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

TCP – Total Contact Period(s)

T – Theory

LIT – Laboratory Integrated Theory

PW – Project Work

IPW – Internship cum Project Work

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.	CN25201	Advanced Construction Techniques	T	3	0	0	3	3	ES (PC)
2.	CN25202	Construction Planning, Costing, Scheduling and Control	T	3	0	0	3	3	ES (PC)
3.	CN25203	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.	CN25204	Construction Management Studio	L	0	0	4	4	2	ES (PC)
7.	CN25205	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.		Programme Elective - V	T	3	0	0	3	3	ES (PE)
5.		Industry Oriented Course II	---	1	0	0	1	1	SD
6.	CN25301	Practical Training (4 weeks)		0	0	0	0	2	SD
7.	CN25302	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.	CN25401	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.	CN25C01	Advanced Concrete Technology	3	0	0	3
2.	CN25001	Advanced Data Analysis	3	0	0	3
3.	CN25002	Construction Project Management	3	0	0	3
4.	CN25003	Design of Energy Efficient Buildings	3	0	0	3
5.	CN25004	Economics and Finance Management in Construction	3	0	0	3
6.	CN25005	Environmental Impact Assessment in Construction Engineering	3	0	0	3
7.	CN25006	Human Resources Management in Construction	3	0	0	3
8.	CN25007	Lean Construction Concepts, Tools & Practices	3	0	0	3
9.	ST25C02	Maintenance, Repair and Rehabilitation of Structures	3	0	0	3
10.	CN25008	Management Information Systems	3	0	0	3
11.	CN25009	Organizational Behaviour	3	0	0	3
12.	CN25010	Project Safety Management	3	0	0	3
13.	CN25011	Quantitative Techniques in Management	3	0	0	3
14.	CN25012	Resource Management and Control in Construction	3	0	0	3
15.	CN25013	Shoring, Scaffolding and Formwork	3	0	0	3
16.	CN25014	Supply chain management and Logistics in construction	3	0	0	3
17.	CN25015	Sustainable Management	3	0	0	3
18.	CN25016	System Integration in Construction	3	0	0	3
19.	CN25017	Digital Design and Construction	3	0	0	3
20.	CN25018	Quality Control and Assurance in 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	*Describe* the characteristics, properties, and manufacturing processes of structural and non-structural construction materials such as wood, steel, aluminum, coatings, and finishes.	-	-	-
CO2	*Compare and classify* 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	*Examine and evaluate* 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	*Develop* 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 Analysishttps://templates.office.com

	CO Description	PO	PSO1	PSO2
CO1	*Explain* the fundamentals of project formulation, life cycle stages, and project identification and screening techniques.	-	-	-
CO2	*Apply* pre-feasibility and techno-economic feasibility (TEF) tools to evaluate project viability and prepare preliminary project reports.	PO1(1) PO2(3)	2	3
CO3	*Analyze* project costing, cash flow estimation, and apply time value of money (TVM) concepts for financial decision-making.	PO2(3) PO3(2)	1	3
CO4	*Evaluate* 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). *Construction planning, equipment and methods*. McGraw Hill.
2. Granberg, G., & Popescu, M. (2006). *Construction equipment and management for engineers, estimators and owners*. Taylor and Francis Publishers.
3. Deodhar, S. V. (2001). *Construction equipment and job planning*. 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.

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	CO Description	PO	PSO1	PSO2
CO1	*Explain* the principles of construction equipment selection, planning, operation, maintenance, and cost management.	-	-	-
CO2	*Classify and compare* 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	*Apply* knowledge of construction equipment, including safety and productivity aspects, to plan equipment usage for various project scenarios.	PO2(2) PO3(3)	2	1
CO4	*Analyze* 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/
   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

Semester II

CN25201	Advanced Construction Techniques	L	T	P	C
		3	0	0	3

Course Objective:

This course introduces students to advanced construction practices in substructure and superstructure works. It covers erection techniques for tall and special structures, rehabilitation strategies, demolition methods, and modern materials and also promotes activity-based learning through practical exposure and real-time applications.

Sub-Structure Construction

Construction of diaphragm walls, H walls and basement – Shoring for deep cutting – Underpinning – Trenchless technology – Box jacking, Pipe jacking – Tunneling techniques – Piling techniques – Driving well and caisson – Sinking cofferdam – Cable anchoring and grouting – Sheet piling – Dewatering techniques and well points – Offshore system laying operations.

Activity: Poster Presentation on Trenchless Methods

Superstructure Construction for Buildings

Techniques of construction for continuous concreting in tall buildings with varied shapes and sections – Erection of tall structures and large span structures – In-situ prestressing, post-tensioning of slabs – Aerial transporting and erection of lightweight components – Composite construction of steel and concrete – Metal deck roofing/flooring – Rapid construction methods – Concrete paving technology – Vacuum dewatering techniques.

Activity: Field Visit to a Major Construction Site

Construction of Special Structures

Construction sequences in skyscrapers, cooling towers, silos, chimneys – Erection of lattice towers, transmission line structures – Bow string bridges, cable stayed bridges – Launching and pushing of box decks – Domes – Support structures for heavy machinery – Jetties and breakwater structures – Space deck and articulated structures – Precast component erection and temporary supports.

Rehabilitation and Strengthening Techniques

Seismic retrofitting – Strengthening techniques for beams, columns, slabs and masonry walls – Foundation strengthening using mud jacking, grouting, micro piling and underpinning – Subgrade waterproofing – Soil stabilization – Structural protection and corrosion mitigation.

Activity: Reproduction and Discussion of a Research Paper on Retrofitting Techniques

Demolition Techniques and Construction Materials

Demolition methods – Mechanical, explosive and robotic techniques – Demolition sequence and dismantling – Safety in demolition – Introduction to material structure and properties – High performance concrete – Metals and special steel alloys – Glass and glazing – Plastics and polymer composites – Membranes, adhesives and coatings – Flooring and facade materials.

Activity: Quiz on Demolition and Construction Materials / Safety Simulation Exercise.

References:

1. Varghese P.C., Building Construction, Prentice Hall of India, 2016.
2. Jha J., Construction Techniques and Practices, Pearson Education, 2018. Peurifoy R.L., Construction Planning, Equipment and Methods, Tata McGraw Hill, 2019.
3. Neville A.M., Properties of Concrete, 5th Edition, Pearson Education, 2016.
4. Mehta P.K. and Monteiro P.J.M., Concrete: Microstructure, Properties and Materials, McGraw Hill, 2017.

E-Resources:

- NPTEL: Advanced Concrete Construction Technology – IISc Bangalore
- NPTEL: Construction Methods and Equipment – IIT Kanpur

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

Assessment Methodology: Poster presentation (10%), Quiz (10%), Assignment (20%), Field visit/Case study report (20%), Internal Examinations (40%)

	CO Description	PO	PSO1	PSO1
CO1	**Explain** the methods and equipment used in sub-structure and superstructure construction, including trenchless, piling, dewatering, and tall-building techniques.	-	-	-
CO2	**Apply** appropriate construction techniques for special structures such as bridges, towers, domes, and heavy-machinery support systems.	PO1 (2) PO3 (3)	3	2
CO3	**Analyze** various rehabilitation, strengthening, and retrofitting methods for structural and geotechnical systems.	PO1 (3) PO2 (2) PO3 (3)	3	2
CO4	**Evaluate** demolition techniques and advanced construction materials for safe, efficient, and sustainable project execution.	PO1 (3) PO2 (3) PO3(3)	2	3

CN25202	Construction Planning, Costing, Scheduling and Control	L	T	P	C
		3	0	0	3

Course Objective:

The course objectives include understanding the various concepts of planning and impart the concepts in network representation and analysis, Precedence network analysis, resource scheduling and project monitoring.

Construction Planning

Basic Concepts in the Development of Construction Plans – Choice of Technology and Construction Method – Defining Work Tasks and Work Break down Levels – Defining Precedence Relationships among Activities – Estimating Activity Durations – Estimating Resource Requirements for Work Activities – Coding Systems.

Activity: Preparation of a work plan, estimating activity duration for a construction project.

Scheduling Procedures and Analysis

Duration Estimation – Gantt / Bar Chart – Types of Network and Techniques – Introduction to Floats, Types of Floats, usage of Floats for Project Decisions - Presenting Project Schedules – Scheduling for Activity-on-Node and with Leads, Lags, and Windows – Critical Path Method (CPM) Network Analysis - PERT Network Modeling and Time Analysis - Calculations for Monte Carlo Schedule Simulation - Crashing and Time/Cost Trade-offs.

Activity: Case study for CPM/ PERT network analysis for a major construction project.

Precedence Network Analysis and Database Management

Introduction to Precedence Diagramming Method (PDM) - PDM network representation, Procedure and Analysis, Issues in PDM, Defining Relationship, Project Monitoring and Control Process - Organizing Information in Databases - Relational Model of Databases - Centralized Database Management Systems.

Activity: Seminar Presentation on PDM/ DBMS

Scheduling Project Work and Resources

Work Scheduling Fundamentals – Bar chart method of Work scheduling – Network Based Project Scheduling – Line of Balance Scheduling for Repetitive Projects - Scheduling with Uncertain Durations – Resources Scheduling Considerations –Case Illustrations – Use of Project management Software for scheduling Process.

Activity: Poster presentation on Project scheduling

Project Monitoring and Quality Control

The Cost Control Approach – Project Budget - Direct and Indirect Cost Control – Activity Cost Control – Financial Accounting Systems and Cost Accounts – Control of Project Cash Flows - Performance Control using Earned Value Management Concepts – Time progress monitoring and Controlling – Time Reduction Techniques – Guidelines for reviewing project Time and Cost Progress – Quality control by statistical methods.

Activity: Mini project on estimation of project costs and project budget in an infrastructure project.

References

1. Albert Lester, Project Management, Planning and Control, 7th Edition, Butterworth Heinemann, USA, 2017.
2. Chitkara K K., Construction project management, planning, scheduling and control, McGraw Hill (INDIA) publishers, New Delhi, third edition 2014.
3. Chris Hendrickson and Tung Au, Project Management for Construction – Fundamental Concepts for Owners, Engineers, Architects and Builders, Prentice Hall, Pittsburgh, 2000.
4. Calin M. Popescu, Chotchai Charoenngam, Project Planning, Scheduling and Control in Construction: An Encyclopaedia of terms and Applications, Wiley, New York, 1995.
5. Halpin, D. W., Financial and Cost Concepts for Construction Management, John Wiley & Sons, New York, 1985.

E-Resources

1. https://download.e-bookshelf.de/download/0002/3724/81/L-G-0002372481-0003338618.pdf
2. https://archive.nptel.ac.in/courses/105/103/105103093/
3. https://nptel.ac.in/courses/105106149

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

Assessment Methodology: Poster presentation (10%), Quiz (10%), Assignment (20%), Field visit/Case study report (20%), Internal Examinations (40%)

	CO Description	PO	PSO1	PSO1
CO1	**Explain** the concepts of construction planning, work breakdown structures, activity relationships, and duration/resource estimation.	-	-	-
CO2	**Apply** CPM, PERT, and precedence-based scheduling techniques to develop and analyze project schedules.	PO1 (2) PO3 (3)	3	2
CO3	**Analyze** project information using PDM, database management concepts, and project monitoring tools for effective decision-making.	PO1 (3) PO2 (2) PO3 (3)	3	2
CO4	**Evaluate** project performance through cost control, earned value analysis, and quality control techniques to support timely and cost-effective delivery.	PO1 (3) PO2 (3) PO3(3)	2	3

CN25203	Contract Laws and Regulations	L	T	P	C
		3	0	0	3

Course Objective:

- To study the various types of construction contract and their legal aspects and provisions,
- To learn concepts in Tenders, To learn concepts in Arbitration and legal requirements,
- To study the concepts in labour regulations.

Construction Contracts

Indian Contracts Act – Elements of Contracts – Types of Contracts – Features – Suitability – Design of Contract Documents – International Contract Document – Standard Contract Document – Law of Torts.

Activity: Poster presentation Indian Standard Contract Conditions

Tenders

Prequalification – Bidding – Accepting – Evaluation of Tender from Technical, Contractual and Commercial Points of View – Contract Formation and Interpretation – Potential Contractual Problems – World Bank Procedures and Guidelines – Tamilnadu Transparency in Tenders Act.

Activity: Prepare a tender notice and prequalification document for a public project.

Arbitration

Comparison of Actions and Laws – Agreements – Subject Matter – Violations – Appointment of Arbitrators – Conditions of Arbitration – Powers and Duties of Arbitrator – Rules of Evidence – Enforcement of Award – Costs.

Activity: Quiz

Legal Requirements

Insurance and Bonding – Laws Governing Sale, Purchase and Use of Urban and Rural Land – Land Revenue Codes – Tax Laws – Income Tax, Sales Tax, Excise and Custom Duties and their Influence on Construction Costs – Legal Requirements for Planning – Property Law – Agency Law – Local Government Laws for Approval – Statutory Regulations.

Activity: Assignment on different laws

Labour Regulations

Social Security – Welfare Legislation – Laws relating to Wages, Bonus and Industrial Disputes, Labour Administration – Insurance and Safety Regulations – Workmen's Compensation Act – Indian Factory Act – Tamilnadu Factory Act – Child Labour Act - Other Labour Laws.

Activity: Examine a case study for compliance with labour laws & safety norms

References:

1. Gajaria G.T., Laws Relating to Building and Engineering Contracts in India, 2000.
2. Jimmie Hinze, Construction Contracts, McGraw Hill, 3rd Edition, 2013.
3. Ali D. Haidar, Handbook of Contract Management in Construction, Springer Cham, 1st Edition, 2021
4. Patil. B.S, Civil Engineering Contracts and Estimates, Universities Press (India) Private Limited, 4th Edition 2015.
5. Dharmendra Rautray, Principles of Law of Arbitration in India, Wolters Kluwer, 2018.

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

Assessment Methodology: Poster presentation (10%), Quiz (10%), Assignment (20%), Field visit/Case study report (20%), Internal Examinations (40%)

	CO Description	PO	PSO1	PSO1
CO1	**Explain** the principles of contracts, tendering procedures, and the legal framework governing construction projects.	-	-	-
CO2	**Apply** appropriate forms of contracts, tender evaluation methods, and documentation practices in construction procurement.	PO1 (2) PO3 (2)	3	2
CO3	**Analyze** arbitration procedures, contractual disputes, and legal obligations related to land, taxation, insurance, and statutory approvals.	PO1 (2) PO3 (3)	3	2
CO4	**Evaluate** labour regulations, safety provisions, and compliance requirements to ensure ethical and legally sound construction practices.	PO1 (3) PO2 (2) PO3(3)	3	3

CN25204	Construction Management Studio	L	T	P	C
		0	0	4	2

Course Objective: This course aims to equip students with practical exposure to modern project planning and management tools. It trains students in the use of spreadsheet applications, estimation software, and advanced construction management tools like Primavera, MS Project, BIM and Navisworks to emphasis on real-time project scheduling, simulation-based risk analysis, and progress tracking.

List of Experiments (Total: 60 Hours)

1. Scheduling of a small construction project using Primavera including report generation and progress tracking.
2. Scheduling of a small construction project using MS Project, including Gantt chart preparation, report generation, and project tracking.
3. Development of simulation models for project risk analysis.
4. Virtual progress tracking of a construction project using Navisworks Manage.
5. Modeling of a small building project using Building Information Modeling (BIM) platforms such as Revit.

Activities

- Flipped classroom approach to scheduling tools
- Mini-project submission using BIM and scheduling integration
- Poster presentation on risk management techniques

E-Resources:

- **NPTEL Course**: Project Management for Construction
- **TOOLS/SOFTWARES:**
  - **Primavera P6** – Oracle
  - **MS Project** – Microsoft
  - **Navisworks Manage** – Autodesk
  - **Revit Architecture (for BIM)** – Autodesk

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

Assessment Methodology: Project (30%), Assignment (10%), Practical (30%), Internal Examinations (30%)

	CO Description	PO	PSO1	PSO1
CO1	**Apply** project scheduling techniques and digital project management tools (Primavera, MS Project, Navisworks, and BIM platforms) to plan, model, and track construction project progress.	PO1 (2) PO2 (2) PO3 (3)	3	2

	CO Description	PO	PSO1	PSO1
CO2	**Analyze** project risks, uncertainties, and performance deviations using simulation models and digital progress-tracking methods to support informed project decisions.	PO1 (3) PO2 (2) PO3 (3)	3	3

CN25205	**Statistical Analysis Laboratory**	L	T	P	C
		0	0	4	2

List of Experiments:

1. Descriptive Statistics: frequency distribution, Applications (Charts, Graphs etc.)
2. Use of statistical packages Correlation, ANOVA, Cross Tabulation, *t*- Test and Simple and Multiple Regression
3. Solving Linear Programming Problems, Transportation and Assignment Models
4. Solving Network Flow Models
5. Solving Decision making Problems in Project Management

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

Assessment Methodology: Project (30%), Assignment (10%), Practical (30%), Internal Examinations (30%)

	CO Description	PO	PSO1	PSO1
CO1	**Apply** statistical techniques and analytical tools—including descriptive statistics, correlation, ANOVA, regression, and optimization models—to analyze engineering and management data.	PO1 (2) PO2 (2) PO3 (3)	3	2
CO2	**Analyze** real-world decision-making and project management problems using linear programming, network flow models, and quantitative decision-support techniques.	PO1 (3) PO2 (2) PO3 (3)	3	3

Semester III

CN25301	Practical Training (4 Weeks)	L	T	P	C
		0	0	0	2

Course Objective:

To train the students in the field work so as to have first-hand knowledge of practical problems related to Structural Engineering in carrying out engineering tasks.

Students are required to undergo a four-week practical training programme during the summer vacation in reputed engineering companies specializing in Construction Engineering and Management. Upon completion of the training, each student must submit a detailed report documenting the work carried out, within ten days from the commencement of the subsequent semester. The performance of the students will be assessed through a viva-voce examination conducted by a panel of internal faculty members.

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

Assessment Methodology: Project (30%), Assignment (10%), Practical (30%), Internal Examinations (30%)

	CO Description	PO	PSO1	PSO2
CO1	Apply construction engineering and management knowledge and industry practices to understand real-time project execution and professional environments.	PO1 (3) PO3 (3)	3	2
CO2	Prepare and present a comprehensive training report and demonstrate effective technical communication during viva-voce.	PO2 (3) PO3 (2)	1	2

CN25302	Project Work I	L	T	P	C
		0	0	12	6

Course Objective:

To identify a specific problem for the current need of the society and collect information related to the same through a detailed review of literature. To develop the methodology to solve the identified problem. To train the students in preparing project reports and to face reviews and viva-voce examinations.

The student shall individually undertake a project on a topic approved by a faculty member with expertise in the chosen area of specialization. The topic may be experimental, analytical, or based on case studies, and must be relevant to the student's programme specialization. By the end of the semester, the student must submit a detailed project report that includes a clear statement of the problem, an extensive literature review, and a well-defined methodology for carrying out the work. The evaluation will be based on a viva-voce examination conducted by a panel of examiners, comprising internal faculty and an external examiner.

References:

1. R. Ganesan, “Research Methodology for Engineers”, MJP Publishers, 2020.
2. Cooper Donald R, Schindler Pamela S and Sharma JK, “Business Research Methods”, Tata McGraw Hill Education, 12e (2018).
3. Catherine J. Holland, “Intellectual property: Patents, Trademarks, Copyrights, Trade Secrets”, Entrepreneur Press, 2007.
4. David Hunt, Long Nguyen, Matthew Rodgers, “Patent searching: tools & techniques”, Wiley, 2012.

E - Resources

1. NOC:Qualitative Research Methods and Research Writing, Prof. Aradhna Malik, IIT Kharagpur, https://archive.nptel.ac.in/courses/127/105/109105115/
2. NOC: Research Methodology, Prof. Soumitro Banerjee IIT Madras, https://archive.nptel.ac.in/courses/127/106/127106227/

	CO Description	PO	PSO1	PSO2
CO1	Formulate a construction engineering problem through systematic literature review and define clear research objectives aligned with the programme specialization.	PO1 (3) PO3 (3)	3	2
CO2	Develop and document a suitable methodology and present the project findings effectively through a detailed technical report and viva-voce examination.	PO1 (2) PO2 (3) PO3 (2)	2	3

CN25401	Project Work II	L	T	P	C
		0	0	24	12

Course Objective: To solve the identified problem based on the formulated methodology. To develop skills to analyze and discuss the test results, and make conclusions.

The student shall continue the work initiated in Phase I, following the approved methodology and research plan. By the end of the semester, upon satisfactorily completing the project work to the approval of the supervisor and the review committee, the student must prepare a detailed project report and submit it to the Head of the Department. The evaluation will be based on the quality of the report and performance in the viva-voce examination conducted by a panel of examiners, which shall include an external examiner.

References:

1. Cooper Donald R, Schindler Pamela S and Sharma JK, “Business Research Methods”, Tata McGraw Hill Education, 12e (2018).
2. Catherine J. Holland, “Intellectual property: Patents, Trademarks, Copyrights, Trade Secrets”, Entrepreneur Press, 2007.
3. David Hunt, Long Nguyen, Matthew Rodgers, “Patent searching: tools & techniques”, Wiley, 2012.

E - Resources

1. NOC:Qualitative Research Methods and Research Writing, Prof. Aradhna Malik, IIT Kharagpur, https://archive.nptel.ac.in/courses/127/105/109105115/
2. NOC: Research Methodology, Prof. Soumitro Banerjee IIT Madras, https://archive.nptel.ac.in/courses/127/106/127106227/

	CO Description	PO	PSO1	PSO2
CO1	Execute the research methodology formulated in Phase I and carry out advanced experimental, analytical, or simulation work leading to meaningful findings in the chosen specialization.	PO1 (3) PO3 (3)	3	2
CO2	Prepare a well-structured dissertation and defend the research outcomes effectively through a comprehensive viva-voce examination.	PO1 (2) PO2 (3) PO3 (2)	2	3

PROGRAMME ELECTIVE COURSES

CN25C01	Advanced Concrete Technology	L	T	P	C
		3	0	0	3

Course Objective: This course aims to provide students with a comprehensive understanding of the behavior, composition, and performance characteristics of advanced concrete materials. It focuses on modern developments such as chemical and mineral admixtures, high-performance and lightweight concrete, and innovative technologies for sustainable construction.

Concrete Characteristics:

Review of cement chemistry and hydration mechanisms- Properties of fresh and hardened concrete- Microstructure of concrete – ITZ, porosity, permeability - Rheology of concrete and workability measurements- Durability concepts – carbonation, chloride ingress, sulphate attack- Testing methods for strength and durability- Process of manufacturing of concrete - various stages - Batching methods - Mixing methods methods of transportation. Compacting - Curing - Finishing.

Activity: Poster presentation on the concrete production cycle

Admixtures in Concrete

Classification and role of admixtures- Superplasticizers, retarders, accelerators, air entrainers- Mineral admixtures – fly ash, silica fume, GGBS, metakaolin- Compatibility issues between cement and admixtures- Nanomaterials in concrete (nano-silica, carbon nanotubes)- Performance-based mix design with admixtures - Secondary Cementitious Materials –characteristics – effects in fresh concrete – effects in hardened concrete– uses - Metakaolin – application. Advantages – uses.

Activity: Prepare a performance-based mix using superplasticizer and one SCM

Lightweight and High-Performance Concrete

Classification and properties of lightweight concrete- Structural lightweight concrete – aggregates, mix proportioning- Foam concrete and aerated concrete- High-Performance Concrete (HPC) and Ultra-High Performance Concrete (UHPC)- Fiber Reinforced Concrete (FRC) – steel, glass, synthetic fibers- Self-Compacting Concrete (SCC) – design and applications- Applications, Blended cement concrete - Definition - Characteristics – Types.

Activity: Quiz

Sustainable and Green Concrete

Environmental impact of cement and concrete industry- Use of recycled aggregates, construction & demolition waste- Alkali-activated materials and geopolymer concrete - Carbon capture and utilization in concrete - Life Cycle Assessment (LCA) of concrete - IS/ASTM/EN standards for sustainable concrete.

Activity: Case study report on the feasibility of using C&D waste in concrete for a sample project.

Special Concretes and Future Trends

High strength concrete, mass concrete - Reactive powder concrete, roller-compacted concrete - Smart concrete – self-healing, piezoelectric, 3D printable concrete - Underwater concrete and shotcrete- Concrete for extreme environments – marine, nuclear, arctic - Trends in AI/ML in concrete mix design and performance prediction.

Activity: Assignment on special concrete

References:

1. M. Neville – Properties of Concrete, Pearson
2. M.S. Shetty – Concrete Technology, S. Chand
3. Mehta and Monteiro – Concrete Microstructure, Properties, and Materials, McGraw-Hill
4. IS: 456, IS: 10262, ASTM and EN standards

Recent journal articles from Cement and Concrete Research, ACI Materials Journal, etc

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

Assessment Methodology: Poster presentation (10%), Quiz (10%), Assignment (20%), Field visit/Case study report (20%), Internal Examinations (40%)

	CO Description	PO	PSO1	PSO1
CO1	Explain the characteristics, behavior, and performance requirements of various concrete types including HPC, SCC, lightweight, sustainable, and special concretes.	-	-	-
CO2	Analyze the influence of admixtures, SCMs, nanomaterials, and rheological factors on fresh and hardened concrete properties.	PO1 (2) PO3 (3)	3	2
CO3	Design concrete mixes (HPC/UHPC/SCC/lightweight/sustainable) using performance-based, codal, and material-optimized approaches.	PO2 (2) PO3 (3)	3	2
CO4	Evaluate durability, microstructure, and long-term performance of modern and special concretes using advanced testing and characterization methods.	PO1 (2) PO2 (3) PO3(3)	2	3

CN25001	Advanced Data Analysis	L	T	P	C
		3	0	0	3

Course Objective: To provide advanced knowledge of statistical and multivariate data analysis techniques and enable students to apply regression, classification, clustering, and advanced modeling methods for real-world data interpretation and decision-making.

Statistical Foundations for Data Analysis:

Data and statistics: types and scales of measurement - Review of basic statistical measures - Probability concepts and probability distributions - Sampling distributions – Parametric -hypothesis testing - Non-parametric tests and applications.

Activity: Assignment on Statistical analysis of a sample dataset using R/SPSS/Python

Multivariate Data Analysis Concepts & Model Building

Introduction to multivariate data analysis - Univariate, bivariate, and multivariate techniques - Types and classification of multivariate techniques - Guidelines for multivariate analysis - Approaches to multivariate model building - Interpretation of multivariate results

Activity: Poster presentation on Model selection strategy for a given application

Regression and Factor-Based Techniques

Simple and multiple linear regression - Least squares estimation - Model diagnostics and validation - Inference from regression models - Factor analysis: Objectives and approaches, Methods of estimation, Factor rotation and factor scores, Variance explained and interpretation - Canonical correlation analysis: Objectives and interpretation

Activity: Hands-on exercise on Regression modeling and diagnostics using software

Classification, Clustering & Advanced Modeling Techniques

Discriminant analysis: Classification of populations, Model validation and accuracy assessment, Cluster analysis: Similarity and distance measures, Hierarchical and non-hierarchical clustering, Interpretation and validation, Conjoint analysis: Attributes, preferences, utility estimation, Multidimensional scaling (MDS): Attribute and non-attribute based techniques, Introduction to Structural Equation Modeling (SEM)

Activity: Case study on Market or engineering decision using conjoint analysis

References:

1. Joseph F Hair, Rolph E Anderson, Ronald L. Tatham& William C. Black, Multivariate Data Analysis, Pearson Education, New Delhi, 2005.
2. Barbara G. Tabachnick, Linda S.Fidell, Using Multivariate Statistics, 6th Edition, Pearson, 2018.
3. Richard A Johnson and Dean W.Wichern, Applied Multivariate Statistical Analysis, Prentice Hall, New Delhi, 2007.
4. David R Anderson, Dennis J Sweeney and Thomas A Williams, Statistics for Business and Economics, Thompson, Singapore, 2017.
5. Howard E.A. Tinsley & Steven D. Brown, Handbook of Applied Multivariate Statistics & Mathematical modeling, Academic Press, 2000.

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%
Assessment Methodology: Poster presentation (10%), Quiz (10%), Assignment (20%), Field visit/Case study report (20%), Internal Examinations (40%)

	CO Description	**PO Mapping**	**PSO1**	**PSO2**
CO1	Explain appropriate statistical and probability concepts to analyze and interpret data.	-	-	-
CO2	Select and implement suitable multivariate and regression models for real-world datasets.	PO1 (3) PO3 (2)	3	1
CO3	Evaluate classification, clustering, and factor-based techniques for decision-making problems.	PO1 (3) PO2 (3)	2	3
CO4	Use statistical software tools (R/SPSS/Python) to build, validate, and interpret data analysis models.	PO1 (3) PO3 (2)	3	2

CN25002	Construction Project Management	L	T	P	C
		3	0	0	3

Course Objective:

This course aims to provide students with a comprehensive understanding of the construction project life cycle, including planning, cost estimation, resource management, and project closure. It equips learners with the tools and techniques required to estimate costs, allocate resources efficiently, and monitor project progress using industry-relevant methods.

Construction Project Perspectives

Construction Project Life Cycle - Types of Construction - Selection of Professional Services -Stake-holders in Construction Project - Structure of Project Organization - Perspectives of Owners& Builders -Role of Project Managers - Financing of Constructed Facilities -Design and Construction as an Integrated Process - Design Concepts.

Activity: Poster Presentation on different types of construction and associated professional services.

Construction Project Cost Estimation & Management

Various Types of Project Cost -Method of Structuring Project Cost - Clients' Estimate and Contractors Estimation of Project Cost - Type of Construction Cost Estimates - Allocation of JointCosts -Estimation of Operating Costs - Cost Indices and its Applications to Estimating – CostPlanning, Budgeting and Control - Cost Codes - Cost Statement - Value Engineering.

Activity: Case Study on Cost Estimation

Resource Planning and Management

Labour Productivity - Factors Affecting Job-Site Productivity -Labour Estimation, Allocation andControl - Materials Estimation - Material Procurement and Delivery - Inventory Control – Trade-offsof Costs in Materials Management - Construction Equipment - Choice of Equipment and StandardProduction Rates -Estimation of Equipment Requirement - Construction Processes Queues andResource Bottlenecks.

Activity: Assignment on Material Planning

Construction Planning, Monitoring and Control

Types of Project Plans - Work Breakdown Structure - Resource Levelling - Resource Allocation - Interface Management aspects -Project Scheduling -Types of Project Scheduling - Project Progress Control - Measuring and Updating of Project Progress using Bar Chart, Progress Reports to aid Progress Review - Stage-wise Completion Cost - Earned Value Analysis

Activity: Preparation of a Work Breakdown Structure (WBS)

Project Closure

Project Closure - Construction Closure - Financial Closure - Contract Closure - Project Managers' Closure - Lessons Learnt from the Project - Profit/Loss at Completion - Disputes and Claims -Settlement of Disputes and Claims - Final Project Closure Reports.

Activity: Drafting a Construction Closure Report, Dispute and Claims Analysis Exercise

References

1. Kumar Neeraj Jha. *Construction Project Management – Theory and Practice*, 2nd ed., Pearson/Dorling Kindersley (India) Pvt. Ltd., 2023
2. K.K. Chitkara. *Construction Project Management: Planning, Scheduling and Controlling*, 4th ed., McGraw Hill Education, 2019
3. Frederick E. Gould & Vary E. Joyce. *Construction Project Management*, latest available edition (1st ed.), Pearson/Prentice Hall, 2000 —
4. S. Choudhury. *Project Management*, latest available edition (1st ed.), Tata McGraw-Hill, 1988
5. George J. Ritz. *Total Construction Project Management*, latest available edition (1st ed.), McGraw-Hill Inc., 1994.

E-Resources

1. Principles of construction management -NPTEL - https://archive.nptel.ac.in/courses/105/104/105104161/
2. Project Planning and control – NPTEL -https://nptel.ac.in/courses/105106149

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

Assessment Methodology: Poster presentation (10%), Quiz (10%), Assignment (20%), Field visit/Case study report (20%), Internal Examinations (40%)

	CO Description	PO	PSO1	PSO1
CO1	Explain the construction project life cycle, organizational structures, stakeholders' roles, and types of construction projects.	-	-	-
CO2	Apply cost estimation methods, cost planning, budgeting, value engineering, and cost control techniques to construction project scenarios.	PO1 (3) PO3 (3)	3	2
CO3	Analyze labour, material, and equipment resources to plan, allocate, and manage project resources efficiently.	PO1 (2) PO3 (3)	3	2
CO4	Evaluate construction project schedules, progress, closure requirements, and dispute/claim situations using modern project monitoring and control tools.	PO1 (3) PO2 (2) PO3(3)	3	3

CN25003	Design of Energy Efficient Buildings	L	T	P	C
		3	0	0	3

Course Objective:

To understanding the concept of energy consumption in buildings and design a energy efficient building

Introduction

Climate adapted and climate rejecting buildings – Heat Transfer – Measuring Conduction – Thermal Storage – Measurement of Radiation – The Greenhouse Effect – Convection – Measuring latent and sensible heat – Psychrometry Chart – Thermal Comfort – Microclimate, Site Planning and Development – Temperature – Humidity – Wind – Optimum Site Locations – Sun Path Diagrams – Sun Protection – Types of Shading Devices – Design responses to energy conservation strategies.

Activity: Poster presentation on different building types and climate adaptation strategies.

Passive Solar Heating and Cooling

General Principles of passive Solar Heating – Key Design Elements – Sunspace – Direct gain – Trombe Walls, Water Walls – Convective Air loops – Concepts – Case Studies – General Principles of Passive Cooling – Ventilation – Principles – Case studies – Courtyards – Roof Ponds – Cool Pools – Predicting ventilation in buildings – Window Ventilation Calculations – Room Organization Strategies for Cross and Stack Ventilation – Radiation – Evaporation and dehumidification – Wind Catchers – Mass Effect – Zoning – Load Control – Air Filtration and odor removal.

Activity: Case study discussion on passive solar applications in real buildings.

Daylighting and Electrical Lighting

Materials, components and details – Insulation – Optical materials – Radiant Barriers – Glazing materials – Glazing Spectral Response – Day lighting – Sources and concepts –Building Design Strategies – Case Studies – Daylight apertures – Light Shelves – Codal requirements – Day lighting design – Electric Lighting – Light Distribution – Electric Lighting control for day lighted buildings – Switching controls – Coefficient of utilization – Electric Task Lighting – Electric Light Zones – Power Adjustment Factors.

Activity: Assignment: Analyze daylighting for a building floor plan and suggest design improvements.

Heat Control and Ventilation

Hourly Solar radiation – Heat insulation – Terminology – Requirements – Heat transmission through building sections – Thermal performance of Building sections – Orientation of buildings – Building characteristics for various climates – Thermal Design of buildings – Influence of Design Parameters – Mechanical controls – Examples. Ventilation – Requirements – Minimum standards for ventilation – Ventilation Design – Energy Conservation in Ventilating systems – Design for Natural Ventilation – Calculation of probable indoor wind speed.

Activity: Quiz

Design for Climatic Zones

Energy efficiency – An Overview of Design Concepts and Architectural Interventions – Embodied Energy – Low Embodied Energy Materials – Passive Downdraft Evaporative Cooling – Design of Energy Efficient Buildings for Various Zones – Cold and cloudy – Cold and sunny – Composite – Hot and dry – Moderate – Warm and humid – Case studies of residences, office buildings and other buildings in each zones – Commonly used software packages in energy efficient building analysis and design - Energy Audit – Certification.

References

1. Energy Conservation Building Code, Bureau of Energy Efficiency, New Delhi, 2018.
2. Brown, G.Z. and DeKay, M., Sun, Wind and Light - Architectural Design Strategies, John Wiley and Sons Inc,3rd Edition, 2014.
3. Handbook on Functional Requirements of Buildings Part 1 to 4 SP: 41 (S and T) 1995
4. Residential Energy: Cost Savings and Comfort for Existing Buildings by John Krigger and Chris Dorsi, Published by Saturn Resource Management, 2013.
5. Majumdar, M (Ed), Energy - Efficient Buildings in India, Tata Energy Research Institute, Ministry of Non-Conventional Energy Sources, 2009.

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

Assessment Methodology: Poster presentation (10%), Quiz (10%), Assignment (20%), Field visit/Case study report (20%), Internal Examinations (40%)

	CO Description	PO	PSO1	PSO1
CO1	Explain climate-responsive design principles and heat transfer mechanisms affecting building performance.	-	-	-
CO2	Apply passive heating, cooling, ventilation, and daylighting strategies to improve building comfort.	PO1 (3) PO3 (3)	3	2
CO3	Analyze thermal performance and environmental behavior of buildings across different climatic zones.	PO1 (2) PO3 (3)	3	2
CO4	Evaluate energy efficiency and sustainability of buildings using analytical tools and assessment methods.	PO1 (3) PO2 (2) PO3(3)	3	3

CN25004	Economics and Finance Management in Construction	L	T	P	C
		3	0	0	3

Course Objective:

This course aims to provide students with a strong foundation in economic principles and their application to the construction industry. It equips learners with essential financial tools and techniques for evaluating project feasibility, investment decisions, and risk management. The course also introduces students to financial accounting, taxation, and the functioning of financial markets relevant to construction businesses.

Fundamentals of Economics

Introduction to economics and its relevance in construction; Macroeconomics – key concepts, Indian economic indicators, GDP calculation, Inflation, Interest rates, Employment correlation; Microeconomics – supply and demand analysis, elasticity, equilibrium; Construction sector economics – GDP contribution, capital formation, infrastructure investment; Types of construction business models – sole proprietorship, partnership, corporations.

Activity: Quiz on Key macroeconomic indicators and their impact on construction projects.

Financial Analysis and Project Evaluation

Principles of project feasibility; Economic vs financial feasibility; Cost of capital, Rate of return (ROR), Minimum attractive rate of return (MARR); Time value of money – Present/Future Value, Annuity, Annuities due; Cash flow diagram and loan amortization; Payback period, Average Annual Rate of Return (AARR); Net Present Value (NPV), project selection for equal/unequal lives, and infinite life cases.

Activity: Case study on Evaluation of a project using NPV, payback period, and AARR.

Advanced Financial Analysis Techniques

Discounted Payback Period (DPP); Internal Rate of Return (IRR), Future Worth and Equivalent Annual Worth (EAW) analysis; Benefit-Cost Ratio (BCR); Incremental Rate of Return; Sensitivity and risk analysis – single and multi-alternative comparison; Break-even analysis; Marginal costing; Cost-Volume-Profit (CVP) analysis; Margin of safety; Payment billing methods – Running Account Bills and Final Bills.

Activity: Assignment on Computation of IRR and DPP for alternative project investments.

Financial Accounting and Taxation

Accounting principles, journal, ledger, trial balance; Financial statements – Profit & Loss account, Balance sheet, Cash flow statement; Ratio analysis and interpretation for financial decision-making; Case-based financial statement evaluation; Overview of the Indian Taxation System; Tax computation and planning for construction firms; Tax exemptions, depreciation, capital allowances, GST implications.

Activity: Prepare trial balance, profit & loss account, and balance sheet from sample project transactions.

Financial Markets and Instruments

Overview of the Indian financial and monetary systems; Types of financial markets – primary, secondary, capital, money markets; Financial instruments – shares, debentures, bonds, mutual funds, derivatives, ETFs; Share market basics – IPOs, trading mechanisms; Financial services – insurance, credit rating, AMC; Private equity, venture capital, and infrastructure funds; Regulatory framework – SEBI, IRDAI, RBI functions and compliance.

Activity: Poster presentation on financial instruments relevant to construction finance.

References:

1. Peterson, S.J. – Construction Accounting and Financial Management, Pearson Education, 2013.A comprehensive guide to cost control, accounting principles, and financial decision-making in construction.
2. Prasanna Chandra – Projects: Planning, Analysis, Selection, Financing, Implementation and Review, McGraw Hill Education, 2014.Widely used in engineering and management programs for project feasibility and financial appraisal techniques.
3. Gordian, M. and Winch, G. – Financial Management in Construction Contracting, Wiley-Blackwell, 2010.Explores project-based financial management and economic decision-making specific to construction.
4. Chitale, A.K. and Gupta, R.C. – Construction Economics: A New Approach, PHI Learning, 2015.Tailored to Indian construction practices, with coverage of economic theories applied to infrastructure.
5. Indian Companies Act (2013), Income Tax Act (with latest amendments), and SEBI/RBI GuidelinesOfficial government documents and acts governing corporate accounting, taxation, and financial compliance in India.

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

Assessment Methodology: Poster presentation (10%), Quiz (10%), Assignment (20%), Field visit/Case study report (20%), Internal Examinations (40%)

	CO Description	PO	PSO1	PSO1
CO1	Explain basic economic principles, construction sector economics, and types of construction business models.	-	-	-
CO2	Apply financial analysis and project evaluation techniques, including NPV, payback period, and cash flow analysis.	PO1 (2) PO3 (3)	3	2
CO3	Analyze advanced financial metrics, risk, sensitivity, break-even, and cost-volume-profit scenarios in construction projects.	PO1 (2) PO3 (3)	3	2

	CO Description	PO	PSO1	PSO1
CO4	Evaluate financial statements, taxation implications, and investment options for construction projects using financial tools and instruments.	PO1 (3) PO2 (2) PO3(3)	3	3

CN25005	Environmental Impact Assessment in Construction Engineering	L	T	P	C
		3	0	0	3

Course objective:

The course objectives include imparting the knowledge and skills required for understanding the various impacts of infrastructure projects on the environment, EIA Assessment, and develop skills to prepare environmental impact assessment report.

Introduction

Environment and its components–Concept of ecological imbalances – Sustainable development - Key approaches for Impact Assessment – EIA approach: Evolution of EIA - Legal and Regulatory aspects in India - Types and Objectives, Components, Process of EIA.

Activity: Poster presentation on Sustainable development goals

Prediction and Assessment

Elements of Environmental analysis - impact on air, water, soil & Noise - Role of Biodiversity Impact Assessment - Identification, Prediction and Evaluation of Impacts on Biodiversity - Techniques of Biodiversity impact assessment - EIA Report Preparation - Environmental Management Plan: Preparation and implementation - Mitigation and Rehabilitation plans - Post Project audit.

Activity: Technical Quiz/ Online Quizon environmental pollution

Health and Socio-Economic Impact Assessment

Impact of Environment on Health - Developing framework for Health impact analysis, tools, and techniques - Overview and Scope of Social Impact Assessment - SIA model and the planning process - Land acquisition: Legal aspects, Resettlement & Rehabilitation, and Development – Environmental risk analysis – Economic valuation methods

Activity: Seminar Presentation on impact of environment on health and socio-economic assessment

Integrated Analysis

Integrated Analysis of Environmental, Social, and Health Impacts - Challenges for Integrated Approach - Scope for Integrated approach in economic analysis - CBA, Social CBA, and CostEffectiveness Analysis - Analytic Hierarchy process-based Approach - Emerging Dimensions and Future Directions.

Activity: Poster presentation on integrated analysis

Impact of Infrastructure Projects And Services

Case Studies: EIA for Mining, extraction of natural resources and power generation - Primary Processing and Material Production - Material Processing, Manufacturing/Fabrication - Service Sectors - Physical Infrastructure including Environmental Services - Building and Construction Projects - Area Development

Projects and Townships - Strategic Environmental Assessment, Technological Assessment, and Risk Assessment.

Activity: Case study of EIA for a major infrastructure project

References

1. Anjaneyulu, Yerramilli, and ValliManickam, “Environmental impact assessment methodologies”, Hyderabad: BS Publications, Third Edition 2022.
2. Lawrence, D.P., “Environmental Impact Assessment – Practical Solutions to recurrent problems”, Wiley-Interscience, New Jersey, 2003.
3. Petts, J., "Handbook of Environmental Impact Assessment', Vol., I and II, Blackwell Science, London, 1999.
4. Canter, L.W., “Environmental Impact Assessment”, McGraw Hill, New York, 1996. 5. World Bank – Source Book on Environmental Impact Assessment, 2010.

E-Resources

1. https://onlinecourses.nptel.ac.in/noc22_ar07/preview
2.https://archive.nptel.ac.in/noc/courses/noc22/SEM1/noc22-ar07/
3.https://www.iitr.ac.in/wfw/web_ua_water_for_welfare/education/Teachers_Manual/Teacher_manual_master_EIA.pdf

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

Assessment Methodology: Poster presentation (10%), Quiz (10%), Assignment (20%), Field visit/Case study report (20%), Internal Examinations (40%)

	CO Description	PO	PSO1	PSO1
CO1	Explain principles of environmental sustainability, EIA processes, legal frameworks, and regulatory aspects.	-	-	-
CO2	Apply prediction and assessment techniques for air, water, soil, noise, and biodiversity impacts in construction and infrastructure projects.	PO1 (2) PO3 (3)	3	2
CO3	Analyze health, socio-economic, and environmental risks using SIA, Health Impact Assessment, and economic valuation methods.	PO1 (2) PO3 (3)	3	2
CO4	Evaluate integrated environmental, social, and economic impacts of infrastructure projects and prepare mitigation, management, and audit plans.	PO1 (3) PO2 (2) PO3(3)	3	3

CN25006	Human Resources Management in Construction	L	T	P	C
		3	0	0	3

Course Objective:

understand the various aspects of manpower management and to help the student further develop their management, team building and leadership skills so as to increase their effectiveness in their job performance on international projects.

Manpower Planning

Manpower planning and forecasting – Recruitment, selection process-Sources-InductionOrientation and Training -Manpower Planning process - Organising, Staffing, directing, and controlling –– Factors influencing supply and demand of human resources – Role of HR manager – Personnel Principles.

Activity: Quiz on the basics of manpower planning and HR functions.

Organisation

Elements of an organisation- Management process in organisations- Planning-Organising-Staffing- Directing- Controlling – Delegation of authority – responsibility – accountability – lines and staff organisation Workforce diversity- international dimensions of Organisation- Organisational structure- determinants of organisational design.

Activity: Case study on organizational structure of a real construction company

Human Relations and Organisational Behaviour

Basic individual psychology – Approaches to job design and job redesign – Self managing work teams – Intergroup – Conflict in organizations – Leadership-Engineer as Manager –aspects of decision making – Significance of human relation and organizational – Individual in organization – Motivation – Personality and creativity – Group dynamics, Team working – Communication and negotiation skills.

Activity: Seminar presentation on Leadership styles and motivation strategies

Welfare Measures

Establishing Pay plans - Basics of compensation - factors determining pay rate - Current trends in compensation - Job evaluation – Incentives- Practices in Indian organisations - Statutory benefits - non-statutory (voluntary) benefits - Insurance benefits - retirement benefits and other welfare measures to build employee commitment – Laws related to welfare measures.

Activity: Assignment on the Comparison of statutory and voluntary welfare measures

Management and Development Methods

Management Development - On-the-job and off-the-job- Management Developments - Performance appraisal in practice. Managing careers: Career planning and development - Managing promotions and transfers of operations – Developing policies, practices and establishing process pattern – Competency upgradation and their assessment – New methods of training and development – Performance Management.

Activity: Group discussion on Career planning, promotions, and competency assessment.

References

1. Charles D Pringle, Justin Gooderi Longenecter, Management, CE Merril Publishing Co. 2001.
2. Dwivedi R.S, Human Relations and Organisational Behaviour, Macmillian India Ltd.,2005.
3. Josy.J, Familaro, “Handbook of Human Resources Administration”, McGraw-Hill Intemational Edition, 2007
4. D. Longford M.R. Hancock, R. Rellows& A. W. Gale, Human Recourse Management in Construction.– Longman Group Limited , fourth impression 2000.
5. Carleton Counter II and Jill Justice Coulter, “The Complete Standard Hand Book of Construction Personnel Management ", Prentice Hall, Inc., New Jersey, 1989.

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

Assessment Methodology: Poster presentation (10%), Quiz (10%), Assignment (20%), Field visit/Case study report (20%), Internal Examinations (40%)

	CO Description	PO	PSO1	PSO1
CO1	Describe the principles of manpower planning, organizational structure, and HR practices in construction projects.	-	-	-
CO2	Implement recruitment, training, and workforce management strategies for effective human resource utilization.	PO1 (2) PO3 (3)	3	2
CO3	Examine organizational behavior, leadership, and team dynamics to enhance productivity.	PO1 (2) PO3 (3)	3	2
CO4	Formulate compensation, welfare, and career development plans to improve employee engagement and performance.	PO1 (3) PO2 (2) PO3(3)	3	3

CN25007	Lean Construction Concepts, Tools, and Practices	L	T	P	C
		3	0	0	3

Course Objective:

To impart knowledge about the basics of lean construction. To impart knowledge about the lean principles. To impart knowledge about the core concepts of lean construction. To impart knowledge about the lean tools and techniques. To impart knowledge about the basics of lean implementation in the construction industry.

Introduction

Introduction and overview of the construction project management -Review of Project Management& Productivity Measurement Systems – Productivity in Construction– Daily Progress Report-The state of the industry for its management practices –construction project phases - Essential features of contemporary construction management techniques - The problems with current construction management techniques– Current production planning.

Activity: Assignment -Prepare a daily progress report template for a sample project.

Lean Management

Introduction to lean management – Toyota's management principle-Evolution of lean in the construction industry - Production theories in construction –Lean construction value - Value in construction - Target value design – Lean project delivery system- Forms of waste in the construction industry – Waste Elimination.

Activity: Poster presentation on the impact of variability on construction workflow and productivity.

Core Concepts in Lean

Concepts in lean thinking – Principles of lean construction – Variability and its impact – Traditional construction and lean construction – Traditional project delivery - Lean construction and workflow reliability – Work structuring – Production control.

Activity: Quiz

Lean Construction Tools and Techniques

Value Stream Mapping – Work sampling – Last planner system – Flow and pull-based production – Last Planner System – Look ahead schedule – constraint analysis – weekly planning meeting- Daily Huddles – Root cause analysis – Continuous improvement – Just in time.

Activity: Create a Value Stream Map for a sample construction process.

Lean Construction Implementation

Lean construction implementation- Enabling lean through information technology – Lean in design - Design Structure Matrix Location Based Management System-BIM (Building Information Modelling) - IPD (Integrated Project Delivery) – Sustainability through lean construction approach.

Activity: Case study: Implement lean using BIM, IPD, and Location-Based Management System in a sample project.

References:

1. Corfe, C. and Clip, B., Implementing lean in construction: Lean and the sustainability agenda, CIRIA, 2013.
2. Shang Gao and Sui Pheng Low, Lean Construction Management: The Toyota Way, Springer, 2014.
3. Dave, B., Koskela, L., Kiviniemi, A., Owen, R., andTzortzopoulos, P., Implementing lean in construction: Lean construction and BIM, CIRIA, 2013.
4. Ballard, G., Tommelein, I., Koskela, L. and Howell, G., Lean construction tools and techniques, 2002.
5. Salem, O., Solomon, J., Genaidy, A. and Luegring, M., Site Implementation and Assessment of Lean Construction Techniques, Lean Construction Journal, 2005.
6. Lincoln H. Forbes, Syed M. Ahmed, Lean Project Delivery and Integrated Practices in Modern Construction, Routledge Publishers, 2nd Edition, 2020.

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

Assessment Methodology: Poster presentation (10%), Quiz (10%), Assignment (20%), Field visit/Case study report (20%), Internal Examinations (40%)

	CO Description	PO	PSO1	PSO1
CO1	Understand lean construction principles, productivity measurement, and modern project management techniques.	-	-	-
CO2	Use lean tools and methods to improve workflow and reduce waste in construction projects.	PO1 (2) PO3 (3)	3	2
CO3	Examine project delivery methods, workflow reliability, and production control techniques.	PO1 (2) PO3 (3)	3	2
CO4	Formulate strategies for implementing lean construction using IT, BIM, IPD, and sustainable practices.	PO1 (3) PO2 (2) PO3(3)	3	3

ST25C02	Maintenance, Repair and Rehabilitation of Structures	L	T	P	C
		3	0	0	3

Course Objective: To study the damages in structures and suggest appropriate repair and rehabilitation measures

Conditional Assessment of Structure: Quality assurance for concrete based on Strength, Durability and Microstructure of concrete - NDT techniques- Cracks- different types, causes — Effects due to Environment, Fire, Earthquake, Corrosion of steel in concrete, Mechanism, quantification of corrosion damage.

Activity: Concept map Poster presentation

Maintenance and Repair Strategies: Maintenance, Repair and Rehabilitation, retrofit and strengthening, need for rehabilitation of structures- Service life behaviour - importance of Maintenance, causes and effects of deterioration. Non-destructive Testing Techniques.

Activity: Quiz on Structural Maintenance & Repair Investigation

Repair Materials and Special Concretes: Repair materials-Various repair materials, Criteria for material selection, Methodology of selection, Special mortars and concretes- Polymer Concrete and Grouting materials- Bonding agents -Latex emulsions, Epoxy bonding agents, Protective coatings -Protective coatings for Concrete and Steel, FRP sheets.

Activity: Case study discussion on repair materials

Protection Methods: Concrete protection methods – reinforcement protection methods- cathodic protection - Sacrificial anode - Corrosion protection techniques — Corrosion inhibitors, concrete coatings-Corrosion resistant steels, Coatings to reinforcement, Introduction to Structural health monitoring.

Activity: Case study discussion on corrosion and protection measures

Repair, Retrofitting and Demolition of Structures: Various methods of crack repair, Grouting, Routing and sealing, Stitching, Dry packing, Autogenous healing, Repair to active cracks, Repair to dormant cracks. Repair of various corrosion damaged of structural elements (slab, beam and columns) Jacketing Techniques, Strengthening Methods for Structural Elements. Engineered Demolition -Case studies.

Activity: Field visit to repaired/retrofitted building

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

Assessment Methodology:

Poster Presentation - 10%
Assignment – 20%
Report preparation for field visit – 20%
Internal Examinations – 50%

References:

1. Woodson, R. D. (2012). *Concrete structures: Protection, repair and rehabilitation*. Butterworth-Heinemann/Elsevier.
2. Kominetzky, D. M. S. (2001). *Design and construction failures*. Galgotia Publications.
3. Ravishankar, K., & Krishnamoorthy, T. S. (2004). *Structural health monitoring, repair and rehabilitation of concrete structures*. Allied Publishers.
4. Central Public Works Department, & Indian Buildings Congress. (2008). *Handbook on seismic retrofit of buildings*. Narosa Publishing House.

E - Resources

1. NOC:Maintenance and Repair of Concrete Structures, ProfRadhakrishna Pillai, IIT Madras, Videos: https://archive.nptel.ac.in/courses/105/106/105106202/

	CO Description	PO	PSO1	PSO2
CO1	Identify causes of deterioration and evaluate structural condition using NDT and durability assessment tools.	-	-	-
CO2	Select appropriate repair materials and propose suitable rehabilitation strategies for damaged structures.	PO1 (2) PO3 (2)	3	3
CO3	Apply protection techniques for concrete and reinforcement to enhance structural service life.	PO1 (2) PO2 (3) PO3 (2)	2	3
CO4	Recommend and design suitable repair, retrofitting, and demolition methods for various structural elements.	PO1 (3) PO2 (2) PO3 (3)	3	3

CN25008	Management Information Systems	L	T	P	C
		3	0	0	3

Course Objective:

To provide students with advanced knowledge of construction project information systems, including development, implementation, and control of computer-based tools. The course aims to enable effective management, monitoring, and auditing of construction projects using integrated information systems and modern methodologies.

Introduction

Maintenance, Repair and Rehabilitation, retrofit and strengthening, need for rehabilitation of structures- Service life behaviour - importance of Maintenance, causes and effects of deterioration. Non-destructive Testing Techniques.

Activity: Quiz on Causes and effects of structural deterioration.

System Development

Modern Information System – System Development Life Cycle – Structured Methodologies- Designing Computer Based Methods, Procedures, Control – Designing Structured Programs.

Activity: Case study - Evaluate structured methodologies for information systems in construction.

Information Systems

Integrated Construction Management Information System – Project Management Information System – Functional Areas, Finance, Marketing, Production, Personnel – Levels, DSS, EIS, and ES – Comparison, Concepts and Knowledge Representation – Managing International Information System.

Activity: Poster presentation on Study Integrated Construction Management Information Systems (ICMIS) in real projects.

Implementation and Control

Control – Testing Security – Coding Techniques – Defection of Error – Validating – Cost Benefit analysis – Assessing the value and risk of Information System.

System Audit

Software Engineering qualities – Design, Production, Service, Software specification, Software Metrics, Software quality assurance – Systems Methodology – Objectives – Time and Logic, Knowledge and Human Dimension – Software life cycle models – Verification and Validation.

Activity: Assignment- Compare software life cycle models and their applicability in construction management.

References:

1. Card and Glass, Measuring Software Design Quality, Prentice Hall, 1990.
2. Gordon B. Davis, Management Information System: Conceptual Foundations, Structure and Development, McGraw Hill, 1985.
3. Joyce J Elam, Case series for Management Information Systems, Simon and Schuster, Custom Publishing, 1996.

4. Kenneth C Laudon and Jane Price Laudon, Management Information Systems - Organisation and Technology, Prentice Hall, 2015.
5. Michael W. Evans and John J Marciniah, Software Quality assurance and Management, John Wiley and Sons, 1987.

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

Assessment Methodology: Poster presentation (10%), Quiz (10%), Assignment (20%), Field visit/Case study report (20%), Internal Examinations (40%)

	CO Description	**PO**	**PSO1**	**PSO1**
CO1	Understand maintenance, rehabilitation, and construction information system concepts.	-	-	-
CO2	Apply SDLC and structured methods to develop construction management systems.	PO1 (2) PO3 (3)	3	2
CO3	Examine integrated, decision support, and executive information systems for projects.	PO1 (2) PO3 (3)	3	2
CO4	Formulate strategies for implementation, control, and auditing of construction information systems.	PO1 (3) PO2 (2) PO3(3)	3	3

CN25009	Organizational Behaviour	L	T	P	C
		3	0	0	3

Course Objective:

To learn basic concepts of organizational behavior. To gain a solid understanding of human behavior in the workplace from an individual. To gain a solid understanding of human behavior in the workplace in the group. To learn the concepts of Leadership and power.

Introduction to Organizational Behaviour

Definition, need, and importance of organizational behaviour –Nature and scope –Frame work – Organizational behaviour models.

Activity: Assignment - Compare and analyze different organizational behaviour models.

Individual Behaviour

Personality: types –Factors influencing personality, theories–Types of learners –The learning process –Learning theories –Organizational behaviour modification – Misbehaviour: Types and Management Intervention - Emotions: Emotional Labour – Emotional Intelligence –Theories – Attitudes: Characteristics, Components, Formation, Measurement, and Values - Perceptions: Importance, Factors influencing perception – Interpersonal perception -Impression Management Motivation –importance –Types – Effects on work behavior.

Activity: Case study - Analyze a workplace scenario to identify misbehaviour and suggest interventions.

Group Behaviour

Organization structure –Formation –Groups in organizations –Influence –Group dynamics – Emergence of informal leaders and working norms –Group decision-making techniques –Team building -Interpersonal relations –Communication –Control.

Leadership and Power

Meaning –Importance–Leadership styles –Theories –Leaders Vs Managers –Sources of power – Power centers –Power and Politics.

Activity: Poster presentation on leadership styles and power influence in organizational settings

Dynamics of Organizational Behaviour

Organizational culture and climate –Factors affecting organizational climate – Importance of Job satisfaction –Determinants–Measurements – Influence on behavior - Organizational change – Importance –Stability Vs Change – Proactive Vs Reaction change– The change process – Resistance to change – Managing change - Stress - Work Stressors–Prevention and Management of stress – Balancing work and Life - Organizational development –Characteristics and objectives – Organizational effectiveness.

Activity: Quiz

References:

1. Stephen P. Robins, “Organisational Behavior”, PHI Learning / Pearson Education, 15th edition,2012.
2. FredLuthans, “Organisational Behavior”, McGraw Hill, 12th Edition, 2005.
3. Schermerhorn, Hunt, and Osborn, "Organisational Behavior”, John Wiley, 12th Edition, 2011.
4. UdaiPareek, “Understanding Organisational Behaviour”, 2nd Edition, Oxford Higher Education, 2008.
5. Mc Shane & Von Glinov, “Organisational Behaviour”, 6th Edition, Tata McGraw Hill, 2012.

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

Assessment Methodology: Poster presentation (10%), Quiz (10%), Assignment (20%), Field visit/Case study report (20%), Internal Examinations (40%)

	CO Description	PO	PSO1	PSO1
CO1	Understand the fundamentals, scope, and models of organizational behaviour.	-	-	-
CO2	Apply theories of personality, motivation, learning, and perception to analyze individual behaviour in organizations.	PO1 (2) PO3 (3)	3	2
CO3	Examine group dynamics, leadership styles, power, and communication to enhance team performance.	PO1 (2) PO3 (3)	3	2
CO4	Formulate strategies for managing organizational change, stress, culture, and overall organizational effectiveness.	PO1 (3) PO2 (2) PO3(3)	3	3

CN25010	Project Safety Management	L	T	P	C
		3	0	0	3

Course Objective:

To equip students with the knowledge and skills to identify construction hazards, apply safety regulations and management systems, and develop effective safety plans and risk control strategies to ensure safe construction practices.

Introduction to Construction Safety

Importance of safety in construction-Common causes of accidents in construction-Safety terminology and definitions-Safety culture and behavior-based safety-Historical development of construction safety regulations.

Activity: Quiz on historical development of construction safety regulations.

Construction Hazards and Risk Management
Types of construction hazards: physical, chemical, electrical, mechanical, environmental.**-**Hazard identification methods-Risk assessment and evaluation-Control measures and hierarchy of controls-Personal Protective Equipment (PPE).

Safety Management Systems (SMS)

Elements of an effective SMS-Safety policy and safety manual-Safety training and awareness-Safety performance monitoring and auditing-Incident and accident investigation.

Activity: Assignment - Perform safety performance monitoring and mock incident investigation.

Construction Safety Laws and Regulations

Indian Factories Act-Building and Other Construction Workers (BOCW) Act-Occupational Safety and Health (OSH) standards-Role of regulatory bodies like National Safety Council (NSC), Director General Factory Advice Service & Labour Institutes (DGFASLI)-Contractual obligations regarding safety.

Activity: Poster presentation on Indian construction safety laws and regulatory compliance.

Safety Planning in Construction Projects

Site safety planning-Preparation of safety plan and method statements-Emergency response planning-Safety in demolition, excavation, scaffolding, and working at height-Fire safety management.

Activity: Prepare a site-specific safety plan including method statements and emergency response.

Case Studies and Safety Best Practices

Analysis of major construction accidents-Lessons learned and preventive measures-Best practices in international and Indian construction projects-Role of modern technology in improving construction safety (IoT, drones, wearables).

Activity: Analyze a major construction accident and prepare a “lessons learned” report

References:

1. Coble, R. J., Hinze, J., & Haupt, T. C., Construction Safety and Health Management, Prentice Hall, 1st Edition, 2001.

2. Sharma, R. K., Construction Safety Handbook, Khanna Publishers, New Delhi, 1st Edition, 2012.
3. Reese, C. D., & Eidson, J. V., Handbook of OSHA Construction Safety and Health, CRC Press, 2nd Edition, 2006.
4. Government of Tamil Nadu, The Tamil Nadu Factories Rules, 1950 (As Amended), Department of Labour and Employment, Chennai.
5. Government of India, The Factories Act, 1948 (Act No. 63 of 1948), Ministry of Labour and Employment, New Delhi.

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

Assessment Methodology: Poster presentation (10%), Quiz (10%), Assignment (20%), Field visit/Case study report (20%), Internal Examinations (40%)

	CO Description	PO	PSO1	PSO1
CO1	Understand fundamental concepts, hazards, and regulations in construction safety.	-	-	-
CO2	Apply hazard identification, risk assessment, and control measures on construction sites.	PO1 (2) PO3 (3)	3	2
CO3	Examine safety management systems and legal compliance in construction projects.	PO1 (2) PO3 (3)	3	2
CO4	Formulate site-specific safety plans, emergency response strategies, and best practice implementation.	PO1 (3) PO2 (2) PO3(3)	3	3

CN25011	Quantitative Techniques in Management	L	T	P	C
		3	0	0	3

Course Objective:

To familiarise student with the use of quantitative techniques in managerial decision making. The quantitative techniques learnt are further augmented by dissemination of various system analysis and operation research techniques, which would be used to determine the best course of action of a decision problem under the restriction of limited resources.

Quantitative Approach to Decision Making

Methodology–Use of Operations Research in Decision making - Linear Programming Problems – Graphical Analysis - Simplex Method -Two-Phase Method - Big M-Method - Duality - Sensitivity Analysis – Transportation and Assignment Problems – Hungarian Methods of Solution.

Activity: Case Study - Apply transportation and assignment problem-solving methods to real-world construction scenarios

Production Management

Inventory Control - EOQ Model - Quantity Discounts - Safety Stock – Replacement Theory – PERT and CPM – Simulation Models – Quality Control.

Activity: Assignment - Calculate EOQ, safety stock, and simulate inventory control scenarios.

Financial Management

Working Capital Management – Compound Interest and Present Value methods – Discounted Cash Flow Techniques – Capital Budgeting.

Activity: Prepare discounted cash flow (DCF) and present value calculations for project investment decisions.

Decision Theories

Decision making under certainty – uncertainty and risk situations –Decision trees – Utility Theory.

Activity: Poster presentation on Construction of decision trees for uncertain project scenarios.

Managerial Economics

Cost Concepts – Break-even analysis – Pricing Techniques – Game theory - Applications.

Activity: Quiz

References:

1. Hamdy A. Taha, Operations Research, Pearson Education India, 10th Edition, 2016.
2. Tang, S.L., Irtishad U. Ahmad, Syed M. Ahmed & Ming Lu, Quantitative Techniques for Decision Making in Construction, Hong Kong University Press, 2015.
3. Vohra, N. D., Quantitative Techniques in Management, McGraw Hill Education, 5th Edition, 2017.

4. Barry Render, Ralph M. Stair, and Michael E. Hanna, Quantitative Analysis for Management, 12/e Global Edition, Pearson India, 2018. 5. Wayne L. Winston, Practical Management Science: spreadsheet modelling and applications. 2013.
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%
Assessment Methodology: Poster presentation (10%), Quiz (10%), Assignment (20%), Field visit/Case study report (20%), Internal Examinations (40%)

	CO Description	PO	PSO1	PSO1
CO1	Understand maintenance, repair, and rehabilitation principles, and factors causing deterioration in structures.	-	-	-
CO2	Use non-destructive testing and assessment techniques to evaluate the strength and durability of concrete structures.	PO1 (2) PO3 (3)	3	2
CO3	Examine repair materials, special concretes, and protection methods for structural elements.	PO1 (2) PO3 (3)	3	2
CO4	Formulate strategies for repair, retrofitting, and structural health monitoring, including corrosion mitigation and demolition planning.	PO1 (3) PO2 (2) PO3(3)	3	3

CN25012	Resource Management and Control in Construction	L	T	P	C
		3	0	0	3

Course Objective:

This course aims to provide a comprehensive understanding of managing various resources effectively throughout the construction project lifecycle ton achieve various project objectives.

Introduction to Construction Resource Management

Definition and importance of resource management in construction. Types of resources: Human resources (labor), Materials, Equipment, Money (Financial resources), Time. Interdependencies between different resources. Challenges and complexities in construction resource management. Overview of construction project lifecycle and resource involvement at each stage. Introduction to resource planning, scheduling, allocation, and control. Key performance indicators (KPIs) for resource management.

Activity: Quiz on resource interdependencies and challenges in a selected construction project.

Human Resource Management in Construction

Labor planning and forecasting: Skill requirements, crew composition, productivity analysis. Labor productivity: Factors affecting productivity (e.g., site conditions, supervision, morale), measurement techniques, and improvement strategies. Labor cost control: Wage rates, overtime, incentives, and labor budgeting. Industrial relations and labor laws in construction. Safety and health management in relation to labor.

Activity: Poster presentation on labor planning, wage budgeting, and compliance with labor laws.

Material Management and Supply Chain

Material planning and procurement: Quantity estimation, specification, sourcing strategies.
Material scheduling and delivery: Just-in-time (JIT) principles, logistics, inventory management. Material handling and storage: Site layout, warehousing, waste minimization. Material quality control and assurance. Construction supply chain management: Upstream and downstream processes, supplier relationship management, risk in supply chain. Lean construction principles applied to material flow. Sustainable material selection and management.

Activity: Case study on supply chain optimization and sustainable material selection.

Construction Equipment Management

Types of construction equipment and their applications. Equipment selection criteria: Technical specifications, economic analysis (ownership and operating costs, depreciation), productivity. Equipment planning and scheduling: Matching equipment to tasks, utilization rates. Equipment maintenance and repair strategies: Preventive, corrective, predictive. Equipment productivity and performance measurement. Fleet

management and optimization. Safety aspects of equipment operation.

Activity: Perform an equipment productivity and maintenance analysis.

Financial Resource Management and Control

Cost estimation and budgeting: Types of estimates, cost breakdowns, contingency planning. Cash flow management: Project financing, cash flow forecasting, working capital. Cost control techniques: Earned value management (EVM), cost variance analysis, trend analysis. Budget monitoring and reporting. Value engineering and value analysis in cost optimization. Risk management in financial aspects.

Activity: Assignment on project cost estimation, cash flow, and earned value management (EVM) report.

Integrated Resource Control and Digital Tools

Integrated resource planning and control systems. Application of Building Information Modeling (BIM) for resource management. Project Management Information Systems (PMIS) for resource tracking. Data analytics and performance dashboards for resource control. Emerging technologies in resource management: IoT, AI, drones. Case studies and practical exercises using software.

References

1. Chitkara, K. K. (2014). Construction Project Management: Planning, Scheduling and Control. Tata McGraw-Hill Education. (Covers broad project management but has good sections on resources)
2. Stevens, G. C. (2012). Managing Materials in Construction. Blackwell Publishing.
3. Peurifoy, R. L., & Ledbetter, W. B. (2018). Construction Planning, Equipment, and Methods. McGraw-Hill Education.
4. Clough, R. H., Sears, G. A., & Sears, S. K. (2017). Construction Project Management. John Wiley & Sons.
5. Hinze, J. W. (2015). Construction Project Management. Pearson.

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

Assessment Methodology: Poster presentation (10%), Quiz (10%), Assignment (20%), Field visit/Case study report (20%), Internal Examinations (40%)

	CO Description	PO	PSO1	PSO1
CO1	Understand types, interdependencies, and challenges of construction resources.	-	-	-
CO2	Apply techniques for managing human, material, and equipment resources effectively.	PO1 (2) PO3 (3)	3	2
CO3	Examine financial control, cost optimization, and resource performance metrics in projects.	PO1 (2) PO3 (3)	3	2
CO4	Formulate integrated resource management plans using digital tools and modern technologies.	PO1 (3) PO2 (2) PO3(3)	3	3

CN25013	Shoring, Scaffolding and Formwork	L	T	P	C
		3	0	0	3

Course Objective:

To disseminate knowledge about detailed planning, materials used in formwork, erection of formwork and design of formwork for domes, shells, and tunnels.

Planning, Site Equipment & Plant for Form Work

Introduction - Forms for foundations, columns, beams walls etc., General objectives of formwork building - Planning for safety - Development of a Basic System - Key Areas of cost reduction - Planning examples. Overall Planning - Detailed planning - Standard units - Corner units - Pass units - Calculation of labour constants - Formwork hours - Labour Requirement - Overall programme - Detailed programme - Costing - Planning crane arrangements - Site layout plan - Transporting plant - Formwork beams - Scaffold frames - Framed panel formwork - Formwork accessories.

Activity: Prepare a detailed site layout and formwork planning report

Materials Accessories Proprietary Products & Pressures

Lumber - Types - Finish - Sheathing boards working stresses - Repetitive member stress - Plywood - Types and grades - Jointing Boarding - Textured surfaces and strength - Reconstituted wood - Steel - Aluminum - Hardware and fasteners - Nails in Plywood - Allowable withdrawal load and lateral load. Pressures on formwork - Examples - Vertical loads for design of slab forms - Uplift on shores - Laterals loads on slabs and walls.

Activity: Poster presentation on a comparative study of lumber, plywood, steel, and aluminium for formwork applications, including load calculations.

Design of Forms and Shores

Basic simplification - Beam formulae - Allowable stresses - Deflection, Bending - Lateral stability - Shear, Bearing - Design of Wall forms - Slab forms - Beam forms - Column forms - Examples in each. Simple wood stresses - Slenderness ratio - Allowable load vs length behaviour of wood shores - Form lining Design Tables for Wall formwork - Slab Formwork - Column Formwork - Slab props - Stacking Towers - Free standing and restrained - Rosett Shoring - Shoring Tower - Heavy Duty props.

Activity: Quiz

Building and Erecting the Form Work

Carpentry Shop and job mill - Forms for Footings - Wall footings - Column footings - Sloped footing forms - Strap footing - Stepped footing - Slab form systems - Sky deck and Multiflex - Customized slab table - Standard Table module forms - Swivel head and uniportal head - Assembly sequence - Cycling with lifting fork - Moving with table trolley and table prop. Various causes of failures - ACI - Design deficiencies - Permitted and gradual irregularities.

Activity: Case study on assembling slab and column formwork systems, highlighting potential failure causes.

Forms for Domes and Tunnels, Slip Forms and Scaffolds

Hemispherical, Parabolic, Translational shells - Typical barrel vaults Folded plate roof details - Forms for Thin Shell roof slabs design considerations - Building the forms - Placing concrete - Form removed -Strength requirements -Tunnel forming components - Curb forms invert forms - Arch forms - Concrete placement methods - Cut and cover construction - Bulk head method - Pressures on tunnels - Continuous Advancing Slope method - Form construction - Shafts. Slip Forms - Principles -Types - advantages - Functions of various components - Planning -Desirable characteristics of concrete - Common problems faced - Safety in slip forms special structures built with slip form Technique - Types of scaffolds - Putlog and independent scaffold -Single pole scaffolds - Truss suspended - Gantry and system scaffolds.

Activity: Assignment on slip form techniques, tunnel formwork, and scaffold types with safety considerations.

References:

1. Austin, C.K., Formwork for Concrete, Cleaver -Hume Press Ltd., London, 1996.
2. Hurd, M.K., Formwork for Concrete, Seventh Edition, American Concrete Institute, Detroit, 2016
3. Michael P. Hurst, Construction Press, London and New York, 2003.
4. Robert L. Peurifoy and Garold D. Oberlender, Formwork for Concrete Structures, McGraw - Hill, 2010.
5. Kumar Neeraj Jha, Formwork for Concrete Structures, 2017

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

Assessment Methodology: Poster presentation (10%), Quiz (10%), Assignment (20%), Field visit/Case study report (20%), Internal Examinations (40%)

	CO Description	PO	PSO1	PSO1
CO1	Understand formwork systems, site equipment planning, and safety requirements in construction projects.	-	-	-
CO2	Apply knowledge of materials, accessories, and pressures for designing basic formwork and shoring.	PO1 (2) PO3 (3)	3	2
CO3	Analyze and design complex formwork systems for slabs, beams, columns, and walls, considering stability and load effects.	PO1 (2) PO3 (3)	3	2
CO4	Evaluate advanced formwork solutions for domes, tunnels, slip forms, and scaffolds with emphasis on safety and efficiency.	PO1 (3) PO2 (2) PO3(3)	3	3

CN25014	Supply Chain Management and Logistics in Construction	L	T	P	C
		3	0	0	3

Course Objective:

Identify and explain key concepts in logistics and supply chain management relevant to construction operations. Analyze construction-specific challenges and develop strategic approaches to manage materials, data, and resources efficiently across the supply chain. Apply emerging technologies, sustainability principles, and integrated logistics systems to enhance construction productivity and environmental performance.

Fundamentals of Logistics and Supply Chain Management

Definition of Logistics and SCM: Evolution, scope, and importance – Supply chain stages and decision phases – Process view of a supply chain – Supply chain flows: Material, information, and finance – Examples of supply chains – Competitive and supply chain strategies – Achieving strategic fit – Expanding strategic scope – Drivers of performance: Facilities, inventory, transport, info, sourcing, pricing – Framework for drivers – Obstacles to fit.

Activity: Assignment – Prepare a flow chart showing material, information, and financial flows for a sample construction supply chain.

Strategic Supply Chain Management in Construction

Challenges in construction logistics – Aggregation of globally sourced materials for just-in-time (JIT) delivery to construction sites – Principles and practices of construction logistics – Management of bulk material supply – Strategies for efficient construction project supply chain management – Formulation of construction-specific supply chain strategies.

Activity: Case study analysis of a construction project to develop strategies for JIT delivery, bulk material management, and site-specific logistics planning.

Integrated data and information management

Role and impact of Building Information Modeling (BIM) and emerging data management technologies on construction supply chain management – Strategies for effective data integration across construction supply chains – Enhancing collaboration and decision-making through centralized data systems.

Activity: Quiz

Construction Logistics and Sustainable Practices

Role of logistics in promoting sustainable construction practices – Enhancing resource efficiency and environmental performance through effective construction logistics – Integration of sustainability goals in supply chain planning and operations.

Activity: Poster presentation on implementing sustainable logistics practices, including resource efficiency and environmental performance in construction projects

Logistics Operations in Construction

Responsibilities and functions of the construction logistics manager – Role of third-party logistics (3PL) providers in construction projects – Strategies for managing logistics in space-constrained urban construction sites – Application of consolidation centers to streamline material flow – Implementation of delivery management systems for improved coordination and efficiency.

Activity: Visit to a construction site or logistics hub

References

1. Greger Lundesjö, *Supply Chain Management and Logistics in Construction: Delivering Tomorrow's Built Environment*, 1st Edition, Kogan Page, 2015.
2. Sunil Chopra, Peter Meindl, and D.V. Kalra, *Supply Chain Management: Strategy, Planning, and Operation*, Pearson Education, 5th Edition, 2013.
3. A. Ravi Ravindran and Donald P. Warsing, *Supply Chain Engineering: Models and Applications*, CRC Press, 2012.
4. G. Srinivasan, *Quantitative Models in Operations and Supply Chain Management*, PHI Learning Pvt. Ltd., New Delhi, 2010.
5. Stephen Pryke, *Successful Construction Supply Chain Management: Concepts and Case Studies*, 2nd Edition, Wiley-Blackwell, 2015.

E-Resources:

1. **NPTEL / MOOC Courses**
   NPTEL Course: [Logistics and Supply Chain Management by Prof. R. Srinivasan (IIT Madras)]Link: https://nptel.ac.in/courses/110106045
   NPTEL Course: [Project Management for Construction by Prof. K. N. Satyanarayana (IIT Madras)]Link: https://nptel.ac.in/courses/105106118
   SWAYAM MOOC: [Construction and Project Management – AICTE Approved FDP Course]
   Link: https://swayam.gov.in (search for latest sessions)
2. **Web Resources**
   SupplyChainDigital: Articles and trends on supply chain technologies and case studies
   Link: https://www.supplychaindigital.com
   Logistics Bureau: Practical insights into logistics and supply chain optimization
   Link: https://www.logisticsbureau.com/blog
   Wiley Online Library: Latest research papers and books on construction SCM
   Link: https://onlinelibrary.wiley.com
   Coursera: [Supply Chain Management Specialization – Rutgers University]
   Link: https://www.coursera.org/specializations/supply-chain-management

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

Assessment Methodology: Poster presentation (10%), Quiz (10%), Assignment (20%), Field visit/Case study report (20%), Internal Examinations (40%)

	CO Description	PO	PSO1	PSO1
CO1	Understand fundamental concepts of logistics and supply chain management in construction projects.	-	-	-
CO2	Apply supply chain strategies and data management techniques to optimize construction material flows and project coordination.	PO1 (3) PO3 (3)	3	2
CO3	Analyze construction logistics challenges and design sustainable solutions for resource and information management.	PO1 (2) PO3 (3)	3	2
CO4	Evaluate operational strategies for efficient logistics and supply chain performance in complex construction environments.	PO1 (3) PO2 (2) PO3(3)	3	3

CN25015	Sustainable Management	L	T	P	C
		3	0	0	3

Course Objectives:

To provide students with fundamental knowledge of the notion of corporate sustainability. To determine how organizations impacts on the environment and socio-technical systems, the relationship between social and environmental performance and competitiveness, the approaches and methods.

Management of Sustainability

Management of sustainability -rationale and political trends: An introduction to sustainability management, International and European policies on sustainable development, theoretical pillars in sustainability management studies.

Activity: Poster presentation on global sustainability policies and political trends affecting construction and industry.

Corporate Sustainability and Responsibility

Corporate sustainability parameter, corporate sustainability institutional framework, integration of sustainability into strategic planning and regular business practices, fundamentals of stakeholder engagement.

Activity: Case study analysis of a corporation integrating sustainability into strategic planning and stakeholder engagement.

Sustainability Management: Strategies and Approaches

Corporate sustainability management and competitiveness: Sustainability-oriented corporate strategies, markets and competitiveness, Green Management between theory and practice, Sustainable Consumption and Green Marketing strategies, Environmental regulation and strategic postures; Green Management approaches and tools; Green engineering: clean technologies and innovation processes; Sustainable Supply Chain Management and Procurement.

Activity: Assignment on designing a green management strategy

Sustainability and Innovation

Socio-technical transitions and sustainability, Sustainable entrepreneurship, Sustainable pioneers in green market niches, Smart communities and smart specializations.

Activity: Poster presentation on sustainable entrepreneurship and examples of innovative green market solutions.

Sustainable Management of resources, Commodities and Commons

Energy management, Water management, Waste management, Wild Life Conservation, Emerging trends in sustainable management, Case Studies.

Activity: Quiz

References:

1. Daddi, T., Iraldo, F., Testa, Environmental Certification for Organizations and Products: Management, 2015
2. Christian N. Madu, Handbook of Sustainability Management 2012
3. Petra Molthan-Hill, The Business Student's Guide to Sustainable Management: Principles and Practice, 2014
4. Margaret Robertson, Sustainability Principles and Practice, 2014
5. Peter Rogers, An Introduction to Sustainable Development, 2006
6. Guide to Building Information Modeling for Owners, Managers, Designers, Engineers and Contractors. John Wiley & Sons.
7. A relevant textbook or user guide for Primavera P6 or Microsoft Project.

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

Assessment Methodology: Poster presentation (10%), Quiz (10%), Assignment (20%), Field visit/Case study report (20%), Internal Examinations (40%)

	CO Description	PO	PSO1	PSO1
CO1	Comprehend principles, policies, and theoretical foundations of sustainability management.	-	-	-
CO2	Implement corporate sustainability practices and stakeholder engagement strategies in organizational contexts.	PO1 (2) PO3 (3)	3	2
CO3	Analyze green management approaches, sustainable supply chains, and regulatory frameworks to enhance competitiveness.	PO1 (2) PO3 (3)	3	2
CO4	Evaluate sustainability innovations and resource management practices for environmental, social, and economic impact.	PO1 (3) PO2 (2) PO3(3)	3	3

CN25016	System Integration in Construction	L	T	P	C
		3	0	0	3

Course Objective:

To understand how the various systems that constitute a building design which are interwoven and integrated with a view to achieving a high-performance building and various environmental factors.

Structural Integration

Structural System, Systems for enclosing Buildings, Functional aesthetic system, Materials Selection and Specification.

Activity: Poster presentation showing integration of structural systems, building enclosure, and material selection for a high-rise building.

Environmental Factors

Qualities of enclosure necessary to maintain a specified level of interior environmental quality – weather resistance – Thermal infiltration – Acoustic Control – Transmission reduction – Air quality – illumination – Relevant systems integration with structural systems.

Activity: Case study on thermal, acoustic, and air quality performance of high-rise building envelopes.

Services

Plumbing – Electricity – Vertical circulation and their interaction – Heating Ventilation and Airconditioning Systems in Buildings and implementation techniques in High Rise Buildings.

Activity: Quiz on service layout plans

Maintenance

Component longevity in terms of operation performance and resistance to deleterious forces - Planning systems for least maintenance materials and construction – access for maintenance – Feasibility for replacement of damaged components – equal life elemental design – maintenance free exposed and finished surfaces.

Activity: Assignment on maintenance plan for building components

Safety Planning

Ability of systems to protect fire – Preventive systems – fire escape system design – Planning for pollution free construction environmental – Hazard free Construction execution for High Rise Buildings.

References

1. A.J. Elder and Martiz Vinden Barg, Handbook of Building Enclosure, McGraw-Hill Book Company, 1983.
2. David V. Chadderton, Building Services Engineering, Taylor and Francis, 2013.
3. Jane Taylor and Gordon Cooke, The Fire Precautions Act in Practices, 1987.

4. Peter R. Smith and Warren G. Julian, Building Services, Applied Science Publishers Ltd., London, 1993.
5. William T. Mayer, Energy Economics and Building Design, McGraw-Hill Book Company, 1983.

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

Assessment Methodology: Poster presentation (10%), Quiz (10%), Assignment (20%), Field visit/Case study report (20%), Internal Examinations (40%)

	CO Description	PO	PSO1	PSO1
CO1	Understand structural, environmental, and service system requirements in high-rise buildings.	-	-	-
CO2	Apply principles of materials selection and system planning for durable and maintainable building components.	PO1 (2) PO3 (3)	3	2
CO3	Analyze environmental, safety, and service integration to optimize building performance and occupant comfort.	PO1 (2) PO3 (3)	3	2
CO4	Evaluate design and planning strategies for high-rise buildings considering sustainability, safety, and lifecycle maintenance.	PO1 (3) PO2 (2) PO3 (3)	3	3

CN25017	Digital Design and Construction	L	T	P	C
		3	0	0	3

Course Objective:

This course will focus on the transformative impact of digital technologies on the entire construction project lifecycle, from conceptual design to operation and maintenance.

Introduction to Digital Construction and BIM Fundamentals

Evolution of digital technologies in AEC. Concept of Digital Construction and Construction 4.0. Introduction to Building Information Modeling (BIM): Definition, benefits, and challenges. BIM dimensions: 3D modeling, 4D (scheduling), 5D (cost), 6D (sustainability), 7D (facilities management). BIM maturity levels and implementation frameworks (e.g., ISO 19650). Interoperability and OpenBIM (IFC standards).

Activity: Poster presentation comparing traditional construction processes vs Construction 4.0 and BIM maturity levels.

BIM for Design and Coordination

Parametric modeling in BIM software (e.g., Autodesk Revit, ArchiCAD). Creating intelligent building components and families. Architectural, structural, and MEP modeling in BIM environments. BIM for quantity takeoff and cost estimation (5D BIM). Clash detection and resolution using coordination software (e.g., Autodesk Navisworks). BIM Execution Plans (BEPs) and information delivery manuals (IDMs). Collaborative BIM workflows and common data environments (CDEs).

Activity: Quiz

Computational Design and Generative Design

Introduction to computational design principles and algorithms. Visual programming languages (e.g., Grasshopper for Rhino, Dynamo for Revit). Parametric and generative design strategies for architectural and structural optimization. Rule-based design and design automation. Performance-driven design: daylighting, energy analysis, structural analysis using computational tools.

Activity: Case study on a sample project dataset to create dashboards

Digital Fabrication and Automation in Construction

Overview of digital fabrication technologies: 3D printing (concrete, metal, polymer), prefabrication, modular construction. Robotics in construction: automated bricklaying, welding, assembly. CNC machining and automated cutting. Design for Manufacturing and Assembly (DfMA) principles. Logistics and supply chain integration with digital fabrication. Challenges and opportunities of automation in construction.

Activity: Assignment on digital transformation roadmap for a hypothetical AEC firm

Data Analytics, Visualization, and Emerging Technologies

Construction data sources and data management. Data analytics for project performance, productivity, and safety. Visualization techniques: dashboards, immersive environments (VR/AR). Internet of Things (IoT) in construction: sensors for monitoring

progress, safety, and asset health. Artificial Intelligence (AI) and Machine Learning (ML) applications: predictive analytics, risk assessment, automated quality control. Digital Twins in construction: concept, implementation, and applications for operations and maintenance. Blockchain for secure data exchange and smart contracts. Unmanned Aerial Vehicles (UAVs/Drones) for site mapping, progress monitoring, and inspection.

Digital Transformation Strategies and Case Studies

Developing a digital transformation roadmap for AEC firms. Change management and organizational adoption of digital technologies. Legal and contractual implications of digital workflow. Cybersecurity in digital construction. Future trends and challenges in digital design and construction.

Activity: Industry case studies showcasing successful digital implementations.

References

1. Eastman, C., Teicholz, P., Sacks, R., & Liston, K. (2018). BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers and Contractors. John Wiley & Sons.
2. Succar, B., & Sher, W. (2016). The BIM Manager's Handbook: A Guide to Implementation and Management. Wiley.
3. A relevant textbook on computational design for architecture and construction (e.g., focusing on Grasshopper/Dynamo, algorithmic design).
4. Kreider, R. G., Messner, J. I., & Dubler, R. E. (2019). Building Information Modeling: A Guide for the Perplexed. Routledge.
5. Whyte, J., & Bouchlaghem, D. (2018). Digital Design and Construction. Wiley Blackwell.

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

Assessment Methodology: Poster presentation (10%), Quiz (10%), Assignment (20%), Field visit/Case study report (20%), Internal Examinations (40%)

	CO Description	PO	PSO1	PSO1
CO1	Understand digital construction concepts, BIM dimensions, and emerging technologies in the AEC industry.	-	-	-
CO2	Apply BIM, computational design, and digital fabrication tools for design, coordination, and project optimization.	PO1 (2) PO3 (3)	3	2
CO3	Analyze project data using digital tools for performance, safety, and sustainability improvements.	PO1 (2) PO3 (3)	3	2
CO4	Evaluate strategies for digital transformation, including workflow integration, automation, and organizational adoption.	PO1 (3) PO2 (2) PO3(3)	3	3

CN25018	Quality Control and Assurance in Construction	L	T	P	C
		3	0	0	3

Course Objective:

To impart fundamental and practical knowledge of quality management, quality assurance, and quality control practices in the construction industry. The course aims to enable students to plan, implement, and improve quality systems using standards, statistical tools, and modern quality improvement techniques.

Quality Management and Quality Systems

Quality concepts, objectives and dimensions – Factors affecting construction quality – Roles and responsibilities – Quality process and quality plan – Quality circles – Evolution of quality standards – ISO 9000 family – ISO 9001 requirements – Quality documentation – Implementation and third-party certification.

Activity: Preparation of a basic Quality Plan and ISO documentation for a construction project.

Quality Planning and TQM

Quality policy and objectives – Customer satisfaction – Time and statistical tolerance – Traditional vs modern quality approaches – TQM principles – Taguchi's concept – QFD – Codes and standards – Contract documents – Construction planning – Inspection procedures – QA/QC cost implications.

Activity: Application of TQM tools (QFD/Taguchi) to a selected construction activity.

Quality Assurance and Control

QA/QC objectives and methods – Quality appraisals – Statistical quality control – Sampling techniques and plans – AQL, LTPD, AOQL – Failure aspects – FMEA – Stability methods and quality control tools.

Activity: Design of a sampling plan and QA/QC checklist for construction materials.

Quality Improvement and Reliability

Reliability concepts – MTTF, MTTR, MTBF – Reliability prediction – Quality improvement through materials, specifications and standardization – Bid preparation – Environmental and safety aspects – Life cycle costing – Value engineering – Six Sigma – Case studies.

Activity: Value engineering and life-cycle cost analysis of a construction component.

REFERENCES

1. Hutchins.G, ISO 9000: A Comprehensive Guide to Registration, Audit Guidelines and Successful Certification, Viva Books Pvt. Ltd., 1994.
2. James, J.O' Brian, Construction Inspection Handbook – Total Quality Management, Van Nostrand, 2012.
3. John L. Ashford, the Management of Quality in Construction, E & F.N.Spon, 2002.
4. Juran Frank, J.M. and Gryna, F.M. Quality Planning and Analysis, McGraw Hill, 2001

5. Steven McCabe, Quality Improvement Techniques in Construction, Addison Wesley Longman Ltd, 2014.
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%
Assessment Methodology: Poster presentation (10%), Quiz (10%), Assignment (20%), Field visit/Case study report (20%), Internal Examinations (40%)

	CO Description	PO	PSO1	PSO1
CO1	Explain quality management principles, ISO 9001 standards, and quality systems applicable to construction projects.	-	-	-
CO2	Prepare quality plans, quality documentation, and apply TQM tools for construction activities.	PO1 (2) PO3 (3)	3	2
CO3	Apply QA/QC techniques, statistical sampling, and reliability concepts to control and assess construction quality.	PO1 (2) PO3 (3)	3	2
CO4	Evaluate and improve construction quality using value engineering, life-cycle costing, and Six Sigma concepts.	PO1 (3) PO2 (2) PO3(3)	3	3