, and consistency that shape how customers perceive and interact with a product. Alignment of Customer Expectations with Product Design: Ensuring that every design decision reflects what customers value, expect, and aspire to achieve through the product.

Total P: 30 periods

TEXT BOOKS

1. T. Brown, '*Change by Design'*. Harper Business, 2009.
2. J. Liedtka, and T. Ogilvie, '*Designing for Growth'*. Columbia Business School Publishing, 2011.

REFERENCES

1. T. Kelley, and D. Kelley, '*Creative Confidence'*. Crown Business, 2013.
2. Stanford d. School resources: https://dschool.stanford.edu/
3. https://apphaus.sap.com/toolkit/methods#design-thinking

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Apply empathy-driven research to understand user needs.	**K3**
CO2	Frame actionable problem statements and generate creative ideas.	**K5**
CO3	Develop and test prototypes to refine innovative solutions to the real-world problems.	**K4**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3					3	3	3	3		3		
CO2		2				2	2	2	2		2		
CO3			1			1	1	1	1		1		
	3	**2**	**1**			**3**	**3**	**3**	**3**		**3**		

1-low, 2-medium, 3-high

25GEM01 INDUCTION PROGRAMME
(Common to CIVIL, CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

All students shall undergo an induction programme at the beginning of the first semester for a duration of three weeks as per the guidelines of All India Council for Technical Education (AICTE). A student completing the induction programme will be awarded a completed grade in the grade sheet, and only the students who complete the induction programme shall be considered as eligible for award of degree subject to satisfying other conditions. A student who does not complete the induction programme in the first semester shall redo the same in the subsequent semester.

SEMESTER II

25MA201 COMPLEX VARIABLES AND TRANSFORMS
(Common to CIVIL, EEE, ECE, ICE, MECH and EE-VLSI)

3 1 0 4

COMPLEX DIFFERENTIATION: Derivative, analytic function, Cauchy-Riemann equations, Laplace's equation, linear fractional transformations. **(9+3)**

COMPLEX INTEGRATION: Cauchy's integral theorem, Cauchy's integral formula, derivatives of analytic functions, Laurent series, singularities and zeros, residue integration method (Residue integration of complex integrals only). **(9+3)**

LAPLACE TRANSFORMS: Laplace transform, linearity, first shifting theorem, transforms of derivatives and integrals, unit step function, second shifting theorem, Dirac's delta function, periodic functions, differentiation and integration of transforms, solving ODEs with constant coefficients and initial value problems. **(9+3)**

FOURIER ANALYSIS: Fourier series – arbitrary period, even and odd functions, half range expansions. Fourier transforms, Fourier cosine and sine transforms. **(9+3)**

PARTIAL DIFFERENTIAL EQUATIONS: Basic concepts of PDEs, wave equation, heat equation, steady state two-dimensional heat problems, solution by Fourier series. **(9+3)**

Total L: 45 + T: 15 = 60 periods

TEXT BOOKS

1. Erwin Kreyszig, '*Advanced Engineering Mathematics*'. Wiley India, New Delhi, 2018.
2. G. Z. Dennis, '*Advanced Engineering Mathematics*'. Jones and Bartlett Pvt Ltd, New Delhi, 2017.

REFERENCES

1. G. Z. Dennis, and D.S. Patrick, '*A first course in Complex Analysis with Applications*'. Jones and Bartlett Pvt Ltd, New Delhi, 2015.
2. C. R. Wylie, and L. C. Barret, '*Advanced Engineering Mathematics*'. Tata McGraw-Hill, New Delhi, 2019.
3. Peter V. O Neil, '*Advanced Engineering Mathematics*'. Cengage, New Delhi, 2018.
4. G. D. Dean, '*Advanced Engineering Mathematics with MATLAB'*. CRC Press, USA, 2017.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the concepts related to Complex Variables, Laplace Transforms, Fourier Analysis and Partial Differential Equations.	**K2**
CO2	Apply the techniques of Complex Variables, Laplace Transforms, Fourier Analysis and Partial Differential Equations to solve engineering problems.	**K3**
CO3	Analyze the solutions of engineering problems employing Complex Variables, Laplace Transforms, Fourier Analysis and Partial Differential Equations.	**K4**
CO4	Use modern tools to solve engineering problems with the help of Complex Variables, Laplace Transforms, Fourier Analysis and Partial Differential Equations.	**-**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3												
CO3		1											
CO4					1								
	3	**1**			**1**								

1-low, 2-medium, 3-high

25CE201 ENGINEERING STATICS AND DYNAMICS

3 1 0 4

STATICS OF PARTICLES & BODIES: Forces – Systems of forces – Concurrent forces in plane and space- Resultant equilibrium of a particle-free body diagram- rigid bodies under plane forces – moment of a force – moment of a couple – equivalent systems of coplanar forces – equilibrium of rigid bodies - types of supports - types of beams - support reactions. **(10+4)**

TRUSS ANALYSIS AND FRICTION: Analysis of trusses by method of joints and method of sections –Friction – frictional force – limiting friction – laws of static friction – coefficient of friction – angle of repose – single bodies on horizontal and inclined planes - connected bodies on horizontal and inclined planes - ladder friction - wedge friction. **(9+2)**

CENTROID, AND MOMENT OF INERTIA: Centroids of areas – centroids of simple geometric shapes – centroids of composite areas – moment of inertia – perpendicular axis theorem – parallel axis theorem – moment of inertia of simple geometric sections – moment of inertia of composite sections – polar axis – polar moment of inertia – radius of gyration – mass moment of inertia of simple solids. **(8+3)**

KINEMATICS OF PARTICLES: Types of motion – Motion curves – Rectilinear motion – time dependent motion – uniformly accelerated motion –projectile motion. **(8+3)**

KINETICS OF PARTICLES: Rectilinear motion – Newton's II law – D'Alembert's principle – Energy – potential energy – kinetic energy – conservation of energy – Work done by a force – work energy method – conservation of momentum – impulse momentum principle – Impact-Direct central impact-oblique central impact. **(10+3)**

Total L: 45 + T: 15 = 60 periods

TEXT BOOKS

1. F. P. Beer, and E. R. Johnson, '*Vector Mechanics for Engineers – Statics and Dynamics*'. Tata McGraw Hill, New Delhi, 2016
2. S. Rajasekaran, and G. Sankarasubramanian, '*Engineering Mechanics – Statics and Dynamics*'. Vikas Publishing House, New Delhi, 2006

REFERENCES

1. R. K. Bansal, '*Engineering Mechanics*'. Laxmi Publications., New Delhi, 2008
2. S. S. Bhavikatti, '*A Text book of Engineering Mechanics*'. New Age International Pvt Ltd., New Delhi, 2008.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Elaborate the fundamental concepts and principles of the science of mechanics	**K2**
CO2	Compute the resultant of the coplanar forces, reactive forces under static & dynamic equilibrium conditions and moments of inertia of different cross sections	**K3**
CO3	Compare the geometrical and structural properties of the members under different practical conditions and propose the suitable support conditions & cross sections.	**K4**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3											2	
CO3		2											
	3	**2**										**2**	

1-low, 2-medium, 3-high

25PH201 APPLIED PHYSICS

3 0 0 3

ARCHITECTURAL ACOUSTICS: Concepts of sound waves-propagation of sound waves-intensity. Reverberation: Reverberation Time-Salient features for an acoustically good room. Absorption- Coefficient of absorption-Absorption materials. Sabine's Formula-Fourier spectrum. Structure of the building for an acoustically good auditorium, school, concert hall. Main parameters that affect experience—reverberation time (large spaces), early reflections, standing wave resonances (small spaces). Noise - Indoor and extraneous. Noise control method - absorptivity, diffusers, low frequency traps. Principle of active noise cancellation. **(10)**

LIGHTING AND PHOTOMETRY: Concepts of illumination - Irradiance-brightness - Photometer - Intensity of illumination. Inverse square law and cosine law of illumination. Day lighting. Artificial lighting. Lighting in building. Design strategies using day light. Colour perception. **(8)**

THERMAL PROPERTIES: Concepts of heat- modes of propagation of heat-conduction of heat through compound medium, radial and cylindrical flow. Thermal Conductivity-Lee's method for bad conductors- Forbes method for good conductors. Thermal comfort factors- Design for minimal heat loss by conduction, radiation. Forced convection-Air filters- air showers- Greenhouse effect. **(10)**

ENERGY EFFICIENT BUILDINGS: Electrical energy - Principle of solar cells. Manufacture of solar panels. Economic considerations in using solar power. Principle of solar collectors. Factors affecting efficiency. Building envelope - economy of air conditioning and refrigeration. Principle of Passive solar buildings. **(9)**

MODERN BUILDING MATERIALS: Composites-Sandwich and laminar panels- Pultrusion - Self Cleaning Glass panes. Metallic Glass- Shape memory alloys. Seismic Sensor materials. Bio mimetic materials. **(8)**

Total L: 45 periods

TEXT BOOKS

1. M. N. Avadhanulu, P. G. Kshirsagar and T. V. S. Arun Murthy, '*A Textbook of Engineering Physics*'. S. Chand and Co., 2024.
2. R. K. Gaur, and S. L. Gupta, '*Engineering Physics*'. Dhanpat Rai Publications (P) Ltd., New Delhi 2022.
3. William D Callister Jr., '*Materials Science and Engineering – An Introduction'.* John Wiley and Sons, 2020.

REFERENCES

1. Krishnan Kumar Chawla, '*Composite Materials Science and Engineering*'. Springer, 2019.
2. Richard Wolfson, '*Essential University Physics*'. Pearson Education, Singapore, 2021.
3. R. O. Davis, and A. P. S. Selvadurai, '*Elasticity and Geomechanics*'. Cambridge University Press, 2014.
4. Paul M. Fishbane, Stephen, Gasiorowicz and Stephen T. Thornton, '*Physics for Scientists and Engineers*'. Extended Version 3rd Edition, 2014.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the principles of acoustics, lighting, thermal properties, energy efficiency, and modern building materials, emphasizing their role in building design and construction.	**K2**
CO2	Apply mathematical and analytical methods to calculate sound intensity, thermal conductivity, and lighting levels in building structures using standard design principles.	**K3**
CO3	Analyze the impact of building materials, lighting design, and thermal management strategies on energy consumption, indoor comfort, and acoustic quality in modern constructions.	**K4**
CO4	Prepare a report or presentation on sustainable building design, focusing on the integration of acoustic treatments, thermal management, and energy-efficient systems in contemporary architecture.	-

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3												
CO3		1											
CO4						1			1		1		
	3	**1**				**1**			**1**		**1**		

1-low, 2-medium, 3-high

25CY201 CHEMISTRY OF BUILDING MATERIALS II

3 0 0 3

METALLIC MATERIALS IN CONSTRUCTION: Ferrous metals: Iron ores – Manufacturing, Properties and uses of cast iron, wrought iron, pig Iron. Manufacturing, properties and uses of steel – mild steel, stainless steel – characteristics, high carbon steel. Non – ferrous: metals- Al, Cu, Zn, Alloys of Al, Cu, Mg, Ni – production, Properties and uses. Anodizing of aluminum, applications. **(9)**

GLASSES, INSULATING AND COMPOSITE MATERIALS: Glass – types, application in construction. Types of insulating materials – air spaces, aerated concrete, gypsum, expanded blast furnace slag, sprayed asbestos, vermiculate, coconut fibers, cork board, cellulose, fibre glass. Sound and electrical insulating materials. Classification and constituents of composites, fiber – reinforced composites and failure – particle reinforced composites, particulate composites, structural composites, advanced composite. **(9)**

GYPSUM, BITUMINOUS MATERIALS AND MIXTURES: Gypsum-Setting and hardening of gypsum-classification and manufacturing of gypsum-application- wall plasters. Bitumen, tar, pitches and asphalts – petroleum asphalts – asphalt cement, cut back asphalts, emulsified asphalts, air blown asphalts. Properties of asphalts – adhesion, specific gravity, durability, rate of curing, ageing and hardening and resistance to reaction with water. **(9)**

LOW-COST BUILDING MATERIALS: Industrial wastes: Fly ash, blast furnace slag, copper slag, red mud aggregate, steel making slag, ferro alloy slag, mine wastes, mica scrap, gypsum mines waste, Iron and gold tailings-coal washery waste and copper mine tailing Agricultural wastes - Rice husk, saw mill dust, jute stalk, sisal fibres, coconut wastes. **(9)**

INNOVATIVE BUILDING MATERIALS: Fly ash bricks, Soil – cement blocks, soil-lime blocks, mud blocks, calcium silicate bricks, Fal-G-cement, corrugated roofing sheets from coir waste. Red-mud, jute fibre polymer composite, expanded polystyrene composite, glass reinforced gypsum-medium fibre boards. **(9)**

Total L: 45 Periods

TEXT BOOKS

1. J. Neil, and R. K. Dhir, '*Civil Engineering Materials'.* Brijbasi Art Press Ltd., Noida, 2007.
2. U. K. Shrivastava, '*Building Materials Technology*'. Galgotia Publications Pvt Ltd, New Delhi., 2012.

REFERENCES

1. P. D. Kulkarni, R. Subramanian, P. S. Galion, A. Juneja, V. P. Puri, and S.K. Likhi '*Civil Engineering Materials*'. Tata McGraw Hill., New Delhi, 1997.
2. S. K. Duggal, '*Building Materials*'. New Age International Publishers., New Delhi, 5th Edition, 2019.
3. R. K. Rajput, '*Engineering Materials – Construction Materials*'. S Chand and Company, New Delhi, Revised 5th Ed., 2016.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Learn the chemistry of Materials for Civil Engineering	**K2**
CO2	Choose the materials for building and construction purpose	**K3**
CO3	Correlate the properties of materials for efficient construction	**K4**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3										3		
CO3								1	1				
	3							**1**	**1**		**3**		

1-low, 2-medium, 3-high

25HS201 தமிழரும் தொழில்நுட்பமும்

1 0 0 1

நெசவு மற்றும் பானைத் தொழில்நுட்பம்: *சங்க காலத்தில் நெசவுத் தொழில் – பானைத் தொழில்நுட்பம் – கருப்பு சிவப்பு பாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள்.* **(3)**

வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்: *சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள், சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு – சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் – மாமல்லபுரச் சிற்பங்களும், கோவில்களும் – சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோயில்கள் – மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு வீடுகள் – பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசெனிக் கட்டிடக் கலை.* **(3)**

உற்பத்தித் தொழில் நுட்பம்: *கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை உருக்குதல், எஃகு – வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணங்கள் – நாணயங்கள் அச்சடித்தல்- மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள், கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்புத் துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.* **(3)**

வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்: *அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார் சமூகம்.* **(3)**

அறிவியல் தமிழ் மற்றும் கணினித்தமிழ்: *அறிவியல் தமிழின் வளர்ச்சி – கணினித்தமிழ் வளர்ச்சி – தமிழ் நூல்களை மின்பதிப்பு செய்தல் – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக்கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.* **(3)**

Total L: 15 periods

25HS201 TAMILS AND TECHNOLOGY

1 0 0 1

WEAVING AND CERAMIC TECHNOLOGY: Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries. **(3)**

DESIGN AND CONSTRUCTION TECHNOLOGY: Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age–Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)-Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period. **(3)**

MANUFACTURING TECHNOLOGY: Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram. **(3)**

AGRICULTURE AND IRRIGATION TECHNOLOGY: Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conch diving - Ancient Knowledge of Ocean - Knowledge Specific Societ.**(3)**

SCIENTIFIC TAMIL & TAMIL COMPUTING: Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project. **(3)**

Total L: 15 Periods

TEXT – CUM – REFERENCE BOOKS

1. *கே. கே. பிள்ளை, தமிழக வரலாறு - மக்களும் பண்பாடும், தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்.*
2. *முனைவர் இல. சுந்தரம், கணினித்தமிழ், விகடன் பிரசுரம்*
3. *கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம், தொல்லியல் துறை வெளியீடு*
4. *பொருநை - ஆற்றங்கரை நாகரிகம், தொல்லியல் துறை வெளியீடு*
5. Dr. K.K. Pillay, '*Social Life of Tamils*'. A joint publication of TNTB, ESC and RMRL
6. Dr. S. Singaravelu, '*Social Life of the Tamils – The Classical Period*'. International Institute of Tamil Studies.
7. Dr. S.V. Subaramanian and Dr. K.D. Thirunavukkarasu, '*Historical Heritage of the Tamils*'. International Institute of Tamil Studies
8. Dr. M. Valarmathi, '*The Contributions of the Tamils to Indian Culture*'. International Institute of Tamil Studies.
9. Keeladi – '*Sangam City Civilization on the banks of river Vaigai*'. Department of Archaeology, Tamilnadu Text Book and Educational Services Corporation, Tamilnadu
10. Dr. K.K. Pillay, Studies in the History of India with Special Reference to Tamilnadu
11. '*Porunai Civilization*'. Department of Archaeology, Tamil Nadu Text Book and Educational Services Corporation, Tamilnadu
12. R. Balakrishnan, '*Journey of Civilization Indus to Vaigai*'. RMRL, Tamilnadu

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Identify the significance of ancient Tamil technologies in weaving, pottery, metallurgy, and architecture, with emphasis on traditional design and construction methods across historical periods.	**K2**
CO2	Use insights from traditional Tamil knowledge systems in agriculture, irrigation, and marine sciences, and connect the development of Tamil language to its applications in digital platforms and computing.	**K3**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1						1			1		1		
CO2						1			1		1		
						1			**1**		**1**		

1-Low, 2-Medium, 3-High

25BS211 BASIC SCIENCES LABORATORY II

0 0 4 2

Physics (Any eight experiments)

1. Determination of velocity of sound in liquid – Acoustic grating.
2. Determination of Young's modulus of the material- Uniform Bending.
3. Determination of Young's modulus of the material – Simple harmonic Oscillations of a cantilever.
4. Determination of thermal conductivity of a bad conductor using Lee's Disc.
5. Determination of particle size of a microparticle film using LASER.
6. Determination of coefficient of viscosity of a liquid – Poiseuille's method.
7. Study the dispersion relation and determination of cut off frequency using lattice dynamics kit.
8. Determination of wavelength of mercury spectrum using spectrometer and grating.
9. Determination of specific resistance of a given wire – Carey foster's bridge.
10. Determination of thermal conductivity of a metallic material – Wiedemann – Franz Law.
11. Determination of force in members of Truss Bridge.
12. Validation of Newton's laws of motion.

Demonstration:

1. Study the energy loss of a ferrite magnetic material specimen by B-H curve.
2. Determination of resolving power of a prism using spectrometer.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Relate the scientific principles, compare the experimental results with theoretical calculations and apply graphical analysis to visualise the importance of precise measurements.	**K3**
CO2	Analyse the experimental result outcomes using analytical and experimental skills for various engineering materials and applications	**K4**

Chemistry (Any eight experiments)

1. Estimation of Ca^{2+} and Mg^{2+} hardness of water by EDTA method.
2. Determination of DO content of water sample by Winkler's method.
3. Estimation of iron content of the given solution using potentiometer.
4. Corrosion experiment-weight loss method.
5. Estimation of percentage of calcium oxide present in Portland cement.
6. Anodizing of aluminium and determination of thickness of anodised film.
7. Determination of kinematic viscosity of lubricating oil using Redwood viscometer.
8. Construction of phase diagram of a simple eutectic system.

REFERENCES:

1. Department of Physics, '*Physics Laboratory Observation*'. 2025.
2. Jerry D Wilson, A. Cecilia, and Hernandez Hall, '*Physics Laboratory Experiments*'. Boston, MA, Cengage Learning, 2016.
3. J Mendham, '*Vogel's Textbook of Quantitative Chemical Analysis, 6th Ed*.,'. Pearsons Education 2009.

Total P: 60 periods

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO3	Demonstrate the measurement of water quality parameters in the given water sample.	**K3**
CO4	Analyze the properties of materials for Engineering applications.	**K4**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3												
CO2		2											
CO3	3								3		3		
CO4				3				3					
	3	**2**		**3**				**3**	**3**		**3**		

1-low, 2-medium, 3-high

25CE211 ENGINEERING PRACTICES LABORATORY

0 0 2 1

ENGINEERING PRACTICES:

1. Carpentry: Study of wood working tools. Exercises: Preparation of "L" and "V" Joints.
2. Plumbing: Study of tools and operations; Exercises: External thread cutting and preparation of PVC pipe joints.
3. Welding: Study of arc welding tools and equipment; Exercises: Preparation of joints using arc and TIG welding.
4. Sheet metal work and Soldering: Study of tools and operations; Exercise: Preparation of a rectangular tray.
5. Basic Machining: Study of tools and operations, Study of types of connections; Exercise: Simple turning and taper turning, Drilling - bolted connections.

Total P: 30 periods

REFERENCES

1. Department of Civil Engineering, '*Engineering Practices Laboratory* Manual'. PSG Institute of Technology and Applied Research, Coimbatore, 2025.
2. W. A. J. Chapman, '*Workshop Technology - Part I, 4th Edition*'. CBS Publications, New Delhi, 2007.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Apply basic manufacturing and fabrication techniques such as welding, carpentry, plumbing, turning, drilling and sheet metal work using appropriate tools and procedures to prepare simple joints and components.	**K3**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	2		2		3							2	2
	2		**2**		**3**							**2**	**2**

1-low, 2-medium, 3-high

25CE212 PROBLEM SOLVING USING PYTHON PROGRAMMING LABORATORY

0 0 4 2

LIST OF EXPERIMENTS:

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)
2. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)
4. Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building –operations of list & tuples)
5. Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)
6. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
7. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
8. Implementing programs using written modules and Python Standard Libraries (pandas, numpy. Matplotlib, scipy)
9. Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)
10. Implementing real-time/technical applications using Exception handling. (divide by zero error, voter's age validity, student mark range validation)
11. Exploring Pygame tool
12. Developing a game activity using Pygame like bouncing ball, car race etc.

Total P: 60 periods

TEXT BOOKS

1. Allen B. Downey, '*Think Python: How to Think like a Computer Scientist'.* O'Reilly Publishers, 2016.
2. Karl Beecher, '*Computational Thinking: A Beginner's Guide to Problem Solving and Programming'.* BCS Learning and Development Limited, 2017.

REFERENCES

1. Paul Deitel, and Harvey Deitel, '*Python for Programmers*'. Pearson Education, 2021.
2. G. Venkatesh, and Madhavan Mukund, '*Computational Thinking: A Primer for Programmers and Data Scientists'*. Notion Press, 2021.
3. John V Guttag, '*Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data*'. Third Edition, MIT Press, 2021
4. Eric Matthes, '*Python Crash Course, A Hands - on Project Based Introduction to Programming*'. No Starch Press, 2019.
5. https://www.python.org/
6. Martin C. Brown, '*Python: The Complete Reference'.* Mc-Graw Hill, 2018.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Develop algorithmic solutions to simple computational problems	**K2**
CO2	Develop and execute simple Python program for real time problems	**K3**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3				3							3	
	3				**3**							**3**	

1-low, 2-medium, 3-high

25EEC01 WORKPLACE COMMUNICATION SKILLS
(Common to CIVIL, CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

0 0 2 0

BUILDING COMMUNICATION SKILLS:

1. Introduction to Workplace Communication
2. Profile Building for Internships
3. English in the Workplace (Grammar & Vocabulary)
4. Professional Communication (Speaking & Writing)
5. Workplace Communication Tools
6. Career Exploration
7. Resume Update

Total P: 30 periods

REFERENCES:

1. P. C. Wren, and H. Martin, '*High school English Grammar and Composition*'. S Chand Publishing, New Delhi, 2017.
2. Norman Lewis, '*Word Power Made Easy*'. Goyal Publisher, New Delhi, 2011.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Present with clarity and coherence while speaking in formal contexts	**K2**
CO2	Understand the importance of soft skills for employability and fine tune their writing skills – Resume writing	**K3**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1									3		3		
CO2									3		3		
									3		**3**		

1-low, 2-medium, 3-high

SEMESTER III

25MA304 MATRIX THEORY AND NUMERICAL METHODS

3 1 0 4

EIGENVALUES AND EIGENVECTORS: Eigenvalues and eigenvectors of a real matrix – characteristic equation, properties - diagonalization - quadratic forms, reduction to canonical form by orthogonal reduction - Errors and approximations in numerical methods, power method for dominant eigenvalue. **(10+3)**

LINEAR ALGEBRAIC SYSTEM OF EQUATIONS AND NONLINEAR EQUATIONS: System of linear equations – Gauss elimination method, Crouts method, Gauss Seidal iterative method, Roots of equations - false-position method, Newton-Raphson method, Graeffe's root squaring method. **(8+3)**

INTERPOLATION, DIFFERENTIATION AND INTEGRATION: Newton's forward and backward interpolating polynomials, Lagrange and Newton's divided difference interpolating polynomials. Numerical differentiation, numerical integration - Newton-Cotes formulae, Trapezoidal rule, Simpson's 1/3 rule. **(12+4)**

ORDINARY DIFFERENTIAL EQUATIONS: Taylor-series method, Euler method, 4^{th} order Runge-Kutta method, multi-step method – Milne's method. **(6+2)**

PARTIAL DIFFERENTIAL EQUATIONS: Finite difference: elliptic equations – Laplace equation, Poisson equation – Liebmann method, parabolic equations – heat conduction equation – Crank Nicolson's method, hyperbolic equations – vibrating string. **(9+3)**

Total L: 45 + T: 15 = 60 periods

TEXTBOOKS

1. David C Lay, Judi J McDonald, and Steven R Lay, '*Linear Algebra and its Applications'*. Pearson Education, New Delhi, 2021.
2. Steven C Chapra, and Raymond P Canale, '*Numerical Methods for Engineers*'. Tata McGraw Hill, New Delhi, 2021.

REFERENCES

1. Curtis F Gerald, and Patrick O Wheatly, '*Applied Numerical Analysis*'. Pearson Education, New Delhi, 2017.
2. Rizwan B, '*Introduction to Numerical Analysis Using MATLAB*'. Infinity Science Press, Hingham, 2010.
3. Richard L. B, and Douglas J. F, '*Numerical Analysis*'. Thomas Learning, New York, 2017.
4. Howard Anton, Chris Rorres and Anton Haul, '*Elementary Linear Algebra*'. Wiley India, New Delhi, 2019.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the concepts related to Matrix Theory and Numerical Methods.	**K2**
CO2	Apply the techniques of Matrix Theory and Numerical Methods to solve engineering problems.	**K3**
CO3	Analyze the solutions of engineering problems employing Matrix Theory and Numerical Methods.	**K4**
CO4	Use modern tools to solve engineering problems with the help of Matrix Theory and Numerical Methods.	**-**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3												
CO3		1											
CO4					1								
	3	**1**			**1**								

1-low, 2-medium, 3-high

25CE301 MECHANICS OF SOLIDS I

3 1 0 4

STRESSES AND STRAINS: Stress and strain due to axial force – Elastic limit – Hooke's law – Factor of safety – Stepped bars – uniformly varying sections – composite bar – stresses due to temperature. **(8+3)**

DIMENSIONAL CHANGES AND STRAIN ENERGY: Lateral strain – Poisson's ratio – Volumetric strain – changes in dimensions and volume – shear stress – shear strain – Relationship between elastic constants – Hoop and Longitudinal stresses in thin cylindrical and spherical shells under internal pressure – changes in dimensions and volume. – Strain Energy due to axial force – proof resilience and modulus of resilience – stresses due to gradual load, sudden load and impact load. **(9+3)**

BENDING OF BEAMS: Shear force and bending moment at a section – Relationship between load intensity, shear force and bending moment – Shear force and bending moment diagrams for cantilever, simply supported and over hanging beams under point loads, uniformly distributed load, uniformly varying loads and concentrated moment – maximum bending moment and point of contra flexure. – Theory of simple bending and assumptions –flexural formula – section modulus – normal stress due to bending – shear stress distribution. **(12+4)**

TORSION: Theory of torsion and assumptions – Derivation of torsion formula – Polar modulus – stresses in solid and hollow circular shafts – Power transmitted by a shaft – Strain Energy due to torsion – close coiled helical spring under axial load. **(8+2)**

PRINCIPAL STRESSES AND STRAINS (TWO DIMENSIONAL ONLY): State of stress at a point – Normal and tangential stresses and their planes – Principal Stress and their planes – Plane of maximum shear stress – Analytical method – Mohr's circle method – Principal strains – Analytical and graphical methods. **(8+3)**

Total L: 45 + T: 15 = 60 periods

TEXTBOOKS

1. R. K. Rajput, '*A Textbook of Strength of Materials: Mechanics of Solids'*. S Chand and Company Limited, Noida, 2025.
2. R. K. Bansal, '*Strength of Materials*'. Laxmi Publications, New Delhi, 2024.

REFERENCES

1. B. C. Punmia, Ashok Kumar Jain, and Arun Kumar Jain, '*Strength of Materials*'. Laxmi Publications, New Delhi, 2025.
2. Egor P Popov, '*Mechanics of Materials*'. Pearson Education India, 2015.
3. Ferdinand P. Beer, E. Russell Johnston, John T. DeWolf, David F. Mazurek, and Sanjeev Sanghi, '*Mechanics of Materials*'. Tata McGraw Hill, Noida, 2020.
4. S. S. Rattan, '*Strength of Materials*'. Tata McGraw Hill, Noida, 2016.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the fundamental concepts of stress, strain, axial deformation, and strain energy under various loading conditions.	**K2**
CO2	Apply analytical methods to determine internal forces (shear force, bending moment), stresses, and deformations in beams, shafts, and shells.	**K3**
CO3	Analyze the behavior of members under axial, bending, and torsional loads by evaluating stress, strain, deformation, and failure criteria.	**K4**
CO4	Demonstrate teamwork and communication skills through group problem-solving and presentation of structural behavior using diagrams and graphical methods such as Mohr's circle.	**-**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3	2										3	
CO3		3										3	
CO4								1	1				1
	3	**3**						**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CE302 CONSTRUCTION MATERIALS AND PRACTICES

3 0 0 3

STONES - BRICKS - CONCRETE BLOCKS - LIME: Stone as building material - criteria for selection - Tests on stones - Bricks - Classification - Manufacturing of clay bricks - Tests on bricks - Compressive strength - Water Absorption - Efflorescence - Bricks for special use - Lime - Preparation of lime mortar - Concrete hollow blocks - Lightweight concrete blocks. **(9)**

MORTAR AND CONCRETE: Cement – Ingredients – Tests on cement – Mortar – classification – Characteristics – Functions - Types of Mortar – Selection – Testing – Aggregate – Classification – Characteristics - Tests on aggregates – Concrete – Ingredients – Batching - Mixing – Transportation – Placing – Compaction – Finishing - Curing. **(9)**

PROPERTIES OF CONCRETE & OTHER MATERIALS: Fresh concrete - Hardened concrete - Non-destructive Testing - Special concretes – Admixtures - Timber - Market forms - Plywood - Veneer - False ceiling materials - Laminates - Steel - Mechanical treatment - Aluminum - Uses - Market forms - Glass - Refractories - Composite Materials – FRP. **(9)**

BUILDING REGULATIONS AND CONSTRUCTION PRACTICES: Functional planning of buildings - Site selection - site plan - Planning regulations and by-laws – principles of planning – orientation of buildings - National Building Code – types of buildings – building components and their requirements – fire safety rules – fire safety construction – fire resisting properties of materials – Foundations – need – bearing capacity – settlement – types of foundation - Brick Masonry – Plastering – Pointing - Cavity walls - Diaphragm walls. **(9)**

BUILDING FINISHES AND SERVICES: Plastering – types – cement mortar plastering - construction practice. Painting – materials and practice for walls – wood and steel. Joineries: Doors and windows – types – fixtures and fastener - water supply – sewage disposal – plumbing – electrical wiring – basic needs of building services for housing – materials – construction practice – safety and maintenance rules. **(9)**

Total L: 45 periods

TEXTBOOKS

1. S. P. Arora, and S. P. Bindra, '*The Text Book of Building Construction*'. Dhanpat Rai Publications, New Delhi, 2025.
2. G. S. Birdie, J. S. Birdie, and T. D. Ahuja, '*A Text Book of Building Construction & Construction Materials*'. Dhanpat Rai Publications, New Delhi, 2026
3. M. S. Shetty, and A. K. Jain, '*Concrete Technology: Theory and Practice*'. S Chand And Company Limited, Noida, 2019.

REFERENCES

1. S. C. Rangwala, and K. S. Rangwala, '*Building Construction*'. 10th Edition, Charotar Publishing House Pvt. Ltd., Gujarat, 2010.
2. P. C. Varghese, '*Building Construction*'. PHI Learning Private limited, New Delhi, 2010.
3. R. Santhakumar, '*Concrete Technology*'. Oxford University Press, New Delhi, 2018.
4. C. Punmia, Ashok Kumar Jain, and Arun Kumar Jain, '*Building Construction*'. Laxmi Publications, New Delhi, 2025.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Demonstrate knowledge of traditional and modern construction materials and the ability to apply construction practices, regulations, planning principles, and building services requirements to achieve safe, durable, and compliant buildings.	**K2**
CO2	Apply the principles of building materials, construction practices, and building regulations to select suitable materials and execute basic building construction and services.	**K3**
CO3	Exhibit effective team work, communication and collaborative skills to present seminars and submit reports related to building construction materials and practices.	**-**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3	1										1	
CO3								1	1				1
	3	**1**						**1**	**1**			**1**	**1**

1-low, 2-medium, 3-high

25CE303 SURVEYING

3 1 0 4

CHAIN AND COMPASS SURVEYING: Definition - Principles - Classification – Field work and office work - Types of chain – Instruments used for Chain Surveying - methods of ranging a line - Chain survey of an area - Compass- Types - Magnetic and true north - magnetic declination and its variation - Bearings - Compass survey - local attraction and its elimination -Traversing - sources, limits of error and their corrections. **(10+3)**

LEVELLING: Principles and theory of levelling - Datum - bench mark and reduced level - level surface and horizontal plane- mean sea level - Types of levels - levelling staff and their types - effect of curvature and refraction- Balancing backsight and foresight distance – Types of levelling - Reducing levels by rise and fall and height of collimation methods and check. **(8+3)**

THEODOLITE AND TACHEOMETRIC SURVEYING: Components of theodolite and its Functions – Measurement of horizontal angles and vertical angles using Theodolite - Heights and distances of Inaccessible Stations - Methods of traversing - Tacheometric surveying - Instrument Constants – anallactic lens - Tangential, stadia and subtense bar methods. **(10+3)**

CONTOURING AND CURVES: Definition - Contour interval and horizontal equivalent -characteristics – interpolation - contouring by grid and radial methods - Drawing contour lines - uses of contour maps – Definitions - Designation of a curve - Elements of simple curve - Location of tangent points - setting out of simple curve by offset and Rankines methods - obstructions and elimination in curve ranging - compound curve - problems. **(8+3)**

ADVANCED AND ENGINEERING SURVEYING: Total Station - Parts and accessories- working Principle - Advantages - field Procedure and applications - Geographic Information System - Global Positioning System - data acquisition – Data Processing- field Procedure and applications - Electronic Theodolite - Laser alignment instrument. Engineering Surveys for Alignment of Highway and Railway track - Construction Survey. **(9+3)**

Total L: 45 + T: 15 = 60 periods

TEXTBOOKS

1. B. C. Punmia, Ashok K. Jain, and Arun K. Jain, '*Surveying Vol. I, II & III'*. Laxmi Publications, New Delhi, 2025.
2. S. K. Duggal, '*Surveying Vol. I & II'*. McGraw Hill, Noida, 2019.

REFERENCES

1. R. Agor, '*A Textbook of Surveying and Levelling'*. Khanna Publishers, New Delhi, 2024.
2. C. Venkatramaiah, '*Textbook of Surveying*'. Universities Press, Hyderabad, 2011.
3. K. R. Arora, '*Surveying Vol. I, II & III'*. Standard Book House, New Delhi, 2019.
4. T. P. Kanetkar, and S. V. Kulkarni, '*Surveying and Levelling*'. Pune Vidyarthi Griha, Pune, 2011.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the fundamental principles, procedures and applications of chain, compass, levelling, theodolite and tachometric surveying, contouring, curve setting and advanced surveying techniques in Civil Engineering.	**K2**
CO2	Apply engineering principles to solve problems related to chain, compass, levelling, theodolite and tachometric surveying, contouring and curve setting.	**K3**
CO3	Analyze data from chain, compass, levelling, theodolite, and advanced surveying techniques to evaluate measurement accuracy, identify errors, and interpret results for mapping and engineering works.	**K4**
CO4	Exhibit effective team work, communication and collaborative skills to present seminars and submit reports related to surveying techniques.	**-**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3	2										3	1
CO3		3										3	1
CO4					1			1	1				1
	3	**3**			**1**			**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25HS301 PROJECT AND FINANCE MANAGEMENT
(Common to all B.E. and B.Tech. Programme)

3 0 0 3

INTRODUCTION TO PROJECT MANAGEMENT: Project: Trends in project management, project management versus general management, agile project management, the three goals of a project, life cycle of projects, project selection methods, project portfolio process, case study – friendly assisted living facility. **(9)**

ROLE OF PROJECT MANAGER AND ORGANISATION: Project managers roles and responsibilities, selection of a project manager, project management as a profession, fitting projects into the parent organization, the project team and agile team roles, case study – the company with traditional functional organizational structure setting up teams for the new initiatives. **(9)**

PROJECT ACTIVITIES: The planning process, work-breakdown structure and other aids, risk management, methods of budgeting, cost estimation, scheduling the project with PERT and CPM networks, allocating resources, resource loading and leveling, Goldratt's Critical Chain, application – using Project Libre for project management, case study – success of Chandrayan-3. **(9)**

INTRODUCTION TO FINANCE MANAGEMENT: Overview - finance and related disciplines, scope and objectives of financial management, time value of money, valuation of securities, and risk and return and calculations with spreadsheet, analysis using cash flow statement and financial statements. **(9)**

PERSONAL FINANCE: Compounding, debt, equity and financial markets and investments- debt and bonds. Equity, mutual funds, hedge funds, real estate, and commodities, Personal financial plan to enhance wealth and job marketability, components of a financial plan, tools for planning – financial statements, applying time value concept of money and tax planning. **(9)**

Total L: 45 periods

TEXTBOOKS

1. Jack R. Meredith and Scott M. Shafer, '*Project Management in Practice*'. Wiley, 2021.
2. Khan M. Y. and Jain P. K., '*Basic Financial Management*'. Tata McGraw Hill, 2012.
3. Michael Fisher, *'Saving and Investing*'. Author House, 2005.
4. Jeff Madura, '*Personal Finance*'. Pearson, 2020.

REFERENCES

1. National Finance Olympiad, '*Personal Finance Handbook'*. Pockvue Solutions, 2024
2. Glen Arnold, '*Investing'*. Financial Times Guides, 2020
3. Rachel Siegel and Carol Yacht, '*Personal Finance'*. Open Textbook Library, Saylor Foundation, 2009
4. Google, '*Google Project Management: Professional Certificate'*. Google Project Management: Professional Certificate, Coursera.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the concepts, principles, and practices of project and financial management.	**K2**
CO2	Apply project management tools, scheduling techniques, and financial planning methods to practical problems.	**K3**
CO3	Analyze project performance, risks, resource allocation, and financial decisions to identify appropriate solutions.	**K4**
CO4	Collaborate effectively as a team to plan, execute, and present project solutions using appropriate project management practices.	

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1												2	2
CO2	3									3		3	3
CO3		2								2		2	2
CO4			1		1		1	1	1	1	1	1	1
	3	**2**	**1**		**1**		**1**	**1**	**1**	**3**	**1**	**3**	**3**

1-low, 2-medium, 3-high

25CE311 STRENGTH OF MATERIALS LABORATORY

0 0 2 1

1. Tension Test on Metals – Studying the stress strain characteristics – determining the characteristics ductility – resilience – toughness.
2. Hardness Tests on Metals - Determination of Brinell and Rockwell Hardness numbers.
3. Impact Test on Metals - Determination of impact strength of metal rods by conducting the Charpy and Izod Impact tests.
4. Tests on Compression and Tension Helical Springs - Plotting the Load - deformation characteristics curve, determining the stiffness, shear stress, modulus of rigidity, strain energy.
5. Compression, Bending and Tension Tests on Wood - Determination of tensile and compressive strengths - Plotting of Load - Deflection Characteristics curve of wooden beam – Determination of Young's Modulus, Modulus of Rupture.
6. Torsion Test on shafts - Plotting of Torque and angle of twist characteristics curve, determination of shear stress, modulus of rigidity, energy stored.
7. Deflection Test on Beams - Plotting of Load deflection characteristics curve, determination of Young's Modulus - Verification of Maxwell's Reciprocal law.
8. Shear Test on Metal rods – Determination of Shear Strength for Single Shear and Double Shear conditions.
9. Compression Test - Determination of Compressive Strength of Concrete cube and Brick.

Total P: 30 periods

REFERENCES

1. Department of Civil Engineering, *'Strength of Materials Laboratory Manual'.* PSG Institute of Technology and Applied Research, Coimbatore, 2025.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Exhibit effective team work, communication and collaborative skills to submit reports by conducting experiments using modern tools related to strength tests on metals, springs, wood, and concrete to determine their mechanical properties and to analyze and interpret experimental data such as stress-strain behaviour, hardness, impact resistance, and deflection.	**K4**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	2	2	2	3	1	1	3	3			3	3
	3	2	2	2	3	1	1	3	3			3	3

1-low, 2-medium, 3-high

25CE312 SURVEY PRATICE

0 0 4 2

CHAIN SURVEYING, COMPASS SURVEYING AND LEVELLING:

1. Study of Instruments
2. Chain Surveying - Cross staff surveying
3. Compass traversing
4. Simple & Fly leveling **(24)**

THEODOLITE SURVEYING, TACHEOMETRIC SURVEYING AND SETTING OUT WORKS:

1. Measurement of horizontal angles by method of repetition and method of reiteration
2. Trigonometrical levelling - Single plane method
3. Stadia & Tangential tacheometry
4. Setting out works - Simple circular curve, Foundation marking
5. Traverse using Total station and Area of Traverse
6. Demonstration of GPS and DGPS **(36)**

Total P: 60 periods

REFERENCES

1. Department of Civil Engineering, *'Survey Practice Laboratory Manual'.* PSG Institute of Technology and Applied Research, Coimbatore, 2025.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Exhibit effective team work, communication and collaborative skills to submit reports by conducting experiments using modern tools related to field applications of chain, compass, levelling, theodolite, tachometry, contouring, curve setting, Total Station and GPS surveying techniques.	**K4**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	2	3	1	1	3	3			3	3
	3	2	2	2	3	1	1	3	3			3	3

1-low, 2-medium, 3-high

25EEC02 FOUNDATIONS OF PROBLEM SOLVING

0 0 2 1

PROBLEM SOLVING:

1. Speed Mathematics (SAW, Oz, Mirror methods)
2. Speed Mathematics (High5, Minion, Butterfly methods)
3. Speed Mathematics (Inception, Goldeneye methods)
4. Thinking with Numbers
5. Problem Solving with Visual information
6. Words Puzzles
7. Resume Writing Essentials

Total P: 30 periods

REFERENCES

1. R. S. Aggarwal, '*Quantitative Aptitude for Competitive Examination*'. S Chand Publishing, New Delhi, 2017.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Solve problems related to speed mathematics, numbers and word puzzles.	**K3**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1										1		
	1										1		

1-low, 2-medium, 3-high

SEMESTER IV
25CE401 MECHANICS OF SOLIDS II

3 1 0 4

THICK CYLINDERS: Thick cylinders – Lame's equation – Hoop stress and radial stress distribution Simple cylinder – problems – compound cylinders – shrink fit – problems. **(8+2)**

BENDING OF CURVED BEAMS AND UNSYMMETRICAL BENDING OF STRAIGHT BEAMS: Curved beams – stresses due to bending by Winkler Bach theory – rectangular, trapezoidal, circular solid sections – crane hook problem. Symmetrical and unsymmetrical bending – bending stresses in beams subjected to unsymmetrical bending – principal axes and principal moments of inertia - change in direction of neutral axis – Simple problems. **(10+3)**

COLUMNS AND STRUTS: Columns – Behaviour of axially loaded short, medium and long column members – Buckling load – Euler 's theory – Different end conditions – Rankine's formula – columns subjected to eccentric loading - problems. **(7+2)**

THEORIES OF ELASTIC FAILURE AND TORSION OF THIN WALLED SECTIONS: Maximum principal stress theory – Maximum principal strain theory – Maximum shear stress theory - Maximum strain energy theory – Maximum shear strain energy theory – Mohr 's theory - simple problems - Shear centre of mono - symmetric open sections. Hollow thin walled open and closed torsion members, single and multi-connected cross – sections. **(10+4)**

DEFLECTION OF DETERMINATE BEAMS: Governing differential equation – Macaulay's method – Moment area method – conjugate beam method – Determinate beams – indeterminate beams - problems. **(10+4)**

Total L: 45 + T: 15 = 60 periods

TEXTBOOKS

1. R. K. Rajput, 'A Textbook of Strength of Materials: Mechanics of Solids'. S Chand and Company Limited, Noida, 2025.
2. R. K. Bansal, '*Strength of Materials*'. Laxmi Publications, New Delhi, 2024.

REFERENCES

1. B. C. Punmia, Ashok Kumar Jain, and Arun Kumar Jain, '*Strength of Materials*'. Laxmi Publications, New Delhi, 2025.
2. Egor P Popov, '*Mechanics of Materials*'. Pearson Education India, 2015.
3. Ferdinand P. Beer, E. Russell Johnston, John T. DeWolf, David F. Mazurek, and Sanjeev Sanghi, '*Mechanics of Materials*'. Tata McGraw Hill, Noida, 2020.
4. A. P. Boresi, and R. J. Schmidt, '*Advanced Mechanics of Materials*'. John Wiley & Sons, 2018.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain stress distribution in thick and compound cylinders, and analyze buckling behavior of columns under axial and eccentric loading.	**K2**
CO2	Apply analytical methods and classical theories to solve problems involving curved beams, unsymmetrical bending, elastic failure, and torsion in thin-walled sections.	**K3**
CO3	Analyze the behavior of structural elements under complex loading conditions by evaluating stress distribution, stability, deflection, and failure using advanced theories and analytical methods.	**K4**
CO4	Demonstrate collaborative and communication skills by effectively presenting the analysis and deflection of determinate beams using various classical methods.	**-**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3	2										3	
CO3		3										3	
CO4								1	1				3
	3	3						1	1			3	3

1-low, 2-medium, 3-high

25CE402 HYDRAULIC ENGINEERING

3 1 0 4

FLUID STATICS, BUOYANCYAND FLOATATION: Total pressure on plane and curved surfaces - Centre of pressure for vertical and inclined plane surfaces - Buoyancy and Meta-centre - Determination of Meta-centric height – Analytical and experimental methods - Conditions of equilibrium of submerged and floating bodies. **(8+3)**

FLUID KINEMATICS AND DYNAMICS: Classification of fluid flow - Stream line - Streak line and Path lines - Continuity equation - Velocity potential function and Stream function - Flow net properties and its uses - Energy possessed by a fluid body in motion - Euler's equation of motion - Bernoulli's equation and its applications – Manometer - Velocity measurement - Pitot tube - Current meter - Discharge measurement, Venturimeter, Orifice meter – Orifices mouthpieces - notches and weirs - Rectangular - triangular - Cippoletti weir - submerged weir. **(12+3)**

FLOW THROUGH PIPES: Energy losses in pipes - Darcy Weisbach's formula - flow through pipes in series - flow through parallel pipes - flow through branched pipes - equivalent pipe - water hammer in pipes - Laminar flow through circular pipes – Hagen Poiseuille's equation - Velocity distribution. Flow through high viscous fluid. **(7+3)**

FLOW IN OPEN CHANNELS: Types of flow in channels - velocity distribution – Chezy's formula – Manning's formula; most economical channel section; Computation of specific energy and critical depth; hydraulic jump and backwater curve. **(9+3)**

PUMPS AND HYDRAULIC DEVICES: Classification of pumps - Centrifugal pumps - multistage pumps - specific speed and characteristic curves - reciprocating pumps - negative slip – Indicator diagram - functions of air vessels. Introductions to turbines. Pressure booster pumps - Hydraulic press - hydraulic accumulator - hydraulic intensifier and hydraulic ram –hydraulic jacks. **(9+3)**

Total L: 45 + T: 15 = 60 periods

TEXTBOOKS

1. P. K. Rajput, '*Textbook of Fluid Mechanics and Hydraulic Machines*'. S Chand and Company Ltd., New Delhi, 2018.
2. P. N. Modi, and S. M. Seth, '*Hydraulics & Fluid Mechanics Including Hydraulics Machines*'. Standard Book House, New Delhi, 2017.

REFERENCES

1. R. K. Bansal, '*A Textbook of Fluid Mechanics and Hydraulic Machines*'. Laxmi Publications, New Delhi, 2018.
2. C. S. P. Ojha, P. N. Chandramouli, and R. Berndtsson, '*Fluid Mechanics and Machinery*'. Oxford, New Delhi, 2010.
3. Yunus A. Cengel, John. M. Cimbala, '*Fluid Mechanics; Fundamentals and Applications*'. Fourth edition, Tata McGraw Hill, 2019.
4. K. Subramanya K, '*Flow in Open Channels*'. Tata McGraw Hill, Fifth edition, 2019.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the fundamental principles of fluid statics, fluid kinematics, fluid dynamics, pipe flow, open channel flow, pumps and hydraulic devices used in fluid mechanics.	**K2**
CO2	Estimate the stability of floating bodies, determine discharge and energy losses in pipe and open-channel flows, and assess the performance of pumps and hydraulic systems in practical engineering situations.	**K3**
CO3	Analyze fluid behavior in static and dynamic conditions by evaluating flow characteristics, energy relationships, losses, and performance of hydraulic systems and devices.	**K4**
CO4	Engage in team-based problem-solving tutorial and assignment activities related to fluid mechanics, using appropriate engineering tools, effective communication and embrace continuous learning.	-

COs-POs & PSOs MAPPING

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

1-low, 2-medium, 3-high

25CE403 BASIC STRUCTURAL STEEL DESIGN

3 1 0 4

BASIC CONCEPTS OF STRUCTURES: Structural form: Classification of structures based on function - material and shape, different structural systems and basic structural requirements: stability strength and stiffness - STRUCTURAL LOADS: Dead load - live load - wind load - dynamic and seismic load - thermal load - DESIGN CONCEPTS: Design Process: Codes of practice - Working Stress Method - Limit State Method of Design. Probabilistic approach to design - Limit state design concepts - structural steel sections - Loads on Structures – Load combinations. **(11+4)**

DESIGN OF CONNECTIONS: Need for connections - Bolted Connection: bearing type and slip critical - axially loaded - eccentrically loaded in plane and perpendicular to the plane - Welded Connection: Types of welded connections - axially loaded - eccentrically loaded in plane and perpendicular to the plan. **(8+3)**

DESIGN OF TENSION MEMBERS: Behavior and Types of sections - strength based on gross and net area basis - net area calculation for bolts – shear lag and block shear - Design of Tension Members. **(8+2)**

DESIGN OF COMPRESSION MEMBERS: Behavior - Euler's equation - basis of IS Code formula - corrections for residual stresses - effective length calculation - selection and design of simple members - Built-up members - simple back to back – toe to toe sections - laced members - battened member - column splices. **(10+4)**

COLUMN BASES: Simple base - gusseted base - column bases subjected to moment and axial loads - design of anchor bolts. **(8+2)**

Total L: 45 + T: 15 = 60 periods

TEXTBOOKS

1. L. S. Jayagopal, and D. Tensing, '*Design of Steel Structures*'. Vikas Publishing House Pvt. Ltd., 2016.
2. N. Subramanian, '*Design of Steel Structures'.* Oxford University Press, 2018.

REFERENCES

1. S. K. Duggal, '*Limit State Design of Steel Structures'.* Tata McGraw Hill, 2019.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the different type of structural systems, loads and basic design methods available for design of steel structures.	**K2**
CO2	Apply engineering and structural design principles and relevant codes to design steel members, connections, and column bases for various loading conditions ensuring strength, stability, and serviceability.	**K3**
CO3	Analyze the performance of structural steel members and connections under diverse loading conditions by assessing strength, stability, failure modes, and compliance with design codes.	**K4**
CO4	Solve a given design problem individually and in a team, exhibiting effective team work, communication and collaborative skills.	-

COs-POs & PSOs MAPPING

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

1-low, 2-medium, 3-high

25CE404 HIGHWAY AND RAILWAY ENGINEERING

3 0 0 3

HIGHWAY ENGINEERING INTRODUCTION, PLANNING AND DEVELOPMENT: History of Road Development - Highway Development in India – Jayakar Committee Recommendations and Realisations - Twenty-year Road Development Plan - On-going Highway Development Programmes at National Level - Institutions for Highway Development at National level - Principles of Highway Economics and financing – Requirements of Ideal Alignment Factors Controlling Highway Alignment. **(8)**

HIGHWAY GEOMETRY AND DESIGN: Classification and Cross Section of Urban and Rural Roads (IRC) - Highway Cross Sectional Elements [IRC Standards]- Horizontal Alignment – Horizontal Curves- Super elevation – Widening of Pavements on Horizontal Curves and Transition Curves - Vertical Alignments - Gradients, Summit and Valley Curves - Sight Distances and factors affecting Sight Distances - Geometric Design of Hill Roads [IRC Standards Only]. **(10)**

HIGHWAY MATERIALS, CONSTRUCTION AND MAINTANENCE: Highway Construction Materials - Desirable Properties and Testing - Construction of flexible and rigid pavements including modern materials and methods - Special consideration for hilly roads - Highway Drainage - road side development and Arboriculture. **(8)**

RAILWAY ENGINEERING INTRODUCTION, PLANNING AND DESIGN: Railroad history - transportation in India today and its significance - Railroad organizations – modern rail transportation - Railway track (Permanent way) its components and their functions - Gauge, tilting of rails - coning of wheels and theory of coning - Rails, Rail fastenings, Creep of rails - Sleepers - Ballasts and Ballast less tracks - Track alignment - Geometric design of Railway Tracks: Gradient, Horizontal curve, super elevation, Transition curves, Summit Curves. **(10)**

RAILWAY TRACK CONSTRUCTION AND MAINTENANCE: Points and crossing – Signalling and interlocking - Stations and Equipment – Yards and equipments - Track maintenance. **(9)**

Total L: 45 periods

TEXTBOOKS

1. S. K. Khanna, C. E. G. Justo, and A. Veeraragavan, '*Highway Engineering'*. Nem Chand & Bros, Roorkee, 2024.
2. S. C. Saxena, and S. P. Arora, '*A Textbook of Railway Engineering'*. Dhanpat Rai Publications, New Delhi, 2017.

REFERENCES

1. L. R. Kadiyali, and N. B. Lal, '*Principles and Practices of Highway Engineering'*. Khanna Publishers, New Delhi, 2023.
2. Satish Chandra, and M. M. Agarwal, '*Railway Engineering*'. Oxford University Press, Noida, 2013.
3. R. Srinivasa Kumar, '*Textbook of Highway Engineering'*. Universities Press, Hyderabad, 2015.
4. R. Srinivasa Kumar, '*Transportation Engineering: Railways, Airports, Docks and Harbours'*. Universities Press, Hyderabad, 2014.
5. Martin Rogers, and Bernard Enright, *'Highway Engineering'*. Wiley, 2016.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Summarize the concepts of highway planning and development, materials, construction and maintenance, railway planning, construction and maintenance.	**K2**
CO2	Apply engineering principles to solve problems related to geometric design of highways and railway tracks.	**K3**
CO3	Exhibit effective team work, communication and collaborative skills to present seminars and submit reports related to highways and railway track planning and design.	**-**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3	1										3	1
CO3								1	1				3
	3	1						1	1			3	3

1- low, 2-medium, 3-high

25CE411 CONCRETE TECHNOLOGY AND HIGHWAY LABORATORY

0 0 4 2

PHYSICAL PROPERTY TESTS ON CONCRETE AND HIGHWAY MATERIALS:

1. Tests on Cement: Standard consistency – Soundness – Initial & Final setting times – Fineness – Compressive strength.
2. Tests on Fine aggregate: Specific gravity - Bulk density - Sieve Analysis, Grading zone, Fineness modulus – Bulking - Water absorption.
3. Tests on Coarse Aggregate: Specific Gravity - Bulk density – Sieve analysis, Size of aggregate, Fineness modulus – Water Absorption - Abrasion value – Shape tests - Crushing and Impact test.
4. Tests on Bitumen: Specific gravity – Penetration – Ductility – Viscosity – Softening point – Flash and Fire point test.
5. Test on Bituminous Mix: Determination of Binder Content using Bitumen extraction test

TESTS ON FRESH AND HARDENED CONCRETE PROPERTIES:

1. Method of Designing and Proportioning of Normal Concrete Mixes by IS method.
2. Workability Tests: Slump test – Compaction factor – Vee bee consistometer - Flow table - Testing Methods of Self compacting concrete – Demo only.
3. Hardened concrete properties: Cube Compressive Strength – Flexural strength - Splitting tensile strength.
4. NDT: Rebound Hammer - Ultrasonic pulse velocity.

Total P: 60 periods

REFERENCES

1. Department of Civil Engineering, *'Concrete Technology and Highway Laboratory Manual'.* PSG Institute of Technology and Applied Research, Coimbatore, 2025.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Exhibit effective team work, communication and collaborative skills to submit reports by conducting experiments using modern tools related to the mechanical properties of cement, aggregates, bitumen and concrete as per relevant IS codes and interpret their suitability for concrete and highway applications.	**K4**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	2	2	2	3	1	1	3	3			3	3
	3	**2**	**2**	**2**	**3**	**1**	**1**	**3**	**3**			**3**	**3**

1-low, 2-medium, 3-high

25CEE01 MINI PROJECT I

0 0 2 1

The student works on a topic approved by the head of the department under the guidance of a faculty member and prepares a project report after completing the work to the satisfaction. The student will be evaluated based on the report and the viva voce examination by a team of internal examiners.

Total P: 30 periods

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Engage in independent study to research and consolidate literature in the identified area and formulate an engineering problem.	**K4**
CO2	Apply knowledge of mathematics, natural science, computing and engineering concepts to design / develop solutions for the identified problem through appropriate engineering tolls and validate the solutions using research-based knowledge.	**K6**
CO3	Contribute in project teams and present solutions for the identified in the form of poster, presentation and project report considering project management, economic, sustainability and ethical principles.	-

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1		3									3	3	
CO2	3		3	3	3							3	
CO3						3	3	3	3	3			3
	3	3	3	3	3	3	3	3	3	3	3	3	3

1-low, 2-medium, 3-high

25EEC03 PROBLEM SOLVING

0 0 2 1

PROBLEM SOLVING:

1. Algorithmic Thinking, Branching & Repetition Problems
2. Logical Reasoning - Data Arrangements & Relations
3. Solving problems based on Coding & decoding, Series, Analogy, Odd man out and Visual reasoning
4. Problems based on Ages, Logical Connectives, Syllogisms, Data Interpretation & Data Sufficiency
5. Solving problems on Clocks Calendars, Direction Sense & Cubes
6. Problems based on Number system, Percentages, Simple & Compound Interest
7. Resume update

Total P: 30 periods

REFERENCES

1. R. S. Aggarwal, '*Quantitative Aptitude for Competitive Examination*'. S Chand Publishing, New Delhi, 2017.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Solve problems related to coding, logical reasoning and prepare resumes.	**K3**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	1										1		
	1										1		

1-low, 2-medium, 3-high

SEMESTER V
25CE501 STRUCTURAL ANALYSIS I

3 1 0 4

FUNDAMENTAL CONCEPTS AND ENERGY METHODS: Introduction - Definition and Determination of Static and Kinematic Indeterminacy - beams, trusses and frames - Degrees of freedom - Fundamental equations for structural analysis - Principle of superposition - Basic methods of structural analysis - Work energy principles - Principle of virtual displacements - Principle of stationary potential energy - Principle of complementary energy - Principle of virtual forces - Castigliano's First and Second theorems - Engesser's First and Second theorems - Betti Maxwell's law - application to statically determinate beams, trusses and frames. **(14+4)**

FORCE METHOD: Consistent deformation method - application to trusses subjected to loads and fixed beams - application of Clapeyron's theorem of three moments for continuous beams - Load and settlement of supports - Plane rigid frames (with one degree of indeterminacy only) subjected to simple loads. **(8+3)**

ARCHES AND STIFFENING GIRDERS: Analysis of three hinged arches and two hinged arches - normal thrust and radial shear in arches - temperature effect - Analysis of three hinged stiffening girders - Suspension bridges. **(6+2)**

INFLUENCE LINES FOR DETERMINATE BEAMS AND TRUSSES: Effect of rolling loads - Description of Influence line - Influence lines for support reactions - shear force and bending moments in beams - A rolling single, two and a series of concentrated loads - rolling uniformly distributed load longer and shorter than the span - Maximum bending moment diagram - Absolute maximum bending moment - Influence lines for statically determinate plane trusses. **(12+4)**

INFLUENCE LINES FOR ARCHES AND CONTINUOUS BEAMS: Influence lines for three hinged parabolic and semicircular arches subjected to loads - Influence lines for horizontal reaction, normal thrust, radial shear and bending moment - Influence lines for two hinged arches – Muller-Breslau's Principle - Influence lines for continuous beams with one degree of indeterminacy only. **(5+2)**

Total L: 45 + T: 15 = 60 periods

TEXT BOOKS

1. B. C. Punmia, A. K. Jain, and A. K. Jain, '*Strength of Materials and Theory of Structures - Vol. 2*'. Laxmi Publications, New Delhi, 2017.
2. C. S. Reddy, '*Basics of Structural Analysis*'. Tata McGraw-Hill Publishing Co., New Delhi, 2017.
3. S. S. Bhavikatti, *'Structural Analysis - I'*. Vikas Publishing House Pvt. Ltd., New Delhi, 2021.
4. S. Ramamrutham, and R. Narayanan, *'Theory of Structures'*. Dhanpat Rai, New Delhi, 2025.

REFERENCES

1. K. M. Leet, and C. M. Uang, '*Fundamentals of Structural Analysis*'. Tata McGraw-Hill Publishing Co., New Delhi, 2017.
2. R. C. Hibbeler, '*Structural Analysis*'. Pearson Education, Noida, 2018.
3. Devdas Menon, '*Structural Analysis*'. Narosa Publications, New Delhi, 2018.
4. S. Rajasekaran, and G. Sankarasubramanian, '*Computational Structural Mechanics'*. Prentice Hall of India Private Ltd., New Delhi, 2015.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Comprehend the principles and theorem for statically determinate and indeterminate beams, trusses and frames.	**K2**
CO2	Apply engineering principles to evaluate the force and displacement response of statically determinate and indeterminate structures and construct influence line diagrams for determinate beams, trusses, arches and continuous beams.	**K3**
CO3	Analyze determinate and indeterminate structural systems using energy methods, force methods, and influence line concepts to evaluate structural response under static and moving loads.	**K4**
CO4	Exhibit effective team work, communication and collaborative skills to submit reports by solving complex problems.	-

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3	2	1									3	
CO3		3	2	2								3	
CO4								1	1				1
	3	**3**	**2**	**2**				**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CE502 DESIGN OF RC ELEMENTS

3 1 0 4

DESIGN OF BEAMS: Introduction on various design philosophies - analysis and design of RC rectangular and flanged beams. **(9+3)**

DESIGN OF SLABS AND LIMIT STATE OF SERVICEABILITY: Design of one-way and two-way slabs - design of one- way continuous slab - estimation of deflection of simple flexural members - estimation of crack width of flexural members. **(9+3)**

DESIGN FOR BOND, ANCHORAGE, SHEAR AND TORSION: Behaviour of RC members in bond and anchorage - design requirements and detailing of joints - behaviour and design of RC beams in shear - design of RC beams for combined bending, shear and torsion. **(9+3)**

DESIGN OF RC COLUMNS: Design of short columns for axial, uni-axial and biaxial bending - RC slender columns (Design Principles only). **(9+3)**

DESIGN OF RC FOOTINGS: Design of isolated footings - design of combined rectangular, trapezoidal and strap beam footings. **(9+3)**

Total L: 45 + T: 15 = 60 periods

TEXT BOOKS

1. P. C. Varghese, '*Limit State Design of Reinforced Concrete'*. Prentice Hall of India Ltd., New Delhi, 2010.
2. S. N. Sinha, '*Reinforced Concrete Design'*. Tata McGraw-Hill Publishing Co., Ltd., New Delhi, 2017.

REFERENCES

1. S. Unnikrishnan Pillai, and Devdas Menon, '*Reinforced Concrete Design'*. Tata McGraw Hill Publishing Co. Ltd, New Delhi, 2021.
2. N. Krishna Raju, and R. N. Pranesh, '*Reinforced concreted design – IS 456-2000 Principles and Practice*'. New Age International Publishers, New Delhi, 2022.
3. N. Subramanian, '*Design of Reinforced Concrete Structures'*. Oxford University Press, 2014.
4. IS 456:2000, *'Plain and Reinforced Concrete - Code of Practice'*. Bureau of Indian Standards, New Delhi, 2000.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain clearly the various design concepts and codal recommendations to design various structural members.	**K2**
CO2	Apply reinforced concrete design principles and codal provisions to design beams, slabs, columns, and footings for strength, serviceability, shear, bond, and torsion requirements.	**K3**
CO3	Analyze the behaviour and design of reinforced concrete beams, slabs, columns, and footings under various loading conditions by evaluating strength, serviceability, bond, shear, and torsional effects as per design standards	**K4**
CO4	Demonstrate effective team work, communication and collaborative skills to submit reports related to design of reinforced concrete beams, slabs, columns, and footings.	**-**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3	2	2									3	
CO3		3	2	2								3	
CO4								1	1				1
	3	**3**	**2**	**2**				**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CE503 MECHANICS OF SOIL

3 1 0 4

BASIC DEFINITIONS, RELATIONSHIP AND CLASSIFICATION BASED ON PHYSICAL PROPERTIES: Phase diagrams, Basic definitions and derivations of relations, Numerical examples - Physical properties including colour, grain shape, grain size distribution and Atterberg limits - Bureau of Indian Standards classification. **(13+4)**

EFFECTIVE STRESS CONCEPT AND PERMEABILITY: Soil water, Capillarity in soils, types of head, state of stress in soil mass, Terzaghi's effective stress law - Flow of water in soils, Darcy's law, Permeability, Constant and falling head permeability tests, factors affecting permeability. **(8+3)**

SEEPAGE THROUGH SOILS AND COMPACTION: Seepage, critical hydraulic gradient, quick sand phenomenon - effect of seepage force on the state of stress in a soil mass - properties and uses of flow nets - Factors influencing soil compaction, Laboratory compaction tests, dry density and moisture content relationship, field compaction, compaction control. **(8+2)**

STRESS DISTRIBUTION AND CONSOLIDATION: Boussinesq's expression for point loads and its extension to uniformly distributed loads - Newmark's chart, approximate methods, examples - Compressibility of soil, measurement of compressibility characteristics, e-log p curve - Various terms involved - Terzaghi's one dimensional consolidation theory, Evaluation of coefficient of consolidation, Numerical examples. **(8+3)**

SHEARING CHARACTERISTICS OF SOILS AND STABILITY OF SLOPES: Review of principal stresses, planes and Mohr's stress circle - Mohr- coulomb theory - Measurement of shear strength in the laboratory - Influence of Drainage conditions on the shear strength parameters - Shear characteristics of granular materials and saturated cohesive soils - Factors influencing shear strength. Stability analysis of infinite and finite slopes - Factor of safety against sliding - stability analysis by Swedish circle method - Taylor's stability chart. **(8+3)**

Total L: 45 + T: 15 = 60 periods

TEXT BOOKS

1. M. Palanikumar, '*Soil Mechanics*'. PHI Learning Private Limited, Delhi, 2018.
2. P. Purushothama Raj, '*Soil Mechanics and Foundation Engineering'*. Pearson, New Delhi, 2013.
3. B. C. Punmia, A. K. Jain, and A. K. Jain, '*Soil Mechanics and Foundations'.* Laxmi Publications, New Delhi, 2023.
4. K. R. Arora, '*Soil Mechanics and Foundation Engineering'.* Standard Publishers & Distributors, New Delhi, 2019.

REFERENCES

1. D. P. Coduto, '*Geotechnical Engineering'.* PHI Learning Private Limited, New Delhi, 2013.
2. B. M. Das, and K. Sobhan, '*Principles of Geotechnical Engineering'*. Cengage Learning, 2017.
3. Gopal Ranjan, and A. S. R. Rao, '*Basic & Applied Soil Mechanics'.* New Age International Publishers, New Delhi, 2023.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Summarize fundamental soil mechanics concepts including soil properties, classification, effective stress, seepage, compaction, consolidation, and shear strength behaviour of soils	**K2**
CO2	Apply soil mechanics principles to solve problems related to permeability, seepage, compaction, stress distribution, consolidation settlement, shear strength, and slope stability.	**K3**
CO3	Analyze soil behaviour and failure mechanisms by evaluating seepage effects, stress distribution, consolidation characteristics, and slope stability using standard analytical methods.	**K4**
CO4	Exhibit effective team work, communication and collaborative skills to present seminars and submit reports related to complex behaviour of soil.	**-**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3	2	1									3	
CO3		3	2	1								3	
CO4								1	1				1
	3	**3**	**2**	**1**				**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CE504 WATER SUPPLY ENGINEERING

3 0 0 3

WATER SUPPLY SYSTEM AND WATER DEMAND: Need for protected water supply - objectives of water supply system - quantity estimation of water - Factors affecting per capita consumption, fire demand, fluctuations in rate of consumption, population forecasting - Design periods for water supply components - Conveyance of water, types of conduits, relative merits. Pipe corrosion and prevention. Hydraulic design of pipes - Laying, joining and testing of pipes, pipe appurtenances - Intake structures and their types. **(10)**

WATER QUALITY AND PRIMARY TREATMENT OF WATER: Sources and types of water pollutants - physical, chemical and bacteriological analysis of water - Water borne diseases - Water quality standards - Objectives of water treatment - Treatment flow charts -screening and aeration - Plain sedimentation - Principles of coagulation, flocculation and sedimentation - Design principles of Flash mixer - Design and drawing (Line sketch) of Flocculator and Sedimentation tank. **(10)**

WATER TREATMENT BY FILTRATION AND OTHER METHODS: Principles of Filtration - Classification - constructional and operational features of slow sand filters and rapid sand filters - Design and drawing (Line sketch) of slow sand filters and rapid sand filters - Disinfection methods - Types of disinfectants - disinfection devices - chlorination - action of chlorine - Advanced water treatment - need for advanced treatment - methods adopted - taste and odour control, iron and manganese removal, water softening, fluoridation and defluoridation - Demineralization - reverse osmosis - Residue Management. **(12)**

DISTRIBUTION SYSTEM OF WATER: Requirements of distribution system - Distribution network layouts - Analysis by Hardy Cross method and Equivalent Pipe method - introduction to computer applications - Service reservoirs - functions, classification - service reservoir design - Leakage detection and prevention - metered and unmetered water supplies - Necessity of pumping in water supply - types of pumps - selection of pump - calculation of head and power - economical diameter of pumping main. **(8)**

WATER SUPPLY AND PLUMBING IN BUILDINGS: Service connection to buildings - Plumbing for water supply in buildings - Plumbing for wastewater drainage in buildings - drainage layout - principles governing drainage - plumbing components and design - traps and fittings - water seal - classification of plumbing systems - choice - IS Code provisions-IS 1172: 1983, IS 2065 :1983. **(5)**

Total L: 45 periods

TEXT BOOKS

1. P. N. Modi, '*Water Supply Engineering'*. Standard Book House, New Delhi, 2021.
2. B. C. Punmia, A. K. Jain, and A. K. Jain, '*Water Supply Engineering'*. Laxmi Publications, New Delhi, 2026.

REFERENCES

1. G. S. Birdie, and J. S. Birdie, '*Water Supply and Sanitary Engineering'*. Dhanpat Rai and Sons, New Delhi, 2026.
2. McGhee Terrence, '*Water Supply and Sewerage'*. McGraw Hill Education, New Delhi, 2014.
3. Central Public Health and Environmental Engineering Organization, '*Manual on Operation and Maintenance of Water Supply Systems'*. CPHEEO, Ministry of Urban Development, New Delhi, 2005

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain principles of water demand estimation, water quality, treatment processes, and distribution systems.	**K2**
CO2	Apply engineering principles to design components of water treatment and distribution systems.	**K3**
CO3	Analyze water supply systems and propose suitable treatment and plumbing solutions.	**K4**
CO4	Demonstrate effective team work, communication and collaborative skills to present seminars and submit reports related to water treatment and distribution systems.	**-**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3	2	1									3	
CO3		3	2	1								3	
CO4								1	1				1
	3	**3**	**2**	**1**				**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CE511 SOIL MECHANICS LABORATORY

0 0 2 1

PHYSICAL PROPERTIES OF SOIL:

1. Specific gravity of soils
2. Sieve analysis on sand
3. Liquid limit and Plastic limit of fine-grained soil
4. Moisture content using pycnometer /conical flask **(7)**

ENGINEERING PROPERTIES OF SOIL:

1. Constant head and Falling head permeability test
2. Direct shear test
3. Unconfined compression test
4. Light compaction test
5. Field density by core cutter method
6. Demonstration on Vane shear, Consolidation test and Triaxial test **(15)**

TEST ON GEO-SYNTHETICS:

1. Tensile strength of geosynthetics
2. Permeability of Geosynthetics
3. Thickness of Geosynthetics
4. Demonstration on friction angle of geosynthetics **(8)**

Total P: 30 periods

REFERENCES

1. Department of Civil Engineering, *'Soil Mechanics Laboratory Manual'*. PSG Institute of Technology and Applied Research, Coimbatore, 2025.
2. J. N. Mandal, and D. G. Devshikar, '*A Guide to Geotextiles Testing*'. New Age International (P) Ltd., New Delhi, 2008.
3. Bureau of Indian Standards, '*SP 36 (Part 1) - 1987 - Compendium of Indian Standards on Soil Engineering, Part 1: Laboratory Testing of Soils for Civil Engineering Purposes'*. New Delhi, 1987.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Analyze the physical, engineering, and geosynthetic properties of soils by interpreting laboratory and field test results to evaluate soil behavior, strength, permeability, compaction characteristics, and soil-geosynthetic interaction for geotechnical applications.	**K4**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	1	1	3	3	1		3	3			3	3
	3	**1**	**1**	**3**	**3**	**1**		**3**	**3**			**3**	**3**

1-low, 2-medium, 3-high

25CE512 HYDRAULICS AND HYDRAULIC MACHINERY LABORATORY

0 0 2 1

HYDRAULICS LABORATORY:

1. Determination of Co-efficient of discharge of Mouth Piece and Orifice
2. Determination of Co-efficient of discharge of a Rectangular Notch, V-Notch and Trapezoidal Notch
3. Determination of Co-efficient of discharge of Venturimeter and Rotameter
4. Determination of Co-efficient of discharge of Orifice meter **(12)**

HYDRAULIC MACHINERY LABORATORY:

1. Determination of pressure loss in pipe flow
2. Performance study of jet on vane apparatus
3. Performance of Pelton Turbine, Kaplan Turbine and Francis Turbine - operating characteristics
4. Study on Performance Characteristics of Centrifugal pump and Submersible pump
5. Study on Performance Characteristics of Reciprocating pump **(18)**

Total P: 30 periods

REFERENCES

1. Department of Civil Engineering, *'Hydraulics and Hydraulic Machinery Laboratory Manual'*. PSG Institute of Technology and Applied Research, Coimbatore, 2025.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Exhibit effective team work, communication and collaborative skills to submit reports by conducting experiments using modern tools related to the concepts of hydraulics and hydraulic machinery and interpret the results.	**K4**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	1	1	3	3	1		3	3			3	3
	3	**1**	**1**	**3**	**3**	**1**		**3**	**3**			**3**	**3**

1-low, 2-medium, 3-high

25CEE02 INTERNSHIP I
25CEE03 COMMUNITY PROJECT

0 0 0 1

The students individually undertake internship / training in reputed civil engineering companies or involve themselves in a community project under the guidance of a faculty member for a period of 2 weeks during the Semester IV summer vacation and assessed in Semester V. At the end of the internship / training or community project work, a report on the work done will be prepared and presented. The students will be evaluated through a viva-voce examination by a team of internal examiners.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Engage as an individual or in teams and present internship / training report or community project report in the form of presentation, video, poster and written reports considering project management, economic, sustainability and ethical principles with ability for life-long learning.	-

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1						3	3	3	3	3	3		3
						3	**3**	**3**	**3**	**3**	**3**		**3**

1-low, 2-medium, 3-high

25EEC04 APTITUDE SKILLS

0 0 2 1

APTITUDE SKILLS:

1. Reading comprehension
2. Sentence correction, Sentence completion and Para-jumbles
3. Vocabulary, Articles, Prepositions and Interrogatives
4. Critical reasoning
5. Ratio and Proportion, Profit and loss, Partnerships and averages
6. Permutation, Combination and Probability
7. Time, Speed and Distance
8. Resume progress check

Total P: 30 periods

REFERENCES

1. R. S. Aggarwal, '*Quantitative Aptitude for Competitive Examination*'. S Chand Publishing, New Delhi, 2017.
2. P. C. Wren, and H. Martin, '*High school English grammar & composition'*. S Chand Publishing, New Delhi, 2017.
3. Norman Lewis, '*Word Power Made Easy*'. Goyal Publisher, New Delhi, 2011.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Solve problems related to vocabulary, critical reasoning, probability and prepare resumes.	**K3**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1										1		
	1										**1**		

1-low, 2-medium, 3-high

SEMESTER VI
25CE601 STRUCTURAL ANALYSIS II

3 1 0 4

SLOPE DEFLECTION METHOD TO BEAMS AND FRAMES: Displacement method concept - Slope Deflection equations - Fixed end moments - Application to statically indeterminate beams and frames - Symmetric structure subjected to symmetric and anti-symmetric loadings - Effect of temperature, settlement - Deformed shape, Bending Moment and Shear Force Diagrams and axial force diagrams. **(8+3)**

MOMENT DISTRIBUTION METHOD TO BEAMS AND FRAMES: Basic concepts - Stiffness factor, distribution factor and carry over factors - Single span beams with different support conditions - Fixed end Moments - Moment Distribution in continuous Beams - Portal frames with and without side sway - Deflected shape, bending moment, shear force and thrust diagrams - symmetric structure subjected to symmetric and anti-symmetric loadings - Naylor's distribution. **(9+3)**

APPROXIMATE METHODS OF ANALYSIS: Multi-storey frames - Analysis using substitute frames - gravity load - loading pattern for maximum moments - Methods of lateral load analysis - portal method - cantilever method. **(7+2)**

FLEXIBILITY METHOD: Flexibility matrix - Definition - Application of Principle of Superposition - Properties - Formulation of Structure Flexibility matrix - Application to Two Degree of Freedom systems - Structure and element co-ordinates - Transformation of forces - Structure flexibility in terms of element flexibility - Forces acting at coordinates and not acting at co-ordinates - Determination of Displacements - Application to trusses, beams and frames. **(11+4)**

STIFFNESS METHOD: Principle of superposition of displacements - one, two degrees of freedom systems - structure stiffness in terms of element stiffness - Formulation of structure stiffness matrix from element stiffness matrix - application to plane trusses, beams and plane frames - determinate and indeterminate structures - forces not acting at co-ordinates - Effect of Temperature, lack of fit - Static condensation technique. **(10+3)**

Total L: 45 + T: 15 = 60 periods

TEXT BOOKS

1. S. Rajasekaran, and G. Sankarasubramanian, '*Computational Structural Mechanics'*. Prentice Hall of India Private Ltd., New Delhi, 2015.
2. B. C. Punmia, A. K. Jain, and A. K. Jain, '*Strength of Materials and Theory of Structures - Vol. 2*'. Laxmi Publications, New Delhi, 2017.
3. S. S. Bhavikatti, *'Structural Analysis - II'*. Vikas Publishing House Pvt. Ltd., New Delhi, 2021.
4. S. Ramamrutham, and R. Narayanan, *'Theory of Structures'*. Dhanpat Rai, New Delhi, 2025.

REFERENCES

1. K. M. Leet, and C. M. Uang, '*Fundamentals of Structural Analysis*'. McGraw-Hill, New Delhi, 2020.
2. Devdas Menon, '*Structural Analysis*'. Narosa Publications, New Delhi, 2018.
3. S. P. Timoshenko, and D. H. Young, *'Theory of Structures'*. McGraw Hill Education, New York, 2017.
4. R. C. Hibbeler, '*Structural Analysis*'. Pearson Education, Noida, 2018.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	'Explain the fundamental concepts for the analysis of statically indeterminate structures using force and displacement methods.	**K2**
CO2	Apply displacement, flexibility, and stiffness methods to analyze beams, trusses, and frames subjected to various loading conditions.	**K3**
CO3	Analyze the behaviour of determinate and indeterminate structures using matrix and displacement methods to evaluate internal forces, deflections, and structural response under different loading conditions.	**K4**
CO4	Demonstrate effective team work, communication and collaborative skills to submit reports in solving complex problems.	-

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3	2	1									3	
CO3		3	2	2								3	
CO4								1	1				1
	3	**3**	**2**	**2**				**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CE602 CONSTRUCTION PROJECT MANAGEMENT

3 0 0 3

MANAGEMENT, PROJECT PLANNING & SCHEDULING: Management objectives and functions, Application of management concepts - Different periods of planning - Pretender data collection, analysis and report; Activity - time scheduling; - Charts for labour, staff, material and plant requirements; BOQ and cost estimates - Pre-contract and Contract planning; Master Program - Bar Chart scheduling CPM/ PERT Network - Activities, their duration and interdependence; - Construction of network diagram; activities and events; activity start and finish time both early and late; forward and backward pass; critical period and critical path; Float; - PERT - three-time aspects and their identification based on statistical data and Beta distribution - Probability of achieving desired time targets for projects. **(13)**

RESOURCE AGGREGATION AND LEVELLING: Differentiate resource smoothening & leveling - Resource aggregation as per early start time and initial histogram - Leveling of resources by manipulating activity start time according to float availability and late finish time and final histogram. **(5)**

TIME COST OPTIMIZATION: Direct cost and indirect cost and their relation to project duration - Normal and crash duration of activities and their corresponding cost - Crashing of network to optimize cost and duration of projects. **(6)**

PROCEDURES OF CONTRACT, PAYMENT FOR WORK &COST CONTROL: Tenders - aim, notice, tender documents, tender submission, opening, scrutiny, acceptance and award; - Contract Agreement - Principal clauses and conditions, types of contracts, their merit and suitability - Payment for works - Measurements, Running bills, deductions; Inventory of materials - Aims and scope of cost control - use of estimates, data, unit rate and standard rate as tools for cost monitoring - Systems of cost control based on accounting details of spends and periodicity of cost compare. **(11)**

EQUIPMENT AND MACHINERY: Classes of equipment according to work cycle and function performed; Modes of procuring equipment by rental, leasing and owning - Performance factors of earthmoving equipment - machine related, environment related and material related; Work and time cycle - Earth work calculation - mass curve, balancing cut and fill and optimizing haul distances and quantities by Mass Haul Diagram. **(10)**

Total L: 45 periods

TEXT BOOKS

1. U. K. Shrivastava, '*Construction Planning and Management*'. Galgotia Publications Pvt. Ltd, New Delhi, 2000.
2. R. G. Ghattas, and Sandra L Mckee, '*Practical Project Management*'. Pearson Education (P) Ltd, New Delhi, 2003.

REFERENCES

1. K. N. Jha, '*Construction Project Management: Theory and Practice*'. Pearson New Delhi, 2013.
2. Peter Fewings, and Christian Henjewele, '*Construction Project Management: An Integrated Approach'.* Taylor & Francis, London, 2019.
3. B. C. Punmia, and K. K. Khandelwal, '*Project Planning and Control with PERT and CPM*'. Laxmi Publications, 2005.
4. Vazirani, and Chandola, '*Construction Management and Accounts*'. Khanna Publishers, New Delhi, 2011.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Elaborate the concepts of planning and management of construction activities & equipment and explain the procedures contract & cost control.	**K2**
CO2	Construct the Network Diagrams and determine the project duration, optimize the resources and control the cost adopting appropriate techniques.	**K3**
CO3	Exhibit effective team work, communication and collaborative skills to present seminars and submit reports related to planning and management of construction activities.	-

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3	1	1									1	
CO3								1	1				1
	3	**1**	**1**					**1**	**1**			**1**	**1**

1-low, 2-medium, 3-high

25CE603 WASTE WATER ENGINEERING

3 1 0 4

SEWERAGE SYSTEM: Importance and scope of sanitary engineering - Sewerage system - classification of sewerage systems - relative merits and situations for adoption - Sources of wastewater - Quantity of sanitary sewage - fluctuations in flow and their significance - Storm runoff estimation - empirical and rational methods - factors affecting storm water runoff - Hydraulics of sewer flow - Hydraulic element charts - Computer applications - Design of storm sewers - surface drains for storm water - Shapes and materials of sewers - Non-circular sections - Laying, jointing and testing of sewers - Sewer appurtenances. **(10+3)**

SEWAGE CHARACTERISTICS AND PRIMARY TREATMENT SYSTEM: Wastewater characteristics and significance - Decomposition - cycles of decomposition - analysis of sewage - dissolved oxygen - Biochemical Oxygen Demand - significance and limitations - Chemical Oxygen Demand - Relative stability - Sewage sampling - population equivalent of industrial effluents - Selection of unit operation and process - Objectives and principles of preliminary, primary treatments - Principle and Design of Preliminary Treatments: Screens, skimming tank - grit chamber - proportional flow weir - Sedimentation types - Principle and Design of Primary sedimentation tanks. **(10+3)**

SECONDARY TREATMENT: Principle of biological treatment system - Suspended growth and attached growth systems - Activated sludge process and its types - working principle and design of conventional activated sludge process - Trickling Filters (conventional and high rate) - working principle and design of Trickling Filters - Oxidation/stabilization ponds - classifications - Brief outlines of Intermittent and filters and contact beds - Rotating biological contactors - Up flow anaerobic sludge blanket (UASB) - Design and Drawing (Line sketch) of Septic Tank, IS Code provisions - septic tank effluent disposal - field tests of permeability for design of dispersion trench/soak pit. **(12+3)**

ADVANCED TREATMENT AND SLUDGE TREATMENT: Need for advanced treatment - Phosphorus and Nitrogen removal - Other advanced treatment methods - Sludge treatment Objectives - Sludge characterization - Weight volume relationship - Thickening - gravity thickener - Sludge digestion - Standard rate and High-rate digester design - Bio gas recovery - Sludge Conditioning and Dewatering - Sludge drying beds - ultimate residue disposal - recent advance. **(8+3)**

DISPOSAL OF SEWAGE: Disposal of sewage on water - conditions favoring - standards and criteria for dilution - self-purification of streams - oxygen sag curve - stages - simple problem - Disposal on land - methods of broad irrigation - subsurface irrigation - sewage sickness of soil. Effluent disposal standards. **(5+3)**

Total L: 45 + T: 15 = 60 periods

TEXT BOOKS

1. P. N. Modi, '*Sewage Treatment & Disposal and Waste Water Engineering'*. Standard Book House, New Delhi, 2024.
2. B. C. Punmia, and A. K. Jain, '*Wastewater Engineering (Including Air Pollution)'*. Laxmi Publications, New Delhi, 2022.

REFERENCES

1. Metcalf & Eddy, Inc., '*Wastewater Engineering Treatment and Reuse'*. Tata McGraw Hill Publications, New Delhi, 2017.
2. G. L. Karia, and R. A. Christian, '*Wastewater Treatment: Concepts and Design Approach*'. Prentice Hall India Learning Private Limited, 2022.
3. Central Public Health and Environmental Engineering Organization, '*Manual on Sewerage and Sewage Treatment Systems'*. CPHEEO, Ministry of Urban Development, New Delhi, 2013

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Describe wastewater characteristics, sewerage systems, and treatment processes.	**K2**
CO2	Apply standard practices and codal provisions to design sewerage systems and wastewater treatment units for specified requirements.	**K3**
CO3	Analyze treatment performance and propose suitable disposal and reuse strategies.	**K4**
CO4	Demonstrate effective team work, communication and collaborative skills to present seminars and submit reports related to waste water treatment systems.	**-**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3	2	1									3	1
CO3		3	1	1								3	1
CO4								1	1				1
	3	**3**	**1**	**1**				**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CE604 FOUNDATION ENGINEERING

3 0 0 3

EARTH PRESSURE ON RETAINING WALLS: Lateral earth pressure - Rankine's earth pressure theory - Coulomb's theory - Basic assumptions and limitations - Applications to retaining walls using Rankine's theory - Culmann's graphical method - Stability of retaining walls. **(8)**

SOIL EXPLORATION: Planning - Boring, sampling and sounding - Hand augers and power drills - wash boring - sampling - Spacing and depth of exploratory borings - preservation of samples - subsurface soundings - Standard Penetration Test - Static Cone Penetration Test - Dynamic Cone Penetration Test - preparation of soil investigation report. **(10)**

BEARING CAPACITY OF SHALLOW FOUNDATIONS: Various definitions - types of failures - Types of foundations - Historical development of bearing capacity theories - Contributions by Terzaghi and Meyerhoff - estimation of bearing capacity as per IS 6403 recommendations - factors affecting bearing capacity - bearing capacity of granular soil based on SPT and SCPT results - contact pressure distribution diagram on the base of the footings - eccentric loading - determination of ultimate bearing capacity of an eccentrically loaded footing - examples. **(8)**

SETTLEMENT OF SHALLOW FOUNDATIONS: Immediate and consolidation settlements - Differential settlement - Allowable bearing pressure based on tolerable settlement - Plate load test - Provisions of IS 1888 - Interpretation of test results - limitations - Allowable pressure on the basis of settlement criterion for footings on sand on the basis of N value. Allowable bearing pressure for raft foundation on sand - Provisions of IS 8009 (Part 1). **(10)**

PILE FOUNDATIONS: Types of piles based on their function, composition and method of installation - Determination of vertical load capacity of a single pile - provisions of IS 2911 (Part 1) - static formulae - dynamic pile driving formulae - Engineering News formula - Modified Hiley's equation - pile load test - method of carrying out the test - Determination of allowable load from pile load test data - provisions of IS 2911 (Part 4) - load carrying capacity of piles based on static cone penetration test and standard penetration test results - Group of piles - Number and spacing - pile group efficiency in sands and clays - pile group efficiency equations - settlement of pile groups in clay and sand - examples - Negative skin friction - piles subjected to uplift. Foundations on expansive soil: Identification of expansive soil - Field conditions favoring swelling - Consequences of swelling - concept of under reamed pile - Provisions of IS 2911 (Part 3). **(9)**

Total L: 45 periods

TEXT BOOKS

1. Gopal Ranjan, and A. S. R. Rao, '*Basic and Applied Soil Mechanics'*. New Age International (P) Ltd., New Delhi, 2022.
2. P. C. Varghese, '*Foundation Engineering'*. Prentice-Hall of India Private Limited, New Delhi, 2012.
3. B. C. Punmia, A. K. Jain, and A. K. Jain, '*Soil Mechanics and Foundations'.* Laxmi Publications, New Delhi, 2023.

REFERENCES

1. V. N. S. Murthy, '*Text Book of Soil Mechanics and Foundation Engineering*'. CBS Publishers and Distributors, New Delhi, 2014.
2. C. Venkatramaiah, *'Geotechnical Engineering'*. New Age International, New Delhi, 2017.
3. Joseph E. Bowles, '*Foundation Analysis and Design*'. The McGraw-Hill Companies Inc., New Delhi, 2011.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain basic concepts, theories, assumptions, and IS code provisions related to earth pressure, soil exploration, bearing capacity, settlement and pile foundations.	**K2**
CO2	Apply earth pressure theories, soil investigation methods, and IS code procedures to compute bearing capacity, settlement, and load capacity of shallow and pile foundations.	**K3**
CO3	Analyze retaining wall stability and foundation performance using field and laboratory data, SPT/SCPT results, pile load tests, and settlement criteria for safe design.	**K4**
CO4	Exhibit effective team work, communication and collaborative skills to present seminars and submit reports related to analysis and design of foundations.	**-**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3	2	1									3	
CO3		3	2	1								3	
CO4								1	1				1
	3	**3**	**2**	**1**				**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CE605 DESIGN OF STEEL STRUCTURES

3 1 0 4

LATERALLY RESTRAINED BEAMS: Classification of sections - simple and compound sections - calculation of plastic modulus of sections - flexural strength of beams - design considerations - behaviour of web under shear - shear check - deflection check - bearing strength of web - buckling strength of web - web buckling - web crippling. **(7+2)**

LATERALLY UNRESTRAINED BEAMS: Behaviour - basic equations - effective length - position of loads - compound beams - plate girders with mono symmetric cross section. **(5+2)**

WELDED PLATE GIRDER: Behaviour - design of flanges - design of webs - simple post critical and tension field actions - design of web under concentrated loads - design of intermediate stiffener - load bearing stiffener - end stiffener - web and flange splices - detailing. **(9+3)**

GANTRY GIRDERS AND ROOF TRUSSES: Types of cranes - mono rail cranes - design of gantry girders with capping channels - design of connections - stiffeners. Roof trusses: metal roof sheets - design of roof and cladding purlins - design of built-up purlins - loads and load combinations - double plane trusses - design of strut and tie members - bracing design - design of connections - base connections - detailing. **(12+4)**

BEAM COLUMNS AND BOLTED BEAM CONNECTIONS: Basic theory - sections under combined bending and axial loads - section strength for uni-axial and bi-axial bending - overall member strength - magnification factor - equivalent factor for uniform moment - structure of interaction equation - in-plane buckling - out of plane buckling - design buckling strength as column - columns under biaxial moment - combined tension and bending - member strength, Bolted beam connections: Simple beam connections - framed connection - unstiffened and stiffened connection - moment resistant connections - split beam connection - bracket connection - detailing. **(12+4)**

Total L: 45 + T: 15 = 60 periods

TEXT BOOKS

1. L. S. Jayagopal, and D. Tensing, '*Design of Steel Structures*'. Vikas Publishing House Pvt. Ltd., 2016
2. N. Subramanian, '*Design of Steel Structures'.* Oxford University Press, 2018.
3. B. C. Punmia, A. K. Jain, and A. K. Jain, *'Limit State Design of Steel Structures'*. Laxmi Publications, New Delhi, 2017.

REFERENCES

1. S. K. Duggal, '*Limit State Design of Steel Structures'.* Tata McGraw Hill Education Private Limited, 2019.
2. N. Krishna Raju, '*Structural Design and Drawing (Reinforced Concrete and Steel)*'. University Press, Hyderabad, 2021.
3. IS 800:2007, *'General Construction in Steel - Code of practice'*. Bureau of Indian Standards, New Delhi, 2007.
4. IS SP:6 (1) - 1964, *'Handbook for Structural Engineers'*. Bureau of Indian Standards, New Delhi, 2003

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Interpret the behaviour and design principles of steel beams, columns, and structural elements.	**K2**
CO2	Solve and design the problems for laterally restrained, unrestrained beams, beam columns and bolted beam connections using IS code provisions.	**K3**
CO3	Analyze and design welded plate girders, gantry girders, and roof trusses.	**K4**
CO4	Demonstrate teamwork and submit reports related to design of steel structures for combined bending and axial loads, including beam-columns and connections.	**-**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3	2	2									3	
CO3		3	2	2								3	
CO4								1	1				1
	3	**3**	**2**	**2**				**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CE611 ENVIRONMENTAL ENGINEERING LABORATORY

0 0 4 2

1. Determination of Turbidity
2. Determination of pH Value
3. Determination of Taste and Odour
4. Determination of Solids
5. Determination of settleable solids
6. Determination of Optimum Coagulant Dosage
7. Determination of Electrical Conductivity
8. Determination of Hardness
9. Determination of Alkalinity
10. Determination of Chlorides
11. Determination of Sulphates
12. Determination of Residual Chlorine in water
13. Determination of Available Chlorine in Bleaching Powder
14. Determination of Nitrate
15. Determination of Iron and Manganese
16. Determination of Fluoride
17. Determination of Dissolved Oxygen
18. Determination of Bio - Chemical Oxygen Demand
19. Determination of Chemical Oxygen Demand
20. Bacteriological Analysis of water (Demonstration)

Total P: 60 periods

REFERENCES

1. Department of Civil Engineering, '*Environmental Engineering Laboratory Manual*'. PSG Institute of Technology and Applied Research, Coimbatore, 2025.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Exhibit effective team work, communication and collaborative skills to submit reports by conducting experiments using modern tools related to water and wastewater quality and interpret the results to evaluate the environmental quality parameters.	**K4**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	1	1	3	3	1		3	3			3	3
	3	**1**	**1**	**3**	**3**	**1**		**3**	**3**			**3**	**3**

1-low, 2-medium, 3-high

25CE612 BUILDING PLANNING AND DRAFTING LABORATORY

0 0 2 1

STUDY OF ELEMENTS OF BUILDING DRAWING:

1. Planning of Buildings using NBC norms
2. Preparation of Plan from given Line Drawing
3. Preparation of Elevation and Section **(6)**

PLANNING AND DRAFTING OF RESIDENTIAL STRUCTURES:

1. Single Floor Office Building Drawing
2. Residential Building with RCC Roof
3. RCC Framed Structure Drawing **(12)**

PLANNING AND DRAFTING OF INDUSTRIAL STRUCTURES:

1. Workshop Building with North Light Roof Truss **(6)**

BUILDING INFORMATION MODELLING:

1. Introduction to BIM concepts and workflow
2. Creation of 3D building models **(6)**

Total P: 30 periods

TEXT BOOKS

1. V. B. Sikka, '*A Course in Civil Engineering Drawing*'. S K Kataria and Sons, 2015.
2. Department of Civil Engineering, '*Building Planning and Drafting Laboratory Manual*'. PSG Institute of Technology and Applied Research, Coimbatore, 2025.

REFERENCES

1. M. G. Shah, C. M. Kale and S. Y. Patki, *'Building Drawing: With an Integrated Approach to Built Environment'*. McGraw Hill, New Delhi, 2019.
2. J. S. Loyal, '*Civil Engineering Drawing*'. Satya Prakashan, New Delhi, 2017.
3. Bureau of Indian Standards, *'National Building Code of India 2016 (NBC 2016)'*. Bureau of Indian Standards, New Delhi, 2016.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Prepare and present drawings for residential, public, and industrial structures by applying principles of building planning, drawing conventions, and relevant standards using appropriate drafting tools and techniques.	**K4**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1	1	1	1	3		1	1	1	1	1	2	1
	1	**1**	**1**	**1**	**3**		**1**	**1**	**1**	**1**	**1**	**2**	**1**

1-low, 2-medium, 3-high

25CEE04 MINI PROJECT II

0 0 2 1

The student works on a topic approved by the head of the department under the guidance of a faculty member and prepares a project report after completing the work to the satisfaction. The student will be evaluated based on the report and the viva voce examination by a team of internal examiners.

Total P: 30 periods

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Engage in independent study to research and consolidate literature in the identified area and formulate an engineering problem.	-
CO2	Apply knowledge of mathematics, natural science, computing and engineering concepts to design / develop solutions for the identified problem through appropriate engineering tools and validate the solutions using research-based knowledge.	-
CO3	Contribute in project teams and present solutions for the identified in the form of poster, presentation and project report considering project management, economic, sustainability and ethical principles.	-

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1		3									3	3	
CO2	3		3	3	3							3	
CO3						3	3	3	3	3			3
	3	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

1-low, 2-medium, 3-high

25EEC05 ENHANCING PROBLEM SOLVING ABILITY WITH CODE

0 0 2 1

ENHANCING PROBLEM SOLVING ABILITY WITH CODE:

1. Compilation, Namespace, Header file, Data types, Variables, Declaration, Scope of variables
2. Input / Output, Type Conversion, Operators
3. For, While, Do-while, break, continue
4. Decision Making
5. Problem solving Pattern Programming
6. Arrays
7. Call by value & Call by reference, with and without arguments
8. Functions, Recursion & Strings
9. Structures & Union
10. Command Line Argument
11. Structure using Pointers
12. Handling Stress
13. Handling Peer pressure
14. Resume progress check

Total P: 30 periods

REFERENCES

1. Gayle Laakmann McDowell, '*Cracking the Coding Interview: 150 Programming Questions and Solutions*'. S Chand Publishing, New Delhi, 2015.
2. John Mongan, Noah Kindler, and Eric Giguère, '*Programming Interviews Exposed: Secrets to Landing Your Next Job*'. Wrox, New Delhi, 2018.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Solve problems related to arrays, functions, structures & unions and prepare resumes.	**K3**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1										1		
	1										**1**		

1-low, 2-medium, 3-high

SEMESTER VII
25CE701 ESTIMATION AND COSTING

3 1 0 4

INTRODUCTION: Units of measurements - Glossary of terminology - Types of Construction estimates - Different methods of Approximate estimates - Plinth area, Cubic meter, CRRI, Service unit, Bay and CCI methods, Advantages and applications. **(8+2)**

DETAILED ESTIMATE OF BUILDINGS: Methods of measuring detailed estimation and Quantity surveying for load-bearing and framed structure as in accordance with IS:1200 - Part I, II, III, IV, XIII, and XV. **(13+5)**

ESTIMATE OF OTHER STRUCTURES: Methods of Estimation of Earthwork for Roads, embankments, and other structures - Estimation of bituminous and cement concrete roads, Estimation for septic tank - soak pit - sanitary and water supply installations - Plumbing and water supply pipeline - sewer line - Estimation of woodworks. **BBS:** RCC Slab, Beam, Column, and footings - Estimation - steel roof truss. **(10+4)**

RATE ANALYSIS AND SPECIFICATIONS: Rate analysis of different items for Building works - RCC, PCC, Brickwork, Plastering, and painting work - Specifications: Objectives and importance, Standard, General, and Detailed Specifications for materials and works, specifications as per building classification, specification. **(6+2)**

VALUATION AND REPORT WRITING: Valuation: Glossary of terminology - Different methods of valuation for Building and Open Land - Calculation of standard Rent - Mortgage - lease. Principles for report preparation - report on the estimate of a residential building - Roads - Water supply and sanitary installations. **(8+2)**

Total L: 45 + T: 15 = 60 periods

TEXT BOOKS

1. M. Chakraborti, *'Estimation, Costing, Specification, and Valuation in Civil Engineering (including Computer estimation)'*. Chakraborti Publications, Kolkata, 2018.
2. B. N. Dutta, *'Estimating and Costing in Civil Engineering'*. CBS Publishers & Distributors Pvt. Ltd., New Delhi, 2020.

REFERENCES

1. G. S. Birdie, *'Text book of Estimation and Costing (Civil Engineering)'*. Dhanpat Publishing Company Private limited, New Delhi, 2014.
2. S. C. Rangwala, *'Estimating, Costing and Valuation'*. Charotar Publications, Anand, 2017.
3. D. D. Kohli, and R. C. Kohli, *'A text book of Estimating and Costing (Civil)'*. S Chand & Company Ltd., New Delhi, 2013.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Summarize the concepts of estimation methods, valuation methods and principles of report preparation.	**K2**
CO2	Estimate the quantity for various Civil Engineering structures using standard methods	**K3**
CO3	Analyze rate analysis for different items of building works to interpret cost components	**K4**
CO4	Exhibit effective team work, communication and collaborative skills to present seminar and submit reports related to estimation techniques	**-**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3	2	1									3	
CO3		3	2	1								3	
CO4								1	1				1
	3	**3**	**2**	**1**				**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CE711 DESIGN AND DETAILING OF STRUCTURES

1 0 4 3

REINFORCED CONCRETE AND RETAINING WALLS:

1. Design and detailing of reinforced concrete slab, beam, column, footing (isolated, stepped and combined)
2. Design and detailing of Retaining wall **(40)**

STEEL STRUCTURES:

1. Design of steel roof - design of purlins - design of strut and tie members - design of connections - base connection - detailing **(35)**

Total L: 15 + P: 60 = 75 periods

TEXT BOOKS

1. N. Krishna Raju, '*Structural Design and Drawing (Reinforced Concrete and Steel)*'. University Press, Hyderabad, 2021.
2. N. Krishna Raju, '*Design of Reinforced Concrete Structures*'. CBS Publishers & Distributors, New Delhi, 2016.

REFERENCES

1. IS 456:2000, *'Plain and Reinforced Concrete - Code of Practice'*. Bureau of Indian Standards, New Delhi, 2000.
2. IS 800:2007, *'General Construction in Steel - Code of practice'*. Bureau of Indian Standards, New Delhi, 2007.
3. IS 875:1987, *'Code of Practice for Design Loads (other than Earthquake) for Buildings and Structures'*. Bureau of Indian Standards, New Delhi, 2003.
4. IS SP:6 (1) - 1964, *'Handbook for Structural Engineers'*. Bureau of Indian Standards, New Delhi, 2003.
5. IS SP: 34 - 1987, '*Handbook on Concrete Reinforcement and Detailing*'. Bureau of Indian Standards, New Delhi, 1987.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Apply the engineering principles to analyze and design the reinforced concrete structural elements, retaining wall and steel roof truss.	**K4**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2				1	1			3	2
	3	**3**	**2**	**2**				**1**	**1**			**3**	**2**

1-low, 2-medium, 3-high

25CE712 COMPUTER ANALYSIS AND DESIGN LABORATORY

0 0 4 2

ANALYSIS AND DESIGN OF RC STRUCTURES:

Basic principles, behaviour and design of reinforced concrete slabs, beams, columns, footings, grids, frames as per IS codes - Structural analysis of beams and frames - modeling - boundary conditions - loads - loading conditions - load combinations - Calculation of deflections, stress resultants - shear force diagrams and bending moment diagrams for beams and frames, axial force diagrams – Analysis and design using computer programs and software. **(30)**

ANALYSIS AND DESIGN OF STEEL STRUCTURES:

Basic principles, behaviour and design of steel trusses, beams, columns and frames as per IS codes - modeling - boundary conditions - loads - loading conditions - load combinations - calculation of deflections - member forces - shear force diagram and bending moment diagram - Analysis and design using computer programs and software. **(30)**

Total P: 60 periods

REFERENCES

1. Department of Civil Engineering, *'Computer Laboratory Manual*'. PSG Institute of Technology and Applied Research, Coimbatore, 2025.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Apply the engineering principles through computer-aided tools to model, analyze, and design reinforced concrete and steel structures as per IS codes, demonstrating proficiency in load combinations, boundary conditions, and interpretation of results (e.g., shear force, bending moment diagrams).	**K4**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	3			1	1			3	2
	3	**3**	**2**	**2**	**3**			**1**	**1**			**3**	**2**

1-low, 2-medium, 3-high

25CEE05 PROJECT WORK I

0 0 4 2

The student works on a topic approved by the head of the department under the guidance of a faculty member and prepares a project report after completing the work to the satisfaction. The student will be evaluated based on the report and the viva voce examination by a team of examiners including one external examiner.

Total P: 60 periods

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Engage in independent study to research and consolidate literature in the identified area and formulate an engineering problem.	-
CO2	Apply knowledge of mathematics, natural science, computing and engineering concepts to design / develop solutions for the identified problem through appropriate engineering tools and validate the solutions using research-based knowledge.	-
CO3	Contribute in project teams and present solutions for the identified in the form of poster, presentation and project report considering project management, economic, sustainability and ethical principles.	-

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1		3									3	3	
CO2	3		3	3	3							3	
CO3						3	3	3	3	3			3
	3	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

1-low, 2-medium, 3-high

25CEE06 INTERNSHIP II

0 0 0 1

The students individually undertake internship / training in reputed civil engineering companies for a period of 2 weeks during the VI semester summer vacation. At the end of the internship / training, a report on the work done will be prepared and presented. The students will be evaluated through a viva-voce examination by a team of internal examiners.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Engage as an individual or in teams and present internship / training report in the form of presentation, video, poster and written reports considering project management, economic, sustainability and ethical principles with ability for life-long learning.	-

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1						3	3	3	3	3	3		3
						3	**3**	**3**	**3**	**3**	**3**		**3**

1-low, 2-medium, 3-high

SEMESTER VIII
25CEE07 PROJECT WORK II

0 0 8 4

The student works on a topic approved by the head of the department under the guidance of a faculty member and prepares a project report after completing the work to the satisfaction. The student will be evaluated based on the report and the viva voce examination by a team of examiners including one external examiner.

Total P: 120 periods

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Engage in independent study to research and consolidate literature in the identified area and formulate an engineering problem.	-
CO2	Apply knowledge of mathematics, natural science, computing and engineering concepts to design / develop solutions for the identified problem through appropriate engineering tools and validate the solutions using research-based knowledge.	-
CO3	Contribute in project teams and present solutions for the identified in the form of poster, presentation and project report considering project management, economic, sustainability and ethical principles.	-

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1		3									3	3	
CO2	3		3	3	3							3	
CO3						3	3	3	3	3			3
	3	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

1-low, 2-medium, 3-high

PROFESSIONAL ELECTIVES
25CEP01 PREFABRICATED STRUCTURES

3 0 0 3

DESIGN PRINCIPLES: Need for industrialized methods in building construction - Historical perspective of precast construction in India - Specific requirements for planning and layout of prefabrication plant - Modular Coordination - Standardization - Mechanization - Disuniting of Prefabricates - Types of prefabrication - Prefabrication systems - Material Properties - Moulds - Manufacture of prefabricated components - Transport and Erection of structural components - Finishing and Fitting up operations - Dimensional deviation and Tolerance - Principles of structural design of prefabricated components - IS code Specifications. **(10)**

FLOORS AND ROOFS: Types of floor slabs - Flooring arrangements - Behaviour - Analysis and design of voided slab floor elements and composite plank floor - Design of Horizontal Floor diaphragms - Types of Roof Slab and its behaviour - Design considerations of shell roofs for industrial sheds - Cylindrical, Folded plate and hyper - prefabricated shells - Erection and jointing techniques. **(9)**

WALLS: Types of wall panels - Blocks and large panels, Sandwich wall Panels, Curtain, Partition and load bearing walls - behaviour - Load transfer path - Stability of wall panels - Location of shear wall in buildings - Design of shear walls - Leak prevention, joint sealants and Expansion joints. **(8)**

PRECAST RC FRAME COMPONENTS: Precast Frame Analysis - Analysis and Design of Beams, Columns and corbel - Structural integrity - Design for Progressive collapse. **(9)**

JOINTS AND CONNECTIONS: Basic force transfer mechanisms - Design Philosophy - Types of joints - Compression, Tension, shear, Flexural and Torsional joints - Structural Connections - Connection Materials - Methods of Connection analysis - Connection between various structural precast elements. **(9)**

Total L: 45 periods

TEXT BOOKS

1. Kim S. Elliot, '*Precast Concrete Structures'*. CRC Press, London, 2017.
2. B. S. Smith, and A. Coull, *'Tall Building Structures: Analysis and Design'*. Wiley, New Delhi, 2018.
3. T. Koncz, *'Manual of Precast Concrete Construction'*. Bauverlag GmbH, Wiesbaden, 2016.

REFERENCES

1. N. Krishnaraju, *'Advanced Reinforced Concrete Design (Precast and Prestressed Concepts)'*. McGraw Hill Education (India) Pvt. Ltd., New Delhi, 2019.
2. M. S. Mamlouk, and J. P. Zaniewski, *'Materials for Civil and Construction Engineers'*. Pearson India Education Services Pvt. Ltd., Noida, 2018.
3. IS 15916:2010, *'Code of Practice for Design and Erection of Precast Concrete Structures'*. Bureau of Indian Standards, New Delhi.
4. A. M. Hass, *'Precast Concrete Design and Construction'*. McGraw Hill Education, New York, 2017.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Elucidate the principles, techniques and choose suitable types of prefabricated structural components for the different construction projects and explain the design principles for different structural elements, precast RC Frames, joints and connections.	**K2**
CO2	Apply engineering principles to design different structural elements, precast RC Frames, joints and connections.	**K3**
CO3	Illustrate effective team work, communication and collaborative skills to present seminars and submit reports related to production and erection process of prefabricated components.	-

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3	2	2									3	
CO3								1	1				1
	3	**2**	**2**					**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CEP02 FINITE ELEMENT METHODS

3 0 0 3

DIRECT STIFFNESS FOR PIN JOINTED FRAMES: Structural Mechanics Concept, Matrix Displacement Method of Analysis - Stiffness matrix, Principle of superposition - Basic Theory of Finite Element Method, Application of Finite Element Method - Advantages and Disadvantages - Concept of direct stiffness, Element Stiffness - Element Assembly to Global Stiffness Matrix, Boundary Condition - Plane truss - displacement of joints, forces in members - Space truss, numerical examples. **(9)**

DIRECT STIFFNESS METHOD FOR BEAMS AND PLANE RIGID FRAMES: Direct Stiffness for Beams and Frames - stiffness matrix for beam element, principle of superposition - Continuous beams, assembly of element stiffness matrices - application of boundary conditions, consistent load vector - evaluation of displacements at nodes, element end forces - shear force and bending moment diagrams - plane rigid frame element, global and local coordinate systems - transformation matrix, element assemble, stiffness matrix - analysis of plane rigid frames, axial force, shear force and bending moment diagram. **(9)**

CONCEPTS OF ELASTICITY AND TWO DIMENSIONAL STRESS ANALYSIS: Introduction to Elasticity theory, Basic concepts - Constitutive law, plane stress, plane strain problems - Equilibrium equations, compatibility equations, transformation - Saint Venant's Principle - Idealization, Triangular Element - Constant Strain Triangle, strain displacement matrix - Element Stiffness, Assembly of Element Stiffness - Application to simple problems - Introduction to Iso-parametric elements, basic concepts only. **(9)**

METHOD OF WEIGHTED RESIDUAL AND VARIATIONAL FORMULATION: Trial function, residue, weight concepts - methods of weighted residual and applications - collocation method and over determined collocation method - subdomain method, Galerkin's method - method of least squares - calculus of variations, Euler Lagrange equation functional, Rayleigh Ritz method concept - application to deflection of beams - application to buckling load of columns. **(9)**

SOLUTION TECHNIQUES FOR STATIC AND DYNAMIC ANALYSIS: Linear system of equations, storage schemes, band form of storage - Gaussian elimination method - Cholesky decomposition method - application to static analysis, evaluation of displacements - Eigen value problems, stress analysis, stability problems - mass matrix, lumped mass, consistent mass - Jacobi method for Eigen value problems - evaluation of maximum Eigen value by forward iteration - evaluation of minimum Eigen value by inverse iteration. **(9)**

Total L: 45 periods

TEXT BOOKS

1. S. Rajasekaran, and G. Sankarasubramanian, *'Computational Structural Mechanics'*. Prentice Hall of India Pvt. Ltd., New Delhi, 2015.
2. S. Rajasekaran, *'Finite Element Analysis in Engineering Design'*. S. Chand Publishing, New Delhi, 2006.

REFERENCES

1. C. S. Krishnamoorthy, *'Finite element analysis - Theory and programming'*. Tata McGraw Hill Publishing Co, New Delhi, 2011.
2. Robert D. Cook, David S. Malkus, and Michael E. Plesha, *'Concepts and Applications of Finite Element analysis'*. John Wiley & Sons (Asia), Singapore, 2007.
3. Chandrapatla, and Belegundu, *'Introduction to Finite Elements in Engineering'*. Prentice Hall of India, New Delhi, 2014.
4. S. S. Rao, *'The Finite Element Method in Engineering'*. Elsevier, 2011.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Describe the principles of finite element formulation and structural modeling.	**K2**
CO2	Apply FEM to analyze trusses, beams, frames, and elastic continua.	**K3**
CO3	Solve static and dynamic structural problems using numerical techniques.	**K4**
CO4	Exhibit effective team work, communication and collaborative skills to present seminars and submit reports related to complex problems.	**-**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3	2	1									3	
CO3		3	2	2								3	
CO4								1	1				1
	3	**3**	**2**	**2**				**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CEP03 STRUCTURAL DYNAMICS AND EARTHQUAKE RESISTANT DESIGN

3 0 0 3

BASIC CONCEPTS IN STRUCTURAL DYNAMICS: Single and Two degrees of freedom system - linear systems - equation of motion - components of vibration system - natural frequency - viscous damping - response to undamped &damped free and forced vibration - response to support motion - principle of accelerometers and displacement meters. **(15)**

STRUCTURES MODELED AS SHEAR BUILDINGS: Free vibration of a shear building - forced vibration of a shear building - reduction of dynamic matrices. **(6)**

ELEMENTS OF EARTHQUAKE ENGINEERING: Elements of Engineering Seismology - Indian Seismicity - faults - seismic waves - earthquake intensity and magnitude - earthquake ground motion - behaviour of structures in the past earthquakes - basic terminology. **(5)**

EARTHQUAKE RESPONSE: Linear systems: Earthquake ground motion - response spectrum - response history analysis - IS codal provisions for the determination of lateral loads - modal analysis. **(9)**

DESIGN CONCEPTS: Seismic Design Concepts - design spectrum - Earthquake Resistant Design of simple framed structures – IS 1893 codal provisions - ductile detailing of Reinforced Concrete frames as per IS13920. **(10)**

Total L: 45 periods

TEXT BOOKS

1. Anil K Chopra, *'Dynamics of Structures - Theory and Applications to Earthquake Engineering'*. Prentice Hall of India (P) Ltd, New Delhi, 2015.
2. Pankaj Agarwal, and Manish Shrikhande, *'Earthquake Resistant Design and Structures'*. Prentice Hall of India, New Delhi, 2011.

REFERENCES

1. R. W. Clough, and Joseph Penzein, *'Dynamics of Structures'*. McGraw Hill, New Delhi, 2019.
2. Paz Mario, and William Leigh, *'Structural Dynamics - Theory and Computation'*. Springer, New Delhi, 2013.
3. R. R. Craig, and J. K. Andrew, *'Structural Dynamics - An Introduction to computer Methods'*. John Wiley & Sons, 2006.
4. V. K. Manickaselvam, *'Elementary Structural Dynamics'*. Dhanpat Rai & Sons, New Delhi, 2001.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Illustrate the principles of structural dynamics, earthquake engineering, seismic response, and earthquake-resistant design of structures.	**K2**
CO2	Apply structural dynamics and earthquake engineering principles to evaluate seismic response and design earthquake-resistant structures in accordance with relevant codes.	**K3**
CO3	Analyze the dynamic and seismic response of structures by evaluating vibration characteristics, earthquake-induced forces, modal behavior, and codal design requirements for earthquake-resistant structures.	**K4**
CO4	Exhibit effective team work, communication and collaborative skills to present seminars and submit reports related to complex problems.	**-**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3	2	1									3	
CO3		3	2	2								3	
CO4								1	1				1
	3	**3**	**2**	**2**				**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CEP04 PRESTRESSED CONCRETE STRUCTURES

3 0 0 3

PRINCIPLES, ANALYSIS AND LOSSES: Principles - types of prestressing - materials definition of Type I, Type II and Type III structures - requirements - behaviour of PSC elements - force transmitted by pretensioned and post tensioned systems - analysis - service loads - ultimate strength - Losses due to deformation and slip of anchorage units - elastic shortening, frictional losses - shrinkage and creep of concrete, relaxation of steel - as per IS 1343:2012. **(13)**

DESIGN FOR FLEXURE: Philosophy - limit states - concepts - collapse and serviceability - service load - basic requirements-stress range approach - Lin's approach - Magnel's approach - cable layouts. **(7)**

DESIGN FOR SHEAR AND TORSION: Shear and principal stresses - limit state shearing resistance of cracked and uncracked sections - design of shear reinforcement by limit state approach - Behaviour under torsion - modes of failure - design for combined torsion - shear and bending as per IS 1343:2012. **(7)**

DEFLECTION AND TRANSFER OF PRESTRESS: Transmission of prestressing force by bond in pretensioned members - Transmission length - Factors affecting transmission length - check for transmission length - transverse tensile stresses - end zone reinforcement - Anchorage zone stresses in post-tensioned members - Magnel's method - Calculation of bearing stress and bursting tensile forces - code provisions - Reinforcement in anchorage zone - Deflection - short and long-term deflection of uncracked and cracked members as per IS 1343:2012. **(7)**

CIRCULAR PRESTRESSING AND STATICALLY INDETERMINATE STRUCTURES: Circular prestressing in liquid retaining tanks - analysis for stresses - design of tank - Methods of achieving continuity - assumptions in elastic analysis - pressure line - linear transformation - concordant cables - Guyon's theorem - analysis and design of continuous beams. **(11)**

Total L: 45 periods

TEXT BOOKS

1. N. Krishna Raju, '*Prestressed Concrete*'. Tata McGraw Hill, New Delhi, 2018.
2. N. Rajagopalan, '*Prestressed Concrete'.* Narosa Publishing House, New Delhi, 2005.

REFERENCES

1. N. Krishna Raju, '*Prestressed Concrete Problems and Solutions*'. CBS Publication, 2014.
2. Praveen Nagarajan, '*Prestressed Concrete Design*'. Pearson, 2013.
3. A. E. Naaman, '*Prestressed Analysis and Design'.* McGraw Hill, 2022.
4. N. C. Sinha, and S. K. Roy, '*Fundamentals of Prestressed Concrete*'. S Chand & Co, 2012.
5. IS 1343:2012, '*Prestressed Concrete: Code of Practice'.* Bureau of Indian Standards, New Delhi, 2012.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the principles, behavior, and design concepts of prestressed concrete members, including prestress losses, flexure, shear, deflection, and circular prestressing.	**K2**
CO2	Apply prestressed concrete design principles and codal provisions to analyze and design prestressed members subjected to flexure, shear, torsion, and serviceability requirements.	**K3**
CO3	Analyze the behaviour and design of prestressed concrete members by evaluating prestress losses, flexural and shear response, deflection, anchorage effects, and the performance of determinate and indeterminate structures as per relevant codal provisions.	**K4**
CO4	Exhibit effective team work, communication and collaborative skills to present seminars and submit reports related to complex problems.	**-**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3	2	1									3	
CO3		3	2	2								3	
CO4								1	1				1
	3	**3**	**2**	**2**				**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CEP05 REPAIR AND REHABILITATION OF STRUCTURES

3 0 0 3

BUILDING MAINTENANCE, CRACKS & DAMPNESS: Maintenance classification - structural appraisal - building maintenance - Building cracks - Principal sources of crack formation - diagnosis of cracks - Sources of dampness - moisture movement from ground - reasons for ineffective DPC - leakage in slab - Ferrocement overlay technique. **(13)**

REPAIR MATERIAL: Epoxy-polymer & latex - acrylic polymers - polyester resins - application of repair chemicals - concrete repair chemicals - examples of concrete chemicals for repair. **(6)**

CONCRETE STRUCTURE: Types and causes of deterioration - diagnosis of deterioration - Corrosion of steel in reinforced concrete - Treatment against carbonation induced and chloride induced corrosion-cracks in RCC structural elements and their prevention. **(8)**

MASONRY STRUCTURE: Causes and treatment of cracks - cracks in load bearing walls-masonry partition walls- Remedial measures - cracks in plastering and rendering - surface cracks - corner cracks - cracks in building due to swelling of soil. **(9)**

STRENGTHENING OF EXISTING STRUCTURES: General principles - relieving loads - strengthening superstructure – plating - conversion to composite construction - post stressing - jacketing - bonded overlays - section enlargement and addition of reinforcement-strengthening of substructure - demolition of structure. **(9)**

Total L: 45 periods

TEXT BOOKS

1. P. C. Varghese, '*Maintenance, Repair and Rehabilitation and Minor works of Buildings*'. PHI Pvt. Ltd., 2014.
2. B. L. Gupta, and Amit Gupta, '*Maintenance and Repair of Civil Structures*'. Standard Publishers, 2018.

REFERENCES

1. Poonam I. Modi, and Chirag N. Patel, '*Repair and Rehabilitation of concrete Structures*'. PHI Pvt. Ltd., 2019.
2. Dodge Woodson R, '*Concrete Structures: Protection, Repair and Rehabilitation*'. Elsevier, 2012.
3. S. Macdonald, '*Concrete-Building Pathology'.* Blackwell Science Limited, 2003.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Describe the principles of structural repair, diagnosis of deterioration, and rehabilitation techniques for concrete and masonry structures.	**K2**
CO2	Apply the principles of structural repair, diagnosis of deterioration, and rehabilitation techniques for concrete and masonry structures.	**K3**
CO3	Demonstrate effective team work, communication and collaborative skills to present seminars and submit reports related to repair and rehabilitation of structures.	**-**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3	2	1									3	
CO3								1	1				1
	3	**2**	**1**					**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CEP06 SUSTAINABLE AND LEAN CONSTRUCTION

3 0 0 3

INTRODUCTION & MATERIALS USED IN SUSTAINABLE CONSTRUCTION: Introduction and definition of Sustainability - Carbon cycle - role of construction material: concrete and steel, etc. - CO_2 contribution from cement and other construction materials - Recycled and manufactured aggregate - Role of QC and durability - Life cycle and sustainability. **(8)**

ENERGY CALCULATIONS: Components of embodied energy - calculation of embodied energy for construction materials - Energy concept and primary energy - Embodied energy via-a-vis operational energy in conditioned building - Life Cycle energy use. **(10)**

GREEN BUILDINGS: Control of energy use in building - National Building Code (NBC), ECBC code, codes in neighboring tropical countries - OTTV concepts and calculations - Features of LEED and TERI - GRIHA ratings - Role of insulation and thermal properties of construction materials - influence of moisture content and modeling - Performance ratings of green buildings - Zero energy building. **(10)**

CORE CONCEPTS IN LEAN: Introduction to Lean - Lean Overview; Need for Productivity Measurement and improvement; Productivity Measurement System (PMS). **(8)**

LEAN CONSTRUCTION TOOLS AND TECHNIQUES: Sampling/Work Sampling; Survey/Foreman delay survey; Value Stream/Process Mapping- 5S, Collaborative Planning System (CPS)/Last Planner™ System (LPS) - Big Room Approach, IT/BIM and Lean, How to Start Practicing Lean Tools in Project Site. **(9)**

Total L: 45 periods

TEXT BOOKS

1. Charles J Kibert, '*Sustainable Construction: Green Building Design & Delivery'.* Wiley Publishers, 2022.
2. Steve Goodhew, '*Sustainable Construction Process'*. Wiley Blackwell, UK, 2016.

REFERENCES

1. Craig A. Langston, and Grace K. C. Ding, '*Sustainable Practices in the Built Environment'*. Butterworth Heinemann Publishers, 2016.
2. O. Salem, J. Solomon, A. Genaidy, and M. Luegring, 'S*ite implementation and Assessment of Lean Construction Techniques'.* Lean Construction Journal, 2005.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Summarize the principles of sustainable construction materials, energy efficiency, and lean construction concepts.	**K2**
CO2	Apply energy calculations, lean tools, and green building standards to optimize construction processes	**K3**
CO3	Demonstrate understanding of collaborative practices, ethical considerations, and communication skills through seminars on sustainable and lean construction.	**-**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3	2	1									3	
CO3								1	1				1
	3	**2**	**1**					**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CEP07 ADVANCED REINFORCED CONCRETE DESIGN

3 0 0 3

SPECIAL STRUCTURAL MEMBERS AND DUCTILE DETAILING: Flat slabs - direct design method and detailing - ribbed hollow block slabs - waffle slabs - deep beams and walls - design of corbels - concepts of ductility, factors influencing ductility, design principles and codal provisions. **(11)**

YIELD LINE THEORY: Yield line theory for slabs of square, rectangular and circular shapes with different boundary conditions - subjected to UDL by virtual work method - concept of segmental equilibrium method - corner lever effects - lower bound solution - Introduction to Hiller Borg's strip method. **(9)**

RETAINING STRUCTURES AND SHEAR WALLS: Design and detailing of cantilever and counter fort retaining walls - design and detailing of tanks resting on the ground, underground and elevated water tanks with staging as per IS 3370 – Classification and loads in shear walls - moment of resistance of rectangular walls - ductile design of shear walls. **(9)**

BUNKERS AND SILOS: Design of a square bunker as per IS 4995 - design of a circular silo - Janssen's theory - principle of Airy's theory (no derivation or problems). **(9)**

CHIMNEYS: Design of RC chimneys as per IS 4998 for combined effect of self-load - wind load and temperature. **(7)**

Total L: 45 periods

TEXT BOOKS

1. P. C. Varghese, *'Advanced Reinforced Concrete Design'*. Prentice Hall of India, New Delhi, 2005.
2. N. Krishna Raju, *'Advanced Reinforced Concrete Design'*. CBS Publishers, New Delhi, 2010.

REFERENCES

1. B. C. Punmia, Ashok Kumar Jain, and Arun Kumar Jain, *'Comprehensive RCC Designs'*. Lakshmi Publications (P) Ltd, New Delhi, 2005.
2. Arthur H. Nilson, David Darwin, and Charles W. Dolan, *'Design of Concrete Structures'*. Tata McGraw Hill Publishing Company Ltd, New Delhi, 2005.
3. S. Unnikrishnan Pillai, and Devdas Menon, *'Reinforced Concrete Design'*. Tata McGraw Hill Publishing Co. Ltd, New Delhi, 2010.
3. N. Subramanian N, *'Design of Reinforced Concrete Structures'*. Oxford University Press, 2014.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the behavior, design concepts, and codal provisions of special reinforced concrete structures, including slabs, retaining structures, tanks, shear walls, bunkers, silos, and chimneys.	**K2**
CO2	Apply reinforced concrete design principles and relevant codal provisions to design and detail special structural elements such as slabs, retaining walls, tanks, shear walls, bunkers, silos, and chimneys.	**K3**
CO3	Analyze the structural behaviour and load-resisting mechanisms of special reinforced concrete structures by evaluating strength, stability, ductility, and serviceability requirements under various loading conditions.	**K4**
CO4	Exhibit effective team work, communication and collaborative skills to present seminars and submit reports related to repair and rehabilitation of structures.	-

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3	2	2									3	
CO3		3	2	2								3	
CO4								1	1				1
	3	**3**	**2**	**2**				**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CEP08 ADVANCED CONCRETE TECHNOLOGY

3 0 0 3

CONCRETE MATERIALS AND MICROSTRUCTURE: Advanced study of cement chemistry - hydration of Portland and blended cements - Chemical admixtures: Mechanism, compatibility, and performance-based selection of Aggregates - microstructural effects, influence of fines, recycled aggregates Interfacial Transition Zone (ITZ) - formation, properties, and modification Characterization techniques: SEM, XRD, MIP, TGA-DTA, FTIR. **(9)**

RHEOLOGY, WORKABILITY AND FRESH STATE BEHAVIOR: Fundamentals of rheology in cementitious materials Factors influencing workability - particle packing - viscosity modifying agents - Advanced testing of fresh concrete: Rheometers. **(9)**

DURABILITY AND SERVICE LIFE PREDICTION: Durability mechanisms: chloride ingress, sulfate attack, carbonation, alkali-silica reaction (ASR) Durability enhancing strategies: pore refinement, corrosion inhibitors - Durability modelling approaches: Fick's law, Life-365, Duracrete models - Electrochemical techniques: half-cell potential, LPR, EIS, chloride profiling Performance-based specifications and service life design. **(9)**

SPECIAL CONCRETES: High-Performance Concrete (HPC), High-Strength Concrete (HSC), and Ultra-High-Performance Concrete (UHPC) - Pervious Concrete - Concrete for low temperature - Low carbon cement concrete - 3D concrete printing - Life Cycle Assessment (LCA) of Concrete. **(9)**

QUALITY CONTROL DIGITAL INNOVATIONS: Quality assurance and control practices in ready-mix and precast concrete - Smart concrete: self-sensing, embedded sensors, data acquisition systems - Concrete Informatics: AI/ML applications in mix optimization and performance prediction - Digital twins and BIM integration for concrete lifecycle management - carbon footprint strategies. **(9)**

Total L: 45 periods

TEXT BOOKS

1. P. K. Mehta, and P. J. M. Monteiro, *'Concrete: Microstructure, Properties, and Materials'*. McGraw Hill, New Delhi, 2006.
2. A. M. Neville, *'Properties of Concrete'*. Pearson Education India, New Delhi, 2013.

REFERENCES

1. S. Mindess, *'Developments in the Formulation and Reinforcement of Concrete'*. Woodhead Publishing, UK, 2019.
2. RILEM and ACI Technical Committee Reports.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Summarize the behavior, durability, special properties, and quality control aspects of advanced concrete materials using microstructural characterization and modern digital technologies.	**K2**
CO2	Apply advanced concrete technology principles to evaluate material behavior, durability, special concretes, and quality control practices for sustainable construction applications.	**K3**
CO3	Demonstrate effective team work, communication and collaborative skills to present seminars and submit reports related to advanced concrete technology concepts.	-

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3	2	1									3	
CO3								1	1				1
	3	**2**	**1**					**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CEP09 AIR POLLUTION AND CONTROL ENGINEERING

3 0 0 3

INTRODUCTION AND EFFECTS OF AIR POLLUTION: Structure and composition of Atmosphere - Definition, Scope and Scales of Air Pollution - Sources and classification of air pollutants and their effect on human health, vegetation, animals, property, aesthetic value and visibility - Ambient Air Quality and Emission standards - Ambient and stack sampling and Analysis of Particulate and Gaseous Pollutants. **(7)**

METEOROLOGY AND ATMOSPHERIC DISPERSION: Effects of meteorology on Air Pollution - Fundamentals, Atmospheric stability, Inversion, Wind profiles and stack plume patterns - Atmospheric Diffusion Theories - Dispersion models, Plume rise. **(6)**

CONTROL OF PARTICULATES: Factors affecting Selection of Control Equipment - Gas Particle Interaction - Working principle, Design and performance equations of Gravity Separators, Centrifugal separators Fabric filters, Particulate Scrubbers, Electrostatic Precipitators - Operational Considerations. **(11)**

CONTROL OF GASEOUS POLUTANTS: Factors affecting Selection of Control Equipment - Working principle, Design and performance equations of absorption, Adsorption, condensation, Incineration, Bio scrubbers, Bio filters - Process control and Monitoring - Operational Considerations. **(11)**

INDOOR AIR QUALITY MANAGEMENT: Sources, types and control of indoor air pollutants, sick building syndrome and building related illness - Sources and Effects of Noise Pollution - Measurement - Standards - Control and Preventive measures. **(10)**

Total L: 45 periods

TEXT BOOKS

1. Daniel A. Vallero, '*Fundamentals of Air Pollution'*. Academic Press, USA, 2025.
2. M. N. Rao, and H. V. N. Rao, '*Air Pollution'*. McGraw Hill Education, India, 2025.

REFERENCES

1. Mukesh Khare, Prateek Sharma, Sri Harsha Kota, and Sumanth Chinthala, '*Air Pollution: Science, Engineering and Management Fundamentals'*. CRC Press, 2024.
2. Swatantra P. Singh, Karthik Rathinam, Tarun Gupta, and Avinash K. Agarwal, '*Pollution Control Technologies: Current Status and Future Prospects'.* Springer Nature, Singapore, 2021.
3. Weixin Yang, Guanghui Yuan, and Yunpeng Yang, '*Air Pollution Control and Sustainable Development'*. MDPI, Switzerland, 2022.
4. Pasquale Avino, Fabiana Carriera, Gaetano Settimo, *'New Perspectives in Indoor Air Quality'*. Elseiver, 2025.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain atmospheric structure, air pollutants, and their environmental and health effects.	**K2**
CO2	Apply meteorological principles to analyze pollutant dispersion and plume behaviour and design principles of particulate and gaseous pollution-control devices for suitable equipment selection.	**K3**
CO3	Use modern air quality monitoring tools and modelling software to assess pollutant levels and standards compliance.	**-**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3	2	1									3	
CO3								1	1				1
	3	**2**	**1**					**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CEP10 ENVIRONMENTAL IMPACT ASSESSMENT

3 0 0 3

ELEMENTS AND METHODOLOGIES OF ENVIRONMENT IMPACT ASSESSMENT (EIA): Elements of Environment Impact Assessment (EIA) Objectives - Environmental Impact statement (EIS) - EIA capability and limitations - Legal provisions on EIA - Impact of development projects under Civil Engineering on environment - Methods of EIA - Checklists - Matrices - Networks - Cost-benefit analysis. **(9)**

PREDICTION AND ASSESSMENT: Analysis of alternatives - case studies - Impact prediction, assessment and monitoring on Socio-economic, Soil, Water and Air quality, Noise, Transport, Ecology - Mathematical models - public participation - Rapid EIA. **(10)**

ENVIRONMENTAL MANAGEMENT PLAN: Plan for mitigation of adverse impact on environment - options for mitigation of impact on water - air and land - flora and fauna; addressing the issues related to the project affected people- Remote sensing and GIS in EIA – ISO 14000. **(9)**

EIA IN INDIA: Procedure for environmental clearance - Flow chart - Environmental guidance for Thermal power plants - Mining projects - River valley development projects - Legislation and Institutional support - International co-operation - Guidance for industrial licensing. **(8)**

CASE STUDIES: EIA for infrastructure projects - Bridges - Stadium - Highways - Dams - Multi-storey Buildings - water supply and drainage projects. **(9)**

Total L: 45 periods

TEXT BOOKS

1. Arjun Kumar A. Rathi, *'Indian Environmental Impact Assessment Practice: Insights and Learnings'*. Cambridge Scholars Publishing, UK, 2024.
2. V. S. Kulkarni, S. N. Kaul, and R. K. Trivedy, '*A Handbook of Environment Impact Assessment'*. Scientific Publishers, India, 2023.

REFERENCES

1. Arjun Kumar A. Rathi, '*Handbook of Environmental Impact Assessment: Concepts and Practice*'. Cambridge Scholars Publishing, UK, 2025.
2. Rachna Bhateria, Mona Sharma, Rimmy Singh, and Sumit Kumar, '*Environmental Impact Assessment: A Journey to Sustainable Development'*. Springer, Switzerland, 2024.
3. Tor Hundloe, '*Environmental Impact Assessment: Incorporating Sustainability Principles'*. Palgrave Macmillan, UK, 2021.
4. Kevin Hanna, *'Routledge Handbook of Environmental Impact Assessment'*. Routledge, UK, 2021.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain EIA elements, objectives, legal provisions, and basic methodologies.	**K2**
CO2	Apply checklist, matrix, and network methods to assess project impacts and apply prediction and assessment techniques for environmental and socio-economic impacts.	**K3**
CO3	Use GIS, remote sensing, and modelling tools for impact prediction and EIA preparation.	-

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3	2	1									3	
CO3								1	1				1
	3	**2**	**1**					**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CEP11 INDUSTRIAL WASTE MANAGEMENT

3 0 0 3

INDUSTRIAL POLLUTION: Types of industries and industrial pollution - characteristics of industrial wastes - Population equivalent - Bioassay studies - effects of industrial effluents on streams - sewer - land - sewage treatment plants and human health - Environmental legislation related to prevention and control of industrial effluents and hazardous wastes - Common effluent treatment plants. **(9)**

WASTE MANAGEMENT: Waste management Approach - Environmental Auditing - ISO 14000 - Basics and Approaches - Volume and strength reduction - Material and process modifications - Waste minimization - Recycle - reuse and byproduct recovery - Applications. **(9)**

TREATMENT TECHNOLOGIES: Equalization - Neutralization - removal of suspended and dissolved organic solids - Chemical oxidation - Adsorption - Removal of dissolved inorganic solids - Combined treatment of industrial and municipal wastes - Common Effluent Treatment methods - Residue management - Dewatering - Disposal. **(9)**

POLLUTION CONTROL FROM AGRO BASED INDUSTRIES: Sources - characteristics - waste treatment flow - sheets for selected industries such as Textiles - Tanneries - dairy - Sugar - Paper - Distilleries. **(9)**

POLLUTION CONTROL FROM OTHER MAJOR INDUSTRIES: Sources - characteristics - waste treatment flow sheets for Pharmaceuticals - Electroplating industries - Steel plants - Refineries - Fertilizer - Thermal power plants - Wastewater reclamation concepts. **(9)**

Total L: 45 periods

TEXT BOOKS

1. Zarook Shareefdeen, *'Hazardous Waste Management: Advances in Chemical and Industrial Waste Treatment and Technologies'*. Springer Cham, 2023.
2. L. K. Wang, M. H. S. Wang, and Y. T. Hung, '*Industrial Waste Engineering'*. Springer, Cham, 2023.

REFERENCES

1. S. E. Hasan, '*Introduction to Waste Management: A Textbook'*. Wiley, New Jersey, 2022.
2. C. Baskar, S. Ramakrishna, and M. Nasr, '*Handbook of Solid Waste Management: Sustainability through Circular Economy'*. Springer, Singapore, 2022.
3. A. M. Yatoo, P. K. Gupta, and R. P. Singh, '*Integrated Waste Management: Trends, Policies, and Perspectives'*. CRC Press, Boca Raton, 2025.
4. N. Singh, and S. Kumar, '*Sustainable Industrial Waste Management: Principles and Practices'*. Springer, Singapore, 2021.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Describe the major sources, characteristics, and impacts of industrial pollution across key sectors.	**K2**
CO2	Apply suitable waste-minimization and process-modification approaches for reducing industrial waste loads, select appropriate treatment methods for different industrial effluents and justify their suitability.	**K3**
CO3	Exhibit effective team work, communication and collaborative skills to propose practical pollution-control measures for local industries through team-based analysis.	-

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3	2	1									3	
CO3								1	1				1
	3	**2**	**1**					**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CEP12 HYDROLOGY AND WATER RESOURCES ENGINEERING

3 0 0 3

PRECIPITATION: Hydrologic cycle - Types of precipitation - Forms of precipitation - Measurement of Rainfall - Spatial measurement methods - Temporal measurement methods - Frequency analysis of point rainfall - Intensity, duration, frequency relationship - Probable maximum precipitation. **(10)**

ABSTRACTION FROM PRECIPITATION: Losses from precipitation - Evaporation process - Reservoir evaporation - Infiltration process - Infiltration capacity - Measurement of infiltration - Infiltration indices - Effective rainfall. **(9)**

HYDROGRAPHS: Factors affecting Hydrograph - Base flow separation - Unit hydrograph - Derivation of unit hydrograph - S-curve hydrograph - Unit hydrograph of different deviations - Synthetic unit hydrograph. **(10)**

FLOODS AND FLOOD ROUTING: Flood frequency studies - Recurrence interval - Gumbel's method - flood routing - Reservoir flood routing - Muskingum's Channel Routing - Flood control. **(9)**

GROUND WATER HYDROLOGY: Types of aquifers - Darcy's law - Dupuit's assumptions - Confined Aquifer - Unconfined aquifer - Recuperation test - Transmissibility - Specific capacity - Pumping test - Steady flow analysis only. **(7)**

Total L: 45 periods

TEXT BOOKS

1. K. Subramanya, *'Engineering Hydrology'*. Mc Graw Hill Education, Fourth Edition, 2017.
2. H. M. Raghunath, *'Hydrology - Principles, Analysis'*. Wiley Eastern Ltd., 2022.
3. P. Jayarami Reddy, *'Text book of Hydrology'*. Laxmi Publications Pvt. Ltd., New Delhi, 2011.

REFERENCES

1. V. T. Chow, and Maidment, *'Hydrology for Engineers'*. McGraw Hill Education, 2017.
2. K. C. Patra, *'Hydrology and Water Resources Engineering'*. Narosa Publishing House, New Delhi, 2008.
3. Madan Mohan Das, and Mimi Das Saika, *'Hydrology'*. PHI Learning Pvt. Ltd., 2010.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Summarize the hydrologic processes and measurement techniques.	**K2**
CO2	Apply hydrologic principles in water resources planning and design to analyze rainfall, runoff, flood routing, and groundwater systems.	**K3**
CO3	Exhibit effective team work, communication and collaborative skills to present seminars and submit reports related to hydrology and water resources engineering.	-

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3	2	1									3	
CO3								1	1				1
	3	**2**	**1**					**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CEP13 SOLID WASTE MANAGEMENT

3 0 0 3

SOURCES AND TYPES: Sources and types of solid wastes - Quantity - factors affecting generation of solid wastes; characteristics - methods of sampling and characterization; Effects of improper disposal of solid wastes - public health effects. Principle of solid waste management - social & economic aspects; Public awareness; Role of NGO's - Legislation. **(9)**

ON-SITE STORAGE &PROCESSING: On-site storage methods - materials used for containers - on-site segregation of solid wastes - public health & economic aspects of storage - options under Indian conditions - Critical Evaluation of Options. **(9)**

COLLECTION AND TRANSFER: Methods of collection - types of vehicles - Man power requirement - collection routes - transfer stations - selection of location - operation & maintenance - options under Indian conditions. **(9)**

TREATMENT AND DISPOSAL: Processing techniques and Equipment; Resource recovery from solid wastes - composting - incineration - pyrolysis - options under Indian conditions - Dumping of solid waste - sanitary landfills site selection design and operation of sanitary landfills - Leachate collection and treatment. **(9)**

HAZARDOUS WASTE MANAGEMENT: Hazardous - radioactive and biomedical wastes - Physico-Chemical treatment - solidification - incineration - secured landfills. **(9)**

Total L: 45 periods

TEXT BOOKS

1. R. Chandrappa, and D. B. Das, '*Solid Waste Management: Principles and Practice'*. Springer, 2024.
2. L. K. Wang, M. H. Sung Wang, and Y. T. Hung, '*Solid Waste Engineering and Management (Volume 1)'*. Springer, 2021.

REFERENCES

1. Syed E. Hasan, '*Introduction to Waste Management: A Textbook'*. Wiley, New Jersey, 2022.
2. Debashish Sengupta, Brajesh K. Dubey, and Sudha Goel, '*Treatment and Disposal of Solid and Hazardous Wastes'*. Springer, Cham, 2022.
3. Ashutosh Pandey, Surendra S. Suthar, and Kassian T. T. Amesho, '*Solid Waste Management: A Roadmap for Sustainable Environmental Practices and Circular Economy'*. Springer, 2025.
4. Javid A. Parray, Nowsheen Shameem, and A. K. Haghi, '*Sustainable Urban Environment and Waste Management: Theory and Practice'*. Springer, Singapore, 2025.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Outline the major sources, types, and characteristics of solid wastes along with their health and environmental implications.	**K2**
CO2	Assess on-site waste storage and segregation using standard methods, evaluate practical Indian waste collection, transfer, treatment, recovery, and disposal systems, and collaboratively develop sustainable community-based solid and hazardous waste management solutions using modern assessment tools.	**K3**
CO3	Exhibit effective team work, communication and collaborative skills to present seminars and submit reports related to solid waste management.	-

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3	2	1									3	
CO3								1	1				1
	3	**2**	**1**					**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CEP14 IRRIGATION ENGINEERING

3 0 0 3

NEED FOR IRRIGATION: Advantages and disadvantages - Types of irrigation - soil formation - functions and properties of soils - types of soil moisture - suitability of soil for crops - suitability of water for irrigation - standards for irrigation water. **(7)**

REQUIREMENTS OF WATER: Duty and delta of a crop - factors affecting duty - crop seasons - Techniques of water distribution - optimum utilization - irrigation efficiency - consumptive use and its estimation. **(7)**

IRRIGATION CANAL AND SEDIMENT TRANSPORT: Alluvial and non-alluvial canals - Alignment of canals - Distribution system - command area - intensity of irrigation - Channel losses - Estimation of required canal capacity - Design of stable channels – Kennedy's and Lacey's theories - cross section of irrigation channels in cutting and embankment - problems and maintenance of irrigation channels. **(11)**

LINING OF CANALS AND WATER LOGGING: Need and justification for lining of canals - Design of lined canals - cross-section - types of lining - drainage - Causes of water logging - methods of reclaiming a water-logged area. **(10)**

RIVER TRAINING AND TANK IRRIGATION: Behaviour of rivers - need for controlling their behaviors - River training works - Tanks in isolation and series - capacity of water spread - estimation of inflow - principal elements of an irrigation tank. **(10)**

Total L: 45 periods

TEXT BOOKS

1. Santhosh Kumar Garg, *'Irrigation and Hydraulic Structures'*. Khanna Publishers, New Delhi, 2023.
2. B. C. Punmia, Pande B. B. Lal, Ashok Kumar Jain, and Arun Kumar Jain, *'Irrigation and Water Power Engineering'*. Laxmi Publications (P) Ltd., New Delhi, 2021.

REFERENCES

1. S. R. Sahasra Budhe, *'Irrigation and Hydraulic Structures'*. Katson Publishing House, Ludhiana, 2013.
2. G. L. Asawa, *'Irrigation and Water Resources Engineering'*. New Age International Publishers, New Delhi, 2024.
3. R. K. Sharma, and T. K. Sharma, *'Irrigation Engineering'*. S Chand and Company Ltd., New Delhi, 2012.
4. H. M. Raghunath, *'Irrigation Engineering'*. Wiley India Pvt. Ltd., New Delhi, 2011.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Describe the fundamental concepts of irrigation engineering including the need for irrigation, soil-water-crop relationship, crop water requirement, irrigation canals, sediment transport, canal lining, water logging, river training works, and tank irrigation systems.	**K2**
CO2	Compute crop water requirements, duty and delta, irrigation efficiency, canal capacity, and basic stable and lined canal sections using irrigation engineering principles, modern tools, teamwork, ethical water use and continuous learning.	**K3**
CO3	Exhibit effective team work, communication and collaborative skills to present seminars and submit reports related to irrigation engineering.	**-**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3	2	1									3	
CO3								1	1				1
	3	**2**	**1**					**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CEP15 WATERSHED CONSERVATION AND MANAGEMENT

3 0 0 3

WATERSHED CONCEPTS: Watershed - Definition, Need and Elements - Principles - Influencing Factors: Geology - Soil - Morphological Characteristics - Toposheet - Delineation - Codification - Prioritization - Watershed Atlas. **(9)**

SOIL CONSERVATION MEASURES: Types of Erosion - Water and Wind Erosion: Causes, Factors, Effects and Management - Soil Conservation Measures: Agronomical and Mechanical - Design procedure of Terraces and Bunds - Estimation of Soil Loss - USLE Equation - Sedimentation. **(9)**

WATER HARVESTING AND CONSERVATION: Yield from a Catchment - Traditional Water Harvesting Techniques - Micro-Catchments - Design of Small Water Harvesting Structures: Farm Ponds, Percolation Tanks, check dams, Grassed Waterways. **(9)**

GIS FOR WATERSHED MANAGEMENT: Applications of Remote Sensing and Geographical Information System - Role of Decision Support System - Conceptual Models and Case Studies. **(9)**

WATERSHED MANAGEMENT: Project Proposal Formulation - Watershed Development Plan - Entry Point Activities - Watershed Economics - Agroforestry - Grassland Management - Wasteland Management - Watershed Approach in Government Programmes - People's Participation - Evaluation of Watershed Management Programmes - Integrated Watershed Management - Case studies. **(9)**

Total L: 45 periods

TEXT BOOKS

1. Ghanashyam Das, *'Hydrology and Soil Conservation Engineering'*. Prentice Hall, New Delhi, 2009.
2. R. Suresh, *'Soil and Water Conservation Engineering'*. Standard Publishers and Distributors Private Limited, New Delhi, 2026.
3. Glenn O. Schwab, Delmar D. Fangmeier, William J. Elliot, and Richard K. Frevert, *'Soil and Water Conservation Engineering'*. Wiley India Private Limited, New Delhi, 2009.

REFERENCES

1. I. W. Heathcote, *'Integrated Watershed Management: Principles and Practice'*. John Wiley and Sons Inc., New York, 2009.
2. John G. Lyon, *'GIS for Water Resources and Watershed Management'*. CRC Press, 2002.
3. Vijay P. Singh, and Donald K. Frevert, *'Watershed Models'*. CRC Press, 2005.
4. Raj Vir Singh, *'Watershed Planning and Management'*. Yash Publishing House, Jaipur, 2016.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Describe the fundamental concepts, principles, and influencing factors of watersheds, including their delineation and prioritization using watershed atlases.	**K2**
CO2	Interpret soil erosion processes and conservation techniques, as well as water harvesting and conservation structures used in watershed management.	**K3**
CO3	Construct watershed management solutions using GIS tools, remote sensing data, and real-world case studies through collaborative assignments, seminars, or mini projects.	-

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3	2	1									3	
CO3								1	1				1
	3	**2**	**1**					**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CEP16 GROUNDWATER ENGINEERING

3 0 0 3

FUNDAMENTALS OF GROUNDWATER: Introduction - Occurrence of groundwater - hydro-geological cycle - movement of groundwater - classification of aquifers - distribution of groundwater - groundwater column - Permeability - Darcy's Law - laboratory permeability test - types of aquifers - water level fluctuations. **(9)**

HYDRAULICS OF GROUNDWATER FLOW: Storage coefficient - specific yield - heterogeneity and anisotropy - transmissivity - governing equations of groundwater flow-steady state flow - Dupuit-Forchheimer assumptions - Velocity potential - Flow nets. **(9)**

ESTIMATION OF PARAMETERS: Transmissivity and Storativity - Pumping test - unsteady state flow - Thiess method - Jacob method Image well theory - effect of partial penetrations of wells. **(10)**

GROUNDWATER DEVELOPMENT, SURFACE INVESTIGATION OF GROUND WATER: Infiltration gallery - collector wells - conjunctive use - artificial recharge - safe yield - yield test - Selection of pumps - Geophysical methods of groundwater investigation, electrical resistivity method, seismic refraction method, gravity and magnetic method, remote sensing techniques. **(9)**

GROUNDWATER QUALITY: Groundwater chemistry - Origin, movement and quality - water quality standards - saltwater intrusion - Environmental concern - Control of groundwater contamination - Groundwater Modeling. **(8)**

Total L: 45 periods

TEXT BOOKS

1. H. M. Raghunath, *'Ground Water*'. New Age International Private Limited, New Delhi, 2021.
2. David K. Todd, and Larry W. Mays, *'Groundwater Hydrology'*. Wiley, New Delhi, 2014.

REFERENCES

1. C. W. Fetter, and David Kreamer, *'Applied Hydrogeology'*. Waveland Pr Inc, 2021.
2. Jacob Bear, *'Hydraulics of Groundwater'*. McGraw Hill Education, New Delhi, 2014.
3. Franklin W. Schwartz, and Hubao Zhang, *'Fundamentals of Groundwater'*. Wiley, New Delhi, 2003.
4. S. Ramakrishnan S, *'Ground Water'*. SciTech Publications India Pvt. Ltd, 2011.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Summarize the essential concepts of groundwater engineering covering aquifer systems, groundwater flow, hydraulic characteristics, groundwater development practices, investigation methods, and quality issues.	**K2**
CO2	Estimate groundwater parameters such as permeability, transmissivity, storability and well yield and interpret pumping test results using modern tools, teamwork, ethical groundwater management and continuous learning.	**K3**
CO3	Exhibit effective team work, communication and collaborative skills to present seminars and submit reports related to groundwater engineering.	**-**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3	2	1									3	
CO3								1	1				1
	3	**2**	**1**					**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CEP17 GROUND IMPROVEMENT TECHNIQUES

3 0 0 3

INTRODUCTION: Role of ground improvement in foundation engineering - Methods of ground improvement - Geotechnical problems in alluvial and black cotton soils - Selection of suitable ground improvement techniques based on soil condition. **(9)**

DRAINAGE AND DEWATERING: Drainage techniques-well points - vacuum and electro osmotic methods - Seepage analysis for two-dimensional flow - Fully and partially penetrating slots in homogeneous deposits (Simple cases only). **(9)**

INSITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS: In-situ densification of cohesionless and consolidation of cohesive soils - Dynamic compaction and consolidation - vibro-floatation - Sand compaction pile - Preloading with sand drains and fabric drains - Stone columns - Lime Piles - Installation techniques only - Relative merits of various methods and their limitations. **(10)**

EARTH REINFORCEMENT: Concept of reinforcement – Types of reinforcement material - Applications of reinforced earth - Use of Geotextiles for filtration - drainage and separation in road and other works. **(9)**

GROUT TECHNIQUES: Types of grouts - Grouting equipment and machinery - Injection methods - Grout monitoring - Stabilization with cement - lime and chemicals - Stabilization of expansive soils. **(8)**

Total L: 45 periods

TEXT BOOKS

1. Purushothama Raj, '*Ground Improvement Techniques*'. Tata McGraw Hill, New Delhi, 2016.
2. Satyendra Mittal, '*An Introduction to Ground Improvement Engineering*'. Scientific International Private Limited, New Delhi, 2013**.**
3. Joyanta Maity, Bikash Chandra Chattopadhyay, '*Ground Improvement Techniques*'. PHI Learning Private Limited, New Delhi, 2017.

REFERENCES

1. Robert M. Koerner, '*Design with Geosynthetics'.* Prentice Hall, New Jersey, 2017.
2. Braja M. Das, '*Fundamentals of Geotechnical Engineering*'. Cengage Learning, 2013.
3. Kenneth D. Weaver, and Donald A. Bruce, '*Dam Foundation Grouting*'. ASCE Press, Virgina, 2007.
4. Jeffrey C. Evans, Michael A. Malusis, and Daniel Ruffin, '*Fundamentals of Ground Improvement Engineering'. CRC Press, 2021.*

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the role, principles, and mechanisms of ground improvement techniques, drainage and dewatering methods, earth reinforcement, and grouting used to solve geotechnical problems in various soil conditions.	**K2**
CO2	Apply appropriate ground improvement, drainage, reinforcement, and grouting techniques to improve soil properties and foundation performance based on soil type and field conditions.	**K3**
CO3	Exhibit effective team work, communication and collaborative skills to present seminars and submit reports related to Ground Improvement techniques.	**-**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3	2	1									3	
CO3								1	1				1
	3	**2**	**1**					**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CEP18 TOTAL STATION AND GPS SURVEYING

3 0 0 3

FUNDAMENTALS OF TOTAL STATION AND ELECTROMAGNETIC WAVES: Methods of Measuring Distance, Basic Principles of Total Station, Historical Development, Classifications, applications and comparison with conventional surveying - Applications of Electromagnetic waves, Propagation properties, wave propagation at lower and higher frequencies - Refractive index (RI) - factors affecting RI - Computation of group for light and near infrared waves at standard and ambient conditions. **(9)**

ELECTRO-OPTICAL AND MICROWAVE: Electro-optical system: Measuring principle, Working principle, Sources of Error, Infrared and Laser Total Station instruments. Microwave system: Measuring principle, working principle, Sources of Error, Microwave Total Station instruments. Comparison between electro-optical and microwave system, Care and maintenance of Total Station instruments. COGO functions: Area, Inverse / MLM, REM, Resection, offsets and stakeout - Land survey applications. **(9)**

SATELLITE SYSTEM: Basic concepts of GPS - Historical perspective and development - applications - Geoid and Ellipsoid - satellite orbital motion - Keplerian motion - Kepler's Law - Perturbing forces - Geodetic satellite - Doppler effect - Positioning concept - GNSS and IRNSS - SBAS: GAGAN and WAAS Different segments - space, control and user segments - satellite configuration - GPS signal structure - Orbit determination and representation - Anti Spoofing and Selective Availability - Task of control segment - GPS receivers. **(9)**

GPS DATA PROCESSING: GPS observables - code and carrier phase observation - linear combination and derived observables software modules - solutions of cycle slips, ambiguities - Multi path and other observational errors - satellite geometry and accuracy measures - Continuously Operating Reference System (CORS) - long base line processing - use of different processing software: Open Source, Scientific and Commercial. **(9)**

SURVEYING METHODS AND APPLICATIONS: Total Station: Traversing and Trilateration measurement and adjustment - Planimetric map and Contour map and Topography Mapping - GNSS: Concepts of rapid, static, semi-Kinematic, pure Kinematic and RTK methods. Observation by Radiation, Lee frog and Trilateration measurement and processing - Topography mapping using PPK and RTK methods Total Station and GNSS applications. **(9)**

Total L: 45 periods

TEXT BOOKS

1. Satheesh Gopi, R. Sathikumar and N. Madhu, '*Advanced Surveying'*. Pearson India, Chennai, 2025.
2. B. C. Punmia, Ashok K. Jain, and Arun K. Jain, '*Surveying Vol. I, II & III'*. Laxmi Publications, New Delhi, 2023.

REFERENCES

1. K. R. Arora, '*Surveying Vol. III'*. Standard Book House, New Delhi, 2015.
2. Jan Van Sickle, '*GPS and GNSS for Land Surveyors'*. CRC Press, New Delhi, 2023.
3. Elliott D. Kaplan and Christopher Hegarty, *'Understanding GPS/GNSS: Principles and Applications'*. Artech House, USA, 2017.
4. J. Paul Guyer, *'An Introduction to Total Station Topographic Survey Procedures'*. Independent Publication, 2018.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Demonstrate a comprehensive understanding of the principles, methods, techniques and applications of Total Station and GPS survey techniques in Civil Engineering.	**K2**
CO2	Apply engineering principles, methods, techniques and applications of Total Station and GPS survey techniques in Civil Engineering.	**K3**
CO3	Exhibit effective team work, communication and collaborative skills to present seminars and submit reports related to applications of Total Station and GPS survey techniques in Civil Engineering.	-

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3	2	1									3	
CO3								1	1				1
	3	**2**	**1**					**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CEP19 GEOGRAPHIC INFORMATION SYSTEMS

3 0 0 3

GIS TECHNIQUE AND DATA INPUT: Map - Types of Maps - Map projections, Development of GIS - Components of GIS - Hardware, software, organization - Types of data - Spatial and non-spatial data - Sources of data - Point, Line, and Polygon - Vector and Raster data - Database structures - Vector and Raster data structures - Important GIS software's and their relevance. **(9)**

DATA ANALYSIS AND MODELLING: Data Retrieval - Query - Simple Analysis - Spatial Analysis - Overlay - Vector Data Analysis - Raster Data Analysis - Modelling using GIS - Digital Elevation Model - Cost and path analysis - Expert Systems - Artificial Intelligence - Integration with GIS. **(9)**

DATA OUTPUT AND ERROR ANALYSIS: Data Output - Types - Devices used - Raster and Vector Display Devices - Printers - Plotters - Devices - Sources of Errors - Types of Errors - Elimination - Accuracies - GIS Standards - Open-Source GIS, Internet GIS. **(9)**

GIS APPLICATIONS IN RESOURCE MANAGEMENT: Fields of Applications - Natural Resources - Agriculture - Soil - Water Resources - Site Selection for civil Engineering Projects, Wasteland Management - Social Resources - Cadastral Records - LIS. **(9)**

ADVANCED GIS APPLICATION: AM/FM - Utility Network Management - Integration with Remote Sensing - Knowledge based techniques - Multicriteria Techniques - Introduction to Object Oriented Database Models. **(9)**

Total L: 45 periods

TEXT BOOKS

1. K. Elangovan, *'GIS: Fundamentals, Applications & Implementation'*. New India Publishing Agency, New Delhi, 2021.
2. M. Anji Reddy, *'Textbook of Remote Sensing and Geographical Information Systems'*. BS Publications, Hyderabad, 2024.

REFERENCES

1. Basudeb Bhatta, '*Remote Sensing and GIS'*. Oxford University Press, Chennai, 2021.
2. Peter A. Burrough, Rachael A. McDonnell, and Christopher D. Lloyd, *'Principles of Geographical Information Systems'*. Oxford University Press, Chennai, 2006.
3. Xuan Zhu, '*Geographical Information Systems: A Practical Approach'*. Routledge, New Delhi, 2025.
4. Kang-Tsung Chang, *'Introduction to Geographic Information Systems'*. McGraw Hill Education, 2019.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Demonstrate a comprehensive understanding of the principles, methods, techniques, data analysis and modelling and applications of GIS in Civil Engineering.	**K2**
CO2	Apply engineering principles, methods, techniques, data analysis and modelling and applications of GIS in Civil Engineering.	**K3**
CO3	Exhibit effective team work, communication and collaborative skills to present seminars and submit reports related to applications of GIS in Civil Engineering.	**-**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3	2	1									3	
CO3								1	1				1
	3	**2**	**1**					**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CEP20 REMOTE SENSING TECHNIQUES AND APPLICATIONS

3 0 0 3

PRINCIPLES AND CONCEPTS: Definition - Historical Background - Components of Remote Sensing - Electromagnetic spectrum - Visible - Infra Red - NIR - Thermal IR - Microwave - Radiation Principle and Energy equations - Active and Passive Remote Sensing - Platforms - Aerial and Space Platforms - Balloons - Helicopters - Aircrafts and satellites - Significance of Remote Sensing - Limitations. **(9)**

ENERGY INTERACTION WITH ATMOSPHERE AND EARTH SURFACE MATERIALS: Atmospheric Characteristics - Atmospheric interference - Scattering of EMR - Rayleigh - Mie and Non-Selective Scattering - Absorption - Atmospheric Windows - Spectral Signature - Interaction of EMR with Atmosphere - Earth surface - Soil - Water and Vegetation. **(9)**

REMOTE SENSING SATELLITES AND DATA INTERPRETATION: Satellites - Types - Based on Orbits and Purpose - Sun Synchronous and Geostationary Satellites - Characteristics of Satellites - Landsat - SPOT - IRS - IKONOS - Quick bird - MODIS - SeaWiFS and other currently available Satellites - Visual Image Interpretations and Digital Image Interpretations. **(9)**

SENSING TECHNIQUES: Classification of remote sensors - Resolution concept: spatial, spectral, radiometric and temporal resolutions - Scanners - Along and across track scanners - Optical-infrared sensors - Thermal sensors - Microwave sensors - Calibration of sensors - High Resolution Sensors - LIDAR, UAV - Orbital and sensor characteristics of live Indian earth observation satellites. **(9)**

AGRICULTURE, SOIL, FORESTRY AND EARTH SCIENCE: Crop inventory mapping - production estimation - command area monitoring - soil mapping - crop stress detection - estimation of soil erosion - forest types and density mapping - forest fire risk zone mapping - Lithology - lithological mapping - structural mapping - Geomorphology - nature and type of landforms - identification - use of remote sensing data for landslides - targeting mineral resources - Engineering geology and Environmental geology. **(9)**

Total L: 45 periods

TEXT BOOKS

1. George Joseph and C. Jeganathan, *'Fundamentals of Remote Sensing'*. Universities Press, Hyderabad, 2018.
2. M. Anji Reddy, *'Textbook of Remote Sensing and Geographical Information Systems'*. BS Publications, Hyderabad, 2024.

REFERENCES

1. Basudeb Bhatta, '*Remote Sensing and GIS'*. Oxford University Press, Chennai, 2021.
2. Thomas M. Lillesand, Ralph W. Kiefer, P. K. Champati Ray and Jonathan W. Chipman, *'Remote Sensing and Image Interpretation'*. Wiley, New Delhi, 2022.
3. James B. Campbell and Randolph H. Wynne, *'Introduction to Remote Sensing'*. The Guilford Press, New York, 2011.
4. John R. Jensen, *'Remote Sensing of the Environment: An Earth Resource Perspective'*. Pearson, Chennai, 2013.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Demonstrate a comprehensive understanding of the principles and applications of Remote Sensing in Civil Engineering.	**K2**
CO2	Apply principles and applications of Remote Sensing in Civil Engineering.	**K3**
CO3	Exhibit effective team work, communication and collaborative skills to present seminars and submit reports related to applications of Remote Sensing in Civil Engineering.	**-**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3	2	1									3	
CO3								1	1				1
	3	**2**	**1**					**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CEP21 GEOSYNTHETICS IN CIVIL ENGINEERING

3 0 0 3

OVERVIEW OF GEOSYNTHETICS AND DESIGN PRINCIPLE: Overview of Geotextiles, geogrids, geonets, geomembranes, geosynthetic clay liners, geopipes and geocomposites - their current applications for various functions, Mechanism of reinforced soil - Factors influencing behaviour and performance, Soil-reinforcement interaction. **(9)**

USE OF GEOSYNTHETICS IN ROADS: Applications, Role of subgrade conditions - Design - The Giroud and Noiray approach - Geotextile serviceability, Application in pavement overlays. **(9)**

DESIGN OF REINFORCED SOIL RETAINING WALLS: Components of reinforced soil walls - Principles of design - Internal and external stability-Design examples. **(9)**

IMPROVEMENT OF BEARING CAPACITY: Modes of failure in reinforced earth, Determination of force induced in reinforcement - Guidelines on the use of geogrids, Bearing capacity improvement in soft soils. **(9)**

EMBANKMENTS IN SOFT SOILS, USE OF GEOSYNTHETICS FOR FILTRATION AND DRAINAGE: Analysis, Influence of reinforcement extensibility, deformation in foundation - Overall stability with respect to bearing - Applications, Geotextile filter requirements, boundary conditions - drain and filter properties, design criteria. **(9)**

Total L: 45 periods

TEXT BOOKS

1. G. L. Sivakumar Babu, '*Introduction to Soil Reinforcement and Geosynthetics*'. Universities Press, Hyderabad, 2009.
2. Robert M. Koerner, '*Designing with Geosynthetics*'. Xlibris Corporation, USA, 2012.

REFERENCES

1. J. N. Mandal, '*Geosynthetics World*'. New Age International (P) Ltd., New Delhi, 2007.
2. Braja M. Das, '*Shallow Foundations: Bearing Capacity and Settlement*'. CRC Press, New York, 1999.
3. C. J. F. P. Jones, '*Earth Reinforcement and Soil Structures*'. Thomas Telford Publishing, UK, 2017.
4. S. K. Shukla, and J. H. Yin, '*Fundamentals of Geosynthetic Engineering'.* Taylor & Francis, UK, 2006.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Illustrate the types, functions, mechanisms, and design principles of geosynthetics and their role in reinforced soil systems, pavements, retaining walls, embankments, filtration, and drainage applications.	**K2**
CO2	Apply appropriate geosynthetic materials and design methods, reinforced soil wall stability checks, bearing capacity improvement, and drain criteria to solve practical geotechnical engineering problems in roads, soft soils, and earth structures.	**K3**
CO3	Exhibit effective multidisciplinary team work, communication and collaborative skills to plan, analyze, and design geosynthetic-based solutions.	-

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3	2	1									3	
CO3								1	1				1
	3	**2**	**1**					**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CEP22 PAVEMENT ENGINEERING

3 0 0 3

PRINCIPLES OF PAVEMENT DESIGN: Types of pavement - Flexible and Rigid - Components of pavement and their functions - Provisions of IRC Guidelines for each component - Comparison between highway and airport pavements - Factors influencing pavement stability: Vehicle and traffic factors - ESWL and Wheel Load Factor - Moisture and climate - soil - CBR - Plate Bearing method for finding modulus of subgrade reaction and North Dakota Cone method - stress distribution factor - Boussinesq and Burmister theories. **(9)**

DESIGN OF FLEXIBLE PAVEMENT: Empirical method based on arbitrary strength - CBR method - Provisions of IRC 37 - Theoretical and semi-theoretical methods - Kansas and Texas triaxial methods - IRC guidelines for design of flexible pavements. Federal Aviation Administration (FAA) method for Airports (Recommended by International Civil Aviation Organization). **(9)**

STRESSES IN RIGID PAVEMENT: Stresses in rigid pavement due to wheel load - Westergaard and Modified Westergaard approach - Bradbury and Kelly theories - Stresses due to change in temperature - Warping stress - theory by Bradbury - Stress due to subgrade restraint - Critical combination of stresses. **(9)**

DESIGN OF RIGID PAVEMENT: Modulus of Rupture of concrete - Design of airport pavement - Federal Aviation Administration (FAA) method (Recommended by International Civil Aviation Organization) - Design of rigid highway pavement - IRC 58 method - Types of joints - Types of rigid pavement based on reinforcement - Design of reinforcement in longitudinal and transverse direction - tie bars and dowel bars. **(9)**

PAVEMENT DISTRESS, EVALUATION AND REHABILITATION INCLUDING STABILIZATION: Distresses in flexible and rigid pavements - condition surveys - Types of roughness - Present Serviceability Index - skid resistance - structural evaluation - Benkelman deflection method - Design of overlays both for highway and airport pavements - Methods suggested by IRC - FAA and Asphalt Institute - Stabilization with special reference to highway pavements - Chemical and mechanical stabilization - Use of Geosynthetics (geotextiles and geogrids) in roads. **(9)**

Total L: 45 periods

TEXT BOOKS

1. Sandipan Goswami, *'Pavement Engineering'*. PHI Learning, New Delhi, 2023.
2. R. Srinivasa Kumar, '*Pavement Design'*. Universities Press, Hyderabad, 2013.
3. R. Srinivasa Kumar, '*Pavement Evaluation and Maintenance Management System'*. Universities Press, Hyderabad, 2014.
4. E. J. Yoder and M. W. Witczak, *'Principles of Pavement Design'*. John Wiley & Sons, New York, 2018.

REFERENCES

1. A. T. Papagiannakis and E. A. Masad, *'Pavement Design and Materials'*. John Wiley & Sons, New York, 2024.
2. IRC: 37-2018, '*Guidelines for the Design of Flexible Pavements'*. Indian Road Congress, New Delhi, 2018.
3. IRC: 58-2015, *'Guidelines for the Design of Rigid Pavements for Highways'*. Indian Road Congress, New Delhi, 2015.
4. IRC SP: 20-2002, *'Rural Roads Manual'*. Indian Road Congress, New Delhi, 2002.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Demonstrate a comprehensive understanding of the principles and methods of designing, evaluation and maintenance of flexible and rigid pavements.	**K2**
CO2	Apply engineering principles to design flexible and rigid pavements.	**K3**
CO3	Exhibit effective team work, communication and collaborative skills to present seminars and submit reports related to design of flexible and rigid pavements.	**-**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3	2	1									3	
CO3								1	1				1
	3	**2**	**1**					**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CEP23 DISASTER MANAGEMENT AND MITIGATION

3 0 0 3

HAZRADS, VULNERABILITY AND DISASTER RISKS: Definition: Disaster, Hazard, Vulnerability, Resilience, Risks - Types of Disasters: Natural, Human induced, Climate change induced - Earthquake, Landslide, Flood, Drought, Fire - Technological disasters - Structural collapse, Industrial accidents, oil spills - Causes, Impacts including social, Economic, political, environmental, health, psychosocial - Disaster vulnerability profile of India and Tamil Nadu - Global trends in disasters: urban disasters, pandemics, Complex emergencies - Inter relations between Disasters and Sustainable development Goals. **(9)**

DISASTER RISK REDUCTION (DRR): Sendai Framework for Disaster Risk Reduction**,** Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness, community based DRR, Structural - non-structural measures, Roles and responsibilities of - community, Panchayati Raj Institutions / Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders - Early Warning System - Advisories from Appropriate Agencies - Relevance of indigenous Knowledge, appropriate technology and Local resources. **(9)**

DISASTER MANAGEMENT: Components of Disaster Management - Preparedness of rescue and relief, mitigation, rehabilitation and reconstruction - Disaster Risk Management and post disaster management - Compensation and Insurance - Disaster Management Act (2005) and Policy - Other related policies, plans, programmers and legislation - Institutional Processes and Framework at State and Central Level - (NDMA - SDMA - DDMA - NRDF - Civic Volunteers). **(9)**

TOOLS AND TECHNOLOGY FOR DISASTER MANAGEMENT: Early warning systems - Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness) - Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster - Disaster Damage Assessment. - Elements of Climate Resilient Development - Standard operation Procedure for disaster response - Financial planning for disaster Management. **(9)**

DISASTER MANAGEMENT CASE STUDIES: Discussion on selected case studies to analyze the potential impacts and actions in the contest of disasters - Landslide Hazard Zonation: Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management - Field work - Mock drill. **(9)**

Total L: 45 periods

TEXT BOOKS

1. Thomas D. Schneid, and Larry Collins, '*Disaster Management and Preparedness*'. CRC Publications, 2016.
2. R. Singh, '*Disaster Management Guidelines: Earthquakes, Landslides, Avalanches and Tsunami'*. Horizon Press Publications, 2017.
3. J. P. Singhal, '*Disaster Management'*. Laxmi Publications, 2024.
4. T. Bhattacharya, '*Disaster Science and Management'*. McGraw Hill India Education Pvt. Ltd., 2012.

REFERENCES

1. Government of India, '*Disaster Management Act'*. New Delhi, 2005.
2. Government of India, '*National Disaster Management Policy'*. New Delhi, 2009.
3. R. Shaw, '*Community based Disaster risk reduction*'. Natural Hazard Science, Oxford Research Encyclopedias, 2016.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the concepts of disasters, disaster risk reduction, disaster management practices, and the role of technology and institutions in building resilient communities.	**K2**
CO2	Apply disaster risk reduction and management principles to assess hazards, plan mitigation measures, and support preparedness, response, and recovery activities.	**K3**
CO3	Exhibit effective team work, communication and collaborative skills to present seminars and submit reports related to disaster management and mitigation.	**-**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3	2	1									3	
CO3								1	1				1
	3	**2**	**1**					**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CEP24 CARTOGRAPHY

3 0 0 3

INTRODUCTION: Cartography today - Nature of Cartography - History of Cartography - Graticules - Cartometry - Map Scales and Contents. **(9)**

EARTH: Earth - Map Relations - Basic Geodesy - Map Projections - Reference and Coordinate system - Transformation - Basic Transformation - Affine Transformation. **(9)**

SOURCES OF DATA: Ground Survey and Positioning - Remote Sensing data collection - Census and sampling - data - Models for digital cartographic information - Map digitizing. **(9)**

PERCEPTION AND DESIGN: Cartographic design - Color theory and models - Color and pattern creation and specification, Color and pattern - Typography and lettering the map - Map compilation. **(9)**

CARTOGRAPHY ABSTRACTION: Selection and Generalization Principles, Symbolization, Topographic and thematic maps - Map production and Reproduction - Map series. **(9)**

Total L: 45 periods

TEXT BOOKS

1. Arthur H. Robinson, Joel L. Morrison, Phillip C. Muehrcke, A. Jon Kimerling and Stephen C. Guptill, *'Elements of Cartography'*. John Wiley & Sons, 2009.
2. John Campbell, '*Introductory Cartography'*. WMC Brown Publishers, 2004.

REFERENCES

1. William Cartwright, *'Multimedia Cartography'*. Springer, 2006.
2. R. P. Mishra, *'Fundamentals of Cartography*'. Concept Publishing Company, 2014.
3. Menno-Jan Kraak, and Ferjan Ormeling, '*Cartography: Visualization of Geospatial Data'*. CRC Press, 2020.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Demonstrate a comprehensive understanding of the principles of map making.	**K2**
CO2	Apply engineering principles to design maps.	**K3**
CO3	Exhibit effective team work, communication and collaborative skills to present seminars and submit reports related to cartography.	**-**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3	2	1									3	
CO3								1	1				1
	3	**2**	**1**					**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CEP25 AIRPORT DOCKS AND HARBOUR ENGINEERING

3 0 0 3

INTRODUCTION: Air transport characteristics - Air transportation in India - Components of airport and aero plane - Aircraft characteristics - National airport Standards - National plan of integrated Airport System - comprehensive view of Metro Airports in India - The role of government in Aviation - National Civil Aviation policy-2016 - Key developers in India. **(9)**

AIRPORT PLANNING AND DESIGN: Airport classification - ICAO - Objects and Types of surveys - Airport zoning - Clearance over highways and railways - Airport layouts - Apron - Hangars - Terminal buildings - Airport buildings - Passenger flow. **(8)**

RUNWAY AND TAXIWAY DESIGN AND AIR TRAFFIC CONTROL: Basic runway length - Balanced field concept - Comparison of runway patterns - Orientation of Runway- Taxiway design - Separation distances - Design speed - Corrections to basic runway length - Drainage - Visual aids - Runway and taxiway markings - Runway and Taxiway lightings - Wind direction indicators - Air traffic control network - Helipads - Service equipment. **(10)**

DOCKS AND HARBOURS: Definition of terms - Classification of Harbours - Ports, Docks - Tides - Waves and wave dynamics - Littoral drift - Hydrographic survey and Topographic Survey - Sounding line, satellite ports - Classification of harbours - Site selection and investigation - Harbour layout - Dry and wet docks, Locks - Navigational aids - Lighthouses - Mooring accessories - Dredging - classification and types - Current. **(9)**

COASTAL STRUCTURES: Port structures - ship characteristics - Piers - Slipways - Breakwaters - Wharves - Jetties - Dolphins, Quays, Spring fenders - Coastal shipping - Inland water transport - Container transportation - Coastal Regulation Zone, 2011 - EIA - methods of impact analysis and its process. **(9)**

Total L: 45 periods

TEXT BOOKS

1. S. C. Rangwala, *'Airport Engineering'*. Charotar Publishing House Pvt. Ltd, Anand, 2018.
2. H. P. Oza, and G. H. Oza, *'Docks and Harbour Engineering'*. Charotar Publishing House Pvt. Ltd., Anand, Gujarat, 2017.

REFERENCES

1. S. K. Khanna, M. G. Arora and S. S. Jain, *'Airport Planning & Design'*. Nem Chand & Brothers, Roorkee, 2017.
2. S. P. Bindra, *'Docks and Harbour Engineering'*. Dhanpat Rai & Sons, New Delhi, 2018.
3. R. Horonjeff, Francis X. Mckelvey, William J. Sproule, and Seth B. Young, *'Planning and Design of Airports'*. McGraw Hill, New Delhi, 2010.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Summarize the concepts of airport, dock and harbor planning, design and development.	**K2**
CO2	Apply engineering principles to solve problems related to design of runway and taxiway.	**K3**
CO3	Exhibit effective team work, communication and collaborative skills to present seminars and submit reports related to airport, dock and harbor planning, design and development.	**-**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3	2	1									3	
CO3								1	1				1
	3	**2**	**1**					**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CEP26 HOUSING PLANNING AND MANAGEMENT

3 0 0 3

INTRODUCTION TO HOUSING: Introduction to housing, housing need - Psychological, physical, Social. Social and economic factors influencing housing affordability - Basic definitions of terms - Types of the house, Economics of housing - housing demand and supply, quantifying and estimating housing need, housing process, Housing classification, Housing in present-day context relation to human settlement pattern. **(8)**

HOUSING POLICY AND PROGRAMME: Housing situation, policy, and public interventions - Institutions for Housing at National, State, and Local Levels - Urban reform, legal and institutional frame for housing - Housing Laws at the State and central level, National Housing Policy, Housing schemes and policies - IAJ, RAY, PMAY, affordable housing policy, and strategy, Site and services scheme, Rental housing policy, Slum rehabilitation policy and program at the state and central levels - Informal housing approaches in improving slum, squatter, and pavement dwellers. **(10)**

HOUSING STANDARD: Study methodology of formulating standards, URDPFI guidelines, standards and regulations, DCR performance standards for housing, model housing law, TCPO, and other agencies for housing development and standards - Census, NSSO, HUDCO, State housing board, and NBO - Zoning, model inclusionary zoning, CRZ rules, and notifications - Housing standards, Layout, and real estate regulations - BMTPC, prefabrication techniques for housing - Energy codes and rating system for housing - TERI, GRIHA, LEED, IGBC, ECBC, and NBC. **(9)**

SITE PLANNING AND HOUSING DESIGN: Planning concepts related to city beautiful movement, Radburn theory, and Neighborhood planning - Site planning, design process and landscaping - Planning housing for - Condominiums, Cooperative housing, Affordable housing, rural housing, group housing, and plotted housing - Types of informal housing with relevance to the Indian context - Community architectural housing, institutional and rental housing and disaster-resistant housing. **(10)**

HOUSING FINANCE AND PROJECT APPRAISAL: Formulation of Housing Projects - Design of Housing Units (Design Problems), Housing infrastructure (physical and urban), and services - Housing and Real estate development - Appraisal of Housing Projects Housing Finance - housing finance system India, types, and importance of microfinance system - Cost Recovery - Cash Flow Analysis, Subsidy and Cross Subsidy, Pricing of Housing Units, Rents, Recovery Pattern, Housing finance Institutions - Project delivery model including PPP. **(9)**

Total L: 45 periods

TEXT BOOKS

1. K. Chandra Sekar, and N. Karthikeyan, *'Housing Planning & Management'*. CGS Publishers & Distributors, 2017.
2. G. Dhanalakshmi, and S. Anbarasan, *Housing Planning & Management'*. KKS Publishers, Chennai, 2016.

REFERENCES

1. Richard Kintermann, and Robert Small, *'Site Planning for Cluster Housing'*. Van Nostrand Reinhold Company, New York, 1982.
2. Ernst, and Peter Neufert, *'Neufert Architects Data'*. Wiley-Blackwell, UK, 2012.
3. Meera Mehta, and Dinesh Mehta, *'Metropolitan Housing Markets'*. Sage Publications Pvt. Ltd, 1989.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Summarize the concepts housing policy, standards, design and finance.	**K2**
CO2	Apply the concepts of housing policy, standards, design and finance to plan housing programmes.	**K3**
CO3	Exhibit effective team work, communication and collaborative skills to present seminars and submit reports related to housing policy, standards, design and finance.	-

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3	2	1									3	
CO3								1	1				1
	3	**2**	**1**					**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CEP27 TRAFFIC ENGINEERING, SAFETY AND MANAGEMENT

3 0 0 3

INTRODUCTION: Elements of Traffic Engineering: significance and scope of traffic engineering - Characteristics of Vehicles and Road Users - Skid Resistance and Braking Efficiency - Design speed, Design Service Volume - Traffic Flow Characteristics - Speed - Flow - Density Relations; Highway capacity and Level of Service - capacity of urban and rural roads - PCU - Road user facilities - Pedestrian facilities. **(12)**

TRAFFIC SURVEYS: Surveys and Analysis - Volume - Capacity - Speed and Delays - Origin and Destination - Parking - Pedestrian Studies - Accident Studies and Safety Level of Services - Problems. **(8)**

TRAFFIC REGULATION AND CONTROL: Motor Vehicles Act - statutory provision for road transport and connected organizations - Traffic signs - Road markings - Design of Traffic signals and Signal co-ordination (Problems) - Traffic control aids and Street furniture - Street Lighting - Traffic regulations, road accident, Traffic safety - Principles and Practice - Road Safety Audit. **(8)**

GEOMETRIC DESIGN OF INTERSECTIONS: Control of Traffic Movements through Time Sharing and Space Sharing Concepts; Conflicts at Intersections - Classification of Intersections - At-grade - Channelized and Unchanneled Intersection - Grade Separators (Concepts only) - Principles of Intersection Design - Elements of Intersection Design - Channelization and Rotary design (Problems) - Crossings including provision for safe crossing of Pedestrians and Cyclists; Grade Separated Intersections, their Warrants and Design Features; Bus Stop Location and Bus Bay Design, Design of Road Lighting. **(9)**

TRAFFIC MANAGEMENT: Nature of traffic problem in cities - Traffic Management - Traffic System Management (TSM) and Travel Demand Management (TDM) - Traffic Congestion - Traffic Forecasting techniques - Restrictions on turning movements - One-way Streets - Traffic Segregation - Traffic Calming - Tidal flow operations - Road pricing, Exclusive Depots and Terminals - Principles and types of layouts, Depot location, Twin depot concept, Crew facilities - Bus terminal, bus stops, bus bays & bus lanes - Introduction to Intelligent Transportation System (ITS). **(8)**

Total L: 45 periods

TEXT BOOKS

1. L. R. Kadiyali, *'Traffic Engineering and Transport Planning'*. Khanna Book Publishing, 2025.
2. S. K. Khanna, C. E. G. Justo, and A. Veeraragavan, '*Highway Engineering'*. Nem Chand & Bros, Roorkee, 2024.

REFERENCES

1. C. S. Papacostas, P. D. Prevedouros, *'Transportation Engineering and Planning'*. Prentice Hall, New Delhi, 2002.
2. C. A. O'Flaherty, *'Transportation Planning and Traffic Engineering'*. Butterworth-Elsevier, Oxford, 2006.
3. IRC: SP:43-2002, *'Guidelines on Low-cost Traffic Management Techniques for Urban Areas'*. Indian Roads Congress, New Delhi, 2002.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Illustrate the concepts traffic characteristics, surveys, regulation, intersection design and management.	**K2**
CO2	Apply engineering principles to solve problems related to traffic surveys, design of intersections and traffic signals.	**K3**
CO3	Exhibit effective team work, communication and collaborative skills to present seminars and submit reports related to traffic characteristics, surveys, regulation, intersection design and management.	-

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3	2	1									3	
CO3								1	1				1
	3	**2**	**1**					**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CEP28 SMART CITY PLANNING AND DEVELOPMENT

3 0 0 3

INTRODUCTION: Urbanization, need of focused development, role of Authorities, Smart city, Opportunity and Challenges - Smart infrastructures for city - Smart Cities Mission. **(6)**

SMART PHYSICAL INFRASTRUCTURE: Infrastructure development in Smart Cities - Physical Infrastructure, Land Use - Compact/mixed-use development, Transit Oriented Development (TOD); Smart City Management - Unified Governance Structure for Transportation (UMTA) - Smart public transportation, Smart parking, Intelligent traffic management, Detour management; Low emission vehicles, Electric Mobility - Environmental projects. **(12)**

SUSTAINABILITY AND SMART PLANNING: Relationship between Sustainability and Smart planning - Place making project guidelines - Surveillance, Smart Street Lighting, Intelligent Emergency Services, Intelligent Disaster Forecasting and Management, GIS-based Spatial Decision Support Systems, Smart Communication Services. **(10)**

APPLICATION OF TECHNOLOGIES IN SMART CITIES: Role of Technologies in Smart Cities - Integrated Command and Control Center (ICCC), Data Analytics, Data driven strategies implementation in smart cities. **(8)**

SMART CITIES PROJECT MANAGEMENT: Need for project management - Philosophy and concepts - Project phasing and stages - Project organizational structuring - Planning and Scheduling - Project cost analysis - Procurement and Contracting - PPP - Project Monitoring and Evaluation - Risk Management - Case studies. **(9)**

Total L: 45 periods

TEXT BOOKS

1. N. Mani, *'Smart Cities & Urban Development in India'*. New Century Publications, 2016.
2. Arun Firodia, and Vishwesh Pavnaskar, *'Smart City'*. Vishwakarma Publications, 2015.

REFERENCES

1. Poonam Sharma, and Swati Rajput, *'Sustainable Smart Cities in India'*. Springer International Publishing, 2017.
2. Stan McClellan, Jesus A. Jimenez, and George Koutitas, *'Smart Cities: Applications, Technologies, Standards, and Driving Factors'*. Springer International Publishing, 2018.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Summarize the concepts of planning, application of technology and financing of smart cities.	**K2**
CO2	Apply the planning concepts, application of technology and financing to plan smart cities.	**K3**
CO3	Exhibit effective team work, communication and collaborative skills to present seminars and submit reports related to planning, application of technology and financing of smart cities.	-

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3	2	1									3	
CO3								1	1				1
	3	**2**	**1**					**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CEP29 DESIGN OF ENERGY EFFICIENT BUILDINGS

3 0 0 3

INTRODUCTION TO CLIMATE: Introduction to the concept of climate - components of climate - characteristics of climatic types - Effect of climate on habitat, shelter, and environment - Study of climatic zones and their effect on building design - Design guidelines for various climatic zone - Need for energy-efficient building - Passive and active cooling techniques - Passive and Active heating systems - Relevant case studies on buildings designed with passive and active heating techniques. **(9)**

SOLAR ENERGY AND HEAT FLOW THROUGH MATERIALS: Solar geometry and built form - Heat transmission through building sections - Solar shading - Design of shading devices - Orientation of buildings - green building methods and techniques, green building rating system - ECBC, LEED, GRIHA, IGBC & BEE. **(9)**

THERMAL COMFORT AND NATURAL VENTILATION: Concepts of thermal comfort, human body heat balance, human comfort, physiological comfort - the sensation of the heat comfort zone - Exercise on the establishment of effective temperature and comfort zone - Thermal design of building, Influence of design parameter - Mechanical control - Natural Ventilation: elements of air and their effect on human beings - Wind movement in general, airflow pattern within and around buildings - Ventilation techniques - Energy conservation in ventilation system - Design of building for natural ventilation. **(9)**

DAYLIGHTING AND ARTIFICIAL LIGHTING: Day Lighting - Principles of day lighting analysis and design - design of fenestration in buildings of various types - the quality of daylighting - Design and analysis of daylighting - Artificial lighting design - Supplementing artificial lighting design - Different types of Lamps - characteristics & Applications - Basic concept of light colour - The modern theory of light and colour. **(9)**

ACOUSTICS, SOUND INSULATION AND NOISE CONTROL: Introduction to architectural acoustics and building physics - Room acoustics and reverberation - Acoustical criteria of space design, auditorium design - Characteristics of audible sound - the behaviour of sound and its effect - acoustical defects - Sound absorption, Sound insulation of building: Building Noise - Characteristics, effect and types, Noise control. **(9)**

Total L: 45 periods

TEXT BOOKS

1. O. H. Koenigsberger, T. G. Ingersoll, Alan Mayhew, and S. V. Szokolay *'Manual of Tropical Housing and Building: Climate Design'*. University Press, Hyderabad, 2015.
2. B. C. Punmia, Ashok Kumar Jain, and Arun Kumar Jain, '*Building Construction*'. Laxmi Publications, New Delhi, 2025.

REFERENCES

1. Central Public Works Department, *'Integrated Green Design for Urban & Rural Buildings in Hot - Dry Climate Zone'*. CPWD, New Delhi, 2013.
2. M. Majumdar, *'Energy Efficient Buildings in India'*. TERI Library, 2000.
3. Sage Russel, *'The Architecture of light'*. Concept Nine, 2012.
4. IS: SP: 41 (1987), *'Handbook on Functional Requirements of Buildings (Other than Industrial Buildings)'*. 1987.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain climatic principles and energy-efficient building concepts.	**K2**
CO2	Apply thermal comfort, lighting, ventilation, and acoustics principles in building design and evaluate building designs using green rating systems and energy conservation strategies.	**K3**
CO3	Exhibit effective team work, communication and collaborative skills to present seminars and submit reports related to planning, application of technology and financing of smart cities.	-

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3	2	1									3	
CO3								1	1				1
	3	**2**	**1**					**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CEP30 DIGITAL CONSTRUCTION TECHNIQUES

0 0 6 3

EXERCISES USING BUILDING DESIGN SOFTWARE:

1. Introduction and understanding of Primavera project planner for construction
2. Using Primavera project planner, update the schedule of the project of a construction project.
3. Introduction and understanding of MS Project for a construction project
4. Using MS project, schedule the construction project planning
5. Introduction to BIM in construction projects
6. Development of BIM for small construction project
7. Progress the work flows in construction project using BIM
8. Development of bid management for a small firm construction industry using software

Total P: 90 periods

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Elaborate the concepts of Construction Project Management and estimation of resources and cost	**K2**
CO2	Apply engineering principles to plan and schedule construction projects using Primavera & MS Project and develop a Building Information Model using Building Design Software's	**K3**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3				3							3	
	3				**3**							**3**	

1-low, 2-medium, 3-high

25CEP31 ARCHITECTURE FOR CIVIL ENGINEERING

3 0 0 3

ARCHITECTURAL DESIGN: Architectural Design - an analysis - integration of function and aesthetics - Introduction to basic elements and principles of design. **(9)**

SITE PLANNING: Surveys - Site analysis - Development Control - Layout regulations - Layout design concepts. **(9)**

BUILDING TYPES: Residential, institutional, commercial and Industrial - Application of anthropometry and space standards – Inter-relationships of functions - Safety standards - Building rules and regulations - Integration of building services - Interior design. **(9)**

CLIMATE AND ENVIRONMENTAL RESPONSIVE DESIGN: Man, and environment interaction - Factors that determine climate - Characteristics of climate types - Design for various climate types - Passive and active energy controls – Green-building concept. **(9)**

TOWN PLANNING: Planning - Definition, concepts and processes - Urban planning standards and zoning regulations - Urban renewal - Conservation - Principles of Landscape design. **(9)**

Total L: 45 periods

TEXT BOOKS

1. V. S. Pramar, *'Design fundamental in Architecture'*. Somaiya Publications Pvt. Ltd., New Delhi, 1997.
2. G. Muthushoba Mohan, *'Principles of Architecture'*. Oxford University Press, New Delhi, 2006.

REFERENCES

1. S. C. Rangwala, *'Town Planning'*. Charotar Publishing House, Anand, 2005.
2. Joseph De Chiara, Michael J. Crosbie, *'Time Saver Standards for Building Types'*. McGraw Hill Publishing Company, New York, 2001.
3. Arvind Krishnan, Nick Baker, Simos Yannas, and S. V. Szokolay, *'Climate Responsive Architecture: A Design Hand Book for Energy Efficient Building'*. Tata McGraw, New Delhi, 2007.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the principles of architectural design, site planning, climate-responsive design, and town planning for functional and sustainable built environments.	**K2**
CO2	Apply architectural and planning principles to design functional, climate-responsive, and sustainable building layouts and urban spaces.	**K3**
CO3	Exhibit effective team work, communication and collaborative skills to present seminars and submit reports related to architectural planning and design.	-

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3	2	1									3	
CO3								1	1				1
	3	**2**	**1**					**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

25CEP32 ENVIRONMENT, HEALTH AND SAFETY

3 0 0 3

INTRODUCTION: Need for developing Environment, Health and Safety systems in work places - International initiatives, National Policy and Legislations on EHS in India - Regulations and Codes of Practice - Role of trade union safety representatives - Ergonomics. **(9)**

OCCUPATIONAL HEALTH AND HYGIENE: Definition of occupational health and hygiene - Categories of health hazards - Exposure pathways and human responses - Exposure Assessment - Occupational exposure limits - Hierarchy of control measures - Role of personal protective equipment and the selection criteria. **(10)**

WORKPLACE SAFETY AND SAFETY SYSTEMS: Features of Satisfactory and Safe design of work premises - good housekeeping - lighting and colour, Ventilation and Heat Control, Noise, Chemical and Radiation Safety - Electrical Safety - Fire Safety - Safety at Construction sites, ETP - Machine guarding - Process Safety, Working at different levels. **(11)**

HAZARDS AND RISK MANAGEMENT: Safety appraisal - Job Safety Analysis - Control techniques - plant safety inspection - Accident investigation - Analysis and Reporting - Hazard and Risk Management Techniques - Onsite and Offsite emergency Plans - Employee Participation - Education and Training - Case Studies. **(8)**

ENVIRONMENTAL HEALTH AND SAFETY MANAGEMENT: Concept of Environmental Health and Safety Management - Elements of Environmental Health and Safety Management Policy and implementation and review - ISO 45001 - Structure and Clauses - Case Studies. **(7)**

Total L: 45 periods

TEXT BOOKS

1. Mark A. Friend, and James P. Kohn, *'Fundamentals of Occupational Safety and Health'*. Government Institutes, UK, 2018.
2. K. U. Mistry, *'Fundamentals of Industrial Safety and Health'*. Shyamaraj Global Commerce, 2022.

REFERENCES

1. David L. Goetsch, *'Occupational Safety and Health for Technologists, Engineers, and Managers'*. Pearson Education, 2018.
2. Phil Hughes, and Ed Ferrett, *'Introduction to Health and Safety at Work'*. Routledge, 2016.
3. Danuta Koradecka, *'Handbook of Occupational Safety and Health'*. CRC Press, 2010.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the principles of Environment, Health, and Safety systems, occupational health, workplace safety, hazard management, and EHS management standards.	**K2**
CO2	Apply concepts of occupational health, workplace safety, hazard control, and EHS management to analyze workplace scenarios and propose effective safety solutions.	**K3**
CO3	Collaborate in groups to prepare seminars, assignments, and case studies demonstrating comprehensive understanding and application of Environment, Health, and Safety practices.	-

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3	2	1									3	
CO3								1	1				1
	3	**2**	**1**					**1**	**1**			**3**	**1**

1-low, 2-medium, 3-high

OPEN ELECTIVE COURSES
25CEO01 ENVIRONMENTAL ENGINEERING AND SUSTAINABILITY

3 0 0 3

ECOSYSTEM, ENVIRONMENT AND SUSTAINABILITY: Structure and function of ecosystems - biotic and abiotic components; energy flow, food chains and webs, biogeochemical cycles (carbon, nitrogen, water); biodiversity - importance, threats, and conservation strategies; environmental services and natural capital; concept of sustainability - definitions, dimensions (social, economic, environmental); Brundtland Report and Sustainable Development Goals (SDGs); ecological footprint and carrying capacity; planetary boundaries framework. **(9)**

WATER ENVIRONMENT AND TREATMENT: Hydrological cycle and freshwater resources; water quality parameters - physical, chemical, biological; water pollution - point and non-point sources; industrial effluents; drinking water standards (BIS/WHO); conventional water treatment - coagulation, sedimentation, filtration, disinfection; wastewater treatment - primary, secondary (activated sludge, trickling filter), tertiary; sewage disposal and water reuse; groundwater contamination and remediation. **(9)**

AIR ENVIRONMENT AND CLIMATE CHANGE: Composition and layers of the atmosphere; ambient air quality standards (NAAQS); air pollutants - $PM_{2.5}$, PM_{10}, SOx, NOx, CO, VOCs, Ozone; sources of air pollution - vehicular, industrial, domestic; health and environmental effects; meteorological factors affecting air quality; greenhouse effect and global warming; climate change - causes, evidence, impacts; ozone depletion; mitigation and adaptation strategies; air pollution control devices - cyclones, scrubbers, ESP, bag filters. **(9)**

SOLID AND HAZARDOUS WASTE MANAGEMENT: Municipal solid waste (MSW) - generation, composition, characterization; integrated solid waste management - 3Rs; collection, transportation, and processing; composting, vermicomposting, anaerobic digestion, incineration; sanitary landfilling; hazardous waste - classification, characteristics, handling; biomedical waste management; e-waste generation, health impacts, management; circular economy principles and industrial symbiosis. **(9)**

ENVIRONMENTAL IMPACT ASSESSMENT AND SUSTAINABLE ENGINEERING: Environmental Impact Assessment (EIA) - concept, objectives, EIA Notification 2006 (India); stages - screening, scoping, baseline study, impact prediction, mitigation, monitoring; Environmental Management Plan (EMP); Life Cycle Assessment (LCA) - phases and applications; green engineering principles; sustainability indicators; GHG accounting; green buildings - GRIHA/LEED rating; role of engineers in sustainable development. **(9)**

Total L: 45 periods

TEXT BOOKS

1. J. R. Mihelcic, and J. B. Zimmerman, *'Environmental Engineering: Fundamentals, Sustainability, Design'*. John Wiley & Sons, New York, 2021.
2. Sudha Goel, *'Advances in Solid and Hazardous Waste Management'.* Springer, 2024.

REFERENCES

1. Bradley A. Striebig, Maria Papadakis, Lauren G. Heine, and Adebayo A. Ogundipe, *'Environmental Engineering and Sustainable Design'*. Cengage Learning, 2023.
2. Yan Liu, and Liang Li, *'Principles of Environmental Engineering'*. Springer, 2023.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Describe the fundamental concepts of environmental engineering including ecosystem components, environmental pollution sources and effects, and the principles of sustainability.	**K2**
CO2	Apply environmental engineering principles to select appropriate treatment and control measures for water, air, and solid waste problems.	**K3**
CO3	Exhibit effective teamwork, communication and collaborative skills to present seminars and reports related to sustainability frameworks and environmental assessment tools.	**-**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1											
CO2	3	2	1								
CO3								1	1		
	3	**2**	**1**					**1**	**1**		

1-low, 2-medium, 3-high

25CEO02 WASTE MANAGEMENT FOR CIRCULAR ECONOMY

3 0 0 3

INTRODUCTION TO MATERIALS AND WASTE: Materials and resource consumption - Types of materials - biomass, fossil fuels, metals and minerals - Drivers of material use - population, economy, technology & IPAT concept - Material lifecycle - Anthropogenic system - Waste generation sources and classification - Municipal solid waste - Industrial and construction waste - Waste hierarchy (Reduce, Reuse, Recycle). **(9)**

IMPACTS OF WASTE AND SUSTAINABILITY: Environmental impacts - Air, water and soil pollution - Greenhouse gas emissions - Human health impacts - Social implications of waste - Economic aspects of waste management - Resource depletion - Concept of sustainability and decoupling - Material productivity and resource efficiency. **(9)**

ASSESSMENT METHODS AND ANALYSIS TOOLS: Material Flow Analysis - Lifecycle Assessment - Lifecycle Inventory - Lifecycle Impact Assessment - Environmental Impact Assessment - Cost-benefit analysis - Indicators for circular economy - Data monitoring and reporting systems. **(9)**

WASTE MANAGEMENT PRACTICES AND TECHNOLOGIES: Waste prevention techniques - Efficient production and consumption - Waste collection systems - Segregation and transportation - Treatment methods: Physical and mechanical treatment - Biological treatment - composting, anaerobic digestion - Thermal treatment - incineration, pyrolysis - Recycling of metals, plastics, paper - Energy recovery - Landfill design and management. **(9)**

CIRCULAR ECONOMY AND POLICY FRAMEWORKS: Concept of circular economy - Material loops, slowing and narrowing flows - Circular strategies, reuse, repair, remanufacturing, recycling - Policy instruments: regulatory and economic tools - Extended Producer Responsibility (EPR) - Green public procurement - Institutional frameworks - Financing mechanisms - International cooperation - Case studies from OECD countries. **(9)**

Total L: 45 periods

TEXT BOOKS

1. Stijn van Ewijk, and Julia Stegemann, *'An Introduction to Waste Management and Circular Economy'.* UCL Press, 2023.
2. Organisation for Economic Co-operation and Development, *'Waste Management and the Circular Economy in Selected OECD Countries'*. OECD Publishing, 2019.

REFERENCES

1. Central Public Health and Environmental Engineering Organization, *'Municipal Solid Waste Management Manual'*. CPHEEO, Ministry of Urban Development, Government of India, 2016.
2. George Tchobanoglous, Hilary Theisen, and Samuel A. Vigil, *'Integrated Solid Waste Management: Engineering Principles and Management Issues'.* Mc-Graw Hill India, 2015.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Summarize the concepts of material flow, waste generation, environmental impacts and sustainability principles.	**K2**
CO2	Apply engineering principles to waste management practices, assessment tools and recycling technologies for sustainable resource management.	**K3**
CO3	Exhibit effective teamwork, communication and collaborative skills to present seminars and reports related to waste management and circular economy practices.	**-**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1											
CO2	3	2	1								
CO3								1	1		
	3	**2**	**1**					**1**	**1**		

1-low, 2-medium, 3-high

25CEO03 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

3 0 0 3

INTRODUCTION: Impacts of Development on Environment - Rio Principles of Sustainable Development- Environmental Impact Assessment (EIA) - Objectives - Historical development - EIA Types - EIA in project cycle - EIA Notification and Legal Framework - Stakeholders and their Role in EIA - Selection & Registration Criteria for EIA Consultants. **(9)**

ENVIRONMENTAL ASSESSMENT: Screening and Scoping in EIA - Drafting of Terms of Reference, Baseline monitoring, Prediction and Assessment of Impact on land, water, air, noise and energy, flora and fauna - Matrices - Networks - Checklist Methods - Mathematical models for Impact prediction - Analysis of alternatives. **(9)**

ENVIRONMENTAL MANAGEMENT PLAN: Plan for mitigation of adverse impact on water, air and land, water, energy, flora and fauna - Environmental Monitoring Plan - EIA Report Preparation - Review of EIA Reports - Public Hearing - Environmental Clearance Post Project Monitoring. **(9)**

SOCIO ECONOMIC ASSESSMENT: Baseline monitoring of Socio-economic environment - Identification of Project Affected Personal - Rehabilitation and Resettlement Plan - Economic valuation of Environmental impacts - Cost benefit Analysis. **(9)**

CASE STUDIES: EIA case studies pertaining to Infrastructure Projects - Real Estate Development - Roads and Bridges - Mass Rapid Transport Systems - Ports and Harbor - Airports - Dams and Irrigation projects - Power plants - CETP's - Waste Processing and Disposal facilities - Mining Projects. **(9)**

Total L: 45 periods

TEXT BOOKS

1. Rachna Bhateria, Mona Sharma, Rimmy Singh, and Sumit Kumar, *'Environmental Impact Assessment: A Journey to Sustainable Development'*. Springer, 2024.
2. Arjun Kumar A. Rathi, *'Indian Environmental Impact Assessment Practice: Insights and Learnings'*. Cambridge Scholars Publishing, 2024.

REFERENCES

1. Alberto Fonseca, *'Handbook of Environmental Impact Assessment (Research Handbooks on Impact Assessment series)'*. Edward Elgar Publishing Ltd, 2022.
2. Peter Wathern, *'Environmental Impact Assessment: Theory and Practice'*. Routledge, 2022.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the principles of sustainable development, Environmental Impact Assessment (EIA) process, legal framework, and stakeholder roles, along with the components of environmental, socio-economic assessment, and environmental management plans.	**K2**
CO2	Apply EIA methodologies such as screening, scoping, impact prediction, assessment techniques (matrices, networks, models), and develop environmental management and monitoring plans for various developmental projects.	**K3**
CO3	Demonstrate the application of EIA concepts through case studies, group assignments, seminars, and quizzes by analyzing real-world projects, preparing EIA-related reports, and evaluating environmental and socio-economic impacts.	**-**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1											
CO2	3	2	1								
CO3								1	1		
	3	**2**	**1**					**1**	**1**		

1-low, 2-medium, 3-high

25CEO04 GREEN BUILDING CONCEPTS

3 0 0 3

INTRODUCTION TO GREEN BUILDINGS AND RATING SYSTEMS: Green buildings - concept, need and global scenario - sustainable development goals - climate-responsive architecture - sustainable construction principles - embodied and operational energy - carbon footprint - urban heat island effect - green building rating systems: LEED, GRIHA and IGBC - ECBC 2017 and NBC 2016 sustainability provisions - Life Cycle Assessment (LCA) - green building certification process - Indian and international case studies. **(9)**

SUSTAINABLE SITE PLANNING AND WATER MANAGEMENT: Sustainable site planning - site analysis and microclimate - native landscaping and heat island mitigation - stormwater management techniques - water-efficient systems and rainwater harvesting - greywater and blackwater treatment and reuse - constructed wetlands, membrane bioreactors and Zero Liquid Discharge (ZLD) concepts. **(9)**

ENERGY EFFICIENCY AND PASSIVE DESIGN STRATEGIES: Passive solar design - building orientation, shading and thermal mass - building envelope performance and insulation - daylighting and natural ventilation - cool roofs and green roofs - high-performance glazing systems - energy-efficient HVAC systems - building energy simulation tools - Zero Energy and Net Zero Energy Buildings. **(9)**

GREEN BUILDING MATERIALS AND INDOOR ENVIRONMENT QUALITY: Green material selection criteria - durability, recyclability, local sourcing and EPD - sustainable materials: fly ash bricks, AAC blocks, rammed earth, bamboo and ferrocement - recycled materials and industrial bye-products - low-VOC materials - thermal comfort and ASHRAE 55 standards - Indoor Air Quality (IAQ), ventilation and filtration - acoustic and visual comfort - glare control and illuminance standards - biophilic design and occupant well-being. **(9)**

RENEWABLE ENERGY SYSTEMS, SMART BUILDINGS AND CERTIFICATION: Solar PV and BIPV systems - grid-connected and off-grid solar systems - solar thermal, wind and geothermal energy systems - waste-to-energy and biogas technologies - smart building systems: BMS, IoT sensors and automation - intelligent lighting, HVAC controls and smart metering - LEED, GRIHA and IGBC certification procedures - commissioning, post-occupancy evaluation and future trends in green and smart buildings. **(9)**

Total L: 45 periods

TEXT BOOKS

1. Jerry Yudelson, *'Green Building Through Integrated Design'*. McGraw-Hill Education, 2023.
2. Arvind Krishan, Nick Baker, Simos Yannas, and S. V. Szokolay, *'Climate Responsive Architecture'*. Tata McGraw-Hill, 2021.
3. Charles J. Kibert, *'Sustainable Construction: Green Building Design and Delivery'*. Wiley, 2022.
4. B. V. Venkatarama Reddy, and K. S. Jagadish, *'Embodied Energy of Building Materials and Technologies'*. Elsevier, 2022.

REFERENCES

1. Ken Yeang, *'Ecodesign: A Manual for Ecological Design'*. Wiley Academy, 2020.
2. Indian Green Building Council, *'Green Homes Rating System - Version 3.0'*. Indian Green Building Council, 2022.
3. Green Rating for Integrated Habitat Assessment, *'GRIHA Manual Volume I-IV'*. The Energy and Resources Institute (TERI), 2023.
4. Energy Conservation Building Code, *'ECBC 2017 User Guide'*. Bureau of Energy Efficiency (BEE), Government of India, 2017.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Describe the principles of green buildings, sustainable construction practices, and environmental performance assessment systems.	**K2**
CO2	Apply engineering principles to sustainable site planning, energy-efficient building systems, water management, and renewable energy concepts in green building design.	**K3**
CO3	Exhibit effective teamwork, communication and collaborative skills to present seminars and reports related to waste management and circular economy practices.	**-**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1											
CO2	3	2	1								
CO3								1	1		
	3	**2**	**1**					**1**	**1**		

1-low, 2-medium, 3-high

25CEO05 CLIMATE CHANGE AND ITS IMPACTS

3 0 0 3

FUNDAMENTALS OF CLIMATE SYSTEM: Atmosphere - Structure and composition - Weather and Climate - Climate parameters: Temperature, Rainfall, Humidity and Wind - Earth's energy balance - Greenhouse effect - Carbon cycle - Global Ocean circulation - El Niño and its effects - Global warming and climate variability. **(9)**

ELEMENTS OF CLIMATE CHANGE: Greenhouse gases - Sources and characteristics - Carbon dioxide emissions by sectors: Industrial, Transportation, Residential and Commercial - Urbanization and land use changes - Causes of global and regional climate change - Changes in temperature, precipitation and sea level rise - Impacts on air quality, hydrology and green spaces. **(9)**

IMPACTS OF CLIMATE CHANGE: Climate change impacts on ecosystems and biodiversity - Human health effects - Heat waves, vector-borne diseases and malnutrition - Human migration and displacement - Socio-economic impacts - Vulnerability assessment - Impacts on agriculture, water resources, infrastructure, coastal areas, industry and tourism. **(9)**

CLIMATE CHANGE ADAPTATION AND MITIGATION: IPCC guidelines for climate impact assessment - Adaptation measures and climate resilience - Urban heat island mitigation - Reflective roofing and pavements - green roofs and urban forestry - Carbon sequestration - Energy conservation in buildings - Energy efficiency measures - Nature-based solutions & sustainable development practices. **(9)**

RENEWABLE ENERGY AND SUSTAINABLE FUTURE: Conventional and non-conventional energy sources - Solar energy - Wind energy - Hydropower - Geothermal energy - nuclear energy - Biofuels and waste-to-energy technologies - Energy policies for climate mitigation - Carbon footprint - Energy audit - Low-carbon technologies and sustainable future. **(9)**

Total L: 45 periods

TEXT BOOKS

1. Sushil Kumar Dash, *'Climate Change - An Indian Perspective'*. Cambridge University Press India Pvt. Ltd., New Delhi, 2021.
2. Velma I. Grover, *'Global Warming and Climate Change'*. Science Publishers, 2022.

REFERENCES

1. William F. Ruddiman, *'Earth's Climate Past and Future'*. W. H. Freeman and Company, 2023.
2. Thomas E. Lovejoy, and Lee Hannah, *'Climate Change and Biodiversity'*. TERI Press, New Delhi, 2020.
3. Intergovernmental Panel on Climate Change, *'Sixth Assessment Report'*. Cambridge University Press, 2023.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Summarize the concepts of climate system, greenhouse effect, global warming and impacts of climate change on environment and society.	**K2**
CO2	Apply engineering principles to climate adaptation and mitigation measures including renewable energy and energy conservation practices for sustainable development.	**K3**
CO3	Exhibit effective teamwork, communication and collaborative skills to present seminars and reports on climate change impacts, adaptation and sustainability practices.	-

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1											
CO2	3	2	1								
CO3								1	1		
	3	**2**	**1**					**1**	**1**		

1-low, 2-medium, 3-high

25CEO06 SUSTAINABLE CONSTRUCTION MATERIALS

3 0 0 3

INTRODUCTION TO SUSTAINABLE CONSTRUCTION MATERIALS: Impacts of built environment on natural environment - Site development - Site selection - Urban heat island - Public transport and vegetation - Development footprint - Storm water runoff - Solar reflectance index - Materials and resources - Segregation, recycling, reduction in waste, reuse of materials and buildings - Features of sustainable building materials and sustainable alternatives. **(9)**

SUSTAINABLE CEMENT AND CONCRETE MATERIALS: Cement and carbon emissions - Alternative fuels for cement production - Alternative cements and supplementary cementitious materials - Sustainable concrete construction - Recycled aggregates and recycled materials - Reduction of cement content - Sustainable additives - Water conservation techniques - Durability and design for longevity - Smart concretes - Permeable concrete - Cool concrete - Ultra High Performance Concrete (UHPC) - Phase Change Materials (PCM). **(9)**

SUSTAINABLE METALS, COMPOSITES AND BIO-BASED MATERIALS: Sustainability of steel reinforcement and structural steel - Building blocks and insulated precast systems - Comparative performance of building materials - Wood-plastic composites - Engineered lumber - Bamboo and bio-based products - Recycled polymers and composites - Construction and demolition waste management - Design for deconstruction and reuse of materials. **(9)**

ENERGY EFFICIENT MATERIALS AND INDOOR ENVIRONMENTAL QUALITY: Building energy issues - Embodied energy - Operational energy and lifecycle energy - Lifecycle Assessment - Lifecycle Costing - Lifecycle Impact Assessment - Energy efficient building materials - Thermal insulation materials - Paints, adhesives and sealants - Volatile Organic Compound emissions - Indoor air quality - Sustainable and health-friendly construction materials - Introduction to sustainability assessment software packages. **(9)**

GREEN BUILDING MATERIALS AND SUSTAINABLE DESIGN APPROACHES: Integrated design approach - Ecological design concepts - Green building evolution - Sustainable material selection strategies - Water-efficient and recyclable materials - Green roofs and reflective materials - Building assessment and eco-labels - Green building standards and rating systems - Leadership in Energy and Environmental Design - Green Rating for Integrated Habitat Assessment - Sustainable construction practices and future trends. **(9)**

Total L: 45 periods

TEXT BOOKS

1. Charles J. Kibert, *'Sustainable Construction: Green Building Design and Delivery'*. Wiley, 2022.
2. Ravindra K. Dhir, Jorge de Brito, and Rui V. Silva, *'Sustainable Construction Materials'*. Woodhead Publishing, 2019.

REFERENCES

1. R. Siddique, and P. Cachim, *'Waste and Supplementary Cementitious Materials in Concrete'*. Woodhead Publishing, 2018.
2. Ajay Sharma, and R. Kumar, *'Green Building Materials and Construction'*. CRC Press, 2021.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the concepts of sustainable construction materials, green buildings and environmental impacts of the built environment.	**K2**
CO2	Apply sustainable construction practices, lifecycle assessment techniques and resource-efficient technologies in building systems.	**K3**
CO3	Exhibit effective teamwork, communication and collaborative skills to present seminars and reports related to sustainable construction materials and green building practices.	-

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1											
CO2	3	2	1								
CO3								1	1		
	3	**2**	**1**					**1**	**1**		

1-low, 2-medium, 3-high

25CEO07 REMOTE SENSING AND GIS

3 0 0 3

CONCEPTS OF REMOTE SENSING AND SATELLITES: Definition- Historical background - Components of remote sensing - Energy source, electromagnetic spectrum, radiation principle, platforms and sensors - Active and passive remote sensing interference - Atmospheric effects on remote sensing - Energy interaction with earth surface feature - Data acquisition - Reflectance, spectral signatures for water, soil and vegetation - Satellites - Types - Sun synchronous - Geo synchronous remote sensing satellites LANDSAT,SPOT & IRS - Resolution - Spectral, spatial, radiometric and Temporal resolution Recent satellites with its applications. **(9)**

DATA PRODUCTS AND IMAGE ANALYSIS: Data products - based on level of processing - o/p - scale - area/coverage - data availability - data ordering- data price - Image interpretation - Visual interpretation elements - interpretation key - Digital image processing - Image enhancement - image classification - Supervised and unsupervised - Vegetation Indices. **(9)**

CONCEPTS OF GIS: Definition - Map and their influences - Characteristics of Maps - Elements - Map scale, Projection, Coordinate systems - Sources of spatial data - History and development of GIS - Definition - Components - Hardware and Software. **(9)**

DATA INPUT AND ANALYSIS: Data - Spatial, Non-Spatial - Database models - Hierarchical network, Relational and Object-Oriented Data Models - Raster and Vector - Methods of Data input - Data Editing - Files and formats - Data structure - Data compression. Introduction to analysis - Measurements - Queries - Reclassification - Simple spatial analysis - Buffering - Neighbouring functions - Map overlay - Vector and raster - Spatial interpolation - Modelling in GIS - Digital Elevation Modelling - Expert systems. **(9)**

APPLICATION OF RS AND GIS: Crop Acreage estimation - Estimation of Crop Water Requirement - Crop condition - Soil mapping - classification of soil with digital numbers - soil erosion mapping - reservoir sedimentation using image processing - Inventory of water resources - water quality assessment - Application of Remote Sensing and GIS in Precision Agriculture - Monitor Crop Health - Management Decision Support Systems. **(9)**

Total L: 45 periods

TEXT BOOKS

1. K. Elangovan, *'GIS: Fundamentals, Applications & Implementation'*. New India Publishing Agency, New Delhi, 2021.
2. M. Anji Reddy, *'Textbook of Remote Sensing and Geographical Information Systems'*. BS Publications, Hyderabad, 2024.

REFERENCES

1. Basudeb Bhatta, '*Remote Sensing and GIS'*. Oxford University Press, Chennai, 2021.
2. Peter A. Burrough, Rachael A. McDonnell, and Christopher D. Lloyd, *'Principles of Geographical Information Systems'*. Oxford University Press, Chennai, 2006.
3. Xuan Zhu, '*Geographical Information Systems: A Practical Approach'*. Routledge, New Delhi, 2025.
4. Kang-Tsung Chang, *'Introduction to Geographic Information Systems'*. McGraw Hill Education, 2019.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Summarize the concepts and applications of Remote Sensing and GIS.	**K2**
CO2	Apply engineering principles to Remote Sensing and GIS techniques to acquire, process, analyze, and interpret spatial data for Civil Engineering applications.	**K3**
CO3	Exhibit effective team work, communication and collaborative skills to present seminars and submit reports related to concepts and applications of Remote Sensing and GIS.	-

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1											
CO2	3	2	1								
CO3								1	1		
	3	**2**	**1**					**1**	**1**		

1-low, 2-medium, 3-high

25CEO08 SMART CITIES

3 0 0 3

INTRODUCTION: Urbanization, need of focused development, role of Authorities, Smart city, Opportunity and Challenges - Smart infrastructures for city - Smart Cities Mission. **(6)**

SMART PHYSICAL INFRASTRUCTURE: Infrastructure development in Smart Cities - Physical Infrastructure, Land Use - Compact/mixed-use development, Transit Oriented Development (TOD); Smart City Management - Unified Governance Structure for Transportation (UMTA) - Smart public transportation, Smart parking, Intelligent traffic management, Detour management; Low emission vehicles, Electric Mobility - Environmental projects. **(12)**

SUSTAINABILITY AND SMART PLANNING: Relationship between Sustainability and Smart planning - Place making project guidelines - Surveillance, Smart Street Lighting, Intelligent Emergency Services, Intelligent Disaster Forecasting and Management, GIS-based Spatial Decision Support Systems, Smart Communication Services. **(10)**

APPLICATION OF TECHNOLOGIES IN SMART CITIES: Role of Technologies in Smart Cities - Integrated Command and Control Center (ICCC), Data Analytics, Data driven strategies implementation in smart cities. **(8)**

SMART CITIES PROJECT MANAGEMENT: Need for project management - Philosophy and concepts - Project phasing and stages - Project organizational structuring - Planning and Scheduling - Project cost analysis - Procurement and Contracting - PPP - Project Monitoring and Evaluation - Risk Management - Case studies. **(9)**

Total L: 45 periods

TEXT BOOKS

1. N. Mani, *'Smart Cities & Urban Development in India'*. New Century Publications, 2016.
2. Arun Firodia, and Vishwesh Pavnaskar, *'Smart City'*. Vishwakarma Publications, 2015.

REFERENCES

1. Poonam Sharma, and Swati Rajput, *'Sustainable Smart Cities in India'*. Springer International Publishing, 2017.
2. Stan McClellan, Jesus A. Jimenez, and George Koutitas, *'Smart Cities: Applications, Technologies, Standards, and Driving Factors'*. Springer International Publishing, 2018.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Summarize the concepts planning, application of technology and financing of smart cities.	**K2**
CO2	Apply engineering principles to smart city planning principles, modern technologies, and project management practices to develop sustainable and efficient urban infrastructure systems.	**K3**
CO3	Demonstrate effective team work, communication and collaborative skills to present seminars and submit reports related to planning, application of technology and financing of smart cities.	-

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1											
CO2	3	2	1								
CO3								1	1		
	3	**2**	**1**					**1**	**1**		

1-low, 2-medium, 3-high

ONE-CREDIT COURSES OFFERED BY CIVIL ENGINEERING DEPARTMENT
25CE901 GREEN BUILDING AUDIT

1 0 0 1

TOPICS:

1. Introduction to sustainable construction.
2. Green building concepts: passive design, energy efficiency, resource conservation.
3. Conventional vs. green buildings - lifecycle perspective.
4. Green Building Rating Systems: GRIHA, IGBC, LEED.
5. Energy audit: lighting, HVAC, envelope performance.
6. Water audit: fixtures, rainwater harvesting, STP/ETP reuse.
7. Indoor Environmental Quality (IEQ): ventilation, daylighting, acoustics, IAQ.
8. Waste and material audit: embodied carbon, recyclability.
9. Field audit procedure: pre-audit, walkthrough, reporting.
10. Instrumentation: lux meter, energy meter, flow meter, IAQ sensors.
11. Software tools for Green Building Audit.
12. Case Studies and Emerging Trends.
13. Net-zero buildings, green retrofitting, and future directions.

Total L: 15 periods

REFERENCES

1. Charles J. Kibert, *'Sustainable Construction: Green Building Design and Delivery'.* Wiley, 2022.
2. Romano Rota, and Renato Pastorino, *'Green Energy Audit of Buildings: A Guide for a Sustainable Energy Audit of Buildings'*. Springer, 2013.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Apply green building audit parameters and standard rating system checklists to assess the sustainability performance of buildings.	**K3**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	2	1	1	1		1	1	1	1	1	1	1	2
	2	**2**	**3**	**2**		**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**

1-low, 2-medium, 3-high

25CE902 TENDER AND CONTRACT DOCUMENT PREPARATION

1 0 0 1

TOPICS:

1. Introduction to Tendering and Contract Management
2. Types of Tenders and Tendering Procedures
3. Preparation of Notice Inviting Tender (NIT)
4. Estimation, Quantity Take-Off, and BOQ Preparation
5. Rate Analysis and Cost Estimation Techniques
6. Preparation of Tender Documents and Technical Specifications
7. Contract Documents and Conditions of Contract
8. E-Tendering and Digital Procurement Systems
9. Bid Evaluation, Contract Award, and Negotiation Process
10. Contract Administration, Claims, Disputes, and Arbitration Procedures

Total L: 15 periods

REFERENCES

1. V. K. Raina, *'Construction & Contracts Management - A Practitioner's Manual'*. Shroff Publishers, 2018.
2. Institution of Civil Engineers, *'Tendering for Civil Engineering Contracts'*. Institution of Civil Engineers, 2000.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Apply the principles of tendering and contract management to prepare tender documents, estimates, bills of quantities, and contract documents for construction projects.	**K3**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	1	1	1		1	1	1	1	1	1	1	2
	2	**2**	**3**	**2**		**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**

1-low, 2-medium, 3-high

25CE903 BUILDING BYE-LAWS AND APPROVAL DRAWING PREPARATION

1 0 0 1

TOPICS:

1. Introduction to Building Bye-Laws and Development Regulations
2. National Building Code (NBC) and Local Building Rules
3. Site Planning and Plot Requirements
4. Setbacks, FAR/FSI, Coverage, and Height Regulations
5. Preparation of Building Approval Drawings
6. Residential Building Planning and Submission Procedures
7. Fire Safety, Ventilation, Lighting, and Accessibility Requirements
8. Preparation of Key Plan, Site Plan, Floor Plans, Elevations, and Sections
9. Approval Process through Local Bodies and Online Submission Systems
10. Building Permit Documents, Completion Certificates, and Occupancy Certific

Total L: 15 periods

REFERENCES

1. Bureau of Indian Standards, *'National Building Code of India 2016 (NBC 2016)'*. Bureau of Indian Standards, 2016.
2. Town and Country Planning Organisation, *'Model Building Bye-Laws 2016'.* Ministry of Urban Development, 2016.
3. M. G. Shah, C. M. Kale, and S. Y. Patki, *'Building Drawing with an Integrated Approach to Built Environment'*. Tata McGraw Hill, 2019.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Apply building bye-laws, planning regulations, and drafting principles to prepare approval drawings and related documents for residential and commercial buildings.	**K3**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	2	1	1	1		1	1	1	1	1	1	1	2
	2	**2**	**3**	**2**		**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**

1-low, 2-medium, 3-high

25CE904 QUALITY CONTROL AT SITE

1 0 0 1

TOPICS:

1. Fundamentals of Quality Assurance/ Quality Control (QA/QC)
2. Definition of Quality, QA, QC, Difference between QA and QC
3. Roles and responsibilities (Contractor vs Client)
4. Importance of quality: Safety, economy, durability
5. Construction Quality Control Process
6. QA during contract stage (specifications, standards)
7. QC during construction stage
8. Inspection & testing procedures
9. QA/QC analogy (preventive vs corrective actions)
10. Inspection, Testing & Documentation - Inspection and Test Plans (ITP), Material testing (cement, aggregates, concrete)
11. Field checks: dimensions, alignment, workmanship
12. Record keeping and reporting, Role of third-party testing agencies
13. Construction Quality Plan - Components of quality plan
14. Organization structure for QA/QC - Common Site Problems & Solutions
15. Common issues, Practical solutions and case studies.

Total L: 15 periods

REFERENCES

1. Kumar Neeraj Jha, Amarjit Singh, and A. R. Sreedevi, *'Construction Quality Management and Control'*. Pearson, 2025.
2. Jude D'Silva, *'Handbook on Quality Assurance & Quality Control in Construction'*. Clever Fox Publishing, 2021.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Apply quality control procedures and inspection techniques to evaluate construction practices and identify defects in construction projects.	**K3**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	1	1	1		1	1	1	1	1	1	1	2
	2	**2**	**3**	**2**		**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**

1-low, 2-medium, 3-high

25CE905 BUILDING INFORMATION MODELLING

0 0 2 1

EXERCISES:

1. Introduction to BIM software interface and project setup
2. Creating levels and grids for architectural modelling
3. Modelling of structural elements (Walls, Columns, and Beams)
4. Developing floor slabs and roof systems
5. Integration of doors, windows, and component families
6. Creating and modifying stairs and railings
7. Conceptual massing and site modelling
8. Generating schedules and material take-offs
9. Introduction to interference checking and clash detection
10. Creating 2D documentation and spatial map layouts from 3D models

Total P: 30 periods

REFERENCES

1. Chuck Eastman, Paul Teicholz, Rafael Sacks, and Kathleen Liston, *'BIM Handbook: A Guide to Building Information Modelling for Owners, Designers, Engineers, Contractors, and Facility Managers'*. John Wiley & Sons, 2011.
2. Karen Kensek, *'Building Information Modelling: BIM in Current and Future Practice'*. Routledge, 2014.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Develop 3D models and perform clash detection to provide integrated solutions for Civil Engineering projects using BIM software.	**K3**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	2	1	1	1	3	1	1	1	1	1	1	2	2
	2	**2**	**3**	**2**	**3**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**

1-low, 2-medium, 3-high

25CE906 MODERN SURVEYING TECHNIQUES

0 0 2 1

EXERCISES:

1. Total Station Setup and Traversing Survey
2. Contour Mapping using Total Station Data
3. Construction Layout and Setting Out using Total Station
4. GPS and DGPS Data Collection for Mapping
5. Contour Mapping using DGPS Data
6. Digital Terrain Model (DTM) Preparation using DGPS Data
7. Route Mapping and Coordinate Plotting using DGPS Data
8. Drone/UAV Flight Planning and Aerial Surveying.

Total P: 30 periods

REFERENCES

1. Satheesh Gopi, R. Sathikumar, and N. Madhu, *'Advanced Surveying'*. Pearson India, Chennai, 2025.
2. Jan Van Sickle, *'GPS and GNSS for Land Surveyors'*. CRC Press, New Delhi, 2023.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Perform various topographic surveys using modern surveying instruments and interpret the results to provide solutions for problems in Civil Engineering.	**K3**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	2	1	1	1	3	1	1	1	1	1	1	2	2
	2	**2**	**3**	**2**	**3**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**

1-low, 2-medium, 3-high

25CE907 GEO-SPATIAL MAPPING

0 0 2 1

EXERCISES:

1. Spatial data input techniques
2. Geo-referencing spatial data
3. Digitization of vector data
4. Attribute data analysis
5. Raster data analysis
6. Vector data analysis - buffer analysis
7. Vector data analysis - network analysis
8. Interpolation of spatial data
9. Web Mapping Service
10. Spatial map layout

Total P: 30 periods

REFERENCES

1. K. Elangovan, *'GIS: Fundamentals, Applications & Implementation'*. New India Publishing Agency, New Delhi, 2021.
2. M. Anji Reddy, *'Textbook of Remote Sensing and Geographical Information Systems'*. BS Publications, Hyderabad, 2024
3. Kang-Tsung Chang, *'Introduction to Geographic Information Systems'*. McGraw Hill Education, 2019.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Perform spatial analysis and provide solutions for problems in Civil Engineering using GIS.	**K3**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	2	1	1	1	3	1	1	1	1	1	1	2	2
	2	**2**	**3**	**2**	**3**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**

1-low, 2-medium, 3-high

LANGUAGE ELECTIVES

25HS211 COMMUNICATION SKILLS FOR ENGINEERS
(Common to all B.E./B.Tech. Programmes)

0 0 4 2

COMMUNICATION CONCEPTS: Process of Communication – Inter and Intrapersonal Communication – Essentials for effectiveness. **(9)**

ORAL COMMUNICATION: Oral presentations with visual aids and Group discussions. **(16)**

FOCUS ON SOFT SKILLS: Etiquette – Work Place etiquette – Telephone etiquette- Body Language – Critical Reasoning and Conflict Management based on Case Studies – Group Communication- Meetings -Interview Techniques. **(14)**

TECHNICAL WRITING: Technical Writing Principles - Style and Mechanics - Technical Definitions – Physical, Functional and Process Descriptions – Technical Report Writing – Preparing Instructions – Interpretation of Technical Data. **(14)**

BUSINESS CORRESPONDENCE: Writing Emails, Preparing Resumes. **(7)**

Total P: 60 periods

TEXT BOOKS

1. Course materials prepared by the Faculty, Department of English, PSG Institute of Technology and Applied Research, Neelambur, Coimbatore.

REFERENCES

1. Jeff Butterfield, '*Soft Skills for Everyone*'. Cengage Learning, New Delhi, 2020.
2. Sabina Pillai, and Agna Fernandez, '*Soft skills and Employability Skills*'. Cambridge University Press, New Delhi, 2019.
3. Prashant Sharma, '*Soft Skills Personality Development for Life Success*'. BPB Publications, New Delhi, 2021.
4. K. N. Shoba, and D. Praveen Sam, '*Technical English*'. Cambridge University Press, New York, 2020.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Produce clear and concise technical reports, compose professional and effective emails and develop well-structured and impactful resumes	**K2**
CO2	Plan, organize, and deliver engaging and informative presentations using appropriate visual aids and participate positively in group discussions	**K3**
CO3	Resolve disagreements constructively, embody professional conduct and a strong work ethic and apply critical thinking to generate effective solutions	**-**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1										2			
CO2										3			
CO3									3	3			
									3	**3**			

1-low, 2-medium, 3-high

25HS212 BASIC GERMAN
(Common to all B.E./B.Tech. Programmes)

0 0 4 2

Guten Tag! - Learning: To greet, learn numbers till 20, practice telephone numbers & e mail address, learn alphabet, speak about countries & languages; **Vocabulary:** related to the topic; **Grammar:** W – Questions, Verbs & Personal pronouns I.

Freunde, Kollegen und ich - Learning: To speak about hobbies, jobs, learn numbers from 20; **Vocabulary:** related to the topic; **Grammar:** Articles, Verbs & Personal pronouns II, sein & haben verbs, ja/nein Frage, singular/plural.

In der Stadt – Learning: To know places, buildings, question, know transport systems, understand international words; **Vocabulary**: related to the topic; **Grammar:** Definite & indefinite articles, Negotiation, Imperative with Sie.

Guten Appetit! – Learning: To speak about food, shop, converse; **Vocabulary:** related to the topic; **Grammar:** Sentence position, Accusative, Accusative with verbs.

Tag für Tag and Zeit mit Freunden – Learning: To learn time related expressions, speak about family, ask excuse, fix appointments on phone, birthdays, understand & write invitations, converse in the restaurant; **Vocabulary:** related to the topic; **Grammar:** Preposition – am, im, um, von…bis, Possessive articles, Modal verbs.

Total P: 60 periods

TEXT BOOK:

1. Dengler, Stefanie et al., '*Netzwerk A1.1*'. Klett-Langenscheidt Gmbh, München, 2013.

REFERENCES:

1. Dengler, Stefanie et al., '*Netzwerk A1'.* Klett-Langenscheidt Gmbh München, 2013.
2. Sandra Evans, Angela Pude, and Franz Specht, '*Menschen A1*'. Hueber Verlag, 2012.
3. Hermann Funk, Christina Kuhn, and Silke Demme, '*Studio d A1*'. Goyal Publishers & Distributors Pvt. Ltd, 2009.
4. Rosa-Maria Dallapiazza, Eduard von Jan, '*Til Schönherr*'. Tangram Aktuell 1 (Deutsch als Fremdsprache), Max Hueber Verlag, 2004.

25HS213 BASIC JAPANESE
(Common to all B.E./B.Tech. Programmes)

0 0 4 2

Orientation Session, Geographic & Socio, economic perspective to Japan, Japanese people and culture and Basic greetings and responses.

Basic script, Method of writing hiragana and katakana, and Combination sounds and simple words.

Topic marker "wa", Desu / dewa arimasen cupolas, Interrogative particle "ka", Grammar particles "mo", "no", "Introducing someone: "Kochira wa ~" and Self introductions: Hajimemashite"

Demonstratives "Kore", "Sore", "Are", Demonstrative "Kono", "Sono", "Ano", Possessive noun particle "no" and Japanese apartments: Greeting your neighbor.

Place markers "Koko", "Soko", "Asoko", Direction markers "Kochira", "Sochira", "Achira" and Japanese department stores: Asking for and buying something.

Asking for and telling the time, Particle "ni (at)" for time, kara (from) ~ made (until), Particle "to (and)", Time periods: Days of the week, months, time of day, Verbs (Present / future and past tense) and Telephone enquiry: Asking for a phone no. And business hours.

Destination particle "e", Particles "de (mode of transportation)" and "to (with) and Japanese train station: Asking for Fare and track no. / types of trains.

Direct object particle "o", Particle "de (place of action)", Verbs ("~masen ka", "~mashou") and "Ohanami" Cherry blossom viewing.

Particle "de (by means of)", Particle "ni (to)", Aaemasu (give) and Moraimasu (receive) and Visiting a Japanese house.

Adjectives ("i" and "na" type), Adjectives (Positive and negative usage), Particle "ga (however, but), "Dore which?)" and Leaving a room, thanking someone for hospitality.

Likes and dislikes, Potential verbs (wakarimasu and dekimasu), "Kara (~ because)", Adverbs and Asking someone out over the phone.

Verbs denoting presence: "Imasu" and "arimasu", Particle "ni (in)", "Dare (who?)", Adverbs ("Chikaku ni ~ "), Particle "dare mo (negative ~ no one)" , Dare ka (anyone), dare ga (who) , Nani ka (anything) , nani ga (what) - ~ya (and) ~ nado (etc.) and Asking for directions.

Counters and Counting suffixes.

Introduction to Adjectives (na and ii type), Different usages of adjectives, Comparison, Likes and dislikes and Going to a trip.

Need and desire (ga hoshii), Wanting to … (Tabeti desu), Going for a certain purpose (mi –ni ikimasu) and Choosing from a menu.
Verb groups, I, II and III and Exercises to group verbs.

Please do (te kudasai), Present continuous tenses (te imasu), Shall I? (~ mashou ka) and Describing a natural phenomenon (It is raining).

To grant permission (~te mo ii desu), Asking for permission (~ te mo ii desu ka) and Should not do (~ te waikemasen) Describing a continuing state and Describing a habitual action.

Roleplays in Japanese.

A demonstration on usage of chopsticks and Japanese tea party.

Total P: 60 periods

TEXT BOOK

1. '*Minna no nohongo'*. – Romaji ban (first 10 lessons of this book).

REFERENCE

1. '*Minna no Nihongo I Honsatsu Roma – ji ban (Main Textbook Romanized Version)'.* International publisher – 3A Corporation,Tokyo, Indian distributor – Goyal Publishers & Distributors, New Delhi.

MANDATORY COURSES

25MC001 ENVIRONMENTAL SCIENCE
(Common to B.E./B.Tech. Programmes)

2 0 0 0

INTRODUCTION TO ENVIRONMENT: Environment - Definition, scope and importance - Types and composition of atmosphere - particles, ions and radicals - Ozone layer - significance, formation and depletion – Ecosystems - Structure and functions, components, energy flow, food chains, food web, Biodiversity-levels, values and threats - India as a mega-diversity nation, hotspots of biodiversity, endangered and endemic species of India, conservation of biodiversity. **(6)**

ENERGY RESOURCES: Introduction - National and International status - exploitation - sustainable strategies - Fossil fuels - classification, composition, physico-chemical characteristics and energy content of coal, petroleum and natural gas; solar energy - introduction, harnessing strategies. Wind energy - availability, wind power plants, wind energy conversion systems, site characteristics, and types of wind turbines - Supporting renewable energy resources - tidal, geothermal, hydroelectric. **(6)**

ENVIRONMENTAL POLLUTION: Definition, Sources, causes, impacts and control measures of air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution, nuclear hazards, RF hazards, Role of an individual in prevention of pollution - Disaster Management: Floods, earthquake, cyclone and landslides - Case studies, consequences and rescue measures. **(6)**

WASTE MANAGEMENT: Waste water - Characteristics of domestic and industrial wastewater - COD and BOD, Various stages of treatment - primary, secondary, tertiary treatment- Biological and advanced oxidation processes. Solid waste management - Characteristics of municipal solid waste (MSW), biomedical, automobile and e-wastes and their management, landfills, incineration, pyrolysis, gasification and composting**.** **(6)**

SOCIAL ISSUES AND THE ENVIRONMENT: Environmentally Sustainable work practices - Rain water harvesting, Role of non-governmental organizations - Human ethics and rights - impact on environment and human health, role of information technology on environment and human kind. Green IT policies, Process of EIA - ISO 14000 - Legislation - Environment protection act - Air (Prevention and Control of Pollution) act - Water (Prevention and control of Pollution) act - Wildlife protection act - Forest conservation act. **(6)**

Total L: 30 periods

TEXT BOOKS

1. Gilbert M. Masters, '*Introduction to Environmental Engineering and Science*'. Pearson Education, New Delhi, 2004.
2. Deswal S and Deswal A, '*A Basic Course in Environmental Studies*'. Dhanpat Rai and Co, New Delhi, 2004.

REFERENCES

1. Benny Joseph, '*Environmental Science and Engineering*'. Tata McGraw - Hill, New Delhi, 2006.
2. Koteswara Rao M V R, '*Energy Resources: Conventional & Non - Conventional*'. BSP Publications, New Delhi, 2006.
3. Botkin and Keller, '*Environmental Science*'. Wiley India Private Limited, New Delhi, 2013.

COURSE OUTCOMES:

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the basic concepts of environment, energy sources and waste management	**K2**
CO2	Use different renewable energy resources and environment protection measures for sustainable development	**K3**
CO3	Conduct a case study and real-time environmental issues and present as a team	**-**

COs-POs & PSOs MAPPING:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	1												
CO3						2	2	2			2		
	1					**2**	**2**	**2**			**2**		

1-low, 2-medium, 3-high

25MC002 INDIAN CONSTITUTION
(Common to B.E./B.Tech. Programmes)

2 0 0 0

INTRODUCTION: Evolution of Indian Constitution; significance of constitution; Composition; Preamble and its Philosophy. **(4)**

RIGHTS, DUTIES AND DIRECTIVE PRINCIPLES: Fundamental Rights - Writs and Duties, Directive Principles of State Policy. **(5)**

UNION GOVERNMENT: Union Government, President and Vice President, Houses of the Parliament and their functions; Types of Bills, Stages of passing of Bill into an Act, Veto Power, Constitution Amendment Procedure, Various Amendments made and their significance for India. **(6)**

STATE GOVERNMENT AND FEDERALISM: Composition of State Legislature; Powers, Functions and Position of Governor, Function of Chief Ministers, Council of Ministers; The Indian Federal System, Administrative Relationship between Union and States. **(8)**

JUDICIARY: Supreme Court, High Court; District Court and Lower Courts - Functions and Powers - Judges - Qualifications and Powers - Judicial Review. **(7)**

Total L: 30 periods

TEXT BOOKS

1. Subash C Kashyap, '*Our Political System*'. National Book Trust, 2011.
2. Praveenkumar Mellalli E, '*Constitution of India, Professional Ethics and Human Rights*'. Sage Publications India Pvt. Ltd., 2015.

REFERENCES

1. Briji Kishore Sharma, '*Introduction to the Constitution of India*'. Prentice Hall of India, 2010.
2. Basu D D, '*Introduction to the Constitution of India*'. Prentice Hall of India, 2016.
3. Jain. M C, '*The Constitution of India*'. Law House, New Delhi, 2001.
4. Shukla V N, '*Constitution of India*'. Eastern Book Company Ltd., New Delhi, 2011.

COURSE OUTCOMES:

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the evolution, significance, and philosophy of the Indian Constitution, including its Preamble, composition, and core principles.	**K2**
CO2	Analyze the structure, powers, and functions of the Union and State Governments, including the roles of the President, Parliament, Governor, and Council of Ministers, as well as the legislative process, types of bills, and constitutional amendments.	**K3**
CO3	Conduct a case study on the Indian Constitution, demonstrating understanding of its evolution, fundamental rights and duties, structure of Union and State governments, federal system, and the role of the judiciary in governance.	**-**

COs-POs & PSOs MAPPING:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	2												
CO3								2	2		2		
	2							**2**	**2**		**2**		

1-low, 2-medium, 3-high

25MC003 INDUSTRIAL SAFETY
(Common to B.E./B.Tech. Programmes)

2 0 0 0

SAFETY TERMINOLOGIES: Hazard - Types of Hazards - Risk-Hierarchy of Hazards Control Measures-Lead indicators - lag Indicators - Flammability - Toxicity Time-weighted Average (TWA) - Threshold Limit Value (TLV) - Short Term Exposure Limit (STEL) - Immediately dangerous to life or health (IDLH) - acute and chronic Effects - Routes of Chemical Entry - Personnel Protective Equipment - Health and Safety Policy - Material Safety Data Sheet MSDS. **(6)**

STANDARDS AND REGULATIONS: Indian Factories Act 1948 - Health - Safety - Hazardous materials and Welfare - ISO 45001:2018 occupational health and safety (OH&S) - Occupational Safety and Health Audit IS14489:1998 - Hazard Identification and Risk Analysis - code of practice IS 15656:2006. **(6)**

SAFETY ACTIVITIES: Toolbox Talk - Role of safety Committee - Responsibilities of Safety Officers and Safety Representatives - Safety Training and Safety Incentives - Mock Drills - On-site Emergency Action Plan - Off-site Emergency Action Plan - Safety poster and Display - Human Error Assessment. **(6)**

WORKPLACE HEALTH AND SAFETY: Noise hazard - Particulate matter - musculoskeletal disorder improper sitting poster and lifting Ergonomics RULE & REBA - Unsafe act & Unsafe Condition - Electrical Hazards - Crane Safety - Toxic gas release. **(6)**

HAZARD IDENTIFICATION TECHNIQUES: Job Safety Analysis - Preliminary Hazard Analysis - Failure mode and Effects Analysis - Hazard and Operability - Fault Tree Analysis - Event Tree Analysis Qualitative and Quantitative Risk Assessment - Check list Analysis - Root cause analysis - What-if Analysis - and Hazard Identification and Risk Assessment. **(6)**

Total L: 30 periods

TEXT BOOKS

1. Jain R. K. and Sunil S. Rao, '*Industrial Safety, Health and Environment Management Systems*'. Khanna Publisher, 4th Edition, 2000.
2. Deshmukh L. M., *'Industrial Safety Management: Hazard Identification and Risk Control'.* McGraw-Hill Education, 2007.

REFERENCES

1. John Ridley, John Channing, '*Safety at Work*'. Routledge, 7th Edition, 2008.
2. Dan Petersen, '*Techniques of Safety Management*: *A System Approach*'. Amer Society of Safety Engineers, 4th Edition, 2003.

COURSE OUTCOMES

At the end of the course, students will be able to		**Bloom's Level**
CO1	Describe the safety protocols and standard operating procedures in industrial settings to ensure compliance with safety regulations and minimize hazards in the workplace.	**K2**
CO2	Implement and test emergency response plans tailored to the industrial environments, ensuring effective action during emergencies such as fires, chemical spills or equipment malfunctions.	**K3**
CO3	Review and present on risk assessments and hazards using industry-specific tools to identify potential safety risks and choose appropriate corrective actions to prevent accidents and injuries.	-

COs - POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	2					2	2						
CO3						1	1	1	1		1		1
	2					**2**	**2**	**1**	**1**		**1**		**1**

1 - low, 2- medium, 3 - high

25MC005 INDIAN KNOWLEDGE SYSTEMS FOR SUSTAINABLE HUMAN DEVELOPMENT

2 0 0 0

INTRODUCTION TO INDIAN KNOWLEDGE SYSTEMS & HUMAN DEVELOPMENT (6)

- Meaning, scope, and significance of Indian Knowledge Systems
- Indian view of life: Purusharthas (Dharma, Artha, Kama, Moksha)
- Relationship between individual, society, and nature
- Relevance of IKS in modern education and engineering

INDIAN PERSPECTIVES ON SUSTAINABILITY & ECOLOGY (6)

- Indian worldview on nature: Pancha Mahabhutas
- Traditional water management, agriculture, and resource conservation
- Sustainable lifestyles in Indian traditions
- Comparison with modern sustainable development goals (SDGs)

HEALTH, WELL-BEING & HUMAN POTENTIAL IN IKS (6)

- Indian concept of health: Body–Mind–Spirit integration
- Introduction to Ayurveda & Yoga for sustainable health
- Mental health and emotional balance in Indian wisdom
- Food, nutrition, and lifestyle from IKS perspective
- Preventive healthcare through traditional knowledge

ETHICS, VALUES & SOCIAL SUSTAINABILITY (5)

- Work ethics and leadership in Indian tradition
- Gender dignity and social justice in Indian thought
- Professional ethics through IKS

IKS, TECHNOLOGY & SUSTAINABLE DEVELOPMENT (7)

- Science and technology in ancient India
- Sustainable engineering in traditional architecture and town planning
- Metallurgy, textiles, and indigenous manufacturing systems
- IKS and modern innovation ecosystems and ethical responsibility
- Role of engineers in sustainable human development

Total L: 30 periods

TEXTBOOKS

1. Dharampal, Indian Science and Technology in the Eighteenth Century
2. Kapil Kapoor, Indian Knowledge Systems
3. S Radhakrishnan, Indian Philosophy
4. B K Matilal, The Character of Logic in India
5. UGC–IKS Documents and AICTE IKS Modules
6. David Frawley, *Ayurvedic Healing*
7. *IIT-IKS Foundation Course Materials*
8. Ministry of Education – IKS Portal Resources

COURSE OUTCOMES:

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the core concepts and evolution of Indian Knowledge Systems.	**K2**
CO2	Interpret Indian views on human development, ethics, and sustainability.	**K3**
CO3	Apply IKS principles to sustainable living and professional practices.	**K3**
CO4	Demonstrate social, ecological, and ethical responsibility in real-life situations.	**K3**

COs - POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1						3	2				3
CO2						3	3				2
CO3			2			3	3		2	2	
CO4				2		3	3	2			
			2	**2**		**3**	**3**	**2**	**2**	**2**	**3**

1 - low, 2- medium, 3 - high

25MC006 STRATEGIC DATA MANAGEMENT AND GOVERNANCE

2 0 0 0

INTRODUCTION TO STRATEGIC DATA MANAGEMENT

Data and Its strategic Value; Types of Data, Data as a Source of Competitive Advantage; The Data Lifecycle; Aligning Data Management with Business Goals; Data Management challenges in Contemporary Organizations; Overview of Data driven Decision making. **(6)**

DATA GOVERNANCE AND FRAMEWORK

Introduction to Data Governance; Data Management Frameworks (DAMA-DMBOK, COBIT, ISO Data management Standards); Structuring Data Leadership Roles; Implementation of Data Policies and Standards. Master Data Management (MDM) and API Integration. **(6)**

DATA PRIVACY, ETHICS AND QUALITY MANAGEMENT

Data Privacy and Protection Regulations (DPDP Act, GDPR); Principles and Importance of Ethical data management; Ethical decision-making models; Key data Quality Dimensions; Role of Data Quality in Effective Decision-Making; Tools and techniques for ensuring data quality. **(6)**

DATA LITERACY AND ORGANIZATIONAL TRANSFORMATION

Role of Data Literacy in Modern Organizations; Strategies for implementing data-driven transformation; Communication and training for Overcoming Resistance to Change; Cross-Functional Collaboration across Organisational Departments; Fostering a Data-Driven Culture **(6)**

DATA ARCHITECTURE AND RECENT TRENDS

Business Intelligence (BI) Architecture; Big Data Ecosystem; AI/ML data pipelines in Business enterprises, Strategic Planning for Data Infrastructure; Build vs. Buy Decisions for Data Platforms; Generative AI in Data Management. **(6)**

Total L: 30 periods

TEXT BOOKS

1. Ladley, J. & Ladley, A. '*Data Governance: How to Design, Deploy, and Sustain an Effective Data Governance Program* (3rd ed.)'. Morgan Kaufmann (Elsevier).
2. Eryurek, E., Gilad, U., Kaye, B., Sicular, S., & Schur, E. (2021). '*Data Governance: The Definitive Guide: People, Processes, and Tools to Operationalize Data Trustworthiness'*. O'Reilly Media.

REFERENCE BOOKS

1. Plotkin, D. (2020). '*Data Stewardship: An Actionable Guide to Effective Data Management and Data Governance* (2nd ed.)'. Academic Press (Elsevier).2020.
2. DAMA International. (2024). '*DAMA-DMBOK: Data Management Body of Knowledge* (2nd ed. Revised)'. Technics Publications.2024.
3. Loukides, M., Mason, H., & Patil, D. J. (2018). '*Ethics and Data Science'*. O'Reilly Media.2018.

COURSE OUTCOMES:

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Understanding the Management role in leveraging data for competitive advantage and strategic decision-making.	**K2**
CO2	Applying governance frameworks to design policies, roles, and standards.	**K3**
CO3	Analyzing ethical challenges in data management to improve data-literacy across organization departments.	**K4**
CO4	Evaluating enterprise data architecture and modern platforms for making strategic decisions on Data Management.	**K5**

COs - POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2				3				3	3
CO2			2			2	3	2		3	
CO3						3	3		3		2
CO4	2		2	2	3	2				3	2
	2	**2**	**2**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**

1 - low, 2- medium, 3 - high

25MC007 PROFESSIONAL ETHICS

2 0 0 0

INTRODUCTION TO THE CONCEPTS OF ETHICS: Introduction to ethics – meaning, definition, dimensions of ethics, determinants and consequences of ethics; ethical dilemmas – types of ethical dilemmas. Morality – definition, types of moral values, levels of moral development. Ethics Versus morality. Professional Ethics – definition, components, types and significance. **(6)**

PSYCHOLOGY OF ETHICAL BEHAVIOR: Attitude – components of attitude in promoting ethical behavior; Motivation – human drives as a trigger for ethical behavior; Role of Cognitive biases (self-serving bias, incrementalism and overconfidence bias) in shaping ethical behavior. **(6)**

WORKPLACE ETHICAL BEHAVIORS: Integrity, honesty, accountability, responsibility, fairness, civic virtue, conscientiousness, empathy, self-confidence, character, respect for others, transparency, loyalty. **(6)**

APPLICATION AREAS OF ETHICS: Application of Ethics in different fields - Engineering ethics, medical ethics, financial ethics, technological ethics, scientific ethics, legal ethics, business ethics, environmental ethics. **(6)**

INDICATORS OF PROFESSIONAL ETHICS IN ORGANIZATIONS: Corporate Governance – Definition, importance, Theories of Corporate Governance: Agency Theory, Stewardship theory, Stakeholder Theory, Resource Dependency Theory. Corporate Social Responsibility – Definition, Models of CSR. **(6)**

Total L: 30 periods

TEXT BOOKS

1. Govindarajan M, Natarajan S and Senthil Kumar VS, *'Engineering Ethics'*. Prentice Hall of India, New Delhi, 2013.
2. Stephen P. Robbins, *'Essentials of Organizational Behavior'*. Pearson Education, 2023.
3. Subramanian. R. '*Professional Ethics'*. Oxford Publication, 2013.
4. Nagarasan. R.S. *Professional Ethics and Human Values'*. New Age International Publications, 2006.

COURSE OUTCOMES:

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Understand the fundamental concepts of ethics, morality and the psychological principles behind ethical behavior.	**K2**
CO2	Demonstrate the application of core ethical values in the different situations of the workplace.	**K3**
CO3	Analyze the ethical issues, challenges in different professional domains and the application of ethical principles to solve the issues	**K4**
CO4	Evaluate the relevance and effectiveness of corporate governance theories and CSR models in addressing ethical and managerial challenges in organizations.	**K5**

COs - POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1						2	3				3
CO2						2	3	3	2		
CO3		2	2			3	3				
CO4						3	3	2		3	2
		2	**2**			**3**	**3**	**3**	**2**	**3**	**3**

1 - low, 2- medium, 3 - high

25HSO01 PHYSICAL EDUCATION
(Common to all B.E./B.Tech./B.Des. Programmes)

0 0 2 0

INTRODUCTION TO PHYSICAL EDUCATION: Importance and scope of physical education, Physical fitness and exercise fundamentals, Conditioning and calisthenics exercises, Posture, flexibility, balance, and coordination, Warm-up, cool-down, and relaxation techniques, Basics of injury prevention and first aid practices, Importance of teamwork, discipline, and sportsmanship.

BASIC GYMNASTICS AND MOVEMENT EXERCISES: Warm-up exercises, conditioning drills, movement education, balance exercises, floor exercises, tumbling basics, swinging and grip exercises, simple apparatus activities, lead-up games, coordination drills, and safety practices.

SKILL DEVELOPMENT IN ANY ONE OF THE FOLLOWING OUTDOOR GAMES: Basketball, Volleyball, Ball Badminton, and Football.

SKILL DEVELOPMENT IN ANY ONE OF THE FOLLOWING INDOOR GAMES: Shuttle Badminton, Chess, Carrom, and Table Tennis.

Total P: 30 Periods

WEIGHTAGE
Continuous Assessment: 100%

ASSESSMENT
- Attendance and Participation – 70%
- Practical Assessment of Physical Fitness and Sports Skills – 30%

REFERENCES:

1. Singh, A. '*Essentials of Physical Education'*. Kalyani Publishers.
2. Kamlesh, M.L. '*Psychology in Physical Education and Sport'*.
3. Mangal, S.K. '*Psychology of Sports Performance'*. Sports Publication.
4. Kandappan, K. '*Foundations of Physical Education'*. Friends Publications.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Demonstrate basic movement, balance, coordination, and fitness exercises with proper technique and safety awareness.	**K2**
CO2	Demonstrate physical fitness parameters such as endurance, agility, flexibility, speed, and strength through regular participation in physical activities.	**K2**
CO3	Develop teamwork, discipline, leadership qualities, and sportsmanship through participation in games and group activities.	**K3**
CO4	Adopt active lifestyle habits and participate regularly in physical and recreational activities for overall well-being.	**K3**

COs - POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1							2	3			2
CO2						2		3			3
CO3							3	3	2		2
CO4						2	2	3			3
						2	**3**	**3**	**2**		**3**

1 - low, 2- medium, 3 - high

25HSO02 YOGA AND HEALTH
(Common to all B.E./B.Tech./B.Des. Programmes)

0 0 2 0

INTRODUCTION TO YOGA: Yoga as a tool for physical and mental wellness, Importance of posture, breathing, relaxation, and mindfulness, Role of yoga in stress management and lifestyle balance, Basic guidelines and safety precautions for yoga practice, Introduction to healthy habits including sleep hygiene, nutrition, and digital well-being

SURYA NAMASKAR – TYPES OF POSTURES: Pranamasana (Prayer Pose), Hastauttanasana (Raised Arms Pose), Padahastasana / Hastapadasana (Standing Forward Bend), Ashwa Sanchalanasana (Equestrian Pose), Dandasana (Plank Pose), Ashtanga Namaskara (Eight-Limbed Salutation), Bhujangasana (Cobra Pose), Adho Mukha Svanasana (Downward-Facing Dog), Ashwa Sanchalanasana (Equestrian Pose), Padahastasana (Standing Forward Bend), Hastauttanasana (Raised Arms Pose), and Pranamasana (Prayer Pose).

BASIC ASANAS:

1. Standing – Tadasana, Utkatasana, Trikonasana, Virabhadrasana, and Vrikshasana
2. Sitting – Sukhasana, Dandasana, Paschimottanasana, Vajrasana, and Gomukhasana
3. Prone Position – Bhujangasana, Salabhasana, Dhanurasana, Makarasana, and Urdhva Mukha Svanasana
4. Supine Position – Apanasana, Viparita Karani, Supta Baddha Konasana, Ardha Halasana, and Savasana

PRANAYAMA TECHNIQUES & MUDRAS: Ujjayi, Nadi Shodhana, Sheetali, Sitkari, Kapalabhati, Bhastrika, and Bhramari. Gyan Mudra (Chin Mudra), Prana Mudra, Apana Mudra, Vayu Mudra, Prithvi Mudra, Varun Mudra, Surya Mudra, Shunya Mudra, Linga Mudra, and Anjali Mudra.

Total P: 30 Periods

WEIGHTAGE: Continuous Assessment: 100%
ASSESSMENT METHODOLOGY: Attendance and Participation – 70%, Practical Demonstration (Surya Namaskar, Asanas, and Pranayama) – 30%

REFERENCES:

1. *'The Heart of Yoga'.* – T.K.V. Desikachar
2. *'Yoga for Holistic Health'.* – Dr. H.R. Nagendra
3. *'Light on Yoga'.* – B.K.S. Iyengar
4. *'Asana Pranayama Mudra Bandha'.* – Swami Satyananda Saraswati

COURSE OUTCOMES

	Course Outcomes	Bloom's Level
CO1	Demonstrate Surya Namaskar and basic asanas in standing, sitting, prone, and supine positions with correct alignment and breathing.	**K2**
CO2	Demonstrate pranayama techniques for stress management and respiratory health.	**K2**
CO3	Improve flexibility, balance, posture, breathing efficiency, and relaxation through regular yoga practice.	**K3**
CO4	Apply principles of healthy living such as nutrition, sleep hygiene, and digital well-being in daily life.	**K3**

COs - POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1							2	3			2
CO2						2	2				2
CO3						2	2	3			3
CO4						3	2	2			3
						3	**2**	**3**			**3**

1 - low, 2- medium, 3 - high