M. Tech. in Civil Engineering with Construction Management

Course Contents

Academic Year 2025-26

Table of Contents

Programme Outcomes for MTech in Civil Engineering with Construction Management

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. An ability to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.
4. An ability to identify, formulate, and solve construction project management issues and engineering problems.
5. An ability to use the research skills, modern engineering and management tools for construction project management.
6. An ability to recognise the need for and have preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

SEM – I

Construction Organisation and Safety Management [PC-MTCM101]

Course Code	Course Name
PC-MTCM101	Construction Organisation and Safety Management

Course pre-requisites	Construction Management

Course Objectives

The objectives of this course are

1. Discuss principles of management and its functions in construction organization.
2. Knowledge of organization's working procedures and organizational developments and group decision making.
3. Identify quality of team leader and qualities of project leader..

Course Outcomes

Upon successful completion of the course, students should be able to

1. Demonstrate an understanding of core management principles, including classical and contemporary theories, the systems approach, and their application within the construction industry.
2. Apply and integrate the key functions of construction management—planning, organising, staffing, leading, and controlling—to enhance project execution and team performance.
3. Analyse and evaluate work study and measurement techniques such as time-motion studies, process charts, and productivity tools to improve operational efficiency in construction activities.
4. Assess and implement safety management practices, legal requirements, and international standards to minimise risks, ensure compliance, and promote a culture of safety on construction sites.

CO-PO Mapping

CO → / PO ↓	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	3	3	2	2
CO2	2	2	3	3	3	2
CO3	3	2	3	3	3	2
CO4	2	2	3	3	3	2

Course Content

Module No.	Details	Hrs.
1	Management: Need, what is it, systems approach, and emergence of management thought, Theory by Fredrick Taylor, Henry Fayol, emergence of behavioral sciences, and that of the modern management thought.	04
2	Construction Management: Planning: Planning process, objectives, strategies and policies, making planning effective, and Organizing; Need and objectives, nature and purpose, types of construction organizations, Staffing: Need and objectives, Nature and purpose, selection, appraisal.	7

	Leading; Need and objectives, Managing and human factor, motivation, leadership, team development, communication, managing conflicts, qualities of project manager; Controlling Need and objectives, Process of controlling	
3	Work study Definition, Objective, Procedure for selecting the work, recording facts, symbols, flow process charts, multiple activity charts, string diagrams. Work Measurement: Time and motion studies, Concept of standard time and various allowances, time study, equipment performance rating. Activity sampling, time-lapse photography technique, Analytical production studies	0
4	Construction Safety Management, role & importance of safety management – Role of various parties, duties and responsibilities of top management, site managers, supervisors etc. role of safety officers, responsibilities of general employees, safety committee, safety training, incentives and monitoring. Writing safety manuals, preparing safety checklists and inspection reports.	06
5	Safety in construction operations – Accidents on various construction sites such as buildings, dams, tunnels, bridges, roads, etc. safety at various stages of construction. Prevention of accidents. Safety protocols. Occupational diseases and hazards. Safety in use of construction equipment e.g. vehicles, cranes, hoists and lifts etc. safety while using scaffolding and working platforms. Safety while using electrical appliances. Managing fire, electricity and Explosives	06
6	Various safety equipment and gear used on site, safety measures while handling machinery, tools and equipment's. First aid on site. Labour laws, legal requirement and cost aspects of accidents on site.	06
7	Study of safety policies, methods, equipment and training provided on any ISO approved construction company, safety audits and OSHA guidelines, international labour standard on occupational safety and health	06

Text Books

1. Koontz, O'Donnell &Weihrich (2010); "Management", Mcgraw Hill. ISBN-13: 9780070144958. 464p.
2. Chinowsky, Paul S. & Songer, Anthony D. (2011) "Organization Management in Construction". Routledge. ISBN-13: 978-0415572613. 216p.
3. Sears, Keoki S, (2008) "Construction Project Management: A Practical Guide to Field Construction Management". Wiley. ASIN: B00HQ1CNE2.
4. Frank Harris (2013); "Modern Construction Management", Ronald Mccaffer Wiley Blackwell Publications. ISBN-13: 978-0470672174. 572p.
5. Wagner.Harvey M (1975) "Principles of Management Science" Prentice Hall College Div. ISBN-13: 978-0137095353. 612p.
6. Snell, Scott & Bohlander George (2009) "Managing Human Resources" South-Western Cengage Learning; ISBN-13: 978-0324593310. 864p.
7. Dessler, Gary (2008) "Human Resource Management" Prentice Hall. ISBN-13: 978- 0131746176. 801p.

8. Dharwadkar P. P (1992); "Management In Construction Industry" Oxford & IBH Luthans.
9. V. J. Davies, K. Tomasin (1996); "Construction Safety Handbook", Thomas Telford, London. Isbn-13: 9780727725196. 303p.
10. PSG Design Data Book, PSG College, Coimbatore (2012)

Reference Books

1. Construction Safety Manual Published By National Safety Commission of India.
2. "Safety Management in Construction Industry" – A Manual for Project Managers. Nicmar Mumbai.
3. "IS For Safety In Construction – Bureau Of Indian Standards.
4. Girimaldi and Simonds (1989); "Safety management", AITBS, New Delhi. ISBN: 9780939874989.651p.

Stranks, Jeremy (2010) "Health and Safety at Work: An Essential Guide for Managers", Kogan Page Publishers. ISBN 13: 9780749461201. 352p.

Applied Statistics and Quantitative Techniques [PC-MTCM102]

Course Code	Course Name
PC-MTCM102	Applied Statistics and Quantitative Techniques

Course pre-requisites	Construction Management

Course Objectives

The objectives of this course are

1. To describe the fundamentals of probability theory and Different methods of statistics.
2. To identify different methods of data collection, along with techniques for analysis and informed decision-making.
3. To discuss the applications of linear programming, transportation problems, and simulation in the construction industry.

Course Outcomes

Upon successful completion of the course, students should be able to

1. Practise and apply statistical methods, probability distributions, and data presentation techniques to solve problems and interpret data relevant to civil engineering applications.
2. Evaluate and simulate various real-world scenarios using probabilistic models and simulation techniques to support effective and data-driven decision-making in construction processes.
3. Implement and solve Linear Programming and Transportation Problems to determine optimal solutions for resource allocation and planning in civil engineering contexts.
4. Analyse and interpret relationships using correlation, regression, ANOVA, and non-parametric tests, and apply the design of experiments (DOE) to optimise construction outcomes through informed decision-making.

CO-PO Mapping

CO → / PO ↓	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	3	3	3	2
CO2	3	2	3	3	3	2
CO3	2	2	3	3	3	1
CO4	3	2	3	3	3	2

Course Content

Module No.	Details	Hrs.
1	Review of basic statistics, probability and Probability Distributions: Theoretical, binomial, poisson, normal, exponential, hypergeometric, uniform. Statistical Quality Control, Total cost & Trade off analysis	08

2	Sampling and Sampling Distributions: Probability and non-probability samples, sampling and non-sampling errors, sample size, sampling distributions : t, F and Chi square distributions	05
3	Hypothesis Testing: Type I and II error, testing of mean, proportion, tests for equality of mean and variances of two populations, confidence interval, 2 test for goodness of fit, ANOVA (one way classification), Non parametric tests : sign test, U test	05
4	Correlation and Regression: Karl Pearson's and Rank Correlation coefficient, simple linear regression: least squares method. Multiple Regression Analysis. Regression problem, use of excel for solving.	06
5	Simulation: Random number generation. Monte Carlo method, Application of Design of Experiments (DOE) and Kappa Coefficient in construction industry.	04
6	Transportation, Assignment and Transshipment Problems, Griffy's waiting line model for sizing-matching of construction equipment, Vendor Rating Indexes based on past performance of suppliers , Mathematical models for equipment downtime analysis	08
7	Linear Programming: Graphical solution, simplex method, dual, Sensitivity analysis, use of MS excel for solving LPP.	06

Term Work
Term work shall comprise of 1. Report on assignments including problems based on the above syllabus shall be submitted as term work. 2. One assignment on each module is to be submitted. 3. Reports of assignments : 25 points

Text Books
1. Shrivastava, Shenoy& Sharma (1989); "Quantitative Techniques for Managerial Decisions" New Age International. ISBN-13: 9788122401899. 941p. 2. Kothari C R (2004); "Research Methodology: Methods and Techniques", New Age International. ISBN-13: 978-8122415223. 401p. 3. Goode W J &Hatt P K (2006) "Methods in Social Research" Surjeet Publication. 386p.

Reference Books
1. Quantitative Technique for Managerial decision by L.C. Jhamb 2. D.S. Hira and Gupta "Operation Research", S.Chand Publication

Research Methodology & IPR [PC-MTCM103]

Course Code	Course Name
PC-MTCM103	Research Methodology & IPR

Course Objectives

The objectives of this course are

1. To develop an ability to identify, formulate research problem.
2. To develop an ability to apply knowledge of research methodology to Engineering Problems.
3. To develop critical thinking to find business opportunities and to solve questions related to industries.
4. To get knowledge on various kinds of Intellectual Properties

Course Outcomes

Upon successful completion of the course, students should be able to

1. Explain the principles of research methodology, including types, objectives, and the scientific research process.
2. Formulate a valid research problem, design an appropriate research framework, and apply effective sampling and data collection techniques.
3. Analyze and interpret data using appropriate tools, and write structured technical and research reports with ethical responsibility.
4. Explain and apply the concepts of Intellectual Property Rights (IPR), including patents, copyrights, and licensing for innovation protection.

CO-PO Mapping

Cos	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	–	2	2	1	–
CO2	3	2	3	2	3	1
CO3	3	3	2	2	3	2
CO4	–	1	2	–	2	2

Course Content

Module No.	Details	Hrs.
1	**Fundamentals of Research** Introduces the meaning, definition, and purpose of research. Various types of research such as descriptive vs analytical, applied vs fundamental, and quantitative vs qualitative, objectives and characteristics of good research, the scientific method, theory building, and the outcomes of research including new ideas, hypotheses, models, and theories.	04
2	**Formulating and Designing Research** Stages of the scientific research process, formulation of research problems, criteria for a good research problem, and common errors in	04

	selecting one. Concept and basic types of research design, overview of sampling techniques and determining sample size, sample design calculations	
3	**Data Collection and Analysis** Methods of data collection from primary and secondary sources. Data collection tools such as interviews, questionnaires, observations, and surveys, conducting pilot studies and pre-tests, basic measurement and scaling techniques, an overview of data analysis methods, and an introduction to statistical tools such as Excel or SPSS. Hypothesis testing, Z test , Chi Square Test , F test, t Test , Annova test	04
4	**Literature Review, Report Writing, Research Paper writing** Purpose and techniques of conducting a literature review, identifying reliable sources such as books, journals, databases, and web resources, and the process of identifying research gaps and developing hypotheses., Format for structuring research papers and theses, techniques for writing research proposals, proper referencing and documentation practices using citation styles , Guidelines for research paper writing and publication, Ethical responsibilities of researchers, forms of plagiarism, detection tools like Turnitin, consequences of misconduct, importance of reproducibility and accountability in scholarly research.	04
5	**Decision Science and Simulation** Decision Making , Steps in Decision making, types of decision making environment, Decision Models, Decision Tree analysis, Simulation defined, Steps in simulation, Advantages, limitations and Application of simulation, Monte carlo Simulation, Simulation problems in Engineering Systems.	04
6	**Basics of IPR (4 hours)** Nature and types of IPR including patents, copyrights, trademarks. Patenting process in India, role of IPR in academic and industrial research, criteria for innovation and patentability, practical aspects of IPR such as licensing, commercialization, technology transfer, importance of Geographical Indications (GI, traditional knowledge. recent developments in IPR including digital copyright, AI-generated inventions, emerging challenges in the digital era.	04

Term work shall comprise of

- Six Assignments based on above course content and useful in MTech programme.
  OR
- Seminar Presentation on Survey Based Data Collection and Analysis of modern Industrial practices relevant to MTech programme.

Recommended Books

1. Dawson, Catherine, 2002, Practical Research Methods, New Delhi, UBS Publishers.
2. Kothari, C.R.,1985, Research Methodology-Methods and Techniques, New Delhi,

Wiley Eastern Limited.
3. Kumar, Ranjit, 2005, Research Methodology-A Step-by-Step Guide for Beginners,(2nd ed), Singapore, Pearson Education.
4. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", 2016.
5. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008
6. N. S. Gopalakrishnan and T. G. Agitha, Principles of Intellectual Property, Lucknow, India: Eastern Book Company, 2009.
7. P. Narayanan, Intellectual Property Law, 4th ed., Kolkata, India: Eastern Law House, 2017.
8. Operation Research Theory and applications , J K Sharma, Trinity Publications 5th Edition 2013

Building Services and Maintenance [PE-MTCM111]

Course Code	Course Name
PE-MTCM111	Building Services and Maintenance

Course Objectives

The objectives of this course are

1. To discuss the concept of various machineries like lift, escalators, vibrators, concrete mixers etc.
2. To explain utility services in building like pluming system, electrical system, fire safety installation and rainwater harvesting system etc.

Course Outcomes

Upon successful completion of the course, students should be able to

1. Implement installation of utility services.
2. Identify drawback if all service lines are not install properly or used any faulty materials.
3. Demonstrate an understanding of green building concepts, materials, and rating systems, and their application in sustainable construction.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	3	3	3	2
CO2	3	2	3	3	3	2
CO3	2	2	3	3	2	3

Course Content

Module No.	Details	Hrs.
1	Machineries: Lifts and Escalators – Special features required for physically handicapped and elderly – Conveyors – Vibrators – Concrete mixers – DC/AC motors – Generators – Laboratory services – Gas, water, air and electricity -Hot Water Boilers – Pumps	06
2	Plumbing Systems in Building: Plumbing services:-Water distribution system-Material for service pipes Service connection- size of service pipe-Water meter-Valves-Storage tanks Drainage system:-Pipe and traps-Sanitary fittings-system of plumbing House drainage plans-Septic tank-Soak pit	06
3	Electrical Systems& Illumination Design in Buildings: Electrical Systems in Buildings: Basics of electricity – Single / Three phase supply – Protective devices in electrical installations – Earthing for safety – Types of earthing – ISI specifications – Types of wires, wiring systems and their choice – Planning electrical wiring for building – Main and distribution	07

	boards – Transformers and switch gears – Layout of substations Principles of Illumination Design: Visual tasks – Factors affecting visual tasks – Modern theory of light and colour – Synthesis of light – Additive and subtractive synthesis of colour – Luminous flux – Candela – Solid angle illumination – Utilisation factor – Depreciation factor – MSCP – MHCP – Lans of illumination – Classification of lighting – Artificial light sources – Spectral energy distribution – Luminous efficiency – Colour temperature– Colour rendering. Design of modern lighting – Lighting for stores, offices, schools, hospitals and house lighting. Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types.	
4	Refrigeration Principles & Applications: Thermodynamics – Heat – Temperature, measurement transfer – Change of state – Sensible heat – Latent heat of fusion, evaporation, sublimation – saturation temperature – Super heated vapour – Sub cooled liquid – Pressure temperature relationship for liquids – Refrigerants – Vapour compression cycle – Compressors – Evaporators – Refrigerant control devices – Electric motors – Starters – Air handling units – Cooling towers – Window type and packaged air-conditioners – Chilled water plant – Fan coil systems – Water piping – Cooling load – Air conditioning systems for different types of buildings –Protection against fire to be caused by A.C. Systems	07
5	Fire Safety Installation: Causes of fire in buildings – Safety regulations – NBC – Planning considerations in buildings like non- combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems. Special features required for physically handicapped and elderly in building types – Heat and smoke detectors – Fire alarm system, snorkel ladder – Fire lighting pump and water storage – Dry and wet risers – Automatic sprinklers	06
6	Rain Water Harvesting: Water Audit of India, Concept of rain water harvesting, Methodologies for Percolation/ recharge bore pit, Percolation/ recharge bore well, Percolation/ recharge well cum bore pit, Harvesting rooftop rainwater, Harvesting driveway runoff. National water harvesters network (NWHN). Some case studies.	06
7	Introduction to Green Building: Need for a green building, planning and design of green buildings, obstacles, Materials used in green building technology, Rating System (According to LEED-INDIA)	04

Recommended Books
1. Heat Pumps and Electric Heating: E.R.Ambrose, John and Wiley and Sons, Inc., New York, 1968. 2. Handbook for Building Engineers in Metric systems, NBC, New Delhi, 1968. 3. Philips Lighting in Architectural Design, McGraw-Hill, New York, 1964.

4. The Lighting of buildings: R.G.Hopkinson and J.D.Kay, Faber and Faber, London, 1969.
5. Air-conditioning and Refrigeration: William H.Severns and Julian R.Fellows, John Wiley and Sons, London, 1988.
6. Air-conditioning and Energy Conservation: A.F.C. Sherratt, the Architectural Press, London, 1980.
7. National Building Code.
8. Building Construction: Dr. B.C. Punmia, Ashol K Jain, A.K Jain
9. Construction Engineering and Management: S. SeetharamanUmeshPublicatins, Delhi.
10. Water supply and Sanitory Installations: A. C. Panchdhari New age international publication, Delhi
11. Fire Safety in Building: V. K. Jain, New age international publication, Delhi

Reference Books

1. Green remodeling: David Johnston.
2. Green Building , Project Planning and Cost Estimation: R.S.Means
3. LEED – INDIA (Abridged Reference guide for Core and Shell, Version 1.0).

Construction Materials [PE-MTCM112]

Course Code	Course Name
PE-MTCM112	Construction Materials

Course Objectives

The objectives of this course are

1. Describe commonly used building materials
2. Develop knowledge of material science and behaviour of various building materials used in.
3. Discuss and understand the properties of building Materials.

Course Outcomes

Upon successful completion of the course, students should be able to

1. Explain the roles and classifications of construction chemicals and admixtures used to enhance the performance and durability of concrete structures.
2. Analyze the properties and applications of special concretes such as self-compacting, high-performance, and self-healing concretes. Evaluate the suitability and sustainability of innovative materials.
3. Evaluate the suitability of advanced materials like fibre-reinforced composites, smart materials, and shielding concretes for specialised applications including nuclear-containment structures.
4. Apply advanced construction materials such as pozzolanic additives, modified bitumen, and smart concretes in relevant structural and infrastructure applications to enhance performance and sustainability.

CO-PO Mapping

CO → / PO ↓	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	3	3	2	2
CO2	3	2	3	3	3	3
CO3	3	2	3	3	3	2
CO4	3	2	3	3	3	3

Course Content

Module No.	Details	Hrs.
1	Introduction to Construction Chemicals: Importance in modern construction, classification. Chemical Admixtures-Plasticizers and Super-plasticizers, Accelerators and Retarders, Air-entraining agents and water-reducers. Specialty Chemicals- Shrinkage-reducing admixtures, Waterproofing agents Surface hardeners, corrosion inhibitors, Bonding agents and curing compounds. Application Techniques and Case Studies	06

2	Fly Ash-Types (Class F and C),Physical and chemical properties, Effects on workability, strength, and durability, Use in blended cements and green concrete Silica Fume-Microstructure and pozzolanic action, Mix design considerations. Advantages-Improved strength, durability, reduced permeability Limitations: Cost, handling, and early-age shrinkage Various types of Wall claddings (Timber cladding, Glass cladding etc)	06
3	Fibre-Reinforced Plastics (FRP)-Types of fibres (glass, carbon, aramid),Use in retrofitting and strengthening Fibre-Reinforced Concrete (FRC)-Types of fibres, mix design, mechanical behaviour. Smart Materials-Introduction and classification, Shape Memory Alloys (SMA)-Functionality and use in seismic zones, Sensors and embedded materials for health monitoring, Responsive concrete materials (self-adjusting to loads or environmental conditions)	06
4	Self-Compacting Concrete (SCC)-Workability criteria: Flowability, passing ability, segregation resistance, Mix design and testing methods (Slump flow, V-funnel, L-box), Applications in densely reinforced structures High Performance Concrete (HPC)-Strength, durability, permeability, and fire resistance Composite Decking and Hollow Core Slabs-Construction techniques, Structural behavior under loading, Benefits: Reduced dead weight, quick installation, thermal and acoustic insulation	06
5	Materials Used in Nuclear Structures-High-density concrete, Reinforced and prestressed concrete. Radiation Shielding Concrete-Types of special aggregates (barite, magnetite, hematite), Mix design considerations and performance. Durability and Safety Considerations-Long-term thermal and chemical stability, Crack control and impermeability. Case Studies-Notable nuclear containment structures and material evaluations.	06
6	Glenium Concrete-BASF product line – high workability and high-performance concrete Self-Healing Concrete-Types: Microbial, encapsulated, and crystalline, Healing mechanisms and experimental evidence, Applications and limitations Photo-catalytic Cement-Air purification properties (NOx reduction), Environmental impact and use in urban infrastructure Glazed Bricks-Thermal and aesthetic performance, Role in green buildings and heritage-style construction	07

7	Crumb Rubber Modified Bitumen (CRMB)-Manufacturing process, composition, Enhanced performance: Rutting, cracking, thermal resistance, Environmental and economic benefits Applications-Highway overlays, airport runways, and sustainable pavements	05

Recommended Books

1. Neville(2008);" Concrete Technology", Pearson Education India ISBN: 9788131705360.452p.
2. M.S.Shetty (2005);" Concrete Technology",ISBN:9788121900034.624p.
3. Ghosh (1991);" Building Materials", ISBN:9788185522005.494p.
4. New Building Materials and Construction World magazine
5. Civil Engineering and Construction Review magazine
6. Construction Materials Reference Book (2018), edited by David Doran, Bob Cather, Routledge Publications, London and Newyork, second edition.
7. Civil Engineering and Construction Review magazine
8. Construction Materials Reference Book (2018), edited by David Doran, Bob Cather, Routledge Publications, London and Newyork, second edition.

Accounting and Finance Management [PE-MTCM113**]

Course Code	Course Name
PE-MTCM113	Accounting and Finance Management(Online Course)

Course Objectives

The objectives of this course are

1. To explain the basic concept of accounting mechanics with financial statements.
2. To summarize use of policies of project finance & financial analysis.
3. To report long term investment decisions.
4. To describe the management of current assets.

Course Outcomes

Upon successful completion of the course, students should be able to

1. Explain the fundamental principles of accounting, including the preparation of financial statements and the use of original books of entry.
2. Demonstrate financial statement.
3. Implement various techniques of financial analysis.
4. Utilize various policies of project finance & investment decisions and appraise the management of current assets.

CO-PO Mapping

CO → / PO ↓	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	3	3	2	2	2
CO2	2	3	3	2	2	2
CO3	3	2	3	3	3	2
CO4	3	2	3	3	3	3

Course Content

Module No.	Details	Hrs.
1	**Basic accounting mechanics** Generally accepted accounting principles, books of original entry	04
2	**Preparation of financial statements** Income statement, balance sheet, preparing bills, issues.	06
3	**Techniques of financial analysis** Statement of changes in financial position (working capital / cash flow / total resources basis)Ratio analysis, internal rate of IIR, net present value.	06
4	**Project financing** Means, norms, and policies of financial institutions, sources of finance, equity, debentures, debit, bond, fixed deposit, mega project finance policy.	06
5	**Long term investment decisions** Cash flow estimates, evaluating techniques, alternative selection, basic	07

	concepts of analysis of risk and uncertainty, cost of capital, lease financing, selection from alternative options, management of inflations.	
6	**Management of current assets-I** Planning, financing and control of working capital, cash flow statement.	06
7	**Management of current assets-II** Management of cash, receivables management inventory management	06

Text Books
1. S. K. Bhattacharyya, John Dearden (1996); "Accounting for Management: Text and Cases" South Asia Books. ISBN 13: 9780706928976. 2. Prasanna Chandra (2011); "Financial Management", Tata McGraw-Hill Education. ISBN 13: 9780071078405. 1026p.
Reference Books
1. Construction Safety Manual Published By National Safety Commission of India. "Safety 2. **Handbook of Finance, Financial Markets and Instruments(2008),** edited by Frank J. Fabozzi, Volume (I), John Wiley and sons, New Jersy.

Management of Infrastructure Services [PE-MTCM121]

Course Code	Course Name
PE-MTCM121	Management of Infrastructure Services

Course Objectives
The objectives of this course are 1. To study the necessity of infrastructure & its management 2. To understand various concepts of infrastructure planning and management.

Course Outcomes

Upon successful completion of the course, students should be able to

1. Analyze the strategies for Infrastructure Project implementation.
2. Design integrated framework for infrastructure planning and management.
3. Evaluate the condition of buildings, pavements, pipelines, and other infrastructure using appropriate assessment schemes and performance surveys.
4. Perform Infrastructure modelling and Life Cycle Analysis Techniques.

CO-PO Mapping

CO → / PO ↓	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	3	3	2	2
CO2	3	2	3	3	3	2
CO3	3	2	3	3	3	2
CO4	3	2	3	3	3	3

Course Content

Module No.	Details	Hrs.
1	**Infrastructure management** Need and concept, expected performance, survey and Scheme of evaluation of distresses, inspection checklists, organization for rehabilitation, policies, funding	04
2	**Concept of infrastructure upkeep**	06
3	**Buildings** Post occupancy Scheme of evaluation of buildings, deformation and common defects in buildings, restoration & rehabilitation measures	06
4	**Pipelines (water/ sewage/ air/ gas)** Purpose and methods of Scheme of evaluation, Scheme of evaluation of physical condition, methods of rehabilitation	06
5	**Pavements (roadways / runways)** Scheme of evaluation and performance surveys, distress Scheme of evaluation, methods of resurfacing, overlays, restoring and rehabilitation, up-gradation and maintenance of permanent way	07

6	**Bridges** Inspection and reporting methods, rehabilitation measures,	07
7	**Ports & Harbours** Inspection and reporting methods, Maintenance of ports, port buildings, and services.	06

Text Books
1. Grigg, Neil, Infrastructure engineering and management, Wiley, (1988). 2. Haas, Hudson, Zaniewski, Modern Pavement Management, Krieger, Malabar,(1994). 3. Hudson, Haas, Uddin, Infrastructure management: integrating design, 4. construction, maintenance, rehabilitation, and renovation, McGraw Hill, (1997).
Reference Books
1. Published books in the relevant areas to be supplemented by latest journal articles and papers, seminar and conference proceedings, in-house publications, monographs etc. 2. Munnell, Alicia, Editor, Is There a Shortfall in Public Capital Investment, Proceedings of a Conference Held in June (1990). 3. World Development Report 1994: Infrastructure for Development (1994). 4. Zimmerman, K. and F. Botelho, "Pavement Management Trends in the United States," 1st European Pavement Management Systems Conference, Budapest, September (2000).

Advanced Construction Techniques [PE-MTCM122]

Course Code	Course Name
PE-MTCM122	Advanced Construction Techniques

Course Objectives

The objectives of this course are

1. To introduce various advanced construction techniques currently used in the industry
2. To make students aware of state of the art construction practices with the help of case studies.

Course Outcomes

Upon successful completion of the course, students should be able to

1. Able to select and apply suitable advanced construction techniques for a given project.
2. Analyze modern and special concrete construction techniques, including precast, pre-stressed, fibre-reinforced, and self-compacting concretes.
3. Evaluate sustainable and advanced construction technologies such as 3D printing, pre-engineered buildings, and low-cost pavement techniques for their effectiveness in large-scale infrastructure projects.
4. Aware of current problems and innovative solutions offered by the industry through case studies.

CO-PO Mapping

CO → / PO ↓	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	3	3	3	2
CO2	3	2	3	3	3	2
CO3	3	2	3	3	3	3
CO4	2	3	3	3	3	3

Course Content

Module No.	Details	Hrs.
1	Review of subsurface soil explorations and geophysical methods for expansive soils, landslide hazards, liquefaction of soils, karst topography. Soil stabilization: mechanical, thermal and chemical.	07
2	Excavation and Tunneling: trenching machines, blasting method, dewatering methods. Tunnel ventilation, lighting and drainage, cut and cover, rock tunneling, shield tunneling in free air, compressed air tunneling, linings, machine tunneling, supporting systems, micro tunneling.	07
3	Construction methods for drilled shafts, caissons, cofferdams,Shores, needles, grillages.	06
4	Special topics of concrete construction: Formwork: types, design criteria, patented systems.	07

	Fabrication of precast and pre-stressed components Pre-stressing: Plants, Equipment for Pre-stressed Construction, Different types of Pre-stressing. Pumped and sprayed concrete, roller compacted, self-compacted, fiber compacted concrete.	
5	Advanced Pavement Construction Techniques: Pavement Construction using Bitumen, Hot mix plant, Concrete Road Construction, Fiber Reinforced Pavement Construction, Low Cost Road Construction Techniques.	07
6	Sustainable construction: Building materials from Agricultural & Industrial wastes. Recycled concrete and aggregates. Pre-engineered Buildings: need, type, advantages and disadvantages.	05
7	Construction of Transit Camps and 3-D Printing; Case study of heavy structures/construction projects like thermal/hydro / nuclear power plants/refineries, etc.	03

Text Books

1. Jonathan Ricketts, M. Loftin, Frederick Merritt (2004); "Standard Handbook for Civil Engineers", Mcgraw Hill. ISBN-13: 978-0071433372. 1600p.
2. Waddell (1974); "Concrete Construction Handbook", Mcgraw Hill
3. J.R. Illingworth (2002)," Construction Methods and Planning" CRC Press. ISBN 13: 9780203478578. 440p.
4. Varma Mahesh (1975); "Construction Equipment, Its Planning & Application" Metropolitan. 539p.

Reference Books

1. Relevant Journal papers and International Conference papers
2. Roger Greeno , R. Chudley), Mike Hurst , Simon Topliss (2012) Advanced Construction Technology, 5th edition, Pearson Education.

Construction Marketing [PE-MTCM123]

Course Code	Course Name
PE-MTCM123	Construction Marketing

Course Objectives

The objectives of this course are

1. Students will learn the components and construction of a strategic marketing.
2. Explore potential marketing areas in the building construction industry

Course Outcomes

Upon successful completion of the course, students should be able to

1. Analyse how internal and external factors affect marketing decisions in the construction sector.
2. Evaluate strategies for marketing goods, services, and projects, considering pricing, legal, and societal aspects.
3. Apply marketing principles to construction and real estate projects, including bidding and global strategies.
4. Develop marketing plans for construction products and real estate using market analysis and promotional tools.

CO-PO Mapping

CO → / PO ↓	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	3	3	2	2
CO2	3	2	3	3	2	2
CO3	3	2	3	3	3	2
CO4	2	3	3	3	3	3

Course Content

Module No.	Details	Hrs.
1	**Marketing environment:** impact of internal and external environment, socio-economic, demographic, political, technological and legal environment, nature and impact of competition, marketing strategy	06
2	**Basics of marketing:** Features of marketing of consumer goods, industrial products and services, product and marketing, marketing organization structures, societal role of marketing	06
3	**Marketing projects I**: Characteristics of construction projects, sources of information, pre-qualification documents, bid preparation – estimating, provision for overheads and profit, bidding models, bidding strategy, pre-bid meetings, negotiation,	06
4	**Marketing projects II:**	06

	Legal aspects, impact of joint ventures, collaborations and alliances, impact of globalization and privatization, strategies for project export.	
5	**Marketing real estate:** Characteristics of real estate, demand and supply relationship, segmentation, product mix, pricing strategies, advertising strategies, legal aspects	06
6	**Marketing products for construction:** Characteristics of construction materials and equipment, strategies for marketing of materials and equipment for construction, demand surveys, advertising strategies, communication, exhibitions and product demonstrations,	06
7	Pricing strategies, financing arrangements for marketing products for construction	06

Text Books
1. Christopher Peerce and Paul Smith (2003), Construction Business Development: Meeting New Challenges, Seeking Opportunities, Butterworth-Heinemann publisher.
Reference Books
1. Published books in the relevant areas to be supplemented by latest journal articles and papers, seminar and conference proceedings, in-house publications, monographs etc.

Repair, Rehabilitation and Retrofitting Techniques [PE-MTCM131]

Course Code	Course Name
PE-MTCM131	Repair, Rehabilitation and Retrofitting Techniques

Course Objectives

The objectives of this course are

1. To understand need for repair and rehabilitation.
2. To develop clear understanding of concepts, and practical knowledge of modern Civil Engineering techniques.
3. To encourage students and faculty to interact with industry, alumni and other reputed institutes for purpose of better understanding of industry requirements and different materials used.
4. To deal with social, environmental and economic issues when applying various techniques.

Course Outcomes

Upon successful completion of the course, students should be able to

1. Select and apply various repair techniques and appropriate materials as per the requirement of the problem.
2. Select and implement suitable structural strengthening methods and materials.
3. Apply appropriate materials for repair and restoration of heritage structures.
4. Prepare protection & maintenance schedule against environmental distress

CO-PO Mapping

CO → / PO ↓	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	3	3	3	2
CO2	3	2	3	3	3	2
CO3	3	2	3	3	2	3
CO4	2	3	3	3	2	3

Course Content

Module No.	Details	Hrs.
1	Importance of rehabilitation as a part of construction engineering.	07
2	Rehabilitation studies of buildings, underground construction, bridges, streets and highways, sewage treatment plants – masonry work, R.C.C. works, steel structures- types of distress.	07
3	Numerical condition surveys for foundation, structural and functional deterioration, design criteria, materials and techniques.	06
4	Predictive performance models, evaluating alternatives based on technical, commercial, management, financial feasibilities, data collection and database management, maintenance of rehabilitated structures.	08

5	Procedure adopted by BIFR (Board of Industrial and Financial Reconstruction).	07
6	Earthquake damages of buildings, their retrofitting, restoration effects of earthquakes, response of building to earthquake motion, factors related to building damages due to earthquake	04
7	Methods of seismic retrofitting, restoration of buildings.	03

Recommended Books
1. R. Dodge Woodson (2009);" Concrete Structures: Protection, Repair and Rehabilitation", ISBN: 9780080949819. 280p.

Appraisal & Implementation of Infrastructure Projects [PC-MTCM132]

Course Code	Course Name
PC-MTCM132	Appraisal & Implementation of Infrastructure Projects

Course Objectives

The objectives of this course are

1. To discuss about Infrastructure project and their feasibility.
2. To explain appraisal of construction project.
3. To describe the need of financial and environmental appraisal of project.
4. To outline project audit, financing and its implementation.

Course Outcomes

Upon successful completion of the course, students should be able to

1. Describe the components, stakeholders, and phases of infrastructure projects.
2. To carry out construction project appraisal.
3. Evaluate infrastructure projects through technical, financial, and environmental appraisal.
4. Practice various method for implementation of construction project including arrangement of finance.

CO-PO Mapping

CO → / PO ↓	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	3	3	2	2
CO2	3	2	3	3	3	2
CO3	3	2	3	3	3	2
CO4	3	2	3	3	3	2

Course Content

Module No.	Details	Hrs.
1	Components of Infrastructure, Infrastructure scenario in India, Key issues sector wise, Urban Infrastructure, Rural infrastructure, characteristics of construction project, stakeholders in Infrastructure projects, Phases of infrastructure project	05
2	Project Feasibility Project management cycle, Detailed Project report, project formulation project implementation, Agencies involved in implementation, methods of implementation like Build, operate and transfer (BOT) method and its variants like BOO, BOOT, BOLT etc, SWOT analysis of project.	05
3	Project Appraisal Introduction, Need of appraisal, steps of appraisal Market appraisal, Demand analysis, forecasting demand, sources of information, market survey, uncertainties in demand forecasting Technical appraisal Location, land, buildings, technology and its appropriateness, size of plant, plant and machinery, raw materials, energy requirements,	08

	water supply, effluent disposal Management appraisal	
4	Financial and Environmental Appraisal of project Break-even analysis, financial projections, financial appraisal tools: payback period, accounting rate of return, net present value, rate of return, benefit cost ratio, cost of capital, risk analysis, social cost benefit analysis. Guidelines for environmental Appraisal for infrastructure project	08
5	Project Audit Project budget and schedule, causes of project failure, reason for audit, Construction Contract audit and phases of project audit.	08
6	Project financing Norms and policies of financial institutions, Types of financing, sources (local and international),Cash flows by financial institutions, planning commission/Niti Aayog, various issues in financing	04
7	Road and bridge Infrastructure Development Issues and challenges in construction and maintenance of road and bridge Infrastructure, sustainable development of Infrastructure, role of PPP in road and bridge infrastructure development.	04

Text / Reference Books
1. Project Preparation, Appraisal, Budgeting, and Implementation: Prasanna Chandra, Tata McGraw Hill.

Management of Housing Projects [PE-MTCM133]

Course Code	Course Name
PE-MTCM133	Management of Housing Projects

Course Objectives

The objectives of this course are

1. To make them understand the concepts of Project Management for planning to execution of projects.
2. To make them understand the feasibility analysis in Project Management and network analysis tools for cost and time estimation.

Course Outcomes

Upon successful completion of the course, students should be able to

1. Explain the role of housing policy and key agencies in rural and urban development.
2. Apply appropriate technologies and methods for low-cost and mass housing.
3. Manage planning and building services across project phases.
4. Interpret policies related to building maintenance, estate management, and slum rehabilitation.

CO-PO Mapping

CO → / PO ↓	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	3	3	2	2
CO2	3	2	3	3	3	2
CO3	2	2	3	3	3	2
CO4	2	3	3	3	2	3

Course Content

Module No.	Details	Hrs.
1	**National housing policy** Need and importance of housing, role of various state and national level agencies, local bodies etc., rural and urban housing, systems approach to housing and urban planning	06
2	**Managing technology** New developments: materials, construction techniques, low cost housing, mass housing, industrialized housing, appropriate technology	08
3	**Planning** Pre-execution phase, project phase and post-execution phase	06
4	**Management of building services** Water supply, waste disposal, lifts, HVAC systems	06
5	**Maintenance of buildings** Need and importance, organization and management	06
6	**Estate management**	05

	Policy and organization	
7	Introduction to RERA, Government policies for slum Rehabilitation	05

Text / Reference Books
1. Published books in the relevant areas to be supplemented by latest journal articles and papers, seminar and conference proceedings, in-house publications, monographs etc.

Advanced Testing Lab [PC-MTCM151]

Course Code	Course Name
PC-MTCM151	Advanced Materials Testing Lab

Course Objectives

Students will learn

1. To understand the type of tests conducted to measure distress in the buildings.
2. To educate the student about the damage identification and repairing techniques.

Course Outcomes

Upon successful completion of the course, students should be able to

1. Determine the degree of deterioration of concrete structures.
2. Suggest the remedial measures to strengthen the structural elements.
3. Carry out modern tests to evaluate concrete quality.

CO-PO Mapping

CO → / PO ↓	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	3	3	3	2
CO2	3	2	3	3	2	2
CO3	3	2	3	3	3	2

Course Content

Expt. No.	Details
1	Carbonation test
2	Rebound Hammer Test
3	Half Cell Potentiometeric Test
4	Core Test
5	Ultrasonic Pulse Velocity test
6	Chemical Analysis of concrete
7	Retrofitting Techniques- (Materials and methods)
8	static and dynamic plate bearing tests
9	Dynamic and integrity test on concrete piles

Lab Work

Lab work shall comprise of

at least seven practical's performed from the list given above : 50 points

1. Neha Jamwal and M L Gambhir (2007)Building and Construction Materials: Testing and Quality Control (Lab Manual Series
2. Bhargava A K (2008) mechanical Behaviour and Testing of Materials.

Reference Books

Relevant Indian/American standards for testing of materials

Geo-Informatics Lab [SE-MTCM101]

Course Code	Course Name
SE-MTCM101	Geo-Informatics Lab

Course Objectives

Students will learn

1. About GIS technology, various softwares of GIS, and their utility.
2. To apply engineering knowledge with GIS technology to conduct small projects.

Course Outcomes

Upon successful completion of the course, students should be able to

1. Describe spatial and non-spatial database
2. Acquire and extract various types of spatial data from Global positioning System (GPS), satellite imageries, printed maps, and online sources.
3. Develop spatial and thematic maps for analysis, decision-making and display it in various forms

CO-PO Mapping

CO → / PO ↓	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	3	2	2	2
CO2	3	2	3	3	3	2
CO3	3	3	3	3	3	2
CO4	2	2	3	2	2	2

Course Content

Module No.	Details

Laboratory work to include at least TEN practicals performed from the list given below:

1. Installation of GIS software and getting familiarized with GIS menu and Tools.
2. Map Projections and Map digitization.
3. Georeferencing.
4. Creating Vector and Creating Raster data / data layers.
5. Creating attribute table.
6. Measurements; length and area.
7. Data viewing based on Single Symbol, Graduated Symbol.
8. Data viewing on Continuous color and unique value.
9. Labeling the features.
10. Selection tool and Geo-processing tool (Buffer, Clip, intersect and difference).
11. Coordinate capture – to save in notepad.
12. Joining layers based on common field.
13. Data conversion (raster to vector), polygon to polyline.
14. Add Graphic overlay to a vector layer.
    Import and export data and Map Layout

Lab Work		
Lab work shall comprise of at least TEN practical's performed from the list given above	:	50 points

Constitution of India (Indian Knowledge System Course) [IK-MTCM101]

Course Code	Course Name
PC-BTC501	Constitution of India (Indian Knowledge System Course)

Course Objectives

The objectives of this course are

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution

Course Outcomes

Upon successful completion of the course, students should be able to

1. Describe the historical development and philosophical foundations of the Indian Constitution, including the role of the Drafting Committee.
2. Explain the Fundamental Rights, Directive Principles, and Fundamental Duties, and their significance in ensuring constitutional governance.
3. Analyse the structure, powers, and functioning of the Legislature, Executive, and Judiciary in India.
4. Interpret the framework of local governance and the role of the Election Commission in strengthening democratic processes.

CO-PO Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	3	1	1	2
CO2	2	2	3	1	1	3
CO3	3	2	3	2	2	3
CO4	2	2	3	2	2	3

Course Content

Module No.	Details	Hrs.
1	History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working)	04
2	Philosophy of the Indian Constitution: Preamble Salient Features	04
3	Contours of Constitutional Rights & Duties: • Fundamental Rights • Right to Equality • Right to Freedom • Right against Exploitation • Right to Freedom of Religion	04

	• Cultural and Educational Rights • Right to Constitutional Remedies • Directive Principles of State Policy • Fundamental Duties.	
4	Organs of Governance: • Parliament • Composition • Qualifications and Disqualifications • Powers and Functions • Executive • President • Governor • Council of Ministers • Judiciary, Appointment and Transfer of Judges, Qualifications • Powers and Functions	04
5	Local Administration: • District's Administration head: Role and Importance, • Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. • Pachayati raj: Introduction, PRI: Zila Pachayat.	04
6	Elected officials and their roles, CEO Zila Pachayat: Position and role. • Block level: Organizational Hierarchy (Different departments), • Village level: Role of Elected and Appointed officials, • Importance of grass root democracy	04
7	Election Commission: Role and Functioning. • Chief Election Commissioner and Election Commissioners. • State Election Commission: Role and Functioning. • Institute and Bodies for the welfare of SC/ST/OBC and women	04

Recommended Books
1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

SEM – II

Project Monitoring and Control [PC-MTCM201]

Course Code	Course Name
PC-MTCM201	Project Monitoring and Control

Course Objectives

The objectives of this course are

1. To describe concept of project monitoring and control.
2. To explain concept of cost and quality management
3. To summarize concept of project safety and management information system

Course Outcomes

Upon successful completion of the course, students should be able to

1. Explain the principles and processes of scope, schedule, cost, and communication management in construction projects, including their interdependencies and impact on overall project performance.
2. Apply tools and techniques for monitoring progress, controlling schedules and costs, and managing quality across various phases of construction project execution.
3. Analyse project delays, variance reports, earned value data, and productivity metrics to identify performance gaps and recommend corrective actions.
4. Evaluate integrated project control systems, including project management information systems (PMIS), communication plans, and lean construction practices for effective project coordination and decision-making.

CO-PO Mapping

CO → / PO ↓	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	2	3	2	2	2
CO2	2	2	3	3	3	2
CO3	3	2	3	3	3	3
CO4	3	3	3	3	3	3

Course Content

Module No.	Details	Hrs.
1	**Scope Management** Definition of Scope Management, Scope variation, Method and process for Scope management, Scope planning and detailing, Scope monitoring and Control, Method Statement	06
2	**Project monitoring** Definition of Project Monitoring and Control, Progress reporting, review meetings, updating plans, formatting progress review report, records to be maintained at site	06
3	**Schedule control**	06

	Common causes of schedule delays, measuring productivity, Methods of enhancing productivity, issue in project delays.	
4	**Cost control** Cost codification, earned value concept, variance analysis, alarm reports, control measures, client and contractor point of view, Introduction to Lean Construction	06
5	**Project Communication and Co-ordination** Need for Communication Management, Methods of communication, Communication Management Plan, Monitoring and Control	06
6	**Quality management** Concept of quality, aspects of quality, quality control and assurance, inspection, preparation of manuals and checklists for different construction, safety and quality works	06
7	**Integrated approach to project control** Need for Integration Management, Methods and Process for integration management, Project management information systems, computer networking, and introduction to related computer software's.	06

Recommended Books

1. Harold Kerzner, Ph.D., Kerzner (2009); "Project Management" John Wiley & Sons, ISBN 13: 9780470548486.
2. Pilcher R (1994); "Project Cost Control in Construction", John Wiley & Sons. ISBN 13: 9780632036370. 400p.
3. Jack R. Meredith, Samuel J. Mantel, Jr (2011); "Project Management: A Managerial Approach" John Wiley & Sons. ISBN 13: 9780470533024. 600p.
4. Ralph W. King, Roland Hudson (2008); "Construction Hazard & Safety Handbook" Butterworths. ISBN 13: 9780408013475. 477p.
5. Brian Thorpe, Peter Sumner, John M. Duncan (1996); "Quality Assurance in Construction" Gower Press. ISBN 13: 9780566077586. 153p

Project Appraisal, Planning and Scheduling [PC-MTCM202]

Course Code	Course Name
PC-MTCM202	Project Appraisal, Planning and Scheduling

Course Objectives

The objectives of this course are

1. Discuss project preparation, Analysis and Appraisal and Risk analysis with its types, measures & tools for assessment.
2. Identify Value analysis including job plan, function analysis, creative thinking, cost
3. To summarize Modeling, life cycle costing, value engineering and management.
4. To report Project planning and scheduling with reference to scheduling tools like bar Chart and Network techniques such as CPM and PERT

Course Outcomes

Upon successful completion of the course, students should be able to

1. Carry out planning, execution and controlling of projects in Civil Engineering with developing capability of preparing project networks
2. Determine time cost relationship by using life cycle costing, value engineering and management.
3. Utilize Project planning and scheduling with reference to scheduling tools like bar Chart and network techniques such as CPM and PERT.
4. Understand and evaluate the impact of digital technologies, IoT, augmented and virtual reality,

CO-PO Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	3	3	3	2
CO2	3	2	3	3	3	2
CO3	2	2	3	3	3	2
CO4	2	2	3	2	3	3

Course Content

Module No.	Details	Hrs.
1	**Project Preparation, Analysis and Appraisal** Project development cycle, project ideas, preliminary screening analysis and appraisal: market and demand, technical, financial, economic, ecological	05
2	Project Planning: Stages of project planning: pre-tender planning, pre-construction planning, detailed construction planning, role of client and contractor, level of detail. Process of development of plans and schedules, work break-down structure, activity lists, assessment of work content, estimating durations, sequence of activities, activity	08

	utility data. Application of MS-Project and PrimaVera for planning	
3	**Project Scheduling** Bar charts, Networks: basic terminology, single and overlapping relationships preparation of CPM networks: activity on link and activity on node representation, analysis of single relationship (finish to start) networks, computation of float values, critical and semi-critical paths, calendaring the events. PERT: Assumptions underlying PERT analysis, determining three time estimates, analysis, slack computations, calculation of probability of completion	08
4	**Resource Scheduling:** Bar chart, line of balance technique, resource constraints and conflicts, resource aggregation, allocation, smoothening and leveling	05
5	**Project Costing and Budgeting** Classification of costs, time cost trade-off in construction projects, Compression and decompression. Preparing budgets, master networks. At least one assignment shall be done using any project planning and scheduling software as part of term work. Introduction of Rivet software in estimation	06
6	**Estimating methods and Appraisal criteria:** parameter, cost capacity factor, cost indices, detailed estimates, provision for escalation, inflation and contingencies. Financial appraisal criteria : NPV, BCR, IRR, Urgency, payback period, ARR, Scheme of evaluation of various criteria, investment appraisal in practice	05
7	**Advancement in Project Management** Advance/latest developments in Project Management: Construction digitization, Introduction of Internet of Things in construction industry, Augmented reality (AV), Virtual reality (RV), Scenario Analysis.	05

Term Work
Term work shall comprise of 1. Report on assignments including problems based on the above syllabus shall be submitted as term work. 2. One assignment on each module is to be submitted. 3. Reports of assignments : 25 points
Recommended Books
1. Prasanna Chandra (1986); "Projects preparation, appraisal, budgeting & implementation", Tata McGraw Hill. ISBN-13: 978-0074516287. 543p. 2. Gregory T. Haugan (2002); "Project Planning and scheduling" Management Concepts Inc. ISBN 13: 9781567261363. 102p. 3. Saleh A. Mubarak (2012); "Construction project scheduling and control" John Wiley

& Sons. ISBN 13: 9780470919958. 480p.
4. James Lewis (2005); "Project Planning, Scheduling & Control, 4E: A Hands-On Guide to Bringing Projects in on Time and on Budget" McGraw-Hill Companies, Incorporated. . ISBN 13: 9780071460378. 510p.
5. 5.Eric S. Norman, Shelly A. Brotherton, Robert T. Fried (2010); "Work Breakdown Structures: The Foundation for Project Management Excellence" John Wiley & Sons. ISBN 13: 9781118000267. 304p.
6. Project Management Institute (2006); "Practice Standard for Work Breakdown Structures"' Project Management Institute, ISBN 13: 9781933890135. 111p.
7. Robert B. Harris (1978); "Precedence & arrow networking techniques for construction" Wiley. ISBN 13: 9780471041238. 448p.
8. Antill&Woodhead (1990); "Critical path methods in construction practice", John Wiley & sons. ISBN-13: 978-0471620570. 440p.
9. Chitkara K K (1998); "Construction Project Management", Tata McGraw Hill, ISBN 13: 9780074620625, 558p.
10. Barrie D.S. & Paulson B C (1992); "Professional Construction Management" , McGraw Hill., ISBN :13 9780070038899. 577p.
11. Harold R. Kerzner (2013); "Project management: A system approach to planning, scheduling and controlling" John Wiley & Sons. ISBN 13:9781118415856. 1296 p.

Seminar/Mini Project [PC-MTCM203]

Course Code	Course Name
PC-MTCM203	Seminar/Mini Project

Course Objectives

Students should be able to

1. Educate the student to understand the field problems in civil engineering.
2. To apply the principles of management and suggest remedial measures.

Course Outcomes

Upon successful completion of the course, students should be able to

1. Identify a relevant research or problem area in construction management through comprehensive literature review and gap analysis.
2. Formulate technical objectives and develop appropriate methodology for the selected seminar or mini project work.
3. Perform analysis, design, or modelling tasks using suitable engineering software tools or laboratory methods.
4. Prepare a well-structured technical report.
5. Deliver a professional technical presentation.

CO-PO Mapping

CO → / PO ↓	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3		2	3	2	2
CO2	3		2	3	3	2
CO3	2		3	3	3	
CO4		3				
CO5		3				

Course requirements

Students are expected to select topics keeping in mind the following points :

- Literature review on recent advances in any construction management sub-discipline (e.g., Project Monitoring and control, concrete technology, sustainable materials).
- Analytical, numerical or experimental work of limited scope.
- Use of structural engineering software (e.g. MSP, Primavera) for scheduling and resource analysis.
- Case study analysis of structural failures or successful engineering projects.

The rubrics for evaluation shall be as follows :

Criteria	Excellent (9–10)	Good (7–8)	Satisfactory (5–6)	Needs Improvement (≤4)
Topic Selection & Relevance	Highly relevant, innovative, aligns with current trends in structural engineering.	Relevant and well-defined; moderate novelty.	Common topic but somewhat relevant.	Irrelevant or poorly defined topic.

Literature Review	Comprehensive, recent references, critical analysis included.	Adequate review with good references, some critical insight.	Limited scope, mostly descriptive.	Incomplete, lacks coherence, outdated references.
Problem Definition & Objectives	Clear problem statement, measurable objectives, strong justification.	Reasonably clear with defined scope.	Objectives not very specific or measurable.	Vague or missing objectives.
Methodology / Technical Work	Well-planned, correct tools used (software/lab/analysis), validated approach.	Properly structured, technically sound.	Basic methodology, lacks depth or rigour.	Poor or incorrect method, unstructured approach.
Data Analysis / Results	Results well interpreted, graphs/tables clear, findings discussed analytically.	Good results with reasonable discussion.	Basic analysis, limited interpretation.	Poor analysis, irrelevant or unsubstantiated results.
Report Quality	Well-written, professional format, error-free, follows citation norms.	Clear language, structured well, minor errors.	Acceptable format but lacks clarity or consistency.	Poorly written, unorganised, full of errors.
Presentation Skills	Confident, clear, engages audience, excellent visuals.	Clear and logical, minor issues with timing or visuals.	Understandable but lacks flow or visual quality.	Poor communication, unreadable slides, disorganised.
Question Handling	Precise, logical responses, good command over subject.	Can answer most questions with some clarity.	Struggles with deeper questions.	Unable to answer or vague/unrelated answers.
Overall Technical Depth	Demonstrates detailed understanding and critical thinking.	Good grasp of subject and concepts.	Basic understanding, limited insight.	Lacks understanding or technical foundation.

Risk and Value Management [PE-MTCM211]

Course Code	Course Name
PE-MTCM211	Risk and Value Management

Course Objectives

The objectives of this course are

1. To discuss the basics of risk and value management.
2. To explain various mathematical tools used in risk assessment process.
3. To describe value engineering job, plan.
4. To outline the process of life cycle costing.

Course Outcomes

Upon successful completion of the course, students should be able to

1. Explain the RAMP process and identify risk events using probability distributions across the investment life cycle, including NPV estimation for various cash flow correlations.
2. Apply risk assessment techniques such as sensitivity analysis, scenario analysis, simulation, decision trees, certainty methods, and risk evaluation tools for informed decision-making.
3. Recommend risk mitigation strategies including insurance-based covers, contractual measures, and methods like elimination, reduction, transfer, and absorption of risk.
4. Apply value engineering and management principles to reduce unnecessary costs and improve project performance, with consideration of energy consumption and cost escalation in construction.

CO-PO Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	3	3	2	2
CO2	3	2	3	3	3	2
CO3	2	2	3	3	3	2
CO4	2	3	3	3	3	3

Course Content

Module No.	Details	Hrs.
1	Risk analysis and Management for projects (RAMP) – Identifying risk events. Probability distribution. Stages in Investment life- cycle; Determination of NPV and its standard deviation for perfectly co-related, moderately co-related and un-correlated cash flows. Sensitivity analysis	07
2	scenario analysis simulation, decision tree analysis, risk profile method, certainly equivalent method; risk adjusted discount rate method, certainty index method, 3 point estimated method; use of risk prompts, use of Risk Assessment tables, details of RAMP process, utility of Grading of construction entities for reliable risk assessment.	08

3	Risk Mitigation – by elimination, reducing, transferring, avoiding, absorbing or pooling. Residual risk, mitigation of unquatified risk. Coverage of risk through CIDC's MOU with the Actuarial Society of India through risk premium such as (BIP) – Bidding Indemnity Policy (DIMO) – Delay in meeting obligation by client policy, (SOC) – Settlement of claims policy (LOP)- Loss of profit policy (TI).	04
4	Transit Insurance policy (LOPCE) Loss of performance of construction equipment policy. Insurance from construction point of view – CAR Policy, EAR Policy, 3rd party risk cover, Professional Liability Insurance policy, Contractor's Plant & machinery policy, and IT risk policy	04
5	Value : Meaning of value, basic and secondary functions, factor contributing to value such as aesthetic, ergonomic, technical, economic : identifying reasons or unnecessary costs	06
6	Value Analysis: value analysis team; principles of value analysis, elements of a job plan viz. orientation, Information, presentation. Implementation, follow up action, benefits of value analysis, various applications; assessing effectiveness of value analysis.	08
7	Value management : Energy resources, consumption patterns, energy cost escalation and its impact, key factors affecting energy consumption in the building and other construction works.	05

Recommended Books

1. Faculty of Actuaries (Great Britain), Institute of Actuaries (Great Britain) (2005); "RAMP - Risk Analysis and Management for Projects: A Strategic Framework for Managing Project Risk and Its Financial Implications". Thomas Telford. ISBN 13: 9780727733900. 147p.
2. Seetharaman (2000);" Construction Engineering and Management", ISBN: 9788188114061.487p.
3. Prasanna Chandra (1986); "Projects preparation, appraisal, budgeting & implementation", Tata McGraw Hill. ISBN-13: 978-0074516287. 543p.
4. Dr.Surendra Kumar "Industrial Engineering and Management of manufacturing systems" .Satya Prakashan.
5. Zimmerman & Hart (1982);" Value engineering - a practical approach for owners, designers &contractors", CBS Publishers. ISBN:9780442295875.279p.
6. S C Rangwala ,Estimating Costing and valuation, Charotar Publishing House.
7. Del Younke, Value Engineering: Analysis And Methodology.

International Construction Business [PE-MTCM212]

Course Code	Course Name
PE-MTCM212	International Construction Business

Course Objectives

The objectives of this course are

1. Explain basic concept of international economy with theories of trade.
2. Describe culture of international business.
3. Summarize legal frame in contest of international business
4. Discuss about multi project management and regulatory committees

Course Outcomes

Upon successful completion of the course, students should be able to

1. Describe global economic systems and their effect on international trade.
2. Analyze cultural impacts on international business practices.
3. Apply legal frameworks and management tools in international projects.
4. Execute multi projects management

CO-PO Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1			2	2		3
CO2			2	3		2
CO3		2	3	3	3	
CO4	2		3	3	3	

Course Content

Module No.	Details	Hrs.
1	**International economy** International political system, economic system, Globalizations, multinationals, features of international trade & investment, national interest in international trade. Impact of EU, SAARC, BRICS, ASEAN on global economy	07
2	**Theories of international trade** OHLINS'S international trade Developing countries in the world economy, international differences in technology, policy implications for host countries International monetary system, balance of international payments, transfer of international payments, foreign exchange rates and their determination. Role of IMF (International Monetary fund), World Bank, IBRD (International Bank for Reconstruction and development), Asian Development Bank	08
3	**Cultural environment of international business:** Elements of culture, culture role, Effect of culture, language, education, religion, value systems on business, impact on management styles in	07

	selected countries, cross-cultural differences.	
4	**Legal Framework and International Trade** Restriction on Import-Export, International Dispute Settlement. Role of WTO and its Function. International arbitration & case studies.	07
5	**Multi project management & control:** International project planning, resource management, document Management, Consortium and collaboration, controlling tools, use of ERP for international business, introduction to CVC.	06
6	Introduction tointernational regulatory committees, GCC/MENA/FU.	05
7	Case studies on international project	02
Recommended Books		
1. Published books in the relevant areas to be supplemented by latest journal articles and papers, seminar and conference proceedings, in-house publications, monographs etc.		

Infrastructure Planning and Management (Online course) [PE-MTCM213**]

Course Code	Course Name
PE-MTCM213**	Infrastructure Planning and Managements (Online Course)

Course Objectives

The objectives of this course are

2. To introduce students to 'real world' risks and challenges in managing infrastructure
3. To explain the infrastructure planning process as well as the state of infrastructure across sectors in India
4. To understand various risks that plague infrastructure projects

Course Outcomes

Upon successful completion of the course, students should be able to

1. Aware of current risks in infrastructure sector
2. Provide solutions that can help to execute infrastructure projects better
3. Carry out strategic management techniques.
4. Evaluate socio-economic factors and governance in infrastructure planning.

CO-PO Mapping

CO → / PO ↓	PO1	PO2	PO3	PO4	PO5	PO6
CO1	-	-	2	2	-	3
CO2	2	-	3	3	3	-
CO3	-	-	3	3	3	2
CO4	-	-	2	2	-	3

Course Content

Module No.	Details	Hrs.
1	Class Introduction, Introduction to Infrastructure and to the Transportation, power and telecom sectors	06
2	Rural and Urban Infrastructure Sectors, Players and Phases in an Infrastructure Project	07
3	Project Finance and Public Private Partnerships	08
4	Construction and Economic Risks, Political and Social Risks	07
5	Stakeholder Management, Design Thinking and Negotiations, Socio-Economic Analysis and Good Governance for Infrastructure	06
6	Guest Lectures from Infrastructure Practitioner, Modelling Flexible Project Arrangements	02
7	Case Studies, Incomplete Design	06

Recommended Books

1. 'Infrastructure Planning Handbook' by Prof Makarand Hastak, ASCE Press

2. 'Strategic Management of Large Engineering Projects' by Miller and Lessard

Management of Construction Resources [PE-MTCM221]

Course Code	Course Name
PE-MTCM221	Management of Construction Resources

Course Objectives

The objectives of this course are

1. To Describe the concept of human Resources Management
2. To explain concept of equipment Management
3. To summarize concept of material management

Course Outcomes

Upon successful completion of the course, students should be able to

1. Explain human resource and manpower planning concepts in construction.
2. Select and manage construction equipment considering economics and maintenance.
3. Apply materials and inventory management techniques for construction projects.
4. Use construction resource management software effectively.

CO-PO Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	-	-	3	3	-	2
CO2	-	-	3	3	2	-
CO3	2	2	3	3	3	-
CO4	1	-	2	2	3	2

Course Content

Module No.	Details	Hrs.
1	**Human Resources Management** Need of HRD in the context of globalization Staffing, recruiting, orientation and training, performance evaluating, merit rating, Labour Management: Strikes and lockouts, collective bargaining, grievances and grievance settling procedure, labour welfare.	06
2	**Manpower planning** Techniques of manpower planning. Estimation of manpower for company project. Manpower planning at various stages considering a risk due to lead time. Remuneration of a person. Various methods of deciding remuneration, Techniques to decide actual manpower resources	07
3	**Equipment Management** Mechanization on construction projects, selection of major and minor equipment, production estimating, sizing and matching of equipment, Sources of construction equipment: purchase, rent and lease, old and new equipment	06
4	**Economics of Equipment** Economics of equipment, useful / economic life of equipment, equipment	06

	operation and service, maintenance, depreciation, obsolescence and replacement. Equipment management systems, organizations, record keeping, training to operators, life cycle costing of equipment	
5	Materials Management Importance and role in construction industry. Objectives and functions. Estimation of materials, Classification and codification, Material Requirement Planning. Vendor analysis, Purchase function: legal aspects of purchase, Requisition forms, Quality assurance	06
6	Inventory Management Stores Management; Planning layout of stores, Plant & machinery, Digitalization in effective control of stores; Inventory control techniques concept of EOQ , Advantages and limitations of use of EOQ, ABC analysis, Stores management, minimizing wastage, Precautions to be taken during storage and transport. Material management systems, Organizations, record keeping.	07
7	Introduction of various software's for construction resource management such as Microsoft Project, Prima Vera, Building Information and Modelling, ERP	04

Recommended Books
1. Varma Mahesh (1975); "Construction Equipment, Its Planning & Application", Metropolitan & Co. 539p. 2. Gopalkrishnan (1977); "Materials Management: An Integrated Approach" PHI Learning Pvt. Ltd. ISBN 13: 9788120300279. 280p. 3. Nunnally (2000); "Managing Construction Equipment", Prentice Hall. ISBN 13: 9780139012167. 399p.

Total Quality Management in Construction [PE-MTCM222]

Course Code	Course Name
PE-MTCM222	Total Quality Management in Construction

Course Objectives

The objectives of this course are

1. To study the concept of quality in construction.
2. To describe the need of MIS in Construction.
3. To explain the need of TQM, ISO and SIX Sigma in Construction.

Course Outcomes

Upon successful completion of the course, students should be able to

1. To carry out quality control in construction.
2. To develop Total quality management system and Management Information System
3. Apply quality control and assurance techniques throughout project stages.
4. Develop a quality culture through training and continuous improvement.

CO-PO Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	-	-	3	3	2	-
CO2	-	-	3	2	3	2
CO3	-	-	3	3	3	-
CO4	-	-	2	2	-	3

Course Content

Module No.	Details	Hrs.
1	Quality: Necessity for improving Quality in the context of Global Challenges.	05
2	Concept of Quality Control, Quality Assurance, Quality Management and Total Quality Management (TQM)	06
3	Study of various Quality Standards in Construction: Related to building materials and other inputs for construction processes, methods and techniques for construction outputs, products and services, such as BIS, BS, Indian standard, British, American, German & Japanese standards, Managing Quality in various projects stages from concept to completion by building quality into design of structures, Inspection of incoming material and machinery In process quality inspections and tests.	08
4	Designing of quality manuals, checklists and inspection reports, installing the quality	07
5	Assurance system, monitoring and control.	06

6	Quality Assurance Department and quality control responsibilities of the line organization. Quality in foundations and piling work, structural work. Concreting, electrical system building facilities, waste recycling and maintenance.	06
7	Developing quality culture in the organization: Training of people, Bench – marking quality. Quality circles.	04

Recommended Books
1. Rumane, Abdul Razzak (2011);" Quality management in construction projects", ISBN: 9781439838723 464p.

International Contracting [PE-MTCM223]

Course Code	Course Name
PE-MTCM223	International Contracting

Course Objectives
The objectives of this course are 1. The significance & role of contracts 2. contracts professionals in the world of business

Course Outcomes
Upon successful completion of the course, students should be able to 1. Describe the fundamental elements of a contract, including basic terms and conditions 2. Develop appropriate selection criteria for vendor selection. 3. Be able to choose the right contract type for a given situation. 4. Evaluate dispute resolution methods and personnel selection in global projects.

CO-PO Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	2	2	-	2
CO2	3	2	3	3	2	-
CO3	3	-	3	3	2	2
CO4	3	3	3	3	3	3

Course Content

Module No.	Details	Hrs.
1	International contracting – meaning, scope, nature, present status of the International construction market, role of Asia- Pacific region countries in the present construction development. Impact of WTO/GATS on the Indian Construction Sector as regards domestic market and export sector.	04
2	Study and application of various conditions of contract under the FIDIC document development of regulatory framework. Project exports from India. Overview of EC, ICC, ENNA, IChemE & AIA , Emerging contract model – Integrated Project Delivery, Guaranteed Maximum Price contract	07
3	International financing: Various institutions such as WB, IMF, ADB. African bank etc. and their role, rules – regulations in funding various projects, forming alliance, bilateral and multilateral funding, trade practices etc.	06
4	International Projects – Types of BOT systems such as BOT, BOOT, BOO, DBO, BOR, BLT, BRT, BTO & DBGO, MOOT, ROO, ROT,	08

	BOLT – Contractual procedures, special features, methods of handling.	
5	Selection of personnel to suit socio-economic-environmental culture in other countries, suitable organisational structure.	06
6	Disputes Resolving – International Courts, formation of DRB's (Dispute resolving boards) functioning and experiences in India and abroad, Advantages of DRB's	06
7	CASE studies of any 2 major project executed/functioning under International contracting.	05

Recommended Books

1. FIDIC documents
2. Simon M.S. McGraw Hill (2007);" Construction Contracts & Claims", New York.
3. ISBN:9780070574335. 278 p.
4. Unified Contract Documents by CIDC
5. ReboertMatays and Mathews (1995);" Dispute Review Board Manual", ISBN-13: 978- 0070410602.
6. K.N.Vaid (1991);" International Construction Contracting", NICMAR Publication. ISBN: 9788185448169

Modern Construction Materials (Online Course) [PE-MTCM224**]

Course Code	Course Name
PE-MTCM224**	Modern Construction Materials (Online course)

Course Objectives

The objectives of this course are

1. To discuss the modern construction materials used in construction industry.
2. To provide the scientific basis for the understanding and development of construction materials.
3. To understand the properties and application of construction materials.

Course Outcomes

Upon successful completion of the course, students should be able to

1. Understand the science and design of construction materials.
2. Identify properties and applications of wood, polymers, metals, and bituminous materials.
3. To Carry out research related to construction materials
4. Practice marketing, decision making, innovation and specification related to construction materials.

CO-PO Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	3	3	-	2
CO2	-	-	3	3	-	2
CO3	3	2	3	3	3	3
CO4	2	3	3	3	2	2

Course Content

Module No.	Details	Hrs.
1	Introduction to the course, Science Engineering and Technology of Materials- 1&2, Atomic Bonding-1, Atomic Bonding-2, Structure of Solids-1, Structure of Solids-2&3	05
2	Movement of Atoms, Development of Microstructure-1, Development of Microstructure-2	04
3	Surface Properties, Response to Stress-1, Response to Stress-2&3, Failure Theories, Fracture Mechanics-1, Fracture Mechanics-2	06
4	Rheology & Thermal properties, Review of Const. Materials & Criteria for election, Wood and Wood Products-1	06
5	Wood and Wood Products-2, Wood and Wood Products-3, Polymers, Fiber Reinforced Polymers-1&2, Metals-1, Metals-2, Metals-3	04
6	Bituminous Materials-1, Bituminous Materials-2, Concrete-1, Concrete-2, Concrete-3	05

7	Concrete-4, Concrete-5, Glass, Waterproofing Materials, Polymer Floor Finishes, Anchors	06

Recommended Books

1. Building Materials, P.C. Varghese, Prentice-Hall India, 2555.
2. Materials Science and Engineering: An introduction, W.D. Callister, John Wiley, 1994.
3. Materials Science and Engineering, V. Raghavan, Prentice Hall, 1990.
4. Properties of Engineering Materials, R.A. Higgins, Industrial Press, 1994.
5. Construction materials: Their nature and behaviour, Eds. J.M. Illston and P.L.J. Domone, 3rd ed., Spon Press, 2551.
6. The Science and Technology of Civil Engineering Materials, J.F. Young, S. Mindess, R.J. Gray & A. Bentur, Prentice Hall, 1998.
7. Engineering Materials 1: An introduction to their properties & applications, M.F. Ashby and D.R.H. Jones, Butterworth Heinemann, 2553.
8. The Science and Design of Engineering Materials, J.P. Schaffer, A. Saxena, S.D. Antolovich, T.H. Sanders and S.B. Warner, Irwin, 1995.
9. Concrete: Microstructure, properties and materials, P.K. Mehta and P.J.M. Monteiro, McGraw Hill, 2556.
10. Properties of concrete, A.M. Neville, Pearson, 2554

Operations Research [OE-MTCM201]

Course Code	Course Name
OE-MTCM201	Operations Research

Course Objectives

The objectives of this course are

1. To impart knowledge in concepts and tools of Operations Research.
2. To understand mathematical models

Course Outcomes

Upon successful completion of the course, students should be able to

1. Formulate and solve linear and non-linear programming problems relevant to civil engineering projects using graphical, simplex, and dual methods.
2. Apply optimisation techniques such as CPM/PERT, dynamic programming, and network flow models for effective planning, scheduling, and resource allocation in construction and infrastructure projects.
3. Analyse inventory control and material management problems in civil engineering using deterministic and probabilistic models.
4. Evaluate construction operations and project strategies using decision-making tools such as game theory, simulation, and sensitivity analysis.

CO-PO Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	–	3	3	3	2
CO2	2	–	3	3	3	3
CO3	3	–	2	2	3	2
CO4	3	–	2	2	3	3

Course Content

Module No.	Details	Hrs.
1	Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models	06
2	Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method	06
3	Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT.	06
4	Scheduling and sequencing - single server and multiple server models - deterministic inventory models	06
5	Probabilistic inventory control models - Geometric Programming.	06
6	Sensitivity analysis - parametric programming	06
7	Competitive Models, Single and Multi-channel Problems,	06

	Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation	

Recommended Books
1. H.A. Taha, Operations Research, An Introduction, PHI, 2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
3. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
4. Hitler Libermann Operations Research: McGraw Hill Pub. 2009
5. Pannerselvam, Operations Research: Prentice Hall of India 2010
6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

Legal Aspects in Construction [OE-MTCM202]

Course Code	Course Name
OE-MTCM202	Legal Aspects in Construction

Course Objectives

The objectives of this course are

1. To describe fundamentals of common law and understand bid cycle
2. To explain Indian contract act and demonstrate the concept contract administration
3. To summarize students with Laws applicable to construction activity
4. To interpret various acts in connection with construction activities

Course Outcomes

Upon successful completion of the course, students should be able to

1. Explain the fundamental principles of contract law, key legal terms, and the relevance of the Indian Contract Act 1872 in the context of construction projects.
2. Interpret and apply contract documents, correspondence, and legal provisions related to dispute resolution, claims, delays, and contract administration.
3. Analyse various types of construction contracts, tendering procedures, bid evaluation systems, and contract signing processes in public and private sector projects.
4. Evaluate legal frameworks applicable to construction such as Arbitration and Conciliation Act, Evidence Act, and labour laws, and assess professional liability in engineering practice.

CO PO Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	–	3	3	3	2
CO2	2	–	3	3	3	3
CO3	3	–	2	2	3	2
CO4	3	–	2	2	3	3

Course Content

Module No.	Details	Hrs.
1	Basic Law	03
2	Contract Administration a. What is a Contract? Understanding Construction Contracts. Contract as per the Law. The necessity and importance of administering the contract. Difference in Management and Administration. b. Understanding legal contract, Void and Voidable contract, Understanding various terms like Waiver, Selection, Estoppels, Constructive notice, Express and Implied Terms, Ad-idem, Terms of contract, etc. c. Understanding the Indian Contract Act 1872 and the importance and relevance of various sections of the Act.	09

	d. Interpretation of Contract e. Importance of correspondence during the progress of work. Methods of writing letters. Common dos and don'ts in administering the contract. f. Areas of Disputes and Differences in Contract. Method of handling various situations, Extra Item, Extension of time, LD etc.	
3	Construction Contract a. Types of Contracts; b. Stages and parts in the Tendering process; c. Preparation of Tender documents; Prequalification and registration of contractors; d. Study of contract conditions for bidding; e. Pre-bid conference and site surveys; f. Bid/No bid analysis; Preparation and submission of bids; g. Evaluation of Tenders; Multi-criteria bid evaluation system; h. Letter of acceptance and contract signing.	08
4	Understanding Delays, Types of Delays and Analysis of Delays. Various types of claims. Understanding the legality of claims.	06
5	Alternative Dispute Resolution, Arbitration and Conciliation Act 1996	06
6	Principle of Evidence Act, Limitation Act, Principle Act, Workmen's Compensation Act, Employer's Liability Act, Payment of wages Act, Contract Labour Act.	05
7	Standard Form of Contract (Indian and International) Professional Liability	05

Recommended Books

1. Bajirao Shankarrao Patil (1986); "Legal Aspects of Building & Engineering Contracts" S.B. Patil. 471p.
2. G. T. Gajria, Kishore Gajria (2000); "Law Relating To Building & Engineering Contracts In India", Lexisnexis Butterworths India. ISBN 13: 9788187162162. 538p.
3. P. C. Markanda, Naresh Markanda (2013); "Law Related To Arbitration and Conciliation" Lexisnexis Butterworths India. ISBN 13: 9788180388132. 1570p.
4. Edward R. Fisk, Wayne D. Reynolds (2013); "Construction Project Administration" Pearson Education. ISBN 13: 9780133149258. 432p.
5. Indian Contract Act 1872
6. Arbitration Conciliation Act 1996.4. All Referred Bare Acts
7. CPWD Manual Volume I & II, A Handbook For Government Officials And Contractors

Business Analytics [OE-MTCM203]

Course Code	Course Name
OE-MTCM203	Business Analytics

Course Objectives

The objectives of this course are

1. The main objective of this course is to give the student a comprehensive understanding of business analytics methods.
2. Understand and critically apply the concepts and methods of business analytics. Identify, model and solve decision problems in different settings.

Course Outcomes

Upon successful completion of the course, students should be able to

1. Describe the role of a business analyst and explain stakeholder dynamics, requirement types, and the importance of effective requirement gathering.
2. Analyse various life cycles including system, project, and requirement life cycles relevant to business analysis processes.
3. Apply structured techniques to transform stakeholder needs into formal models using tools such as UML, BPMN, and data flow diagrams.
4. Evaluate and manage business requirements through prioritisation, change control, and the use of analytical tools while exploring emerging trends like data storytelling and collaborative intelligence.

CO PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	2	1	1	1
CO2	2	–	2	2	2	–
CO3	3	2	3	2	3	–
CO4	2	2	2	3	3	2

Course Content

Module No.	Details	Hrs.
1	Business Analysis: Overview of Business Analysis, Overview of Requirements, Role of the Business Analyst. Stakeholders: the project team, management, and the front line, Handling Stakeholder Conflicts.	06
2	Life Cycles: Systems Development Life Cycles, Project Life Cycles, Product Life Cycles, Requirement Life Cycles.	06
3	Forming Requirements: Overview of Requirements, Attributes of Good Requirements, Types of Requirements, Requirement Sources, Gathering Requirements from Stakeholders, Common Requirements Documents.	07
4	Transforming Requirements: Stakeholder Needs Analysis, Decomposition Analysis, Additive/Subtractive Analysis, Gap Analysis, Notations (UML & BPMN), Flowcharts, Swim Lane Flowcharts, Entity-Relationship	06

	Diagrams, State-Transition Diagrams, Data Flow Diagrams, Use Case Modeling, Business Process Modeling	
5	Finalizing Requirements: Presenting Requirements, Socializing Requirements and Gaining Acceptance, Prioritizing Requirements. Managing Requirements Assets: Change Control, Requirements Tools	06
6	Recent Trands in: Embedded and collaborative business intelligence	06
7	Visual data recovery, Data Storytelling and Data Journalism.	05

Recommended Books

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G.Schniederjans, Christopher M. Starkey, Pearson FT Press.
2. Business Analytics by James Evans, persons Education.

Cost Management of Engineering Projects [OE-MTCM204]

Course Code	Course Name
OE-MTCM204	Cost Management of Engineering Projects

Course Objectives

The objectives of this course are

1. Cost management is to reduce the Project cost expended by Direct Costs and indirect costs
2. Establish systems to help streamline the transactions between corporate support departments and the operating units.

Course Outcomes

Upon successful completion of the course, students should be able to

1. Explain the strategic cost management process and apply cost concepts such as relevant, differential, and opportunity cost in engineering decision-making.
2. Analyse cost estimation methods including analogous and parametric techniques, and develop project control budgets from engineering, procurement, and construction perspectives.
3. Interpret financial statements and working capital metrics to assess project profitability and optimise cash flow and resource allocation.
4. Apply earned value management, cash flow analysis, and financial controls to manage direct and indirect project costs effectively, including GST and insurance considerations.

CO PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6
CO1	–	–	3	3	2	–
CO2	–	–	3	3	3	–
CO3	–	–	3	3	3	–
CO4	–	–	3	3	3	2

Course Content

Module No.	Details	Hrs.
1	Introduction and Overview of the Strategic Cost Management Process	06
2	Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.	06
3	Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and nontechnical activities. Detailed Engineering activities. Pre-project execution main clearances and documents	07

4	**Cost Estimations** Methods of cost estimation – Analogous estimates – Parametric estimates & cost aggregation method – Contingency reserve and management reserve in project cost estimations - Cost baseline & cost budgeting, Developing Project Control Budget. Understanding the cost estimates from Engineering, Procurement and Construction point of view.	06
5	**Financial Statements** Understanding Financial Statements, EBITDA, PBIT, PAT, Financial Ratios for understanding Profitability and healthy Cash Flow management	06
6	**Working Capital Management** Working Capital Basics - Working Capital Issues in Projects - Estimating Working Capital - Working Capital ratios - Inventory Ordering Cost - Economic Order Quantity (EOQ) - Work In Progress (WIP).	06
7	**Project Cash flow Management** Project Cash flow, Components of Cash flow - Impact of Cash flow on Project Performance - Construction cumulative cost curves - Earned Value Management concept, Direct & Indirect Cost in Projects, Project overheads, Understanding the aspects of GST, Project Insurance.	05

Recommended Books

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster, Advanced Management Accounting
3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
4. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher
5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd
6. Prasanna Chandra (2011); "Financial Management", Tata McGraw-Hill Education. ISBN 13: 9780071078405. 1026p.

Artificial Intelligence in Engineering [OE-MTCM205]

Course Code	Course Name
OE-MTSCM205	Artificial Intelligence in Engineering

Course Objectives

The objectives of this course are

1. To introduce the students to the various soft computing techniques.
2. To prepare the student for the application of artificial intelligence techniques in engineering.

Course Outcomes

Upon successful completion of the course, students should be able to

1. Explain basics of soft computing techniques.
2. Apply artificial intelligence techniques to the engineering problems.

CO and PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	–	2	–	1	1
CO2	3	–	3	3	3	2

Course Content

Module No.	Details	Hrs.
1	Introduction to Soft computing techniques- soft computing techniques, importance, types of soft computing techniques, advantages and limitations.	06
2	Introduction to Fuzzy logic: Fuzzy sets Fuzzy set operations- Fuzzy Relations-Cardinality of Fuzzy Relations-Operations on Fuzzy Relations-Properties of Fuzzy relations- Membership Functions-Features of Membership functions- Fuzzification-Methods of Membership value Assignments- Fuzzy Rule Base-Defuzzification-Defuzzification methods-Fuzzy logic controller (Block Diagram)	06
3	Artificial Neural Networks: Basic Concepts-Neural network Architectures- Single layer feed forward network-Multilayer feed forward network- Recurrent Networks-Characteristics of Neural Networks-Learning methods. Perceptron networks-Back Propagation Networks-Radial base function network-Hopfield network- Kohonen Self organizing maps.	10
4	Fundamentals of genetic algorithms and Genetic Programming: Basic concepts- working principle - encoding different methods - fitness function, reproduction-different methods. Genetic modelling in heritance-Crossover mutation-convergence of genetic algorithm. Basic difference between genetic algorithm and genetic programming.	10

5	Introduction to Hybrid systems: Concept of hybrid system and its significance in general to water resources problems, Neural network, fuzzy logic and genetic algorithm hybrids - Neuro fuzzy hybrids- neuro genetic hybrids-Fuzzy genetic hybrids-Genetic algorithm based back propagation network- Fuzzy back propagation networks -fuzzy logic controlled genetic algorithms.	10

Recommended Books

1. Rajasekharan, S. and Vijayalakshmi, G.A.Pai, -Neural Network, Fuzzy Logic and Genetic Algorithms Synthesis and Applications, Prentice Hall India.
2. Sivanandam, S.N and Deepa, S.N. -Principles of Soft Computing, Wiley India
3. Ross Timothy J, -Fuzzy logic with Engineering Applications, McGraw Hill, New York.
4. Haykins S. -Neural Networks a Comprehensive foundation, Pearson Education.
5. Goldberg, D.E. -Genetic Algorithms in Search Optimization and Machine Learning, Pearson Education
6. Recent Literature

Building Information Modelling (BIM) Lab [SE-MTCM201]

Course Code	Course Name
SE-MTCM201	Building Information modelling (BIM)Lab

Course Objectives

1. To educate the student on 3D design of Civil / Commercial Buildings
2. To develop model using Navisworks
3. To monitor progress of work

Course Outcomes

Upon successful completion of the course, students should be able to

1. Explain the modeling concept of building information.
2. Illustrate planning, design and construction by using BIM software

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	3	3	2	2
CO2	3	2	3	3	3	2

Course Content

Module No.	Details	Hrs
1	Exploring the User Interface, Working with Revit elements, Creating a basic Floor Plan.	02
2	Working with grids and Structural Columns, adding and Modifying Walls, Loading Additional Building Components, importing and Exporting using External Files and Linking Files	02
3	Creating Advanced Components, Creating and Modifying Parametric Families.	02
4	Viewing the Building Model, Controlling Object Visibility, Creating and Modifying Section And Elevation Views.	02
5	Developing the Building Model, Creating and Modifying Floors, Ceilings, Roofs and Curtain Wall.	02
6	Detailing and Drafting, Duplicating Views, Creating Elevations, Creating Section structural Works, Floor Framing, Working with Roofs, Working with Structural Steel Frames.	02
7	Working with Sloped Beams, Working with Floor Decks, Working with Foundation Slabs and Slabs, Footings and Grade Beams, Managing Revisions, User Interface & File Organization.	02
8	Viewing the Building Model, Controlling Object Visibility, Creating and Modifying Section And Elevation Views	02
9	**NevisWorks :** (Model Development User Interface & File Organization, Overriding transparency, color,	02

	and object/model location.	
10	Importing 3D Files, How to import and append 3D model File, Understanding NavisWorks file formats, Object enablers	02
11	Navigation, Zooming, panning, walking around Sectioning, Moving objects, Hiding layers and objects, Establishing Selection Sets.	02
12	Viewpoints, Establishing and organizing custom, Viewpoints, Publishing the model file and Viewpoints, Internal/in-house clash detection, 4D simulation	02

Lab Work

Lab work shall comprise of

1. Report on assignments including problems based on the above syllabus shall be submitted as term work.
2. One assignment on each module is to be submitted.
3. Reports of assignments : 50 points

Project Management Lab [PC-MTCM251]

Course Code	Course Name
PC-MTCM251	Project Management Lab

Course Objectives

1. To educate the student about modern construction management software
2. To apply the knowledge of planning and scheduling technique for a construction project

Course Outcomes

Upon successful completion of the course, students should be able to

1. Identify construction activities and establish logical dependencies for the development of project schedules and work breakdown structures.
2. Prepare bids, construction plans, and activity schedules using dedicated project management software tools.
3. Demonstrate the use of general-purpose software to create applications for managing project cash flow, resource allocation, and other construction-related functions.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	3	3	2	1
CO2	2	3	3	3	3	2
CO3	2	2	3	2	3	3

Course Content

Details

Laboratory work to include;

FUNDAMENTALS OF PROJECT MANAGEMENT using M.S .Project

Structuring of Projects and Organizations. Applications of Network Techniques using software, Resource profiles, tables, and resource/cost curves; Setting Up a Project, Creating Calendars, Defining Task and Relationship, Creating WBS, Scheduling and Progress of Project, Resource organization in Project Plans,

Monitoring & Control

- Updating and Reporting on Project Performance Monitoring, Controlling and Report Generation.

Project structuring, task organizations, scheduling, resources, costs etc. various features and functions available in Primavera.

Creating Project, sub-project, activities planning and scheduling calendars

Resource definitions: Task types, resource types, resource planning, allocations of cost etc.; Various Structures i.e. WBS, OBS, EPS, etc. Activity codes, Project progress, progress updating: setting baseline, status updating, tracking formatting for printing etc.

Tilos

TILOS Interface Overview; Overview of Capabilities and Benefits Time Distance View layout, settings, and properties; Time Scale Distance Scale, Elevation Profiles, Grid Lines, Inserting tasks (activities)

Linking tasks (logic/relationships), Calendars, Holidays, and shift patterns Text Fields, Layers, Filters, Task Templates, Resources like Labor, Machines, and Material , Costs and expenditures, Histograms; E**nvironmental Constraints,** Task Groups (Fragnets), Splitting Tasks Adding project milestones, Creating a baseline, Reporting progress Detecting task clashes/conflicts, Reschedule, Adding a Legend, Logo, and images, Hints, Tips, and shortcuts.
Lab Work
Lab work shall comprise of 1. Report on assignments including problems based on the above syllabus shall be submitted as term work. 2. One assignment on each module is to be submitted. ***3.*** Reports of assignments : 50 points

English for Technical Writing [AE-MTCM201]

Course Code	Course Name
AE-MTCM201	English for Technical Writing

Course Objectives

Students will be able to:

1. Learn about what to write in each section.
2. Understand the skills needed when writing a Title.
3. Use language as an effective tool of communication.

Course Outcomes

Upon successful completion of the course, students should be able to

1. Demonstrate improved writing skills and enhanced readability by applying principles of technical English proficiency.
2. Apply structured writing processes and strategies to produce high-quality research papers and user-oriented technical documents across various genres.
3. Adhere to professional conventions in research writing, including clarity, style, design, and layout to create well-structured written materials.
4. Prepare effectively for campus placement by developing professional reports, resumes, and participating confidently in group discussions and interviews.
5. Present research content with clarity, precision, and confidence through well-organized oral and written presentations.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6
CO1	–	3	2	–	1	1
CO2	1	3	2	1	2	1
CO3	–	3	2	–	1	–
CO4	–	3	1	1	1	2
CO5	1	3	2	1	2	2

Course Content

Module No.	Details	Hrs.
1	**Foundations of Academic English in Research:** Academic English - MAP (Message-Audience-Purpose) - Language Proficiency for Writing - Key Language Aspects - Clarity and Precision - Objectivity - Formal Tone - Integrating References - Following Academic Conventions Word Order - Sentences and Paragraphs - Link Words for Cohesion - Avoiding Redundancy / Repetition - Breaking up long sentences - Structuring Paragraphs - Paraphrasing Skills – Framing Title and Sub-headings	05
2	**Advanced Reading Skills for Researchers:** Reading Academic Texts – Barriers – Reading Strategies-Critical Reading	03

	Strategies - Skimming and Scanning - Primary Research Article vs. Review Article - Reading an Abstract - Analysing Research Articles - Identifying Arguments - Classifying Methodologies - Evaluating Findings - Making Notes	
3	**Report Writing and Proposals:** Report writing: Objectives of report writing, Language and style in a report, Types of reports. Formats of reports: Memo, Letter, and Project report Survey based. (A Computer- aided presentation of the Project report) - Technical paper writing- Proposal writing. Business & Technical writing: Types of meetings, Notice, Agenda, Minutes of the meetings, Strategies for conducting effective. **Mastery In Revising, Editing, And Proofreading:** Effective Revisions - Restructuring Paragraph - Editing vs Proofreading Editing for Clarity and Coherence - Rectifying Sentence Structure Issues - Proofreading for Grammatical Precision – Spellings - Tips for Correspondence with Editors	06
4	**Grammar Refinement for Research Writing:** Advanced Punctuation Usage - Grammar for Clarity - Complex Sentence Structures - Active- Passive Voice - Subject-Verb Agreement - Proper Use of Modifiers - Avoiding Ambiguous Pronoun References - Verb Tense Consistency - Conditional Sentences	04
5	**Presentation Language Skills:** Written vs. Spoken English - Dynamic Vocabulary for Presentations – Expressive Language for Audience Engagement - Q&A Session Preparation Strategies - Language for Clear and Impactful Slides - Adapting Language Style to Different Audiences-	03
6	**Employment Skills:** Group Discussion -SWOT Analysis- Interview Skills: Preparation and Presentation- Meaning and types of interviews (F2F, telephonic, video, etc.) Dress Code- Background Research-Do's and Don'ts- (STAR Approach) for facing an interview-Interview procedure -Important questions generally asked in a job interview (open and closed ended questions)-Simulation- Observation of exemplary interviews- Comment critically on simulated interviews -Elevator Pitch-Crafting effective elevator pitch - structure concise and relevant speeches-Mock Interviews.	06
7	**Resume Skills:** Preparation and Presentation- Introduction of resume and its importance- Difference between a CV, Resume and Bio data-Essential components of a good resume.- Common Errors-Common errors people generally make in preparing their resume Prepare a good resume of her/his considering all essential component	03
End Semester would be 50 marks of presentation and report (conducted before hand)		

and 50 marks for the final written end semester paper

Recommended Books
1. Bailey. S. 2015. Academic Writing: A Handbook for International Students. London and New York: Routledge.
2. Craswell, G. 2004. Writing for Academic Success. Sage Publications.
3. Creme, P. & M. Lea. 2008. Writing at University: A guide for students. Open University Press.
4. Oshima, A. & Hogue, A. 2005. Writing Academic English, Addison-Wesley, New York
5. Swales, J. & C. Feak. 2012. Academic Writing for Graduate Students: Essential Skills and Tasks. Michigan University Press.
6. Wallwork, Adrian. 2015. English for Academic Research: Grammar, Usage and Style, Springer, New York
7. English for Writing Research Papers, Springer, New York.

Project Planning and Management [AE-MTCM202]

Course Code	Course Name
AE-MTCM202	Project Planning and Management

Course pre-requisites	Basics of structural analysis and design, surveying, soil mechanics, hydraulics, construction materials and practices, working of organizations

Course Objectives

The objectives of this course are

1. Understand the roles and responsibilities of civil /structural and Construction engineer in practice.
2. Understand the important activities and the sequence in which they are to be carried out.
3. Learn the importance of accuracy and correctness in work and how this is achieved.
4. Understand the skills required by a civil /structural and Construction engineer.

Course Outcomes

Upon successful completion of the course, students should be able to

1. Have a clear understanding of Project Planning and Management; the stages and activities in project execution
2. Draw upon the academic knowledge gained in college to achieve efficiency in actual practice.
3. Appreciate the developments in Civil/Structural engineering, Construction and the continuous upgradation of knowledge and skills.
4. Approach industry with enthusiasm, motivation, confidence and a strong pride in the profession

CO-PO Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	–	2	–	2	3
CO2	2	2	2	–	2	3
CO3	–	–	–	–	–	3
CO4	–	2	–	–	–	3

Course Content

Module No.	Details	Hrs.
1	**Project and Project Management:** • Project and its features • Project Management and Its Importance • Change in approach in the seventh edition of PMBOK Guide • Project Management Principles • Project Performance Domains	07

	• Important components of Project Management	
2	**Project Planning:** • Project Charter and Project Management Plan • Project Scope and Schedule Management • Project Cost and Quality Management • Project Resource and Risk Management	07
3	**Introduction and Early work:** • Roles and challenges of the Civil and structural engineer • Construction Management overview • Surveying activity for a project • Geotechnical Investigation for a project **Basic Design of a Project:** • Plot Layout Planning, • Construction strategy • Tendering and Contract strategy for a project • Design basis for the project • Important codes, specifications and standards • Site Development	07
4	**Global design:** • Important engineering principles and concepts • Preliminary structural analysis and design • Tender Document and specification • Quantity and cost estimation and monitoring • Piling in a project • Material Estimation for ordering	07
5	**Detailed Design:** • Detailed computer analysis and design of structures, • 3D computer modelling, BIM and interaction with other engineering disciplines like Mechanical, Electrical and Plumbing (MEP) . • 2D Detailed construction drawings for Reinforced concrete, Steel and Architecture	07
6	**Construction Stage:** • Steel fabrication drawings and concrete bar bending schedules. • Construction management • Present and future trends in Civil and Structural engineering & construction • Essential skills required by a Civil Structural and Construction Engineer	07
7		

Recommended Books
1. PMBOK Guide Seventh edition –PMI 2. PMBOK Guide Sixth edition -PMI 3. Koontz, O'Donnell &Weihrich (2010); "Management", Mcgraw Hill. ISBN-13:

9780070144958. 464p.
4. Chinowsky, Paul S. & Songer, Anthony D. (2011) "Organization Management in Construction". Routledge. ISBN-13: 978-0415572613. 216p.
5. Sears, Keoki S, (2008) "Construction Project Management: A Practical Guide to Field Construction Management". Wiley. ASIN: B00HQ1CNE2.
6. Frank Harris (2013); "Modern Construction Management", Ronald Mccaffer Wiley Blackwell Publications. ISBN-13: 978-0470672174. 572p.
7. Wagner.Harvey M (1975) "Principles of Management Science" Prentice Hall College Div. ISBN-13: 978-0137095353. 612p.
8. Snell, Scott & Bohlander George (2009) "Managing Human Resources" South-Western Cengage Learning; ISBN-13: 978-0324593310. 864p.
9. Dessler, Gary (2008) "Human Resource Management" Prentice Hall. ISBN-13: 978- 0131746176. 801p.
10. Dharwadkar P. P (1992); "Management In Construction Industry" Oxford & IBH Luthans.
11. V. J. Davies, K. Tomasin (1996); "Construction Safety Handbook", Thomas Telford, London. Isbn-13: 9780727725196. 303p.
12. PSG Design Data Book, PSG College, Coimbatore (2012)
13. Construction Safety Manual Published By National Safety Commission of India.
14. "Safety Management in Construction Industry" – A Manual for Project Managers. Nicmar Mumbai.
15. "IS For Safety In Construction – Bureau Of Indian Standards.
16. Girimaldi and Simonds (1989); "Safety management", AITBS, New Delhi. ISBN: 9780939874989.651p.
17. Stranks, Jeremy (2010) "Health and Safety at Work: An Essential Guide for Managers", Kogan Page Publishers. ISBN 13: 9780749461201. 352p

SEM – III

Disaster Management [VE-MTCM301]

Course Code	Course Name
VE-MTCM301	Disaster Management

Course Objectives

The objectives of this course are

1. Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. critically understand the strengths and weaknesses of disaster management approaches,
   planning and programming in different countries, particularly their home country or the countries they work in.

Course Outcomes

Upon successful completion of the course, students should be able to

1. Differentiate between various types of natural and man-made disasters, and explain their causes, characteristics, and impacts.
2. Identify disaster-prone regions in India and evaluate the socio-economic and ecological repercussions of major disaster events.
3. Apply risk assessment techniques and remote sensing tools to monitor, predict, and evaluate disaster threats for effective preparedness.
4. Propose appropriate disaster mitigation strategies and assess the role of structural and non-structural measures in reducing vulnerability.

CO-PO Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	–	–	–	2	3
CO2	2	–	–	–	3	3
CO3	3	–	2	2	3	3
CO4	2	–	2	2	3	3

Course Content

Module No.	Details	Hrs.
1	**Introduction** Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.	04
2	**Repercussions of Disasters and Hazards** Economic Damage, Loss of Human and Animal Life, Destruction of	04

	Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.	
3	**Disaster Prone Areas in India** Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemics.	04
4	**Disaster Preparedness and Management** Preparedness: Monitoring of Phenomena Triggering A Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.	04
5	**Risk Assessment** Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.	06
6	**Disaster Mitigation** Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends in Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.	06

Recommended Books

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.
2. Sahni, Pardeep Et. Al. (Eds.)," Disaster Mitigation Experiences and Reflections", Prentice Hall of India, New Delhi.
3. Goel S. L., Disaster Administration and Management Text and Case Studies", Deep &Deep Publication Pvt. Ltd., New Delhi.

Introduction to Sustainability and Sustainable Development [VE-MTCM302]

Course Code	Course Name
VE-MTCM302	Introduction to Sustainability and Sustainable Development

Course Objectives

The objectives of this course are

1. This course provides an in-depth understanding of sustainability and sustainable development goals to create a better- informed engineer, which will lead to a more sustainable action by all and for all.

Course Outcomes

Upon successful completion of the course, students should be able to

1. Explain the core concepts and evolution of sustainability and sustainable development at national and global levels in an engineering context.
2. Examine industrial–environmental interactions and system-based approaches to societal sustainability challenges.
3. Apply sustainable engineering principles in practice.
4. Evaluate tools and strategies for assessing sustainability using efficiency and sufficiency principles.

CO-PO Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	–	2	3	2	–	2
CO2	3	–	3	3	2	2
CO3	3	–	3	3	3	2
CO4	3	–	3	3	3	2

Course Content

Module No.	Details	Hrs.
1	**Introduction**: What is sustainability and sustainable development? – definitions, Concept & components of sustainability **Limits to exponential growth on a finite planet**, Complexity of growth and equity, Environmental issues and crisis, Resource degradation, greenhouse gases, global warming, desertification, social insecurity, industrialization, globalization. **An Engineers role in sustainability**	02
2	**Sustainability perspective for Energy, Materials, Water, Food and Shelter:** World energy usage, Problems with fossil fuels Alternatives - reduction, efficiency, renewable energy. Impacts of material production, sources of waste, Problems with current waste management, Suggestions for reducing the impact of material use Water resource and use worldwide, Associated problems with current water systems, Sustainable water management, World food production, Usage of	08

	resources and environmental impacts, Alternatives - organic/local Current building styles and associated problems, Retrofit vs new build Sustainable Architecture	
3	**Social & Economic Sustainability** Social sustainability - Components - equality, diversity, democracy, social cohesion, Issues - gender issue, poverty, environmental degradation, peace & justice, social sustainability performance - community engagement, community development, empowerment, health, volunteerism, etc. Economic sustainability - Relationship between macroeconomics policies, poverty and environment, Trade-offs between economic growth, social equity, and environmental sustainability, Role of international environmental agreements, green economy and climate change policies.	06
4	**Governance for Sustainable Development Systems**: Socio-economic policies for sustainable development, Strategies for implementing eco-development programmes, Policy responses to environmental degradation, Public participation- Demographic dynamics and sustainability, Integrated approach for resource protection and management.	05
5	**Strategies and measurements of SD**: Introduction to Sustainability assessment, Environment Sustainability metrics – simple and complex indicators, Sustainability methods and assessment - green buildings, Renewable energy, CSR, Biodiversity, Technologies, human development index (HDI), sustainability development index (SDI), LCA	04
6	**The road to Sustainable Development** - National and International Contribution: National Contribution: Societal transformations. Institutional theory, Rural and Urban development, Action plan for implementing sustainable development International Contribution - Brundtland, Rio summit, SDGs, Conventions, Protocols & Agreements, Action plan for implementing sustainable development, Moral obligations and Operational guidelines, Role of developed countries in the sustainable development.	03

Recommended Books

1. Harris, J.M., Basic Principles for Sustainable Development, Global Development and Environment Institute, working paper 00-04. Available at: http://ase.tufts.edu/gdae/publications/Working_Papers/Sustainable%20Development.PDF
2. Mackenthun, K.M., Basic Concepts in Environmental Management, 1 st edition, Lewis Publication, London, 1998.
3. Hjorth, P. and A. Bagheri, Navigating towards Sustainable Development: A System Dynamics Approach, In Futures, 38(1): 74-92, 2006.
4. Mog, J.M., Struggling with Sustainability - A Comparative Framework for Evaluating Sustainable Development Programs, World Development 32(12): 2139-2160, 2004.
5. ECBC Code 2007, Bureau of Energy Efficiency, New Delhi Bureau of Energy Efficiency Publications-
6. Rating System, TERI Publications – GRIHA Rating System

7. Indian Green Building Council, IGBC Green Buildings rating system (New & Existing) - Abridged Reference Guide, Pilot Version, 2017.
8. IISD Commentary on the OECD's Draft Principles for International Investor Participation in Infrastructure (PDF – 68 kb)
9. Courses to refer - Sustainability and Engineering : https://rdmc.nottingham.ac.uk/bitstream/handle/internal/112/Engineering%20Sustailability

Safety in Construction [VE-MTCM303]

Course Code	Course Name
VE-MTCM303	Safety in Construction

Course Objectives

The objectives of this course are

1. This course aims to make the students well-versed with Construction Safety Management system, major Construction Safety hazards, the latest safety and health regulations and the Indian Standards applicable to the construction industry.

Course Outcomes

Upon successful completion of the course, students should be able to

1. Identify, assess and manage potential hazards effectively.
2. Implement and monitor safety protocols.
3. Develop comprehensive safety audit reports.
4. Understand the legal and regulatory requirements for construction safety.

CO-PO Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	–	2	–	3	3
CO2	2	–	2	–	3	3
CO3	2	3	–	–	2	3
CO4	2	–	–	–	2	3

Course Content

Module No.	Details	Hrs.
1	Introduction to Construction Safety, Occupational Health and Safety, Safety Terminology, Heinrich's Accident Triangle, Construction Safety Management System and its four Pillars, Safety Organisation	06
2	Safety Objectives, Safety Policy, Making Safety Policy effective, Safety Risk Management, Construction Hazard Identification, Job Hazard Analysis, Construction Risk Assessment	04
3	Safety Assurance, Internal Safety Audits, Incident investigation Safety promotion, Safety Training, Safety Communication	04
4	OSHA's Fatal Four Construction Hazards, Fall protection In Construction, Fall Prevention, Fall Arrest systems, Struck-by in Construction, Hierarchy of Controls, Five levels of Hierarchy	04
5	Electrocutions in Construction, Electricity as a Construction Risk Common causes of electrical emergencies, Caught-between in Construction, Caught-between Hazards, OSHA's Safety and Health Regulations for Construction	04
6	Legal Requirements for Construction Safety in India, The Building and	04

	Other Construction Workers Act, 1996, The Maharashtra BOCW Rules, 2007. Indian Standards Applicable to Construction Sites, Personal Protective Equipment, Fire Safety in Construction, Fire hazard control measures, Concrete Construction Safety Hazards	

Field/Community Engagement Project [FP-MTCM301]

Course Code	Course Name
FP-MTCM301	Field/Community Engagement Project

Course Objectives

The objectives of this course are

1. To expose students to real-world challenges in structural engineering through direct fieldwork or professional practice.
2. To promote social responsibility and engagement by addressing structural or infrastructural issues affecting communities.
3. To provide a platform for applying theoretical knowledge to practical problems through site visits, internships, or community-driven projects.

Course Outcomes

Upon successful completion of the course, students should be able to

1. Identify and define real-world structural engineering problems through field study, community interaction, or professional internship.
2. Apply engineering principles and technical skills to address community-based infrastructure challenges or professional tasks.
3. Document field or internship experiences through a structured technical report and presentation, demonstrating analytical thinking and problem-solving ability.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	2	3	2	3
CO2	3	3	3	3	3	3
CO3	3	3	2	2	2	3

Course Content

Modes of Engagement (any one or a combination):

- Field Project: Hands-on work in infrastructure planning, scheduling, budgeting, monitoring, etc.
- Community Project: Planning and implementation of small-scale infrastructure (e.g., footbridges, shelter designs) in collaboration with local bodies or NGOs.
- Internship: Minimum 4 weeks of internship at a reputed Project management consultancy, construction firm, research lab, or government agency.

Dissertation Phase -I [DS-MTCM301]

Course Code	Course Name
DS-MTCM301	Dissertation Phase -I

Course Content
Dissertation Phase–I is intended to initiate students into the process of independent research in Construction management. During this phase, typically in the third semester, students are expected to identify a specific research area aligned with their academic interests and professional goals. The selection of the dissertation topic should be done in consultation with a faculty supervisor and must reflect current challenges, innovations, or gaps in the construction management domain. Students will begin with an extensive and critical literature review on their chosen topic, studying research papers, technical reports, codes, and case studies to understand the background, existing work, and scope for further research. The outcome of this phase should be a well-defined problem statement, clear research objectives, and a feasible methodology that lays the foundation for the main dissertation work in the following semester. Students are required to prepare a detailed seminar report comprising the problem context, significance, literature review, methodology, and expected outcomes. They will present this report in a seminar format before an internal evaluation panel. The seminar will assess the student's ability to synthesise knowledge, articulate research ideas, and justify the direction of their intended work. In addition to the literature survey, the student must also begin initial stages of work during this phase. This may include project planning and scheduling models**,** cost estimation frameworks**,** risk assessments**,** preliminary simulations, identification of relevant tools and software, setup of experimental frameworks, or field data collection plans—depending on the nature of the study. These foundational tasks are expected to validate the feasibility of the research and demonstrate early engagement with the problem. Students must document their findings and initial progress in a technical report, which will include the background, objectives, methodology, early outcomes (if any), and a detailed review of relevant literature.

SEM – IV

Stress Management by Yoga [CC-MTCM401]

Course Code	Course Name
CC-MTCM401	Stress Management by Yoga

Course Objectives

The objectives of this course are
1. To achieve overall health of body and mind
2. To overcome stress

Course Outcomes

Upon successful completion of the course, students should be able to
1. Explain the eight limbs of yoga (Ashtanga) and demonstrate an understanding of ethical principles like Yam and Niyam for personal and social well-being.
2. Practise selected yogic asanas and pranayama techniques, and describe their physical, mental, and emotional benefits.
3. Apply yogic values and lifestyle disciplines such as ahimsa, satya, shaucha, and swadhyay to cultivate holistic well-being and self-awareness.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6
CO1	–	2	–	–	–	3
CO2	–	–	–	–	1	3
CO3	–	2	–	–	–	3

Course Content

Module No.	Details	Hrs.
1	Definitions of Eight parts of yog. (Ashtanga)	08
2	Yam and Niyam. Do`s and Don't's in life. • Ahinsa, satya, astheya, bramhacharya and aparigraha • Shaucha, santosh, tapa, swadhyay, ishwarpranidhan	08
3	Asan and Pranayam • Various yog poses and their benefits for mind & body • Regularization of breathing techniques and its effects-Types of pranayama	08

Recommended Books

1. 'Yogic Asanas for Group Tarining-Part-I" :Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

Dissertation Phase -II [DS-MTCM401]

Course Code	Course Name
DS-MTSE401	Dissertation Phase -I

Course Content
Seminar (Pre –Synopsis) This phase involves detailed execution of the proposed research through analytical modelling, simulation, experimentation, or field-based study. The focus is on achieving research objectives, validating results, and critically analysing findings within the context of construction management. Students must submit a well-documented dissertation and a presentation that reflects technical competence, systematic methodology, and original contribution. The report should include results, interpretations, comparison with literature, conclusions, and future scope. **Dissertation and Viva Voce** A viva voce will be conducted to assess the student's understanding, problem-solving approach, and ability to defend the work before a panel comprising internal and external examiners.