Shri ShamraoPatil (Yadravkar) Educational & Charitable Trust's
Sharad Institute of Technology College of Engineering
Yadrav (Ichalkaranji)-416121, Dist. – Kolhapur
(An Autonomous Institute)

Department: Civil Engineering

Rev: Course Structure /01/NEP/2024-25

Class: T.Y. B. Tech **Semester:** V

Course Code	Course Type	Course	Teaching Scheme				Examination Scheme					Credits
			L	T	P	Total Hrs.	CAI	CAII	MSE	ESE	Total	
23CE3501	PCC	Structural Analysis	03	-	-	03	10	10	30	50	100	03
23CE3502	PCC	Environmental Engineering	03	-	-	03	10	10	30	50	100	03
23CE3503	PCC	Design of Steel Structure	03	-	-	03	10	10	30	50	100	03
23CE3504	PCC	Environmental Engineering Lab	-	-	02	02	15	15	-	20	50	1
23CE3505	VSEC	Auto CAD lab	-	-	04	04	15	15	-	20	50	2
23CE3506	ELC	Mini Project	-	-	02	02	25	25	-	-	50	1
23CE3507	ELC	Industrial Training/ Field Training	-	-	-	-	-	-	-	50	50	Audit
23CE3508	MC	Constitution of India	01	-	-	01	25	25	-	-	50	Audit
23OECE31	OE	OE-III	03	-	-	03	10	10	30	50	100	03
23CEPEXX	PEC	PEC-I	03	-	-	03	10	10	30	50	100	03
23CEMDXX	MDM	From Basket	03	-	-	03	10	10	30	50	100	03
23HSSM01	VEC	Aptitude skill- III	01	-	-	01	25	25	-	-	50	Audit
23HSSM02	VEC	Language skill-III	-	-	02	02	25	25	-	-	50	Audit
TOTAL			**20**	**-**	**10**	**30**	**190**	**190**	**180**	**390**	**950**	**22**

Program Elective Courses – I

(Subject 1)	(Subject 2)	(Subject 3)
Site Administration & Control (23CEPE11)	Solid Waste Management (23CEPE21)	Advance Material & Techniques (23CEPE31)

Multidisciplinary Minor – III

Infrastructure Engineering (Basket A)	Architectural Aspect (Basket B)	Transportation Engineering (Basket C)
Construction Methods and Techniques (23CEMDA3)	Building Services (23CEMDB3)	Airport Engineering (23CEMDC3)

Open Elective – III

Sustainable Energy (23OECE31)

***Open Elective course will be offered to students of other programs and will not be offered to students of the same program**

Structural Analysis

23CE3501	PCC	Structural Analysis	3-0-0	3 Credits

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Make a use of Euler's and Rankine's theory for analyzing column.
CO2	Determine the determinate beam using various techniques.
CO3	Formulate the static and kinematic indeterminacy.
CO4	Develop the Shear force and Bending Moment diagrams for indeterminate beams by Clapeyron's
CO5	Develop the Shear force and Bending Moments diagrams for indeterminate beams by slope deflection method.
CO6	Analyze the continuous beams and portal frames by Matrix method.

Course Content:

Unit 1: Column Critical load and buckling of load, Euler's theory, Limitations of Euler's formula, Equivalent length for various end conditions, Rankin's theory **Principal planes and stresses** Principal planes and stresses in two dimensions, concept of principal planes and stresses by analytical and graphical method- Mohr's circle method **Influence line diagram** Concepts of influence lines-ILD for reactions, SF and BM for determinate beam	**[6]**
Unit 2: Slope and Deflection of beam Slope and deflection of determinate beam, double integration method, Maculay's method, Moment area method, Conjugate beam method.	**[7]**
Unit 3: Static and Kinematic Indeterminacy Classification of Structures, degrees of freedom, static and kinematic indeterminacy for beams, Determination of Static and Kinematic Indeterminacy, Consistent Deformation method and its numerical of continuous beams, propped cantilever (up to two degree of redundancy)	**[6]**
Unit 4: Deflection of Beams: **Clapeyron's Three Moment Theorem**: Introduction **,** application to continuous beams (up to 2span) with different MI **Moment Distribution Method**: Introduction, application to continuous beams (up to 2span) with different MI and simple orthogonal portal frames (without sway)	**[7]**

Unit 5: Slope and Deflection Method Introduction, application to continuous beams (up to 2 span), Sinking of supports, Portal frame without sway analysis.	**[6]**
Unit 6: Matrix Method **Flexibility Matrix Method**: Flexibility coefficient, Development of flexibility matrix, applications to propped cantilever, fixed beam and continuous beam. (Degree of S.I. ≤ 2), **Stiffness Matrix Method**: Stiffness coefficient, Development of stiffness matrix, applications to beams and portal frames (Degree of K.I. ≤ 2)	**[7]**

Text Books:

1. Punmia B.C., "Structural Analysis", Laxmi Publications
2. Khurmi R.S., "Theory of Structures", S Chand, Delhi
3. Reddy C. S., "Basic Structural Analysis", Tata McGraw Hill,3rd edition 2010
4. Vazirani V.N., Ratwani M.M and Duggal S.K., "Analysis of Structures - Vol. I",
5. ISBN NO: 978-81-7409-140-8
6. Wang C.K., "Statically Indeterminate Structures", McGraw Hill

Reference books:

1. Ramamrutham S. and Narayanan R., "Theory of Structures" DhanpatRai Publishers, Delhi
2. Hibbler R. C., "Structural Analysis", Pearson Publications, 9th Edition
3. Timoshenko and Young, "Theory of structures", McGraw Hill
4. Kinney J. S., "Indeterminate Structural Analysis", Oxford and IBH

Environmental Engineering

23CE3502	PCC	Environmental Engineering	3-0-0	3 Credits

Teaching Scheme:	Examination Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Impart knowledge of design components necessary for water treatment and supply.
CO2	Able to assess the different water quality parameters, their importance and limitations, and also
CO3	Acquire the knowledge of different methods and stages for water treatment and need for the supply of safe potable water supply.
CO4	Assess different wastewater constituents and different sources of wastewater generation.
CO5	Adopting advanced water and wastewater treatment techniques.
CO6	Plan proper method for the final disposal of treated wastewater.

Course Content:

Unit 1: Water Demand and Quality Importance of water, sources, types of demand, factors affecting population growth and water consumption, effect of water demand variation on design of water supply components. Water quality parameters: Physical, chemical and biological category, permissible limits under BIS, water-borne diseases.	**[5]**
Unit 2: Water Treatment Sedimentation – plain, flocculation and coagulation. Filtration - sand filtration – types, application, working, design. Disinfection - theory, types, application. Water distribution – types, hydraulic analysis.	**[6]**
Unit 3: Municipal wastewater Sources, components, characteristics of wastewater with thrust on COD, BOD. Sewage and Sewerage system – types, simple hydraulic design of sewers, Grey water – concept and treatment**.**	**[5]**
Unit 4: Municipal wastewater treatment Types of treatment - general layout of STP, screens, detritus tank, ASTP – function, design considerations, F/M, MLSS, MLVSS, SVI. Trickling Filter – types, design consideration, efficiency,	**[7]**
Unit 5: Nanotechnology in Water Quality and Wastewater Introduction to nanotechnology: Introduction, nanomaterials – microporous materials, carbon nanotubes, photocatalysts.	**[7]**

Nanotechnology based water treatment strategies – importance, types of nanomaterials used, and mechanisms for contaminants' removal. Application of nanotechnology - for reduced waste and improved energy efficiency.	
Unit 6: Wastewater disposal Dilution method – favorable conditions, parameters to be considered, Streeter-Phelps equation, Classification of rivers in India. Disposal on land – conditions, limitations, sewage sickness.	**[4]**

Text Books:

1. Garg S. K. " Water Supply Engineering" , Khanna Publishers, New Delhi. Ed. 35
2. Birdie J. S. and Birdie G.S. "Water Supply Engineering and Sanitary Engineering" Dhanpa Rai Publications, 8th Ed. New Delhi.
3. E.W.Steel, "Water Supply and Sewerage" , McGraw – Hill publishers.
4. Wiesner M., Bottero J-Y., Environmental Nanotechnology : Applications and Impacts of Nanomaterials Applications and Impacts of Nanomaterials, McGraw Hill Professional.
5. Pradeep T., Textbook of Nanoscience and Nanotechnology, McGraw Hill Education (India) Private Limited

Reference books:

1. Peavy and Rowe, " Environmental Engineering" , McGraw Hill Publishers, 4th Ed.2003
2. Sharma and Kaur, "Environmental Chemistry" , Goyal Publisher
3. Government of India, "Water Supply and Treatment Manual" .
4. Manual on Water Supply and Treatment, CPHEEO, Ministry of Jal Shakti/ Department of Drinking Water and Sanitation.

Design of Steel Structures

23CE3503	PCC	Design of Steel Structures	3-0-0	3 Credits

Teaching Scheme:	Examination Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the principles of steel structure design
CO2	Analyze the connections in steel structures.
CO3	Analyze and design Tension and Compression members.
CO4	Analyze and design column and bases.
CO5	Design the beams in steel structures.
CO6	Explain the Limit state method of design.

Course Content:

Unit 1: Introduction Introduction, advantages & disadvantages of steel structures, permissible stresses, factor of safety, methods of design, types of connections, various types of standard rolled sections, types of loads and load combinations. Introduction to Plastic Analysis, Hinge formation, Collapse mechanism	**[6]**
Unit 2: Bolted and Welded connections Bolted and Welded connections: Analysis of axially & eccentrically loaded connections, Permissible stresses, Design of connections. (IS 800: 1984)	**[6]**
Unit 3: Tension& Compression members **Tension members:** Common sections, net effective area, load carrying capacity, connection using weld / bolts. (IS 800: 1984) **Compression members:** Common sections used, effective length and slenderness ratio, permissible stresses, load carrying capacity, connection using weld / bolt (IS 800: 1984)	**[6]**
Unit 4: Columns and Column Bases **Columns**: Simple and built up section, lacing, battening, column subjected to axial force and bending moment, column splices. (IS 800: 1984) **Column bases:** Analysis and design of slab base, gusseted base, design of anchor bolt. (IS 800: 1984)	**[6]**
Unit 5: Beams Beams: Laterally supported & unsupported beams, design of simple beams, built up beams using flange plates, curtailment of flange plates, web buckling & web crippling, secondary and main beam arrangement, beam to beam connections.(IS 800: 1984)	**[6]**

Unit 6: Introduction to Limit State method Introduction to provisions in IS 800-2007,Basis for Design, Classification of cross-Sections, Limit state of strength and Limit state of serviceability, Partial Safety Factors for Loads, Partial Safety Factors for Materials.	**[6]**

Note: Unit 1 to 5are based on working stress method of design (IS 800: 1984), Unit 6 is based Limit state method of design (IS 800 2007)
Use of IS 800: 1984, IS: Handbook No.1 for Steel Section /Steel Table is permitted for theory examination.

Text Books:

1. Duggal S. K., "Design of Steel Structures", Tata McGraw Hill Pub. Co. Ltd., New Delhi.
2. Dayaratnam P., "Design of Steel Structures", Wheeler Publishing, New Delhi
3. S. Ramamrutham, "Design Of Steel Structures" Dhanpatrai Publishing Co (p) Ltd
4. Gambhir, "Fundamentals of Structural Steel Design", Tata McGraw Hill Pub. Co. Ltd., New Delhi
5. Subramanian N., "Steel Structures: Design and Practice" Oxford Univ. Press, Delhi

Reference Books:

1. Publications of Bureau of Indian Standards, New Delhi, IS 800:1984
2. Publications of Bureau of Indian Standards, New Delhi, IS 800:2007
3. Vazirani & Ratwani, "Design of Steel Structures", Standard Book House, New Delhi
4. Duggal S. K., "Limit State Design of Steel Structures", Tata McGraw Hill Pub. Co. Ltd., New Delhi
5. Salmon and Johnson, "Steel Structures: Design and Behaviour", Harper and Row, New York
   Steel Designers Manual

Environmental Engineering Laboratory

23CE3504	PCC	Environmental Engineering Laboratory	0-0-2	1 Credits

Teaching Scheme:	Examination Scheme:
Practical: 2 hrs/week	Continuous Assessment -I : 15 Marks Continuous Assessment -II : 15 Marks End Semester Exam : 20 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Demonstrate quality parameters considered in water testing.
CO2	Conclude the status of water quality.
CO3	Define the wastewater characteristics and propose treatment
CO4	Define the measurement of air pollutants and demonstrate the air quality.

Course Content:

Section 1: Test in Lab

1. To determine pH, alkalinity, chlorides, EC and turbidity.
2. To determine percentage available chlorine in bleaching powder, residual chlorine, chlorine demand and break-point chlorination.
3. To determine optimum dose of alum, total, dissolved, suspended and volatile solids.
4. Determination of fluoride and total iron.
5. Determination of sulphates and nitrates.
6. Determination of SVI, BOD and COD.
7. Determination of DO, total hardness, temporary, permanent, calcium and magnesium hardness.
8. Assessment of SPM.

Section 2: Site Visit

1. Report on visit to nearby WTP.
2. Report on visit to nearby STP.

Text Books

1. " Manual on Water and Wastewater Analysis" , NEERI publication 5th edition
2. " Guide Manual: Water and Wastewater Analysis" Central Pollution Control Board publication.2 005.

Reference books:

1. Standard Methods for the Examination of Water and Wastewater. American Public Health Association, 24th Ed.

Auto CAD Laboratory

23CE3505	**PCC**	**Auto CAD Laboratory**	**0-0-4**	**2 Credits**

Teaching Scheme:	**Examination Scheme:**
Practical: 4 hrs/week	Continuous Assessment -I : 15 Marks Continuous Assessment -II : 15 Marks End Semester Exam : 20 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Describe use & commands of CAD for civil engineering.
CO2	Explain various components of building.
CO3	Illustrate use of layers of CAD.
CO4	Develop drawing for building by using CAD software.

Course Content:

1. Introduction to computer aided drafting
2. Practice exercises on CAD software by using different commands
3. Drawing of plans of Single storeyed buildings using software
4. Developing sections and elevations for Single storeyed building
5. Exercises on development of working of buildings.
6. Exercises on development of Municipal drawing of buildings.

Text Books

1. AutoCAD – George Omura
2. AutoCAD 2019 training guide AutoCAD

Reference books:

1. David Frey (BPB Sybex Publications)

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PEC-I

23CEPE11	PEC	Site administration and control	3-0-0	3 Credits

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Understand the roles, responsibilities, and principles of site administration.
CO2	Plan, schedule, and manage resources effectively on construction sites.
CO3	Apply quality control measures to ensure high construction standards.
CO4	Identify and mitigate safety risks and ensure compliance with Indian safety standards.
CO5	Maintain effective communication and documentation for site management.
CO6	Use legal and financial aspects of site operations efficiently.

Course Content:

Unit 1: Introduction to Site Administration Roles and responsibilities of site administrators. Site organization and layout planning. Importance of documentation and record-keeping at the site. Coordination between contractors, subcontractors, and labor. Overview of Indian legal requirements for construction site administration (e.g., labor laws, Building & Other Construction Workers Act).	**[6]**
Unit 2: Construction Site Planning and Control Site logistics and material management. Resource allocation: Manpower, materials, and machinery. Time scheduling and work sequence planning (e.g., bar charts, Gantt charts).Traffic management within and around the construction site. Safety measures and compliance with Indian safety standards (NBC and IS codes).	**[6]**
Unit 3: Site Supervision and Quality Control Role of supervision in ensuring construction quality. Implementation of quality control plans and inspection protocols. Use of checklists and quality audits on-site. Common construction defects and corrective measures. Tools and techniques for real-time quality monitoring	**[6]**
Unit 4: Construction Safety and Risk Management Site safety regulations and standards as per Indian codes (IS 3764, IS 13416).Identification and mitigation of hazards: Electrical, fire, excavation, and machinery. Risk management: Assessment, prevention, and control. Role of personal protective equipment (PPE).Accident reporting, investigation, and corrective measures.	**[6]**
Unit 5: Communication and Documentation on Site Importance of effective communication between stakeholders. Site meetings: Agenda, minutes, and follow-ups. Preparation of daily, weekly, and monthly progress reports. Documentation of labor	**[6]**

attendance, material usage, and equipment logs. Use of technology in documentation (BIM, site management software).	
Unit6: Legal and Financial Aspects of Site Administration Construction contracts: Types, clauses, and dispute resolution. Compliance with labor laws and statutory obligations in India. Financial management on-site: Budget control, billing, and payments. Handling claims, variations, and delays. Ethical practices in site administration.	**[6]**

Text Books:

1. Construction Project Management: Theory and Practice by Kumar Neeraj Jha.
2. Building Construction by B.C. Punmia, Ashok Kumar Jain, and Arun Kumar Jain.
3. Construction Management and Planning by B. Sengupta and H. Guha.
4. Site Management for Engineers by R. B. Cooke and P. M. Williams.

Reference Books:

1. Construction Planning and Management by P. S. Gahlot and B. M. Dhir.
2. Handbook of Construction Management by P. K. Joy.
3. Site Management and Administration by Derek Millett.
4. The National Building Code of India (BIS, latest edition).
5. Labour Laws and Other Statutory Obligations by H.L. Kumar.

PEC-I

23CEPE21	PEC	Solid Waste Management	3-0-0	3 Credits

Teaching Scheme:	Examination Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Outline the functional elements of solid waste through management.
CO2	Identify and interpret the characteristics of MSW.
CO3	Organize the collection system and optimize the route for MSW transfer.
CO4	Demonstrate the knowledge on fundamental principles of present and emerging technologies for MSW treatment and value recovery.
CO5	Analyze different treatment processes for disposal and recovery under MSW.
CO6	Examine and understand biomedical and hazardous waste collection, transport and disposal.

Course Content:

Unit 1: Fundamentals of solid waste management Definition, Sources and types of solid waste, composition of solid waste, environmental impact of solid waste, factors affecting solid waste generation rate, physical and chemical characteristics of solid waste, sampling methods, functional elements of solid waste management	**[6]**
Unit 2: Storage and Collection of solid waste Storage of solid waste, types of solid waste collection services, types of collection system-hauled and stationary container system, tools and equipment used in collection, terms used- pick up time, haul time, off-site and on site time, time and frequency of collection, collection route and its layout, labor requirement, route optimization	**[7]**
Unit 3: Transportation of solid waste Need of transfer operation, transportation vehicles, transfer station- definition, necessity, location, advantages and disadvantages, operation and maintenance of transfer station	**[5]**
Unit 4:Processing of Solid Waste Purpose of processing solid waste, mechanical volume reduction and size reduction, component separation- air separation, Magnetic separation, screening, hand sorting, inertial separation, drying and dewatering	**[6]**
Unit 5:Disposal of Solid Waste Composting, factors affecting composting, types of composting, landfilling- site selection criteria, landfilling methods, advantages and disadvantages, Incineration- process, products of incineration and their uses, advantages and disadvantages, Pyrolysis and its types, leachate, leachate treatment and collection system, impact of open dumping	**[6]**

Unit 6: Biomedical and Hazardous Waste Biomedical waste – Definition, sources, types, biomedical waste management technologies, biomedical waste management rule-2016 Hazardous waste- Definition, sources, types,Physico-chemical, Chemical and Biological Treatment of hazardous waste	**[6]**

Text Books:

5. Construction Project Management: Theory and Practice by Kumar Neeraj Jha.
6. Building Construction by B.C. Punmia, Ashok Kumar Jain, and Arun Kumar Jain.
7. Construction Management and Planning by B. Sengupta and H. Guha.
8. Site Management for Engineers by R. B. Cooke and P. M. Williams.

Reference Books:

6. Construction Planning and Management by P. S. Gahlot and B. M. Dhir.
7. Handbook of Construction Management by P. K. Joy.
8. Site Management and Administration by Derek Millett.
9. The National Building Code of India (BIS, latest edition).
10. Labour Laws and Other Statutory Obligations by H.L. Kumar.

PEC-I

23CEPE31	PEC	Advance Materials And Techniques	3-0-0	3 Credits

Teaching Scheme:	Examination Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Identify and classify advanced materials used in modern construction.
CO2	Explain the application of composite materials and high-performance concrete.
CO3	Assess the benefits of modern construction techniques like prefabrication and 3D printing.
CO4	Evaluate sustainability and durability aspects of advanced materials.
CO5	Apply knowledge of smart materials for structural health monitoring.
CO6	Understand the use of nanotechnology and green materials in construction.

Course Content:

Unit 1: Advanced Construction Materials High-performance concrete (HPC) and self-compacting concrete (SCC),Fiber-reinforced concrete (FRC) and polymer concrete, Geopolymer concrete, Smart materials: shape memory alloys, piezoelectric materials, Properties and applications of carbon fiber, glass fiber, and aramid fiber	**[6]**
Unit 2: Composite Materials in Construction Definition and classification of composites, fiber-reinforced polymers (FRP), and their applications, Sandwich panels and laminated composites, High-strength structural plastics, Case studies on composite material applications.	**[6]**
Unit 3: Modern Construction Techniques Prefabrication and modular construction, 3D printing in construction, Precast and pre-stressed construction methods, Tunnel Formwork and Mivan formwork, Hybrid construction techniques.	**[6]**
Unit 4: Sustainable and Green Construction Materials Recycled aggregate concrete and its applications, ,Green building materials and energy-efficient construction techniques, Phase change materials for thermal regulation, Concepts of net-zero energy buildings.	**[6]**
Unit 5: Nanotechnology in Construction Nanomaterials: carbon Nano-tubes, Nano-silica, Nano-clay, Applications of nanotechnology in cement and concrete, Self-cleaning and self-healing materials, Water-repellent and fire-resistant coatings, Impact of nanotechnology on durability and sustainability.	**[6]**

Unit6: Smart and Intelligent Materials Sensors and actuators in construction, Smart concrete and structural health monitoring systems, Bio-mimetic and bio-engineered construction materials ,Shape memory alloys and self-sensing materials, AI and robotics in modern construction.	**[6]**

Text Books:

1. P.K. Mehta & P.J.M. Monteiro – Concrete: Microstructure, Properties, and Materials
2. Chung Deborah D.L. – Composite Materials: Science and Applications
3. K.S. Jagadish, B. V. Venkatarama Reddy & K.S. Nanjunda Rao – Alternative Building Materials and Technologies
4. Gambhir M.L. – Concrete Technology
5. James K. Wight & James MacGregor – Reinforced Concrete: Mechanics and Design

Reference Books:

1. Sanjay Kumar Shukla – Advanced Civil Engineering Materials
2. P.C. Aïtcin – High-Performance Concrete
3. A.M. Neville & J.J. Brooks – Concrete Technology
4. M. S. Shetty – Concrete Technology: Theory and Practice
5. S. K. Duggal – Building Materials

MDM-III

23CEMDA3	MDM	Construction Method and Techniques	3-0-0	3 Credits

Teaching Scheme:	Examination Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Understand the fundamental principles of prefabricated structures
CO2	Analyze the processes involved in modular construction practices
CO3	Evaluate the requirements for effective formwork
CO4	Assess new design trends and construction techniques in high-rise buildings
CO5	Examine conventional and advanced bridge construction techniques
CO6	Investigate advanced construction techniques that promote sustainability

Course Content:

Unit 1:Prefabricated Structures: Introduction to Prefabricated structures, Planning for pre-casting, Selection of equipment for fabrication, Transport and erection of prefabricated components, Quality measures, Design considerations of precast elements, Safety measure during erection.	**[6]**
Unit 2:Modular Construction Practices Introduction to Modular Construction, Modular coordination, Modular Standardization, Modular System Building, Limitation and Advantages of Modular Construction	**[6]**
Unit 3:Formwork Requirements of Formwork, Loads carried by Formwork, Types of Formwork: Timber, Steel, Modular shuttering, Slip forms, Scaffolding, Deep Excavation Methods.	**[6]**
Unit 4:High Rise Buildings New Design Trends in Geometrical Forms, Construction Techniques of High Rise Buildings, High Rise Construction Techniques, and Brick work, Selected High-Tech High-Rise Buildings.	**[6]**
Unit 5: Bridge construction techniques Introduction to Embankments and Foundations, Conventional Bridge Construction Techniques, Accelerated Bridge Construction, Prefabricated Bridge Construction	**[6]**
Unit 6: Advanced construction techniques Advanced construction techniques for better sustainability; Techniques for reduction of Green House Gas emissions in various aspects of Civil Engineering Projects	**[6]**

Text Books:

1. Robert L.Peurifoy, Clifford, J. Schexnayder, Robert Schmitt and AviadShapira, Construction Planning, Equipment, and Methods, McGraw-Hill Education, 2018, Ninth Edition.
2. S. C. Sharma, Construction Equipment and Management, Khanna Publishing, 2019, First Edition

Reference Books:

1. Cameron Andres, Ronald Smith and W. Woods, Principles and Practices of Commercial Construction, Pearson, 2018, Tenth Edition.
2. D. S. Vijayan, S. Arvindan and A. Paulmakesh, Construction Materials and Techniques, Notion Press, 2021, First Edition.
3. Edward Allen and Joseph Iano, Fundamentals of Building Construction: Materials and Methods, Wiley, 2019, Seventh Edition.

MDM-III

23CEMDB3	MDM	Construction Method and Techniques	3-0-0	3 Credits

Teaching Scheme:	Examination Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Understand the importance and classification of building services.
CO2	Apply water supply and drainage systems for buildings.
CO3	Implement efficient and safe electrical systems in buildings.
CO4	Plan and design fire protection systems as per national standards.
CO5	Apply the principles of HVAC systems to ensure indoor air quality and comfort.
CO6	Study of sustainable and smart building services for energy conservation and environmental impact.

Course Content:

Unit 1: Introduction to Building Services Definition and importance of building services. Classification: Mechanical, electrical, plumbing, fire safety, and HVAC systems. Coordination of building services with architecture and structural design. Overview of building regulations and standards in India (e.g., NBC).	**[6]**
Unit 2: Water Supply and Drainage Systems Water supply systems: Sources, storage, and distribution. Hot and cold water systems in buildings. Drainage systems: Sanitary drainage, storm water drainage, and rainwater harvesting. Wastewater treatment and recycling systems. Plumbing materials, fixtures, and fittings.	**[6]**
Unit 3: Electrical Systems in Buildings Basic electrical systems: Wiring, circuit breakers, and distribution boards. Illumination systems: Types of lights and lighting design principles. Power supply systems: Standby generators, UPS, and renewable energy integration. Earthing systems and protection against electrical hazards. Energy-efficient electrical systems.	**[6]**
Unit 4: Fire Protection Systems Principles of fire safety in buildings. Fire detection systems: Smoke detectors, heat sensors, and alarm systems. Fire suppression systems: Sprinklers, hydrants, and extinguishers. Evacuation planning and fire safety regulations (NBC and IS codes).Case studies of fire incidents and lessons learned.	**[6]**

Unit 5: HVAC (Heating, Ventilation, and Air Conditioning) Systems Principles of heating, ventilation, and cooling. Types of HVAC systems: Centralized and decentralized systems. Components of HVAC systems: Compressors, ducts, chillers, and fans. Indoor air quality and thermal comfort. Energy-efficient HVAC systems and renewable energy integration.	**[6]**
Unit6: Sustainable and Smart Building Services Concepts of green buildings and sustainable building services. Energy conservation and management in buildings. Smart building technologies: Automation, IoT, and Building Management Systems (BMS).Waste management in buildings. Case studies of sustainable and smart buildings in India.	**[6]**

Text Books:

1. Chatterton, David V. "Building Services Engineering." Routledge, 2013.
2. M.A. Aziz. "Building Services." McGraw Hill Education, 2017.
3. Singh, Gurucharan. "Water Supply and Sanitary Engineering." Standard Publishers, 2016

Reference Books:

1. Hall, Fred. "Building Services Handbook." Routledge, 2017.
2. Deolalikar, S.G. "HVAC and Building Services Design." Tata McGraw Hill, 2010.
3. Bureau of Indian Standards. "National Building Code of India 2016." BIS, 2016.
4. Kumar, Satish. "Energy Efficient Buildings in India." The Energy and Resources Institute (TERI), 2014.
5. Smith, Peter. "Sustainable and Resilient Building Services." Routledge, 2020.

MDM-III

23CEMDC3	MDM	Airport Engineering	3-0-0	3 Credits

Teaching Scheme:	Examination Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Identify the elements of airport and aircraft
CO2	Understand the fundamental principles of airport planning planning
CO3	Illustrate the various geometric design elements of Runway and taxiway
CO4	Enumerate the elements of terminals and systems of parking aircrafts
CO5	Describe the grading requirements and characteristics of airport drainage
CO6	Understand the importance of installing visual aids and runway lighting

Course Content:

Unit 1: Introduction History of aviation, development of Air transportation in India, Open sky policy, parts of aeroplane, aircrafts characteristics, aerodromes, airport classifications as per ICAO.	**[4]**
Unit 2: Airport Planning Importance of Airport Planning, Airport site selection, factor affecting the Airport Size, Airport obstruction, clear Zone, Turning zone, zoning laws, Airport Architecture, estimation of future air traffic, development of new airport, requirements of an ideal airport layout.	**[6]**
Unit 3: Runway and Taxiway Design Wind rose and orientation of runway ,wind coverage and crosswind component, factors affecting runway length, basic runway length, runway geometrics and runway patterns, Runway marking, taxiway geometric elements, layout, exit taxiway, Loading aprons, Holding aprons, Separation Clearance.	**[8]**
Unit 4: Terminal Area and Airport Pavement Terminal area elements and requirements, systems of air parking, gate position and capacity design aircraft parking, Hangars, Typical Airport layouts, maintenance and evaluation of airport pavement, Classification of Aircraft pavement as per ICAO	**[6]**
Unit 5: Grading and Drainage Airport grading importance and requirements, operations, airport drainage characteristics and requirements, surface drainage and its elements, Methods of sub surface drainage.	**[6]**
Unit 6: Air Traffic Control and Visual Aids Air traffic control objectives, control network and control aids, landing aids, airport markings, Elements of airport lighting, Runway Visibility.	**[6]**

Text Books:

1. Robert Horonjeff, Francis X. McKelvey , William J. Sproule, Seth B. Young. Planning and Design of Airports. Tata McGraw Hill Pub. Co., New York
2. Richard de Neufville Amedeo R. Odoni. Airport Systems and Planning, Design and Management. Tata McGraw Hill Pub. Co., New York

Reference Books:

1. Dr. S. K. Khanna, M.G.Arora and S.S. Jain, Airport Planning & Design, Nem Chand & Bros.,Roorkee
2. G.V. Rao Airport Engineering, Tata McGraw Hill Pub. Co., New Delhi
3. S.C.Rangwala and P.S.Rangwala. Airport Engineering, Charotar Publishing House Pvt. Ltd, Anand

Aptitude Skill-II (Numerical Ability)

23HSSM01	**VEC**	**Aptitude Skills- II**	**1-0-0**	**1 Credit**

Teaching Scheme:	**Examination Scheme:**
Lecture: 1 hrs/week	Continuous Assessment -I : 25 Marks Continuous Assessment -II : 25 Marks

Pre-Requisites: Basic Mathematics

Course Outcomes: At the end of the course, students will be able to:

CO1	Make use of multiplications, squares, square roots, cubes and cube roots to solve aptitude problems
CO2	Solve questions based on Number system
CO3	Solve questions based on percentage, average, ratio, proportion, Speed, Time and Distance
CO4	Solve questions based on Profit & Loss and mensurations.

Course Content:

Unit 1: Speed Math Techniques Multiplication, Squares, Square roots, Cubes, Cube roots	**[3]**
Unit 2: Number System Types of Number System, Last Digit Method, BODMAS Calculation, HCF and LCM, Progressions	**[3]**
Unit 3: Basic Aptitude Percentage, Average, Ratio and Proportion, Fraction, Partnership **Speed- Time- Distance** Speed, Time, and Distance, Trains, Boats, Streams, Races	**[3]**
Unit 4: Business Aptitude Profit & Loss, Simple Interest, Compound Interest **Geometry and Venn Diagram** 2D and 3D Mensuration, Venn diagram	**[3]**

Text books:

1. Arun Shrama - Quantitative aptitude for CAT.
2. RS Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S. Chand Publisher; 2016 edition

Reference books:

1. Fast Track Objective Arithmetic Paperback, by Rajesh Verma – 2018
2. Teach Yourself Quantitative Aptitude, Arun Sharma
3. The Pearson Guide To Quantitative Aptitude For Competitive Examination by Dinesh Khattar

Language Skill- II

23HSSM02	**VEC**	**Language Skill- II**	**0-0-2**	**1 Credit**

Teaching Scheme:	**Examination Scheme:**
Practical: 2 hrs/week	Continuous Assessment -I : 25 Marks Continuous Assessment -II : 25 Marks

Pre-Requisites: Language Skill- I

Course Outcomes: At the end of the course, students will be able to:

CO1	Develop programs using Functions.
CO2	Make use of Structures & Union to develop programs in C language
CO3	Make use of Pointers to develop programs in C language
CO4	Develop programs to perform various operations on files using File Handling.

Course Content:

1. Develop programs on using different built-in functions.
2. Develop programs on using function without argument and without return category.
3. Develop programs on using function with argument and without return category.
4. Develop programs on using function without argument and with return category.
5. Develop programs on using function with argument and with return category.
6. Develop programs using more than one used defined functions.
7. Develop programs on recursion.
8. Develop programs on Structure using various entities and size of structure.
9. Develop programs on array of structure.
10. Develop programs on structures and functions and compare structure and union.
11. Develop programs to display different data type of data and their addresses using pointer
12. Develop programs on pointer to array, pointer to structure, pointer to functions and pointer expressions.
13. Develop program to read, write and append data from a file.

Text books:

1. C Programming Absolute Beginner's Guide, Que Publishing; 3rd edition (22 August 2013)
2. C Programming Language 2nd Edition, Peasrson Publication

Reference books:

1. Programming in C Practical Approach by Ajay Mittal, Pearson
2. Let Us C, By Yashwat Kanetkar