

# MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous Institute affiliated to RGPV, Bhopal)

NAAC Accredited with A++ Grade

**For Batch Admitted in 2023-2024**

## Master of Engineering in Construction Technology & Management (Semester – I)

### Scheme of Examination

| S. No. | Subject Code | Subject Name                                  | Maximum Marks Allotted |            |                  |                |                      |            |          | Total Marks | Contact Periods per week |          |          | Total Credits |
|--------|--------------|---|------------------------|------------|------------------|----------------|----------------------|------------|----------|-------------|--------------------------|----------|----------|---------------|
|        |              |   | Theory Slot            |            |                  | Practical Slot |                      | MOOCs      |          |             | L                        | T        | P        |               |
|        |              |   | End Sem                | Mid Sem    | Quiz/ Assignment | End Sem        | Lab Work / Sessional | Assignment | Exam     |             |                          |          |          |               |
| 1.     | 510111       | Computational Techniques                      | 70                     | 20         | 10               | -              | -                    | -          | -        | 100         | 3                        | -        | -        | 3             |
| 2.     | 510121       | Construction Materials, Machines & Techniques | 70                     | 20         | 10               | -              | -                    | -          | -        | 100         | 3                        | -        | -        | 3             |
| 3.     | 510113       | Contract Management                           | 70                     | 20         | 10               | -              | -                    | -          | -        | 100         | 3                        | -        | -        | 3             |
| 4.     |              | #Elective - I                                 | 70                     | 20         | 10               | -              | -                    | -          | -        | 100         | 3                        | -        | -        | 3             |
| 5.     |              | *Open Category Course (OC-1)                  | 70                     | 20         | 10               | -              | -                    | -          | -        | 100         | 3                        | -        | -        | 3             |
| 6.     | 510119       | Construction Lab                              | -                      | -          | -                | 90             | 60                   | -          | -        | 150         | -                        | -        | 4        | 4             |
| 7.     | 510120       | \$ Self Learning / Presentation               | -                      | -          | -                | -              | 100                  | -          | -        | 100         | -                        | -        | 2        | 2             |
|        |              | <b>Total</b>                                  | <b>350</b>             | <b>100</b> | <b>50</b>        | <b>90</b>      | <b>160</b>           | <b>-</b>   | <b>-</b> | <b>750</b>  | <b>15</b>                | <b>-</b> | <b>6</b> | <b>21</b>     |

#### #Elective - I

510114. Maintenance Management

510115. Infrastructure Development

510116. Formwork for Concrete Structures

\* Open Category Course (OC-1) will have to be opted from the pool of open courses (Student can opt from parent department and other department) and based on interdisciplinary aspects.

800108. Organizational Behaviour & Management

800109. Safety & Quality Management

*During labs, students have to perform practical/assignments/ minor projects related to theory subjects/theoretical concepts of respective semester using recent technologies / languages / tools etc.*

\$Self learning / presentation through SWAYAM / NPTEL (Registration in a course will be compulsory for students bus assessment will be based on internal seminar presentation)

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## Master of Engineering in Construction Technology & Management (Semester – II)

### Scheme of Examination

| S. No. | Subject Code | Subject Name   | Maximum Marks Allotted |           |                  |                |                      |            |           | Total Marks | Contact Periods per week |          |          | Total Credits |
|--------|--------------|--|------------------------|-----------|------------------|----------------|----------------------|------------|-----------|-------------|--------------------------|----------|----------|---------------|
|        |              |  | Theory Slot            |           |                  | Practical Slot |                      | MOOCs      |           |             | L                        | T        | P        |               |
|        |              |  | End Sem                | Mid Sem   | Quiz/ Assignment | End Sem        | Lab Work / Sessional | Assignment | Exam      |             |                          |          |          |               |
| 1.     | 510211       | Project Economics & Financing                        | 70                     | 20        | 10               | -              | -                    | -          | -         | 100         | 3                        | -        | -        | 3             |
| 2.     | 510212       | Construction Cost Management                         | 70                     | 20        | 10               | -              | -                    | -          | -         | 100         | 3                        | -        | -        | 3             |
| 3.     | 510213       | Construction Project Management                      | 70                     | 20        | 10               | -              | -                    | -          | -         | 100         | 3                        | -        | -        | 3             |
| 4.     |              | ##Elective - II                                      | -                      | -         | -                | -              | -                    | 25         | 75        | 100         | 3                        | -        | -        | 3             |
| 5.     |              | **Open Category Course (OC-2)                        | 70                     | 20        | 10               | -              | -                    | -          | -         | 100         | 3                        | -        | -        | 3             |
| 6.     | 510219       | Computational Laboratory for Construction Management | -                      | -         | -                | 90             | 60                   | -          | -         | 150         | -                        | -        | 4        | 4             |
| 7.     | 510220       | \$ Self Learning / Presentation                      | -                      | -         | -                | -              | 100                  | -          | -         | 100         |                          |          | 2        | 2             |
|        |              | <b>Total</b>   | <b>280</b>             | <b>80</b> | <b>40</b>        | <b>90</b>      | <b>160</b>           | <b>25</b>  | <b>75</b> | <b>750</b>  | <b>15</b>                | <b>-</b> | <b>6</b> | <b>21</b>     |

##Elective-II (Through SWAYAM / NPTEL / MOOC based learning platform (with credit transfer facility))

510221. Construction Methods and Equipment Management

510218. Strategies for Sustainable Design

**\*\*Open Category Course (OC-2) will have to be opted from the pool of open courses (Student can opt from parent department and other department) and based on interdisciplinary aspects. This course may run through SWAYAM/NPTEL based platform (with credit transfer facility).**

800208. Sustainable Materials and Green Buildings

*During labs, students have to perform practical/assignments/ minor projects related to theory subjects/theoretical concepts of respective semester using recent technologies / languages / tools etc.*

*\$Self learning / presentation through SWAYAM / NPTEL (Registration in a course will be compulsory for students bus assessment will be based on internal seminar presentation)*

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## Master of Engineering in Construction Technology & Management (Semester – III)

### Scheme of Examination

| S. No. | Subject Code | Subject Name   | Maximum Marks Allotted |          |                  |                          |  |            |           | Total Marks | Contact Hours per week |   |           | Total Credits |
|--------|--------------|--|------------------------|----------|------------------|--------------------------|--|------------|-----------|-------------|------------------------|---|-----------|---------------|
|        |              |  | Theory Slot            |          |                  | Practical Slot           |  | MOOCs      |           |             | L                      | T | P         |               |
|        |              |  | End Sem.               | Mid Sem. | Quiz/ Assignment | End Sem. /Practical Viva | Sessional Work/ Practical Record/ Assignment/ Quiz/ Presentation | Assignment | Exam      |             |                        |   |           |               |
| 1.     | 510311       | Dissertation Part-I (Literature Review/ Problem Foundation/ Synopsis/survey paper, etc.) | -                      | -        | -                | 150                      | 100  |            |           | 250         | -                      | - | 10        | 10            |
| 2.     | 8003XX       | <b>*MOOC Course</b>  | -                      | -        | -                | -                        | -  | 25         | 75        | 100         | 02                     | - | -         | 02            |
|        |              | <b>Total</b>   | -                      | -        | -                | <b>150</b>               | <b>100</b>   | <b>25</b>  | <b>75</b> | <b>350</b>  | <b>02</b>              | - | <b>10</b> | <b>12</b>     |

**\*MOOC Course :**

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## Master of Engineering in Construction Technology & Management (Semester – IV)

### Scheme of Examination

| S. No. | Subject Code | Subject Name         | Maximum Marks Allotted |          |                  |                          |  | Total Marks | Contact Hours per week |   |           | Total Credits |
|--------|--------------|----------------------|------------------------|----------|------------------|--------------------------|--|-------------|------------------------|---|-----------|---------------|
|        |              |                      | Theory Slot            |          |                  | Practical Slot           |  |             | L                      | T | P         |               |
|        |              |                      | End Sem.               | Mid Sem. | Quiz/ Assignment | End Sem. /Practical Viva | Sessional Work/ Practical Record/ Assignment/ Quiz/ Presentation |             |                        |   |           |               |
| 1.     | 510405       | Dissertation Part-II | -                      | -        | -                | 300                      | 200  | 500         | -                      | - | 14        | 14            |
|        |              | <b>Total</b>         | -                      | -        | -                | <b>300</b>               | <b>200</b>   | <b>500</b>  | -                      | - | <b>14</b> | <b>14</b>     |

# **Syllabus**

**w.e.f. July 2020 Admitted onward  
batches**

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# **Semester-I**

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**Course Code: 510121**

**Course Name: Construction Materials, Machines & Techniques**

| L | T | P | C |
|---|---|---|---|
| 3 | - | - | 3 |

## Course Objectives:

1. To impart knowledge about ingredients of concrete, production of concrete at site and ready mix concrete.
2. To apprise about special concretes for different field requirements.
3. To apprise about various types of equipments/machineries used in construction industry.
4. To develop understanding of construction procedure for piles and well foundations.
5. To impart know-how of formwork and scaffolding.
6. To develop technical know-how of shop and insitu construction/fabrication.

## Syllabus:

### Unit-I

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

### Unit-II

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

### Unit-III

**Construction Equipments:** Characteristics, Operation and selection of different types of construction equipments viz. Power shovels, Drag lines, Scraper, Bulldozer, Tractor, Rippers, Motor graders; Equipments for aggregate processing plant; Ready Mix Concrete Plant; and Hot Mix plant

### Unit-IV

**Foundations:** Construction of piles, Well foundations, Cofferdams and diaphragms; Drilling and blasting, Underpinning, Shoring and shuttering.

**Formwork:** Different types of formworks, Stationary and slip formwork techniques, Formwork of special structures eg. Shells, Bridges, Towers etc; Scaffolding

### Unit-V

**Steel Construction:** Shop and insitu construction techniques, Pre-engineered buildings; Erection of steel structures like bridges, and trusses.

**Prefabrication:** Application of prefabrication in construction, Modular coordination and standardization; equipments for industrial production of prefabricated components.

**Prestressing:** Prestressing methods; Materials; Loss of prestress; equipments for industrial production of prestressed components; Production of Railway Sleepers, Poles and Tanks.

## Course Outcomes:

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

**CO 1: Define** the relevant characteristics of concrete and its ingredients.

**CO 2: Explain** the details of various stages in concrete production.

**CO 3: Design** concrete mix for specific requirements using codal provisions.

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**CO 4: Determine** the suitability of special concretes for specific requirements.

**CO 5: Evaluate** the suitability of various equipments for a construction site.

**CO 6: Apply** shop and insitu methods and the pre-stressing concepts for a construction project.

## **Reference Books:**

1. D. G. Gransberg, C. M. Popescu and R. C. Ryan, Construction Equipment Management for Engineers, Estimators, and Owners, Taylor & Francis, New York.
2. R. L. Peurifoy, C. J. Schexnayder, A. Shapira and R. Schmitt, Construction planning, equipment, and methods, 8<sup>th</sup> ed., McGraw Hill, New York, 2010.
3. A. R. Santha Kumar, Concrete Technology, Oxford University press.
4. A.M. Neville, Properties of concrete, Pearson Publication
5. M.L. Gambhir, Concrete Technology, Tata Mc Graw Hill Pub. Co.
6. Soil Mechanics by Gopal Ranjan, New Age Publishers.
7. Mahesh Verma, Construction Equipment, its planning & Application, Metropolitan Book Co.(P) Ltd.
8. Foundation Design Manual by Narayan V. Nayak, Dhanpat Rai Publications
9. Prestressed Concrete by T.Y. Lin and N.H. Burns, Wiley Publishers
10. Highway Engg by Justo and Khanna, Publisher: Nem Chand and Brothers



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**Course Code: 510113**

**Course Name: Contract Management**

| L | T | P | C |
|---|---|---|---|
| 3 | - | - | 3 |

**Course Objectives:**

1. To understand specification writing, rate analysis and estimating.
2. To understand necessity and methods of valuation.
3. To understand role of Architect, Engineer, Contractor and Owner in a construction project.
4. To know about different acts related to construction.
5. To know about various laws related to construction labour.
6. To know about important conditions of contract in construction.
7. To understand the construction contracts used in infrastructure projects.

**Syllabus:**

**Unit-I**

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

**Unit-II**

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

**Unit-III**

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

**Unit-IV**

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

**Unit-V**

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

**Course Outcomes:**

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

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

**CO2: Prepare** estimate of building/road works and valuation.

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**CO3: Differentiate** between rights and responsibilities of Architect, Engineer, Contractor and Owner in a construction project.

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

**CO5: Draft** tender document for construction project.

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

## **Reference Books:**

1. Construction Engineering and Management by S. Seetharaman, Publisher Umesh Pub.
2. Construction Planning and Management by B. Sengupta, Pub. Tata McGraw-Hill Education
3. Construction and Project Management Theory And Practices by N.K. Jha, Pub. Pearson Education India
4. Construction Contracts by Jimmie Hinze, Publisher Tata McGraw-Hill Education
5. Estimating and Costing by B.N. Datta

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**Course Code: 510114**

**Course Name: Maintenance Management**

| L | T | P | C |
|---|---|---|---|
| 3 | - | - | 3 |

**Course Objectives:**

1. To learn about building services required in a building.
2. To learn about fire fighting systems in buildings.
3. To understand planning and maintenance requirements of lifts in high rise buildings.
4. To understand water management and planning system in a building.
5. To learn maintenance of building services and management of related tasks.

**Syllabus:**

**Unit I**

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

**Unit II**

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

**Unit III**

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

**Unit IV**

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

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**Unit V**

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

**Course Outcome:**

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

**CO1: Identify** various services required in a building.

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

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

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

**Reference Books:**

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

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**Course Code: 510115**

**Course Name: Infrastructure Development**

| L | T | P | C |
|---|---|---|---|
| 3 | - | - | 3 |

**Course Objectives:**

1. To make them understand the various aspects like operation, maintenance, sustainability, life cycle cost of infrastructure systems.
2. To make them able to develop infrastructure system plan considering various risks.
3. To make them develop disaster management plan for Infrastructure systems.
4. To illustrate use of I. T. Tools for various phases of Infrastructure system.

**Syllabus:**

**Unit-1**

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

**Unit –II**

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

**Unit-III**

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

**Unit-IV**

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

**Unit - V**

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

**Course Outcomes:**

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

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

**CO2: Identify** various risks in Infrastructure projects.

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

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

**Reference Books:**

1. Infrastructure Development and Financing in India by N Mani Publisher Rediff books,2012
2. Risk Management in Civil Infrastructure by Mohammed M. Ettouney, Shreenivas Alampalli. Publisher CRC Press Taylor and Francis group.2017.
3. Infrastructure Management: Integrating Design, Construction, Maintenance, Rehabilitation and Renovation by W. Ronald Mudson, Ralph Haas . Publisher Mc Graw-Hill.1997
4. Disaster Resilience Management of Infrastructure System: Computational modeling and Geospatial Technologies by W Waheed Uddin Publisher CRC Press LLC.

**Course Code: 510116**

**Course Name: Formwork for Concrete Structures**

| <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|----------|----------|----------|----------|
| <b>3</b> | -        | -        | <b>3</b> |

**Course Objectives:**

1. To know about various formworks for concrete structure.
2. To know about various issues in formworks and subsequent solutions.

**Syllabus:**

**Unit-1 Introduction**

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

**Unit-2 Formwork for building components**

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

**Unit-3 Formwork for special structure**

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

**Unit-4 MIVAN Formwork**

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

**Unit-5 Issues and failure of Formwork**

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

**Course Outcomes:**

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

- CO1: Explain** the concept of formworks.
- CO2: Explain** various types of formworks.
- CO3: Evaluate** the use of formworks in various structures.

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

**Reference Books:**

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



**Course Code: 800108**

**Course Name: Organizational Behaviour & Management**

| L | T | P | C |
|---|---|---|---|
| 3 | - | - | 3 |

**Course Objectives:**

1. To know the environment levels in management.
2. To explore the organizational structure and its design.
3. To understand the stress management and communication.
4. To explore the leadership quality for updating the organisation structure.
5. To compare and explore the existing management activity in the world.

**Syllabus:**

**Unit – I:**

**Nature of Management:** Social Responsibilities of Business - Manager and Environment Levels in Management - Managerial Skills - Planning - Steps in Planning Process - Scope and Limitations - Short Range and Long Range Planning - Flexibility in Planning –Characteristics of a sound Plan - Management by Objectives (MBO) - Policies and Strategies.

**Unit-II**

**Organisation:** Organisation Structure and Design - Authority and Responsibility Relationships - Delegation of Authority and Decentralisation - Interdepartmental Coordination - Emerging Trends in Corporate Structure, Strategy and Culture - Impact of Technology on Organisational design - Mechanistic vs Adoptive Structures - Formal and Informal Organisation.

**Unit – III**

**Perception and Learning** - Personality and Individual Differences - Motivation and Job Performance - Values, Attitudes and Beliefs - Stress Management - Communication Types-Process - Barriers - Making Communication Effective.

**Unit – IV**

**Group Dynamics:** Leadership - Styles - Approaches - Power and Politics - Organisational Structure - Organisational Climate and Culture - Organisational Change and Development.

**Unit – V**

**Comparative Management Styles and approaches :** Japanese Management Practices Organisational Creativity and Innovation - Management of Innovation - Entrepreneurial Management - Benchmarking - Best Management Practices across the world - Select cases of Domestic & International Corporations - Management of Diversity.

**Course Outcomes:**

After completing this course, the students will be able to:

- CO1: Explain** the environment levels in management.
- CO2: Analyse** the organizational structure and its design.
- CO3: Apply** the stress management and communication in organization.
- CO4: Develop** the leadership quality for updating the organisation structure.
- CO5: Evaluate** the existing management activity in the world.

**Recommended Books:**

1. Kast & R. Seuwing : Organisation & Management
2. Singh & T. N. Chabra : Management Concepts & Practices
3. George R. Terry : Principles of Management
4. Anthony : Art of Japanese Management
5. Aswathapa K : Organisational Behaviour

**Course Code: 800109**

**Course Name: Safety & Quality Management**

| <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|----------|----------|----------|----------|
| <b>3</b> | -        | -        | <b>3</b> |

### **Course Objectives:**

1. To study the basics of quality and safety management.
2. To learn the code of practice in design and construction for quality standards.
3. To understand and evaluate quality and safety management principles and best practices in construction.
4. To understand and evaluate safety management principles in construction;
5. To acquire good basic practices for quality system and progress for quality assurance and quality improvement for construction companies.

### **Syllabus:**

#### **Unit – I**

**Quality Management:** Introduction – Definitions and objectives, Factors influencing construction quality; Responsibilities and authority; Quality plan; Quality Management Guidelines; Quality circles; cost of quality and safety; Quality transition - quality control and inspection; quality assurance; total quality management-principles, tools and techniques; Planning and control of quality during design of structures; Tools and techniques for quality management.

#### **Unit – II**

**Quality Systems:** Introduction - Quality system standard, ISO 9000 family of standards; Requirements-Preparing Quality System Documents; Quality related training; Implementing a Quality system; Third party Certification; Quality assurance in construction; Concepts of quality control-Objectives, definitions, and systems.

#### **Unit – III**

**Quality Planning:** Quality Policy, Objectives and methods in Construction industry; Consumers satisfaction, Ergonomics, Time of Completion, Statistical tolerance, Taguchi's concept of quality; Inspection procedures-Processes and products (materials and machinery); Total cost implication.

#### **Quality Assurance and Quality Improvement Techniques:**

Objectives of quality assurance; Methods, Techniques and needs of quality assurance; Different aspects of quality Appraisals; Critical, major failure aspects and failure mode analysis; Stability methods and tools; Reliability testing, Reliability coefficient and reliability prediction; Life cycle costing; Value engineering and value analysis; Quality Improvement Tools and Techniques.

#### **Unit – IV**

**Safety management :** Planning for safety provisions, budgeting for safety, safety policy, Safety audit, safety management practices, safety survey, safety inspection, safety sampling, evaluation of performance of supervisors on safety; Construction hazards and safety guidelines; Overall accident investigation process; Risk management; Prevention techniques for construction accidents; Site management with regard to safety recommendations; Training for safety awareness and implementation; Construction safety and health manual.

#### **Unit-V**

**Recent trends and Case studies:** Quality and safety issues in steel construction, concrete construction (including pre-cast, and pre-stressed); computer aided hazard analysis.

#### **Course Outcomes:**

After this course, students will be able to:

- CO 1: Explain** the quality management systems and utilize the ISO 9000 family of standards.
- CO 2: Improve** the quality of the project through tools and techniques.
- CO 3: Perform** the environmental impact assessment (EIA) for construction projects towards quality.
- CO 4: Analyse** the quality assurance and quality control, quality improvement tools and techniques;
- CO 5: Evaluate** the contract and inspection procedures.
- CO 6: Identify** the safety management practices in construction industry.

#### **Reference Books:**

1. B. G. Dale, Managing quality, 4th ed., Blackwell Publishing, Oxford, 2003.
2. D. Reese and J. V. Eidson, Handbook of OSHA construction safety and health, 2<sup>nd</sup> ed., CRC Press, Bocaaton, 2006.
3. F. Harris, R. McCaffer and F. Edum-Fotwe, Modern construction management, 6<sup>th</sup> ed., Blackwell Publishing, Oxford, 2006
4. K. Knutson, C. J. Schexnayder, C. M. Fiori and R. Mayo, Construction management fundamentals, 2<sup>nd</sup> ed., McGraw Hill, New York, 2008.
5. S. J. Holt, Principles of construction safety, Blackwell Publishing, Oxford, 2008.
6. The Management and Control of Quality: Sixth edition: James R.Evans, William M.Lindsay.
7. Safety management by John V.Grimaldi Rollin H.Simonds.
8. ISO 9000 family of standards.

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**Course Code: 510119**

**Course Name: Construction Lab**

| L | T | P | C |
|---|---|---|---|
| - | - | 4 | 2 |

**Course Objectives:**

1. To Study and understanding basic knowledge of building materials, such as their identification and classification, relationships between physical characteristics and mechanical properties experimentally measuring them.
2. To understand the role of water in soil and concrete behavior.
3. To understand the concrete mix design and testing; non-destructive testing methods; Studies on simple building system components

**List of Experiments:**

1. Mix Design of Concrete
2. Permeability Test of Concrete
3. Creep Test of Concrete
4. Measurement of In-situ Strength determination by Rebound Hammer and Moisture content in aggregates, soil and hardened concrete surface using NDT techniques.
5. Unconfined Compression Test
6. Direct Shear Test
7. Static Cone Penetration Test
8. Triaxial Shear Test  
(Unconsolidated Undrained, Consolidated Undrained, Consolidated Drained)
9. Vane Shear Test
10. C.B.R Test of Soil
11. Consolidation Test
12. SPT Test (Demonstration)
13. Marshall stability test of bitumen

**Course Outcomes:**

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

**CO1: Check** physical properties of soil, aggregate, and concrete.

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**CO2: Check** strength properties of soil, aggregate, and concrete.

**CO3: Differentiate** the flow properties and stresses of soil.

**CO4: Apply** various non-destructive testing method on concrete.

## **Reference Books:**

1. Metha P.K and Monteiro. P.J.M, " CONCRETE", Microstructure, Properties and Materials, Third Edition, Tata McGraw- Hill Publishing company Limited, New Delhi, 2006
2. Shetty .M.S., " Concrete Technology, Theory and Practice", Revised Edition, S. Chand & company Ltd., New Delhi,2006
3. Neville. A.M., " Properties of Concrete", 4th Edition Longman,1995
4. Soil Mech. & Found. Engg., Dr. K. R. Arora, Std. Publishers Delhi, 7<sup>th</sup> edition 2014
5. Soil Mech. & Foundation, Dr. B. C. Punmia, Laxmi Publications, Delhi, 16<sup>th</sup> edition 2017
6. Soil Mech. & Found Engg., S. K. Garg, Khanna Publishers, Delhi, 1st edition, 2003
7. Soil Testing for Engg., T.W. Lambe, John Wiley & Sons. Inc., 1969

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**Course Code: 510120**

**Course Name: Self Learning / Presentation**

| <b>L</b> | <b>T</b> | <b>P</b> | <b>Credit</b> |
|----------|----------|----------|---------------|
| <b>0</b> | <b>0</b> | <b>2</b> | <b>1</b>      |

**Course Objectives:**

- 1) To encourage students to read, study & understand different topics of CTM published in articles, literatures.
- 2) To help in presenting different topics of CTM and related subjects to supplement theoretical knowledge gained in class.
- 3) To make student acquire good oral & written communication skills.
- 4) To promote the habit of lifelong learning.
- 5) To prepare students develop adequate soft skills to be able to present their topic effectively to listeners.

**Syllabus:**

Any relevant topic related to civil engineering/CTM from within or beyond the syllabus through Swayam / NPTEL/MOOC.

**Course Outcomes:**

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

**CO 1: Analyze** contemporary issues in civil engineering/CTM & its allied areas through literature survey.

**CO 2: Distinguish** state of art & relevance of the topic in national & international arena.

**CO 3: Demonstrate** good oral & written communication skills.

**CO 4: Develop** poster and power point presentations for effective communication.

**CO 5: Display** lifelong learning.

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# **Semester-II**



**Course Code: 510211**

**Course Name: Projects Economics & Financing**

| <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|----------|----------|----------|----------|
| <b>3</b> | -        | -        | <b>3</b> |

**Course Objectives:**

1. To understand managerial economics.
2. To understand demand analysis and forecasting in construction industry.
3. To understand Time value of money and Cost of Capital.
4. To understand budgeting of construction projects.
5. To understand selection and evaluation of construction projects.
6. To understand project financing and risk.
7. To understand the accounting processes in construction industry.

**Syllabus:**

**Unit-I**

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

**Unit-II**

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

**Unit-III**

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

**Unit-IV**

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

**Unit-V**

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

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**Course Outcomes:**

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

**CO1: Apply** principles of managerial economics.

**CO2: Perform** demand analysis in construction sector.

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

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

**CO5: Determine** appropriate means of financing a project.

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

**Reference Books:**

1. Project Planning, Analysis, Selection, Financing, Implementation & Review by Prasanna Chandra, Publisher Tata McGraw-Hill Education.
2. Engineering Economics & Analysis, by Donald G Newnan, Publisher Oxford University Press.
3. Economic Theory and The Construction Industry by P. Hillebrandt, Publisher Palgrave Macmillan UK
4. Construction Economics: A New Approach by Danny Myers, Publisher Routledge
5. Construction and Project Management Theory And Practices by K.N. Jha, Publisher Pearson Education India
6. Construction Project Management: Planning, Scheduling and Controlling by K.K. Chitkara, Publisher Tata McGraw-Hill Education

**Course Code: 510212**

**Course Name: Construction Cost Management**

| L | T | P | C |
|---|---|---|---|
| 3 | - | - | 3 |

**Course Objectives:**

1. To know about the trade-offs in construction projects.
2. To explore the time cost trade-off.
3. To understand the multi-objective optimization techniques.
4. To discuss the MCDM methods.
5. To apply the value engineering and productivity in construction.

**Syllabus:**

**Unit-I**

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

**Unit – II**

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

**Unit-III**

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

**Unit-IV**

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

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**Unit-V**

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

**Course Outcomes:**

After completing this course, the students will be able to:

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

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

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

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

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

**Recommended Books:**

1. **Golden**, Bruce L., **Wasil**, Edward A., **Harker**, Patrick T. (Eds.) The Analytic Hierarchy Process, Springer.
2. Joseph J. Moder., PROJECT MANAGEMENT with CPM, PERT and Precedence Diagramming.
3. S. Rajasekaran. and G.A. VijayalakshmiPai, "Neural Networks, Fuzzy Logic, and Evolutionary algorithms". Eastern Economic edition.
4. Kalyanamoy Deb, "Multi-objective optimization using evolutionary algorithms". Wiley.
5. Sumanth, D.J, Productivity Engineering and Management, TMH, New Delhi, 1990
6. Sudit, Ephraim F., "Productivity Based Management", Springer 1984
7. Alphonse Dell'Isola, "Value Engineering: Practical Applications for Design, Construction, Maintenance & Operations", R S Means Co., 1997.
8. Richard Park, "Value Engineering: A Plan for Invention", St. Lucie Press, 1999.

**Course Code: 510213**

**Course Name: Construction Project Management**

| L | T | T | C |
|---|---|---|---|
| 3 | - | - | 3 |

**Course Objectives:**

1. To know about the basic of project management and project organization.
2. To understand the project planning process, project networks and its analysis through CPM.
3. To understand the method of PERT and Precedence Network analysis for scheduling of const.
4. To plan and manage the resources and discuss the cost control in project's perspective.
5. To discuss the material, inventory and risk management in construction.

**Syllabus:**

**Unit-I**

**Project Management:** Construction Project and its phases. Importance of construction and construction Industries. Construction Project Management and its Relevance. Stakeholders of construction project. Management Information System and its Application in Construction.

**Project Organization:** Construction Organizations and its forms. Structure of Construction Organization. Management Levels. Traits of a Project Manager. Ethical Conduct for Engineers. Factors behind the success of construction projects and construction organizations. Introduction to Claim, Dispute and Project Closure.

**Unit – II**

**Project Planning and Network Analysis:** Introduction to Project Planning Process. Types of Project Plans. Network techniques- Gantt Chart, Mile stone Chart, Work Breakdown structure, AOA & AON networks. Event and Activities. Numbering of events. Event times – Earliest events time and latest event time. Slack, critical events. Activity times – Earliest start time, Latest finish time, Float and critical activities. Network critical path and its significance. Network analysis by CPM – Defining scope of work, determining activities, preparation of network logic program and draft network. Development of structured network using network drawing rules, Numbering of events and computation of critical path. Numerical problems.

**Unit-III**

**PERT:** Introduction to PERT. Difference between CPM and PERT. Uncertainty in project duration estimation. Three time estimate in PERT. Frequency distribution curves for activity duration. Computation of expected time, standard deviation and variance. Critical limit theorem and critical path determination. Event time, slack and computation of completion probability of project.

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**Precedence Network (PN):** Introduction to PN. Precedence relationship between activities. Precedence Network Analysis – Modeling procedure analysis of time in PN. Use of PN in repetitive works network. Difference between PN and CPM.

## Unit-IV

**Resource Planning:** Planning construction Manpower, Scheduling Construction site workers. Planning Construction Materials quantity estimation. Constrained and unconstrained resource scheduling. Resource usage profile, Resource smoothing, Resource leveling.

**Cost Control:** Project cost, Direct and indirect, slope of direct cost curve, Total project cost and optimum duration, Contracting the network for cost optimization. Escalate & Variation in prices.

## Unit-V

**Materials & Inventory Management:** Introduction to Material management. Material Procurement Process. Material Management Functions. Inventory management in construction.

**Risk and Insurance in Construction:** Introduction to Risk and Risk Management in construction. Risk Identification Process. Risk Analysis and Evaluation Process. Risk Treatment Strategies. Different Insurances in Construction Companies.

## Course Outcomes:

After successful completion of the course, the students will be able to:

**CO1: Identify** the various approaches of project management and organization structure.

**CO2: Classify** the various project network techniques and its applicability in project management.

**CO3: Analysis and schedule** the project using PERT and PN method.

**CO4: Determine** the applicability of resources and finding the optimum cost and optimum project duration.

**CO5: Apply** the concepts of material, inventory and risk management tools in construction project.

## Reference Books:

1. Construction Project Management by K.N Jha
2. C.P.M & PERT by L.S. Srinath.
3. Construction Management by Sen & Gupta.
4. Project Planning and control with PERT and CPM by BC Punmia, K. K. Khandelwal.
5. CPM & PERT by Weist& Levy
6. DDOT Construction management Manual.
7. Project Management and design administration manual by Design construction division.
8. Construction Project Management Handbook: Federal Transit Administration -US

**Course Code: 800208**

**Course Name: Sustainable Material & Green Building**

| L | T | P | C |
|---|---|---|---|
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**Course Objectives:**

1. To study the properties of various types of sustainable materials in construction.
2. To learn the code of practice and guidelines for green buildings.
3. To select of different types of sustainable construction practices.
4. To understand the alignment of the current practices with the sustainable development goals.
5. To learn the field problems of sustainability in the construction sector.

**Syllabus:**

**Unit-I**

**Sustainable Materials:** Sources, methods of production and environmental Implications of building materials; Embodied Energy in Building Materials: Transportation Energy for Building Materials; Maintenance Energy for Buildings; Material cycles in construction, life Cycle impacts of materials and products, life cycle assessment of buildings; Resources for Sustainable Building Materials.

**Unit-II**

**Green Buildings:** Concept of Green building, Principles of green buildings, Bureau of energy efficiency: Functions, policies, guidelines, Energy Conservation Building Code; Certification systems – Green Rating for Integrated Habitat Assessment (GRIHA) and Leadership in Energy and Environmental Design (LEED), transforming the existing buildings to sustainable buildings based on GRIHA EB Manual: Criteria and their weightage, site parameters, maintenance and housekeeping, energy, water efficiency, human health and comfort.

**Unit-III**

**Green Construction Practices & Technologies:** Comparative analysis between the traditional and sustainable construction practices, Concrete versus steel technology suitability; Life cycle analysis of technologies; Sustainable Construction Technologies; Waste-based /recycled materials and technologies.

**Unit-IV**

**Sustainable Development Goals and Policies:** Sustainable consumption and production (Goal 12), Sustainability issues for concrete, Operational energy in building role of materials and thermal

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conductivity, Recycling of Industrial and Buildings Wastes, Biomass Resources for buildings, Need and framing of Policies and action plans to reduce construction and demolition waste.

## Unit-V

### Recent trends and Case studies:

**Case studies and examples:** Study of existing green buildings-Energy auditing; Green building approaches on field through case studies; Performance rating systems; Environmental impact studies of building projects.

**Recent Trends:** Introduction to softwares used in green buildings, carbon calculators, Role of Building Automation and performance enhancement, Integrated building management system.

### Course Outcomes:

After this course, students will be able to:

**CO 1: Explain** the properties of various types of sustainable materials used in construction industry accordingly.

**CO 2: Distinguish** the suitability of sustainable and green practices in construction sector.

**CO 3: Perform** the environmental impact assessment (EIA) for construction projects towards quality.

**CO 4: Assess** an existing building on the norms available by GRIHA for transforming existing buildings to sustainable buildings.

**CO 5: Examine** the impact of building materials choices by auditing the resources used to maintain the materials in their building and discussing the economic, environmental, and health impacts.

**CO 6: Identify** the potential of construction and demolition wastes in order to meet the sustainable development goals.

### Reference Books:

1. Green Rating for Integrated Habitat Assessment (GRIHA) guidelines
2. Energy Conservation Building Codes: [www.bee-india.nic.in](http://www.bee-india.nic.in)
3. Tom Woolley, Sam Kimmins, Paul Harrison and Rob Harrison, Green Building, Handbook, Volume I, Spon Press, 2003
4. Kibert, C. "Sustainable Construction: Green Building Design and Delivery", John Wiley & Sons, 2005
5. Chaturvedi, Swati, and John Ochsendorf. "Global Environmental Impacts due to Cement and Steel." *Structural Engineering International* (August 2004)
6. Jerry Yudelson Green building Through Integrated Design. McGraw Hill, 2009.
7. Fundamentals of Integrated Design for Sustainable Building by Marian Keeler, Bill



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Burke

8. Renewable Energy and Environment -A Policy Analysis for India, H, Ravindranath, K Usha Rao, B Natarajan, P Monga, Tata McGraw Hill, 2000
9. Gambhir M.L., Neha Jamwal, Building Materials: Products, Properties and Systems, McGraw Hill Education(India) Private Limited, 2014.
10. Varghese P.C., Building Materials, PHI Learning Pvt. Ltd., Delhi, 2015.
11. Advances in Building Materials and Construction, Central Building Research Institute, Roorkee, 2004.
12. Duggal S.K., Building Materials, New Age Publishers, 2012
13. Rangwala, Engineering Materials, Charotar Publishers, 2015

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**Course Code: 510219**

**Course Name: Computational Laboratory For Construction Management**

| L | T | P | C |
|---|---|---|---|
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**Course Objectives:**

1. To know and apply the use of software in construction projects such as MATLAB, Primavera, BIM 4D, MS PROJECT and Excel

**List of Experiments:**

1. Introduction to MATLAB and its application.
2. MS Project and its application.
3. Primavera and its application in networking and scheduling.
4. Basics of BIM 4D.
5. Excel and its application.
6. Case study analysis using Primavera, BIM 4D and MS Project.

**Course Outcomes:**

After completing this course, the students will be able to:

- CO1: Apply** MATLAB in Construction Projects
- CO2: Apply** Primavera and MS project in Construction Projects.
- CO3: Apply** BIM 4D in Construction Projects.

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**Course Code: 510220**

**Course Name: Self Learning / Presentation**

| <b>L</b> | <b>T</b> | <b>P</b> | <b>Credit</b> |
|----------|----------|----------|---------------|
| <b>0</b> | <b>0</b> | <b>2</b> | <b>1</b>      |

**Course Objectives:**

- 1) To encourage students to read, study & understand different topics of CTM published in articles, literatures.
- 2) To help in presenting different topics of CTM and related subjects to supplement theoretical knowledge gained in class.
- 3) To make student acquire good oral & written communication skills.
- 4) To promote the habit of lifelong learning.
- 5) To prepare students develop adequate soft skills to be able to present their topic effectively to listeners.

**Syllabus:**

Any relevant topic related to civil engineering/CTM from within or beyond the syllabus through Swayam / NPTEL/MOOC.

**Course Outcomes:**

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

**CO 1: Analyze** contemporary issues in civil engineering/CTM & its allied areas through literature survey.

**CO 2: Distinguish** state of art & relevance of the topic in national & international arena.

**CO 3: Demonstrate** good oral & written communication skills.

**CO 4: Develop** poster and power point presentations for effective communication.

**CO 5: Display** lifelong learning.