

ANNA UNIVERSITY, CHENNAI
NON- AUTONOMOUS COLLEGES
AFFILIATED TO ANNA UNIVERSITY
M.E. CONSTRUCTION ENGINEERING AND MANAGEMENT
REGULATIONS 2025

PROGRAMME OUTCOMES

PO	Programme Outcomes
1	An ability to independently carry out research/investigation and development work to solve practical problems.
2	An ability to write and present a substantial technical report/document.
3	Students should be able to demonstrate a degree of mastery over the area as per the specialization of the programme. The mastery should be at a level higher than the requirements in the appropriate bachelor programme.

PROGRAMME SPECIFIC OUTCOMES

PSO	Programme Specific Outcomes
1	Apply advanced knowledge of construction engineering and management to plan, schedule, execute, and critically analyze projects using modern tools to develop sustainable and resilient infrastructures.
2	Engage in research, innovation, and lifelong learning to address construction challenges, contribute to industry/ academia, and uphold professional and ethical practices.



ANNA UNIVERSITY, CHENNAI

POSTGRADUATE CURRICULUM (NON-AUTONOMOUS AFFILIATED INSTITUTIONS)

Programme: M.E – Construction Engineering and Management **Regulations:** 2025

Abbreviations:

BS – Basic Science (Mathematics)

ES – Engineering Science (General (**G**), Programme Core (**PC**), Programme Elective (**PE**))

SD – Skill Development

OE – Open Elective

T – Theory

LIT – Laboratory Integrated Theory

PW – Project Work

IPW – Internship cum Project Work

TCP – Total Contact Period(s)

Semester I

S. No.	Course Code	Course Title	Type	Periods per week			TCP	Credits	Category
				L	T	P			
1.	MA25C04	Probability, Statistics and Tensor Methods	T	3	0	0	3	3	BS
2.	CN25101	Modern Construction Materials	T	3	0	0	3	3	ES (PC)
3.	CN25102	Project Formulation and Appraisal	T	3	1	0	4	4	ES (PC)
4.	CN25103	Construction Equipment & Management	T	3	0	0	3	3	ES (PC)
5.	ST25C01	Advanced Construction Engineering and Experimental Techniques Laboratory	L	0	0	4	4	2	ES (PC)
6.	CN25104	Technical Seminar	---	0	0	2	2	1	SD
TOTAL							19	16	

Semester II

S. No.	Course Code	Course Title	Type	Periods per week			TCP	Credits	Category
				L	T	P			
1.		Advanced Construction Techniques	T	3	0	0	3	3	ES (PC)
2.		Construction Planning, Costing, Scheduling and Control	T	3	0	0	3	3	ES (PC)
3.		Contract Laws and Regulations	T	3	0	0	3	3	ES (PC)
4.		Programme Elective - I	T	3	0	0	3	3	ES (PE)
5.		Industry Oriented Course I	---	1	0	0	1	1	SD
6.		Construction Management Studio	L	0	0	4	4	2	ES (PC)
7.		Statistical Analysis Laboratory	---	0	0	4	4	2	ES (PC)
8.		Self Learning Course	---	-	-	-	-	1	-
TOTAL							21	18	

Semester III

S. No.	Course Code	Course Title	Type	Periods per week			TCP	Credits	Category
				L	T	P			
1.		Programme Elective - II	T	3	0	0	3	3	ES (PE)
2.		Programme Elective - III	T	3	0	0	3	3	ES (PE)
3.		Programme Elective - IV	T	3	0	0	3	3	ES (PE)
4.		Open Elective	T	3	0	0	3	3	ES (OE)
5.		Industry Oriented Course II	---	1	0	0	1	1	SD
6.		Practical Training (4 weeks)		0	0	0	0	2	SD
7.		Project Work I	---	0	0	12	12	6	SD
TOTAL							25	21	

Semester IV

S. No.	Course Code	Course Title	Type	Periods per week			TCP	Credits	Category
				L	T	P			
1.		Project Work II	---	0	0	24	24	12	SD
TOTAL							24	12	

PROGRAMME ELECTIVE COURSES (PE)

S. No.	Course Code	Course Title	Periods Per week			Credits
			L	T	P	
1.	CN	Advanced Concrete Technology	3	0	0	3
2.	CN	Advanced Data Analysis	3	0	0	3
3.	CN	Construction Project Management	3	0	0	3
4.	CN	Design of Energy Efficient Buildings	3	0	0	3
5.	CN	Economics and Finance Management in Construction	3	0	0	3
6.	CN	Environmental Impact Assessment in Construction Engineering	3	0	0	3
7.	CN	Human Resources Management in Construction	3	0	0	3
8.	CN	Lean Construction Concepts, Tools & Practices	3	0	0	3
9.	ST	Maintenance, Repair and Rehabilitation of Structures	3	0	0	3
10.	CN	Management Information Systems	3	0	0	3
11.	CN	Organizational Behaviour	3	0	0	3
12.	CN	Project Safety Management	3	0	0	3
13.	CN	Quality control and assurance in construction	3	0	0	3
14.	CN	Quantitative Techniques in Management	3	0	0	3
15.	CN	Resource Management and Control in Construction	3	0	0	3
16.	CN	Shoring, Scaffolding and Formwork	3	0	0	3
17.	CN	Supply chain management and Logistics in construction	3	0	0	3
18.	CN	Sustainable Management	3	0	0	3
19.	CN	System Integration in Construction	3	0	0	3
20.	CN	Digital Design and Construction	3	0	0	3

Semester I

MA25C04	Probability, Statistics and Tensor Methods	L	T	P	C
		3	0	0	3

Course Objectives:

- **Understand** the concepts of random variables, correlation, regression, multivariate analysis, and tensor analysis with relevance to engineering applications.
- **Apply** probabilistic and statistical methods to model, analyze, and interpret real-world civil engineering problems such as material strength, traffic flow, and structural reliability.
- **Develop** analytical and computational skills to use tensorial methods in stress-strain analysis and multivariate techniques for data-driven decision-making in civil engineering.

RANDOM VARIABLES: One-dimensional Random Variables, Moments and MGF, Binomial, Poisson, Geometric, Exponential and Normal distributions, Two-dimensional Random Variables, Marginal and Conditional distribution, Covariance and Correlation coefficient, Functions of one-dimensional and two-dimensional Random Variables.

Activities: Problem Solving on beams/columns Failure, Concrete strength Mixture,

CORRELATION AND REGRESSION: Multiple and partial correlation, Method of least squares, Plane of regression, Properties of residuals, Coefficient of multiple correlation, Coefficient of partial correlation, Multiple correlation with total and partial correlations, Regression and partial correlations in terms of lower order co-efficient.

Activities: Regression Analysis in Construction cost, review of competitive exam question papers.

MULTIVARIATE ANALYSIS: Random vectors and matrices, Mean vectors and covariance matrices, Multivariate normal density and its properties, Principal components: Population principal components, Principal components from standardized variables.

Activities: Covariance between rainfall at different stations, Random vector modeling in high-rise structures, Data reduction from satellite images.

Tensor Analysis: Concept of scalars, vectors, and higher-order tensors, Tensor Algebra, Contraction of indices, Symmetric and skew-symmetric tensors, Tensor Calculus: Transformation laws of tensors (Cartesian & curvilinear coordinates), Covariant and contravariant differentiation, Stress and Strain Tensors, Constitutive equations (Hooke's law in tensor form)

Activities: Stress analysis in 2D and 3D continua, Mohr's circle representation, Applications structural mechanics

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.

References:

1. **Papoulis, A. & Pillai, S. U.** *Probability, Random Variables and Stochastic Processes*, McGraw Hill.
2. **Johnson, R. A. & Wichern, D. W.** *Applied Multivariate Statistical Analysis*, Pearson.
3. **Timoshenko, S. and Goodier, J.N.** *Theory of Elasticity*, McGraw Hill.
4. **Chadwick, P.** *Continuum Mechanics: Concise Theory and Problems*, Dover Publications

E-resources:

1. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-041-probabilistic-systems-analysis-and-applied-probability>
2. <https://nptel.ac.in/courses/111/105/111105041>
3. <https://www.colorado.edu/engineering/CAS/courses.d/IFEM.d/Tensor.d/Tensor.pdf>

	Description of CO	PO	PSO1	PSO2
CO1	Apply probability distributions and random variable concepts to model engineering uncertainties.	PO1 (1) PO3 (3)	2	3
CO2	Analyze correlation and regression techniques for predictive modeling in civil engineering applications.	PO2 (1) PO3 (3)	1	3
CO3	Interpret multivariate data using covariance, correlation matrices, and principal component analysis.	PO1 (2) PO3 (3)	1	3
CO4	Utilize tensor analysis for stress-strain representation and elasticity problems in continuum mechanics.	PO1 (1) PO3 (3)	2	2

CN25101	Modern Construction Materials	L	T	P	C
		3	0	0	3
Course Objective: To study and understand the properties of modern construction materials used in construction such as special concretes, metals, composites, water proofing compounds, non-weathering materials, and smart materials.					
Structural Materials: Wood and Wood Product, Metals, Types of Steels, Manufacturing process of steel, Advantages of new alloy steels, Properties and advantages of aluminum and its products, Types of Coatings & Coatings to reinforcement, Applications of Coatings. Activity: Quiz on material properties and processes.					
Non-Structural Materials, Accessories and Finishes: Introduction of Non-Structural Materials and Criteria for Selection, Types and properties of Water Proofing Materials, Types of Non-weathering Materials and its uses, Types of Polymer Floor Finishes, Paint, Tiles, Acoustic Treatment materials, Dry Walls, Anchors. Activity: Review of Question papers (GATE, IES, etc)					
Composites: Types of Plastics, Polymer, Properties & Manufacturing process, Advantages of Reinforced polymers, Types of FRP, FRP on different structural elements, Applications of FRP, Bituminous Materials, Glass, Closure, Environmental Concerns. Activity: Case study analysis on FRP vs conventional reinforcement.					
Special Concretes: Concretes, Behavior of concretes, Properties and Advantages of High Strength and High Performance Concrete, Properties and Applications of Fibre Reinforced Concrete, Self-compacting concrete, Geo Polymer Concrete, Alternate Materials to concrete on high performance & high Strength concrete. Activity: Seminar presentations on new concretes (Geo-polymer, HPC, Nano-concrete).					
Smart and Intelligent Materials: Types & Differences between Smart and Intelligent Materials, Special features, Nano Concrete, Nano Technology in Construction, Case studies showing the applications of smart & Intelligent Materials. Activity: Design-based group project: suggest innovative solutions using smart/FRP/nano materials.					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%					
Assessment Methodology: Quiz - 10%, Assignment – 15%, Report preparation from Case study – 20%, Review of Question papers (GATE, IES, etc) – 15%, Internal Examinations – 40%					

References:

1. Subramanian, N. (2019). *Building materials testing and sustainability*. Oxford Higher Education.
2. Shetty, M. S. (2019). *Concrete technology: Theory and practice*. S. Chand & Company Ltd.
3. Ganapathy, C. (2015). *Modern construction materials*. Eswar Press.
4. Santhakumar, A. R. (2006). *Concrete technology*. Oxford University Press.
5. Ashby, M. F., & Jones, D. R. H. H. (2005). *Engineering materials 1: An introduction to properties, applications and designs*. Elsevier Publications.

	CO Description	PO	PSO1	PSO2
CO1	<i>Describe</i> the characteristics, properties, and manufacturing processes of structural and non-structural construction materials such as wood, steel, aluminum, coatings, and finishes.	-	-	-
CO2	<i>Compare and classify</i> different composites, plastics, polymers, FRPs, and bituminous materials based on their properties and suitability for structural and non-structural applications.	PO1(2) PO3(3)	2	2
CO3	<i>Examine and evaluate</i> the performance of special concretes (high strength, high performance, self-compacting, fibre reinforced, geo-polymer) and recommend alternatives for sustainable construction.	PO2(1) PO3(3)	3	2
CO4	<i>Develop</i> the concepts of smart and intelligent materials, including nano-technology and case-based applications, to propose innovative construction solutions.	PO2(2) PO3(3)	3	2

CN25102	Project Formulation and Appraisal	L	T	P	C
		3	1	0	4
Course Objective: This course aims to equip students with the knowledge and skills to conceptualize, formulate, and appraise development and business projects across various domains. It enables learners to analyse technical, market, financial, environmental, and social aspects of project planning using appropriate tools and methodologies. Students will also develop the ability to prepare and present a comprehensive project proposal that meets industry and stakeholder expectations.					
Fundamentals of Project Formulation: Characteristics, and types of projects - Project Life Cycle: Idea generation to implementation, Project Identification and Screening: Sources of ideas, SWOT analysis, preliminary screening techniques - Pre-feasibility Study: Techno-Economic Feasibility (TEF) Study, Clearances and Approvals, Detailed Project Report (DPR) Activities: Case Study: Review a sample DPR and identify mandatory clearances for projects. Group activity: Idea screening matrix.					
Project Costing and Cash Flow Estimation: Project Costing and Cash Flows: Classification of project costs: Fixed vs. variable, capital vs. operational - Cash Flow Estimation, Time Value of Money (TVM), Concept of average cost of capital (WACC), Cost of debt, preference shares, equity, Role of depreciation in cash flow Activities: Assignment on Worksheet Activity: Prepare a capital cost estimate for a sample project					
Financial Appraisal of Projects: NPV - BCR - IRR - ARR – Urgency, Pay Back Period, Assessment of Various Methods, Indian Practice of Investment Appraisal, International Practice of Appraisal, Analysis of Risk, Sensitivity analysis, Scenario analysis, Break even analysis, Hillier Model, Simulation analysis, Decision tree analysis, Project selection under risk Activities: Review of Question papers : Calculate PV, FV, annuity values using TVM formulas, Quiz					
Project Financing: Concept and structure of project financing, Sources of Finance, : Equity Capital, Preference Capital: Characteristics and role in capital structure, Internal Accruals: Retained earnings and depreciation funds- Debt Financing:Term loans (banks, financial institutions), Debentures and bonds, Working capital finance (cash credit, overdraft) -Miscellaneous Sources:Government grants/subsidies, lease financing, Key Financial Indicators, Capital structure ratios Activities: Case Study: Analyse financing strategies of a real-world infrastructure/start-up project					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%					
Assessment Methodology: Quiz - 10%, Assignment – 15%, Report preparation from					

Case study – 20%, Review of Question papers (GATE, IES, etc) – 15%, Internal Examinations – 40%

References

1. Chandra, P. (2023). Projects: Planning, analysis, selection, financing, implementation and review. McGraw Hill Education.
2. Machiraju, H. R. (2019). Introduction to project finance. Vikas Publishing House.
3. Agarwal, N. P., & Mishra, B. K. (2021). Project appraisal and financing. Himalaya Publishing House.
4. Esty, B. C. (2020). Modern project finance: A casebook. John Wiley & Sons.
5. United Nations Industrial Development Organization (UNIDO). (2018). Manual for the preparation of industrial feasibility studies. UNIDO.

E-Resources

1. World Bank – Project Appraisal Documents (PADs)<https://projects.worldbank.org>
2. MSME Project Profiles (Govt. of India)<https://msme.gov.in>
3. Microsoft Excel Templates for Financial Analysis<https://templates.office.com>

	CO Description	PO	PSO1	PSO2
CO1	<i>Explain</i> the fundamentals of project formulation, life cycle stages, and project identification and screening techniques.	-	-	-
CO2	<i>Apply</i> pre-feasibility and techno-economic feasibility (TEF) tools to evaluate project viability and prepare preliminary project reports.	PO1(1) PO2(3)	2	3
CO3	<i>Analyze</i> project costing, cash flow estimation, and apply time value of money (TVM) concepts for financial decision-making.	PO2(3) PO3(2)	1	3
CO4	<i>Evaluate</i> investment appraisal methods and financing options to recommend optimal project selection and funding strategies under risk and uncertainty.	PO2(3) PO3(2)	2	2

CN25103	Construction Equipment and Management	L	T	P	C
		3	0	0	3
Course Objective: To study and understand the various types of equipment used for earthwork, tunneling, drilling, blasting, dewatering, material handling conveyors and its applications in construction projects.					
Construction Equipment Selection: Identification, Planning of equipment, Selection of Equipment, Equipment Management in Projects, Maintenance Management, Equipment cost, Operating cost, Cost Control of Equipment, Depreciation Analysis, Replacement of Equipment, Replacement Analysis, Safety Management. Activity: Mini-project: prepare cost control measures for a fleet of equipment.					
Equipment for Earthwork: Fundamentals of Earth Work Operations, Earth Moving Operations, Types of Earth Work Equipment, Tractors, Motor Graders, Scrapers, Front end Waders, Dozer, Excavators, Rippers, Loaders, trucks and hauling equipment, Compacting Equipment, Finishing equipment. Activity: Field visit: observe equipment at a construction site or plant.					
Other Construction Equipment: Equipment for Dredging, Trenching, Drag line and clamshells, Tunneling, Equipment for Drilling and Blasting, Pile driving Equipment, Erection Equipment, Crane, Mobile crane, Types of pumps used in Construction, Equipment for Dewatering and Grouting, Equipment for Demolition. Activity: Flipped classroom sessions on equipment for demolition.					
Asphalt and Concreting Equipment: Aggregate production, Different Crushers, Feeders, Screening Equipment, Handling Equipment, Batching and Mixing Equipment, Pumping Equipment, Ready mix concrete equipment, Concrete pouring equipment. Asphalt Plant, Asphalt Pavers, Asphalt compacting Equipment. Activity: Case study Presentation					
Materials Handling Equipment: Forklifts and related equipment, Portable Material Bins, Material Handling Conveyors, Material Handling Cranes, Industrial Trucks.					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%					
Assessment Methodology: Quiz - 10%, Assignment – 15%, Report preparation from Case study – 20%, Review of Question papers (GATE, IES, etc) – 15%, Internal Examinations – 40%					
References: 1. Peurifoy, R. L., Schexnayder, C., & Shapira, A. (2010). <i>Construction planning, equipment and methods</i> . McGraw Hill. 2. Granberg, G., & Popescu, M. (2006). <i>Construction equipment and management for engineers, estimators and owners</i> . Taylor and Francis Publishers. 3. Deodhar, S. V. (2001). <i>Construction equipment and job planning</i> . Khanna Publishers.					

4. Arora, S. P., & Bindra, S. P. (2010). *Building construction, planning techniques and method of construction*. Dhanpat Rai and Sons.
5. Sharma, S. C. (2019). *Construction equipment and management*. Khanna Publishers.

	CO Description	PO	PSO1	PSO2
CO1	<i>Explain</i> the principles of construction equipment selection, planning, operation, maintenance, and cost management.	-	-	-
CO2	<i>Classify and compare</i> different types of equipment used in earthwork, asphalt, concrete, and material handling operations based on their functions and performance.	PO1(2) PO3(3)	3	1
CO3	<i>Apply</i> knowledge of construction equipment, including safety and productivity aspects, to plan equipment usage for various project scenarios.	PO2(2) PO3(3)	2	1
CO4	<i>Analyze</i> equipment costs, operating expenses, depreciation, and replacement alternatives to support effective equipment management decisions.	PO2(3) PO3(3)	2	2

ST25C01	Advanced Construction Engineering and Experimental Techniques Laboratory	L	T	P	C
		0	0	4	2
Course Objective: To provide a thorough knowledge of material selection through the material testing based on specification. To provide a detailed account of modern experimental techniques in construction Engineering research. To introduce the basic working principles, the operational know-how, and the strength and limitations of the techniques.					
List of Exercises 1. Mix design of concrete as per BIS methods for high performance concrete. 2. Flow Characteristics of Self Compacting concrete. 3. Workability, strength and durability of concrete made using minerals and chemical admixtures 4. NDT on hardened concrete - UPV, Rebound hammer and core test. 5. RCC Beam two-point flexural testing 6. Permeability test on hardened concrete (RCPT) – Demonstration 7. Density, Mass fraction, tensile strength and modulus of elasticity of modern construction materials – GFRP, CFRP laminates 8. Determination of elastic constants – Hyperbolic fringes 9. Determination of elastic constants – Elliptical fringes 10. Strain gauge meter – Determination of Young’s modulus of a metallic wire 11. Ultrasonic interferometer – ultrasonic velocity in liquids 12. Electrical conductivity of metals and alloys with temperature-four probe method 13. Resistivity measurements 14. NDT – Ultrasonic flaw detector 15. Calibration of Proving Ring and LVDT					
Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%					
Assessment Methodology: Project (30%), Assignment (10%), Practical (30%), Internal Examinations (30%)					
References: 1. Bureau of Indian Standards. (2019). IS 10262: Concrete mix proportioning - Guidelines. Bureau of Indian Standards. 2. American Concrete Institute. (n.d.). ACI 211: Standard practice for selecting proportions for normal, heavyweight, and mass concrete. American Concrete Institute. 3. British Standards Institution. BS EN 206 and BS 8500 4. Bureau of Indian Standards. IS 13311, IS 18256, IS 18255					
E - Resources 1. Virtual lab, Smart Structures and Dynamics Laboratory, https://vssd-iitd.vlabs.ac.in/ 2. Virtual lab, Concrete Structures lab, https://cs-iitd.vlabs.ac.in/					

	CO Description	PO Mapping	PSO1	PSO2
CO1	Illustrate the modern experimental techniques in construction Engineering research.	PO1 (3) PO2 (2) PO3 (1)	2	2
CO2	Integrate the analytical techniques and graphical analysis to interpret the experimental data	PO1 (3) PO2 (2) PO3 (1)	1	3