MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
(Deemed University)
(Declared Under Distinct Category by Ministry of Education, Government of India)
NAAC Accredited with A++ Grade
Department of Civil Engineering
Scheme of Evaluation
M. E. I Semester *(Construction Technology & Management)*

(for batch admitted in academic session 2024-25)

S. No.	Course Code	Category Code	Course Name	Theory Block — Continuous Evaluation — Minor Evaluation I	Theory Block — Continuous Evaluation — Minor Evaluation II	Theory Block — Continuous Evaluation — Quiz/Assignment	Theory Block — Major Evaluation	Practical Block — Continuous Evaluation — Lab Work & Sessional	Practical Block — Major Evaluation	Total Marks	L	T	P	Total Credits	Mode of Learning	Mode of Major Evaluation	Duration of Major Evaluation
1.	51241101	DC	Computational Techniques	20	20	30	30	-	-	100	3	-	-	**3**	Face to Face	PP	2 Hrs
2.	51241102	DC	Construction Project Management	20	20	30	30	-	-	100	2	1	-	**3**	Face to Face	PP	2 Hrs
3.	51241103	DC	Construction Materials, Machines & Techniques	20	20	30	30	-	-	100	2	1	-	**3**	Face to Face	PP	2 Hrs
4.	512411XX	DE	**Departmental Elective (DE-1)**	20	20	30	30	-	-	100	3	-	-	**3**	Face to Face	PP	2 Hrs
5.	51241104	SPC	Management Theory (SPC-1)	20	20	30	30	-	-	100	3	-	-	**3**	Face to Face	PP	2 Hrs
6.	51241105	DLC	**Materials Lab** [#]	-	-	-	-	70	30	100	-	-	4	**2**	Experiential	SO	-
7.	51241106	SLP	**Seminar/Presentation** [$]	-	-	-	-	70	30	100	-	-	4	**2**	Mentoring	SO	-
8.	51241111	NEC	**Classified Novel Engaging Course (Activity Based Learning) MS Project & Excel**	-	-	-	-	-	50	50	-	1	-	**1**	Interactive	SO	-
			Total	100	100	150	150	140	110	750	13	03	08	**20**	-	-	-

MCQ: Multiple Choice Question   **PP:** Pen Paper   **SO:** Submission + Oral   **OB:** Open Book

[#] During lab, students have to perform practical/assignments/minor projects related to the courses of respective semester using recent technologies / languages / tools etc.

[$] Seminar/Presentation through SWAYAM / NPTEL (Registration in a course will be compulsory for students but assessment will be based on internal seminar presentation).

DE-1		
S. No.	**Course Code**	**Course Name**
1.	51241107	Maintenance Management
2.	51241108	Infrastructure Development
3.	51241109	Formwork for Concrete Structures
4.	51241110	Environmental Auditing & Management Systems

Mode of Learning					Mode of Examination					Total Credits
Theory		Lab		NEC	Theory			Lab	NEC	
Face to Face	Online	Mentoring	Experiential	Interactive	PP	MCQ	OB	SO	SO	
15		2	2	1	15			4	1	20
75%		10%	10%	5%	75%			20%	5%	Credits %

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Department of Civil Engineering
Scheme of Evaluation
M. E. II Semester *(Construction Technology & Management)*

(for batch admitted in academic session 2024-25)

S. No.	Course Code	Category Code	Course Name	Theory Block Continuous Evaluation — Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment	Major Evaluation	Practical Block Continuous Evaluation — Lab Work & Sessional	Major Evaluation	MOOCs Assignment	Exam	Total Marks	L	T	P	Total Credits	Mode of Learning	Mode of Major Evaluation	Duration of Major Evaluation
1.	51241201	DC	Project Economics & Financing	20	20	30	30	-	-	-	-	100	3	-	-	3	Face to Face	PP	2 Hrs
2.	51241202	DC	Construction Cost Management	20	20	30	30	-	-	-	-	100	2	1	-	3	Face to Face	PP	2 Hrs
3.	51241203	DC	Contract Management	20	20	30	30	-	-	-	-	100	2	1	-	3	Face to Face	PP	2 Hrs
4.	512412XX	DE	**Departmental Elective* (DE-2)**	-	-	-	-	-	-	25	75	100	3	-	-	3	Online	MCQ	3 Hrs
5.	51241204	SPC	Repair, Rehabilitation & Retrofitting of Structures **(SPC-2)**	20	20	30	30	-	-	-	-	100	2	1	-	3	Face to Face	PP	2 Hrs
6.	51241205	DLC	**Computational Lab #**	-	-	-	-	70	30	-	-	100	-	-	4	2	Experiential	SO	-
7.	51241206	SLP	**Seminar/Presentation$**	-	-	-	-	70	30	-	-	100	-	-	4	2	Mentoring	SO	-
8.	51241207	NEC	**Classified Novel Engaging Course (Activity Based Learning)** Fire Safety & Regulation in Building	-	-	-	-	-	50	-	-	50	-	1	-	1	Interactive	SO	-
			Total	80	80	120	120	140	110	25	75	750	12	04	08	20	-	-	-

MCQ: Multiple Choice Question   **PP:** Pen Paper   **SO:** Submission + Oral   **OB:** Open Book

* This course will run through SWAYAM / NPTEL /MOOC based learning platform (with credit transfer facility). The course can be related & relevant to other domain as well.

During lab, students have to perform practical/assignments/minor projects related to the courses of respective semester using recent technologies / languages / tools etc.

$ Seminar/Presentation through SWAYAM / NPTEL (Registration in a course will be compulsory for students but assessment will be based on internal seminar presentation).

DE-2* (through SWAYAM / NPTEL /MOOC)		
S. No.	Course Code	Course Name
1.	51241208	Strategies for Sustainable Design

Mode of Learning					Mode of Examination					Total Credits
Theory		Lab		NEC	Theory			Lab	NEC	
Face to Face	Online	Mentoring	Experiential	Interactive	PP	MCQ	OB	SO	SO	
12	3	2	2	1	12	3		4	1	20
60%	15%	10%	10%	5%	60%	15%		20%	5%	Credits %

Department of Civil Engineering

Scheme of Evaluation
M. E. III Semester *(Construction Technology & Management)*

(for batch admitted in academic session 2024-25)

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted						Total Marks	Contact Hours per week			Total Credits	Mode of Learning	Mode of Major Evaluation	Duration of Major Evaluation
				Theory Block				Practical Block			L	T	P				
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation								
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional									
1.	51242101	DLC	**Preliminary Dissertation** *(Literature Review/ Problem Foundation/ Synopsis/ survey paper, etc.)*	-	-	-	-	175	75	250	-	-	28	**14**	Interactive	SO	-
			Total	-	-	-	-	**175**	**75**	**250**	-	-	**28**	**14**	-	-	-

Department of Civil Engineering

Scheme of Evaluation
M. E. IV Semester *(Construction Technology & Management)*

(for batch admitted in academic session 2024-25)

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted						Total Marks	Contact Hours per week			Total Credits	Mode of Learning	Mode of Major Evaluation	Duration of Major Evaluation
				Theory Block				Practical Block									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation		L	T	P				
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional									
1.	51242201	DLC	Dissertation	-	-	-	-	350	150	500	-	-	32	16	Interactive	SO	-
			Total	**-**	**-**	**-**	**-**	**350**	**150**	**500**	**-**	**-**	**32**	**16**	**-**	**-**	**-**

Course Code: 51241101

Course Name: Computational Techniques

L	T	P	Credit
3	0	0	3

Course Objectives:

- o To know about the formulation of L.P.P. & its solution
- o To explore the Non linear programming problem and dynamic programming
- o To describe Probability and random Process
- o To describe random sampling and hypothetical test
- o To perceive the Z-transform techniques

SYLLABUS

Unit 1:

Concept of LPP, LPP formulation, Graphical method for solving LPP with two variables, Simplex method, Duality theory, Transportation and Assignment problems. Non Linear Programming Problems (NLPP): Introduction of NLPP, constraints and non-constraint problems of maxima and minima, constraints in the form of equations.

Unit 2:

Introduction to game theory, competitive games, finite and infinite games, two person zero sum game, pure and mixed strategies, saddle point, maximin and minimax principle, solution of a rectangular game in terms of mixed strategies, Graphical method of (2xm) and (nx2) games.

Dynamic Programming: Basic concepts, Bellman's optimality principle, dynamic programming approach in decision making problems, optimal subdivision problems.

Unit 3:

Theory of Probability: Concept of probability, Random variable, discrete probability distributions, Continuous probability distributions, Moment generating function, Probability density function, some special distributions, bi-variate distribution, Random variable, conditional distribution function, Joint probability distribution function, Marginal probability distribution, cumulative probability distribution.

Unit 4:

Testing of Hypothesis, Basic concept of estimation, concept of theory of sampling, chi-square (χ^2) distribution, t-distribution, Fisher's Z-distribution. Analysis of variance, one way and two-way classification.

Unit 5:

Z-transform and their properties, inverse Z-transform, convolution theorem, solution of difference equations by Z-transform. Basic concept of Bessel's function, Hankel transform and their properties, Parseval's theorem.

Course Outcomes:

Upon completion of the course, a student will be able to

CO1: **Determine** the solution of Linear and Non Linear Programming Problems

CO2: **Evaluate** the problems related to game theory& dynamic progamming.

CO3: **Acquire** the knowledge of Probability theory and Random Variable.

CO4: **Analyze** the test of hypothesis and Analysis of Variance.

CO5: **Apply** transforms for engineering applications.

Recommended Books

1. Griva, S. G. Nash and A. Sofer: Linear and Non Linear Optimization, Society for Industrial & Applied, U. S. Mathematics, 2012.

2. F. B. Hildebrand: Methods of Applied Mathematics, Prentaince Hall, 1992.

3. H. K. Dass: Advance Engineering Mathematics, S. Chand, 2018.

4. P. R. Thie and G. E. Keough: An Introduction to Linear Programming & Game Theory, Wiley India Private limited, 2008.

5. Introduction to Probability Models: S. M. Rose, Elsevier India Pvt Limited, 10th Edition 2011.

Course Code: 51241102
Course Name: Construction Project Management

	L	**T**	**P**	**Credit**
	2	**1**	**0**	**3**

Course Objective:

To learn estimating, specifications, rate analysis, valuation, claims & arbitration, laws related to construction labour, conditions of contract and construction contracts in infrastructure projects.

SYLLABUS

Unit-I

Schedule Planning: Work breakdown structure, Activity and project planning, Level of details, Development of various charts for project planning, Gantts and other charts, Networks and its development.

Unit-II

Work Study Techniques: Introduction, Method study and work of measurement techniques, Different types and techniques method study and work measurements. Work Sampling, delay measurements, determinate and probabilistic activity durations.

Unit-III

Productivity in Construction: Definition of productivity, Productivity measurement, Qualitative and quantitative measurements, Productivity of production components, Labour, Equipment, Material and capital productivity, Productivity planning, designing and execution processes, System productivity

Unit-IV

Critical Path Method/PERT: Overview of CPM basic scheduling computations, Forward and backwards pass, concepts of early start, Early finish, late start and late finish time for activities and events. Different types of slacks, PERT system of three time estimates, PERT scheduling computations.

Unit-V

LOB and other techniques: line of balance techniques, Modified LOB and EnPERT scheduling techniques

Resource Scheduling: Activity time-cost and time-resource functions, Time-cost trade-off functions, Linear, Non linear and discrete time cost/ resource functions, crashing of projects, different methods.

Resource loading and leveling, different methods, unconstrained & constrained resource scheduling, relative effectiveness & use of heuristics in scheduling.

Reference books

1. Project Management with CPM and P ERT by Joseph J . Moder, Cecil R . Phillips, Van Nostrand Reinhold Company
2. A Management Guide to PERT/CPM With GERT/PDM/DCPM and Other networks by Jerome D. Wiest, Ferdinand K. Levy, Prentice Hall.
3. PERT & CPM Principles and Applications by L.S. Srinath, Affiliated EWP Pvt. Ltd.
4. Project Management Scheduling PERT and CPM by Dr. B.C. Punmia, K.K. Khandelawal

Course Outcomes:

Upon completion of the course, a student will be able to

CO1: Know the attributes of project and its different phases.

CO2: Develop the project network based on work breakdown structure and estimation of activity durations

CO3: Analyze the project network and make decide the various alternates.

CO4: Evaluate the optimum cost of project for assigned deadlines.

CO5: Understand the different options to arrange the finances to complete it within stipulated time

Course Code: 51241103
Course Name: Construction Materials, Machines & Techniques

L	T	P	Credit
2	1	0	3

Course Objective:

To impart knowledge about the details of normal and special concretes; construction equipments; and modern construction techniques.

SYLLABUS

Unit-I

Ingredients of concrete including mineral admixtures and chemical admixtures; Proportioning of ingredients; Stages in production of concrete i.e. Batching, Mixing, Transporting, Placing compacting and curing. Design of high strength concrete; Production of Ready mix concrete.

Unit-II

Polymer concrete, Light weight concrete, Heavy weight concrete, Concrete for radiation shielding, No-Fines concrete, Pervious concrete; Ferro cement; Fiber reinforced concrete, Dry lean concrete and Pavement quality concrete; Self compacting concrete.

Unit-III

Characteristics, Operation and selection of different types of construction equipments viz. Power shovels, Draglines, Scrapper, Bulldozer, Tractor, Rippers, Motor graders; Equipments for aggregate processing plant; Ready Mix Concrete Plant; and Hot Mix plant.

Unit-IV

Construction of piles, Well foundations, Coffer dams and diaphragms; Drilling and blasting, Underpinning, Shoring and shuttering; Different types of form works, Stationary and slip form work techniques, Scaffolding; Application of Geosynthetics.

Unit-V

Application of prefabrication in construction, Modular coordination and standardization; Prestressing methods; Materials; Loss of prestress; equipments for industrial production of prestressed components; Production of Railway Sleepers, Poles and Tanks; Pre-engineered buildings; Erection of steel structures like bridges, and trusses.

Reference Books

1. D. G. Gransberg, C. M. Popescu and R. C. Ryan, Construction Equipment Management for Engineers, Estimators, and Owners, Taylor & Francis, New York.

2. R. L. Peurifoy, C. J. Schexnayder, A.Shapira and R. Schmitt, Construction planning, equipment, and methods, McGraw Hill, New York

3. A. R. Santha Kumar, Concrete Technology, Oxford University press.

4. Soil Mechanics by Gopal Ranjan, New Age Publishers.

5. Foundation Design Manual by Narayan V. Nayak, Dhanpat Rai Publications

6. Mahesh Verma, Construction Equipment, its planning & Application, Metropolitan Book Co.(P)Ltd.

7. Prestressed Concrete by T. Y. Lin and N. H. Burns, Wiley Publishers

8. Highway Engg by Justo and Khanna, Publisher: Nem Chand and Brothers

Courses Outcomes:

Upon completion of the course, a student will be able to

   CO1: Design normal and high strength concretes.

   CO2: Explain the details of various types of special concrete.

   CO3: Analyse the suitability of various equipments for construction sites.

   CO4: Describe the details of deep foundations; form works and geosynthetics.

   CO 5: Apply modern construction practices for concrete and steel structures.

Course Code: 51241104
Course Name: Management Theory

L	T	P	Credit
3	0	0	3

Course Objective:

To learn and understand the Special Features of Construction Industry, Management principles and functions, behavior of individual & group behavior and motivational theories, different theories of organization construction management and SWOT analysis.

SYLLABUS

Unit I

Special Features of Construction Industry: Significance and importance of construction VIS AVIS other industry Importance of construction industry in National economy. Recognition of construction as industry. Significant differences between construction & other manufacturing. Production and process industry with special reference to planning. Execution finance and other aspects.

Unit-II

Management Principles: Concepts and theory. Historical developments. Management functions: Forecasting, Planning, Organizing, directing, coordinating, motivating, controlling and evaluating. Problems of construction industry influencing management process.

Unit-III

Behavioral Sciences: Principles. Historical development. Individual and group behavior. Group dynamics, Motivational theories, Leadership interaction.

Unit-IV

Organization Theory: Introduction. Historical development, Growth and various models. Type of construction organization. Design of organization. Organization systems. Goals, Culture & environment. Developing self learning organizations.

Unit-V

Construction Management and Different Management Requirements: Principles of sales. Purchase. Marketing. Stores and site management on construction projects. Entrepreneurship. Business policy. Corporate planning, SWOT analysis.

Reference Books

1. Construction Project Management Theory And Practices by K.N. Jha, Pub. Pearson Education India
2. Organizational Behavior in Construction, Anthony Walker, Willey Blackwell
3. Principles and Practice of Management by L. M. Prasad, S. Chand & Sons
4. Human Resource Management: Text and Cases by K. Aswathappa, Himalaya Publishing.
5. Entrepreneurial Development" by S.S. Khanka, S. Chand & Sons

Courses Outcomes:

Upon completion of the course, a student will be able to

CO1: Differentiate between construction and other manufacturing industry regarding various aspects like planning, execution and finance.

CO2: Manage and solve the problems.

CO3: Apply motivational theories at work place.

CO4: Contribute to understand design organization system for the company.

CO5: Carry out the SWOT analysis and construction site management.

Course Code: 51241107 / 53241110
Course Name: Maintenance Management

L	T	P	Credit
3	0	0	3

Course Objective:

To learn about the various building services & their planning and service management required in a building.

SYLLABUS

Unit I

Introduction: Introduction to primary services in a building, Type of services required to keep facility usable, planning of services. Organization structures of services management. Role and administrative functions of supervisors. Outline of the concept of carbon trading and self sustainable zero carbon building. Importance

Unit II

Fire Fighting: Standard fire, fire resistance, classification of buildings. Basic requirement of the works for fighting system, various components of the fire fighting system. Maintenance required of the system, fire fighting in high-rise buildings, commercial/industrial complexes. Public buildings, checklist for fire safety. Provision of NBC.

Unit III

Lifts/Elevators, Escalators: Legal formalities for elevators, various types of lifts, working mechanisms of lift and escalators. Indian standard codes for planning & installations of elevator, inspection & maintenance of lifts.

Unit IV

Plumbing Services Water Supply System: Basics of Plumbing systems. Requirement of Plumbing works, Agency, Activity flow chart for plumbing work. Quality checking of materials. Water supply and distribution system is high-rise building & other complexes, pumps and pumping mechanisms. Operation & maintenance of fittings & fixtures of water supply & sanitary. Do's & Don'ts for water pipe networks.

Unit V

Maintenance and management of services: Telecommunication network, computer network LAN, Electrical network & appliances. Basics of single phase & three phase electrification, precautions and safety measures during electrification. Indian standard codes for electrical appliances & wiring operations & maintenance of network & appliances. Landscaping & Horticulture. Building maintenance management, applications of computer in service management. Flowcharts of air conditioning & heating. Centralised systems, monitoring and working of the equipments, Checklist of inspection, Performance testing. Water proofing. Damp proofing & Termite proofing. Working procedure & stages of work of water proofing for W.C., Bathrooms, Terrace, sloping roof, Basements, tanks. Use of chemicals for water proofing treatment.

Reference Books

1. Building services Design and Management by Jakie Partman, Willey Blackwell 2014.
2. Building Services Engineering by David V .Chadderton, Routledge 2013.

Courses Outcomes:

Upon completion of the course, a student will be able to

  CO1: Identify various services required in a building.

  CO2: **Carry** out planning of firefighting system for a building.

  CO3: Develop a management strategy for maintenance of building services in a building.

  CO4: **Design** a sustainable building services plan for a building.

Course Code: 51241108
Course Name: Infrastructure Development

	L	T	P	Credit
	3	0	0	3

Course Objective:

To provide the knowledge and skills to students so that they can plan, operate, maintain, and ensure the sustainability of infrastructure systems by considering risk management, disaster preparedness and applying IT tools.

SYLLABUS

Unit-1

Infrastructure and economic development: Energy needs, sources and management. Different types of build infrastructure systems, challenges and opportunities.

Unit –II

Strategic issues in Infrastructure development: Planning, Design and Construction of Infrastructure. Quality control in Infrastructure development. Role of Public PPP in Infrastructure development.

Unit-III

Performance monitoring: Maintenance, Rehabilitation and Renovation of Infrastructure. Life cycle cost analysis of Infrastructure.

Unit-IV

Risk management in Infrastructure projects: Basic components of risk, components of risk management – risk assessment, risk acceptance, treatment, monitoring and communication.

Unit - V

Disaster management of Infrastructure: Application of IT tools in various phases of Infrastructure development.

Reference Books:

1. Risk Management in Civil Infrastructure by Mohammed M. Ettouney, Shreenivas Alampalli. Publisher CRC Press Taylor and Francis group.2017.

2. Infrastructure Management: Integrating Design, Construction, Maintenance, Rehabilitation and Renovation by W. Ronald Mudson, Ralph Haas, Publisher Mc Graw- Hill.1997

3. Disaster Resilence Management of Infrastructure System: Computational modeling and Geospatial Technologies by W Waheed Uddin Publisher CRC Press LLC.

Courses Outcomes:

Upon completion of the course, a student will be able to

CO 1: **Develop** plan for infrastructure considering operation, maintenance, sustainability and life cycle cost.

CO2: Identify various risks in Infrastructure projects.

CO3: Illustrate management and disaster management needs for Infrastructure systems.

CO4: Apply I. T. Tools in various phases of Infrastructure system.

Course Code: 51241109
Course Name: Formwork for Concrete Structures

L	T	P	Credit
3	0	0	3

Course Objective:

To equip students with the knowledge and skills needed to design, construct, and manage formwork systems for concrete structures efficiently and safely.

SYLLABUS

Unit-1 Introduction

Introduction to Sheeting, Shuttering, Centering, Staging, Formwork, Scaffolding and False work, Mould. Formwork as a temporary structure. Requirements for a formwork. Classification (Types) of Formwork. Formwork Materials.

Unit-2 Formwork for building components

Formwork for raft foundation, pile foundation, footings, RCC columns, beams, slabs and wall. Formwork area calculation. Various loads and moments on formwork. Slip form and their types.

Unit-3 Formwork for special structure

Formwork for Highways. Formwork for Bridge structures. Formwork for Multi-Story Building Construction. Formwork for precast concrete. Formwork for pre-stressed concrete. Flying formwork and their advantages, disadvantages and limitations.

Unit-4 MIVAN Formwork

Introduction, materials used in MIVAN formwork, parts of MIVAN formwork, Procedure of MIVAN formwork construction, pin and wedge system in MIVAN formwork, Work cycle of MIVAN formwork, Comparison between MIVAN and traditional formwork, Technical specification of MIVAN formwork, advantages and disadvantages of MIVAN formwork

Unit-5 Issues and failure of Formwork

Causes of Formwork Failure. Common deficiency in design leading to formwork failure. A case study on formwork failure. Avoiding formwork failure. Pre-Award and Post –award Formwork Management Issues.

Reference Books:

1. Jha, K.N., Formwork for Concrete Structures, First Edition, McGraw Hill. 2012
2. Austin, C.K., Formwork for concrete, Cleaver - Hume Press Ltd., London, 1996
3. Michael P. Hurst, Construction Press, London and New York. 2003

Courses Outcomes:

Upon completion of the course, a student will be able to

CO1: Explain the concept of formworks.

CO2: **Explain** various types of formworks.

CO3: Evaluate the use of formworks in various structures

CO4: **Assess** the failure issues in formworks.

Course Code: 51241105
Course Name: Materials Lab

L	T	P	Credit
0	0	4	2

Course Objective:

This lab course is aimed to be familiar with methods used for characterization of building material; mix design and quality checking of concrete; characterization of soils and highway materials.

List of Experiments:

1. Mix Design of Concrete
2. Permeability Test of Concrete
3. Creep Test of Concrete
4. Measurement of concrete Strength determination by NDT techniques.
5. Unconfined Compression Test
6. Direct Shear Test
7. Static Cone Penetration Test
8. Triaxial Shear Test (Unconsolidated Undrained, Consolidated Undrained, Consolidated Drained)
9. Vane Shear Test
10. C.B.R Test
11. Consolidation Test
12. SPT Test (Demonstration)
13. Marshall stability test of bitumen

Course Outcomes:

Upon completion of the course, a student will be able to

   CO1: Determine different properties of concrete.

   CO2: Determine different properties of soil

   CO3: Determine different properties of highway materials

   CO4: Apply various non-destructive testing methods on concrete

   CO5: Design different types of concrete mixes

Reference Books:

1. Mehta P.K and Monteiro P.J.M, "Concrete: Microstructure, Properties and Materials, Third Edition, Tata McGraw-Hill Publishing company Limited, New Delhi,2006

2. Shetty M. S., "Concrete Technology, Theory and Practice", Revised Edition, S. Chand & company Ltd., New Delhi,2006

3. Neville. A. M., "Properties of Concrete", 4th Edition Longman,1995

4. Soil Mech. & Found. Engg., Dr. K. R. Arora, Std. Publishers Delhi,7th edition2014

5. Soil Mech. & Foundation, Dr. B. C. Punmia, Laxmi Publications,Delhi,16th edition2017

6. Soil Mech. & Found Engg., S. K. Garg, Khanna Publishers, Delhi, 1stedition,2003

7. Soil Testing for Engg., T. W. Lambe, John Wiley & Sons. Inc., 1969

Course Code: 51241106

Course Name: Seminar / Presentation

L	T	P	Credit
0	0	4	2

Course Objective:

To enhance students' understanding of Construction Technology & Management by encouraging the study of diverse literature, fostering lifelong learning, and developing the soft skills necessary for effective presentation.

Syllabus

Any relevant topic related to Construction Technology & Management from within or beyond the syllabus through Swayam / NPTEL/MOOC.

Course Outcomes:

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

CO 1: Analyze contemporary issues in Construction management & its allied areas.

CO 2: Demonstrate good oral communication skills.

CO 3: Develop poster and power point presentations for effective communication.

Course Title: MS Project and Excel

Course Objective:

Understand the fundamentals of project management and the role of MS Project and Excel.

Course Modules:

Module 1: Introduction to Project Management

- Overview of Project Management principles
- The role of software in project management
- Introduction to MS Project and Excel
- Setting up a new project
- Defining project scope and goals
- Work breakdown structure (WBS)
- Task creation and management
- Setting up milestones

Module 2: Resource and Cost Management in MS Project

- Resource allocation and leveling
- Estimating project costs
- Budgeting in MS Project
- Tracking and managing costs
- Creating a project schedule
- Gantt charts and network diagrams
- Critical Path Method (CPM)
- Handling project delays and rescheduling

Module 3: Tracking and Managing Projects with MS Project

- Baselines and project tracking
- Monitoring progress and performance
- Earned Value Management (EVM)
- Reporting and exporting project data
- Excel basics: Functions, formulas, and data formatting
- Creating project timelines and Gantt charts in Excel
- Budget tracking and cost analysis using Excel

Module 4: Advanced Excel Techniques for Data Analysis

- Pivot tables and pivot charts
- Advanced formulas and functions (e.g., VLOOKUP, HLOOKUP, INDEX-MATCH)
- Data validation and conditional formatting
- Data visualization: Creating charts and graphs

Module 5: Integration of MS Project and Excel

- Exporting data from MS Project to Excel
- Creating dynamic dashboards in Excel for project reporting
- Customizing reports and charts using Excel

Course Materials:

- Textbook: "Microsoft Project 2019 Step by Step" by Carl Chatfield and Timothy Johnson
- Additional readings: Selected articles and case studies
- Software: MS Project, Excel

Course Outcomes:

CO1: Master project management principles and apply them using MS Project and Excel.

CO2: Develop comprehensive project plans, including scope, timelines, and resources.

CO3: Effectively manage project costs and resources using MS Project tools.

CO4: Utilize advanced Excel techniques for data analysis and project reporting.

CO5: Integrate MS Project and Excel to enhance project tracking and performance monitoring.

Course Title: Optimization Using MATLAB Toolbox

Syllabus

1. **Introduction to Optimization:**
   - Basic concepts and definitions
   - Types of optimization problems (linear, nonlinear, integer, etc.)

2. **MATLAB Optimization Toolbox Overview:**
   - Introduction to the toolbox and its capabilities
   - Setting up the MATLAB environment

3. **Linear Programming (LP):**
   - Formulating LP problems
   - Solving LP problems using linprog

4. **Nonlinear Programming (NLP):**
   - Unconstrained optimization (using fminunc)
   - Constrained optimization (using fmincon)

5. **Quadratic Programming (QP):**
   - Formulating and solving QP problems using quadprog

6. **Mixed-Integer Linear Programming (MILP):**
   - Solving MILP problems using intlinprog

7. **Least Squares Problems:**
   - Linear and nonlinear least squares (using lsqnonlin and lsqcurvefit)

8. **Multi-objective Optimization:**
   - Formulating and solving multi-objective problems (using fgoalattain and fminimax)

9. **Genetic Algorithm:**

10. **Project Work:**
    - Hands-on projects to apply optimization techniques to real-world problems

Course Code: 51241201

Course Name: Project Economics & Financing

L	T	P	Credit
3	0	0	3

Course Objective:

To provide a comprehensive understanding of managerial economics in the construction industry, including demand analysis, forecasting, time value of money, cost of capital, budgeting, project selection and evaluation, project financing, risk management, and accounting processes.

SYLLABUS

Unit-I

Basic Economic Theories: Principles of managerial economics. Economic theories. Demand analysis and forecasting. Demand elasticity. Cost and production analysis. Production function. Pricing decisions. Policies & practice.

Unit-II

Money: Time value of money. Different methods & comparisons. Cash flow, discounted cash flow, cash flow forecasting. Financial ratios and statements. Cost of Capital.

Unit-III

Capital Budgeting: Working capital. Capital budgeting and performance budgeting. Break even analysis. Project selection. Project appraisals

Unit-IV

Project Financing: Means of Finance, Financial institutions in India, Policies of financial institutions, financial assistance, Special schemes, Project risk

Unit-V

Financial Accounting: Book keeping processes of construction industry. Accountancy cycle. Journals. Forms and ledgers etc. for accounting and monitoring labor, equipment and material costs. PWD accounting procedure and types of financial statements in Government.

Course Outcomes:

Upon completion of the course, a student will be able to

CO1: Apply principles of managerial economics.

CO2: Perform demand analysis in construction sector.

CO3: Workout time value of money and cost of capital.

CO4: Analyze break-even point and appraisal of projects.

CO5: Determine appropriate means of financing a project.

CO6: Monitor the various cost components of construction projects by using accounting Procedures.

Reference Books:

1. Project Planning, Analysis, Selection, Financing, Implementation & Review by Prasanna Chandra, Publisher Tata McGraw-Hill Education.

2. Engineering Economics & Analysis, by Donald G Newnan, Publisher Oxford University Press.

3. Economic Theory and The Construction Industry by P. Hillebrandt, Publisher Palgrave Macmillan UK

4. Construction Economics: A New Approach by Danny Myers, Publisher Routledge

5. Construction and Project Management Theory And Practices by K.N. Jha, Publisher Pearson Education India

6. Construction Project Management: Planning, Scheduling and Controlling by K.K. Chitkara, Publisher Tata McGraw-Hill Education

Course Code: 51241202
Course Name: Construction Cost Management

L	T	P	Credit
2	1	0	3

Course Objective:

To understand and apply trade-offs in construction projects, including time-cost trade-offs, multi-objective optimization techniques, MCDM methods, value engineering, and productivity enhancement.

SYLLABUS

Unit-I

Trade off Analysis in construction project: Development of Network. Time-cost trade off curves. Non – convex discontinuous and discrete cost time trade – off curves. Crashing of projects. Resource-constrained project scheduling. Multi-objective trade-off problems. Introduction to deterministic, heuristic and meta-heuristics methods for making multi-objective trade-off. Siemen's method of project cost curve.

Unit – II

Multi criteria Decision Making Methods: Analytical Hierarchy Process, and its application in planning and management, Introduction to Fuzzy Set Theory and its Application in MCDM.

Unit-III

Multi-objective optimization methods: Single and multi-objective optimization problems. Pareto-optimality. Introduction to NSGA. Selection. Crossover. Mutation. Non-dominated Sorting. Differences among GA, MOGA, NSGA, NSGA-II. Particle Swarm Optimization. Particle and its position. Local best and global best position. Updating the position of particle. Multi-objective PSO.

Unit-IV

Productivity in Construction: Definition of Productivity. Productivity measurements. Productivity of production components, Labors, Equipment and Material Capital Productivity. Need for Productivity Planning – Short term and long term productivity planning, Productivity improvement approaches, Productivity Improvement techniques – Technology based, Material based, Employee based and Product based.

Unit-V

Value Engineering: Principles of value engineering in Project Management, Value engineering team, Value engineering technique, Job Plans, Role of value engineering in productivity, Life cycle costing and its applications.

Course Outcomes:

Upon completion of the course, a student will be able to

CO1: Explain the concept of trade-off in construction.

CO2: Analyze the trade-off phenomenon in construction using MCDM.

CO3: Evaluate the multi-objective trade-off problems using metaheuristic methods.

CO4: Apply the value engineering and LCC in construction projects.

CO5: Evaluate the labour, material and equipment in construction productivity.

Reference books

1. Golden, Bruce L., Wasil, Edward A., Harker, Patrick T. (Eds.) The Analytic Hierarchy Process, Springer.

2. Joseph J. Moder., PROJECT MANAGEMENT with CPM, PERT and Precedence Diagramming.

3. S. Rajasekaran. and G.A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic, and Evolutionary algorithms". Eastern Economic edition.

4. Kalyanamoy Deb, "Multi-objective optimization using evolutionary algorithms". Wiley.

5. Sumanth, D.J, Productivity Engineering and Management, TMH, New Delhi, 1990

6. Sudit, Ephraim F., "Productivity Based Management", Springer 1984

7. Alphonse Dell'Isola, "Value Engineering: Practical Applications for Design, Construction, Maintenance & Operations", R S Means Co., 1997.

8. Richard Park, "Value Engineering: A Plan for Invention", St. Lucie Press, 1999.

Course Code: 51241203
Course Name: Contract Management

L	T	P	Credit
2	1	0	3

Course Objective:

To learn estimating, specifications, rate analysis, valuation, claims & arbitration, laws related to construction labour, conditions of contract and construction contracts in infrastructure projects.

SYLLABUS

Unit-I

Quantity Surveying: Basic principles of estimating. Construction costs. Different methods and stages of estimating. Specification of construction items and method of statement. Principles of rate analysis and valuation.

Unit-II

Claims and Arbitration: Indian contract act and arbitration act. Variations in work and conditions. Claims and disputes. Liquidated damages. Rights. Responsibilities and duties of client (Owner). Architect. Engineer. Contractor etc. Purchase order as contracts insurance contract and claims.

Unit-III

Legal Frame Work of Construction: Contract labors act 1970 and other acts and laws relating to labors management. Wages. Bonus and Industrial disputes.

Unit-IV

Contract Conditions: Important contract clauses. Terms of payments. Retention. Acceptance and final payment. Time of completion. Extension of time. Maintenance period etc.

Unit-V

Construction Contracts: BOT projects, Variation in BOT projects. Infrastructural projects, International contract rules and regulation.

Courses Outcomes:

Upon completion of the course, a student will be able to

CO1: Write the specifications and perform rate analysis of various construction items.

CO2: Prepare estimate of building/roadwork's and valuation.

CO3: Differentiate between rights and responsibilities of Architect, Engineer, Contractor and Owner

in a construction project.

CO4: Apply the provisions of various acts and laws applicable in construction.

CO5: Draft tender document for construction project.

CO6: Identify the role of project participants and financing of infrastructure projects.

Reference Books

1. Construction Engineering and Management by S. Seetharaman, Publisher Umesh Pub.

2. Construction Planning and Management by B. Sengupta, Pub. Tata McGraw-Hill Education

3. Construction Project Management Theory And Practices by K.N. Jha, Pub. Pearson Education India

4. Construction Contracts by Jimmie Hinze, Publisher Tata McGraw-Hill Education

5. Estimating and Costing by B.N. Datta

Course Code: 51241204
Course Name: Repair, Rehabilitation & Retrofitting of Structures

L	T	P	Credit
3	0	0	3

Course Objective:

To understand the concept of repair, rehabilitation and retrofitting; various methodology for assessment of structure and methods for repair and retrofitting of structures

SYLLABUS

Unit 1:

Introduction to Repair, Rehabilitation and Retrofitting; Principles of Repair, Rehabilitation and Retrofitting; Terminology and Criteria for Repair, Rehabilitation and Retrofitting.

Unit 2:

Testing Methodology for RC Structures and Masonry Structures; Techniques for assessment of Structure Condition; Non-Destructive Testing.

Unit 3:

Various Techniques for Structural Repair; Materials for Repair; Repair and Retrofitting using FRP Materials.

Unit 4:

Methods for Repair and Retrofitting of RC Structure and Masonry Structure.

Unit 5:

Methods for Repair and Retrofitting of Heritage Structures; Case Studies.

Reference Books:

1. P. C. Varghese: Maintenance Repair & Rehabilitation & Minor Works of Buildings, PHI Learning Pvt. Ltd.
2. P. I. Modi and C. N. Patel: Repair and Rehabilitation of Concrete Structures, PHI Learning Pvt. Ltd.

Courses Outcomes:

Upon completion of the course, a student will be able to

CO1: **Understand** the terminology and principles for repair, rehabilitation and retrofitting.

CO2: **Apply** various methods for assessment of structures.

CO3: **Apply** various methods for repair of structures

CO4: **Apply** various methods for retrofitting of structures.

CO5: **Evaluate** various repairs and retrofitting technique.

Course Code: 51241205
Course Name: Computational Lab

L	T	P	Credit
0	0	4	2

Course Objective:

This lab course is aimed to make students familiar with the use of software in construction projects such as MATLAB, MS Excel, Primavera, BIM 4D.

List of Experiments:

1. Introduction to MATLAB and its application.

2. Error estimation and methods of roots finding.

3. Order of convergence of various methods using MATLAB.

4. Curve fitting and Interpolation using MATLAB.

5. Descriptive Analytics through Data Visualization using MS EXCEL.

6. Descriptive Analytics - Data statistics using MS EXCEL.

7. Diagnostic Analytics using MS EXCEL.

8. Primavera and its application in networking and scheduling.

9. Basics of BIM 4D.

10. Case study analysis using Primavera and BIM 4D

Course Outcomes:

Upon completion of the course, a student will be able to

CO1: Apply the concepts of MATLAB in problem solving.

CO2: Analyze the data using different tools of MS Excel.

CO3: Apply the concepts of PrimaVera, BIM 4D in project scheduling and management.

Course Code: 51241206

Course Name: Seminar / Presentation

L	T	P	Credit
0	0	4	2

Course Objective:

To enhance students' understanding of Construction Technology & Management by encouraging the study of diverse literature, fostering lifelong learning, and developing the soft skills necessary for effective presentation.

Syllabus

Any relevant topic related to Construction Technology & Management from within or beyond the syllabus through Swayam / NPTEL/MOOC.

Course Outcomes:

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

   CO 1: Analyze contemporary issues in Construction management & its allied areas.

   CO 2: Demonstrate good oral communication skills.

   CO 3: Develop poster and power point presentations for effective communication.

Course Title: Fire Safety & regulation in Building

Course Objective:

Understanding of Fire Hazards, Identify various fire protection systems and implement fire safety regulation

Course Content:

- Fire alarm system and their types
- Fire suppression agents
- Types of water distribution system
- System readiness
- Building fire hazards
- Fire safety in buildings: basic principles
- Fire safety management
- Codes and regulations

Course Outcomes:

CO1: Explain the working of fire alarm system, suppression system, and portable fire extinguishers.

CO2: Identify various types of water storage devices, type of pipe material and different valves used in water supply system

CO3: Apply fire safety principles, management and regulation in building