# Course Structure

# for Degree Program

# M.Tech. in Civil Engineering

with Specialization in

# Construction Technology and Management

## In line with National Education Policy 2020

## (Effective from AY 2024-25)


**Dr. Babasaheb Ambedkar Technological University**

**Lonere 402 103, Dist- Raigad, Maharashtra, INDIA**

Established vide Maharashtra Act No. XXII of 1989 and Act. No. XXIX of 2014
"Vidyavihar", P.O. Lonere, Dist. Raigad, Pin 402 103, Maharashtra, India
Telephone and Fax.: 02140 - 275142
www.dbatu.ac.in

# Course Structure, Guidelines, Rules and Regulations

## Preamble

Economic advancement of a country is closely tied to the quality of technical education it offers. Engineering education is reaching new heights and plays a significant role in the overall education system. The preparation of engineering graduates should focus on enhancing their employability and sustainability in response to evolving industry and societal needs. As technology advances and expectations change rapidly, updating the curriculum to be contemporary and relevant is imperative.

In order to align our technical education system with global standards and practices, based on performance and assessment system was implemented earlier for all Undergraduate Programs (UG). Now as per National

Education Policy-2020 framework we are incorporating project-based learning. The realm of engineering and technology, characterized by its interdisciplinary nature, demands the synthesis of knowledge from a wide array of domains including humanities, arts, and advanced technologies. However, what distinguishes technologists is their proficiency in design and their ability to adeptly apply this knowledge across diverse disciplines to achieve effective problem solving.

In response to these needs, aspiring engineers need thorough preparation and a deep understanding of the latest technological trends and industrial requirements. This calls for studying under a modern and adaptable curriculum that mirrors the global environment. As part of this initiative, there is a push to integrate recent advancements and enrich course content with pertinent and up-to-date subjects. Consequently, a revised structure and curriculum will debut from the academic year 2023-24 for First Year Civil Engineering, with intentions to progressively implement these updates across second, third- and fourth-year engineering programs.

Project-based learning has been introduced alongside traditional classroom teaching and laboratory-based learning to enhance the overall learning experience. The objective is to encourage students to learn collaboratively in groups of 3 to 4, focusing on solving meaningful problems. These problems can be theoretical, practical, social, and technical, symbolic, cultural, or scientific, arising from students' curiosity across various disciplines and professional contexts. The selected problems should be exemplary and may require an interdisciplinary approach for both analysis and resolution. This approach aims to develop students' capacity for learning through shared cognition.

- Laboratory Course:

This is focused on completing experiments and assignments related to the courses of the Semester.

- Seminar: This aspect will revolve around state-of-the-art topics selected by students and approved by the authority. Students are required to submit a certified seminar report in a standard format, evaluated by their assigned guide and the department/institute head for satisfactory completion of the work.
- Project Work in Final Year: Project work in the seventh Semester is integral to the curriculum. It involves applying knowledge gained throughout the graduation program, ideally addressing societal needs. The project provides an opportunity for students to design and construct complete systems or subsystems, specializing in areas of their interest. Students must prepare a certified final project report in standard format, evaluated by their guide and the department/institute head for satisfactory completion of the work.
- Internship: Internships are crucial for educational and career development, offering practical experience in field of discipline. It plays a significant role as employers seek well-trained employees. The primary objective is to expose technical students to real-world industrial environments, providing insights into the social, economic, and administrative factors influencing organizational operations. Students may choose internships in industries, government agencies, NGOs, MSMEs, rural settings, innovation hubs, intellectual property rights (IPR), or entrepreneurship initiatives. They can opt to focus on innovation, leading to start-up's, or gain experience in industry/NGO/government/MSME settings to prepare for professional roles. The conduction, monitoring, assessment, and evaluation of internships follow guidelines provided by AICTE.

## Definition of Credit **

| | |
|---|---|
| 1 Hour Lecture (L) per week | 1 credit for 1 Hour |
| Tutorial (T) per week | 1 credit for 1 Hour |
| Practical(P) per week 2 Hours Practical (Lab)/week | 1 credit for 2 Hours |

** The head of Tutorial and Practical (as a special case) may be merged for common credit with the permission of authority.

**Rule No. 1: Eligibility for Admission**

**Eligibility Criteria**

Students seeking admission to the first year of the Bachelor's degree course in Engineering and Technology must fulfil the eligibility criteria as laid down from time to time by the following authorities:

- **Dr. Babasaheb Ambedkar Technological University (DBATU)**
- **Government of Maharashtra**
- **All India Council for Technical Education (AICTE)**

**Rule No. 2: Scheme of Assessment**

**Eligibility for the Degree of Master of Technology**

To be eligible for the degree of Master of Technology, a candidate must:

1. **Appearing for Examinations**:
    - A candidate is required to appear for all prescribed examinations during the course of study. This includes theory exams, practical exams, term-work assessments, project evaluations, and any other form of examination as specified in the syllabus.
2. **Passing of Examinations**:
    - A candidate must pass all the prescribed examinations. The passing criteria, including minimum marks required in theory, practical, term-work, and other components, will be as per the rules laid down by the university.

**Components of Assessment**

The scheme of assessment typically includes the following components:

1. **Theory Examinations**:
    - Conducted at the end of each Semester.
    - Assess the theoretical understanding of the subjects.
2. **Practical Examinations**:
    - Conducted to assess the practical skills and application of knowledge.
    - Includes laboratory work, experiments, and practical assignments.
3. **Term-Work Assessments**:
    - Continuous assessment of assignments, tutorials, and project work throughout the Semester.
    - Includes the evaluation of written assignments, presentations, and project reports.
4. **Project Work**:
    - Assessment of project-based learning and final year projects.
    - Includes continuous assessment by the faculty and final evaluation through project reports, presentations, and viva-voce.
5. **Internal Continuous Assessment**:
    - Regular assessments conducted throughout the Semester.
    - Includes quizzes, class tests, mid-term exams, and participation in class activities.

# Program Objectives

Goal of the Civil engineering with a specialization in Construction Technology and Management (CTM) at Dr. Babasaheb Ambedkar technological University, Lonere (BATU) is to provide students with preparation to become worthy of professional careers in the field and to be motivated for lifelong learning. All prescribed courses have definite objectives and outcomes. Program objectives are expected qualities of engineers as under:

**a) Preparation:** To prepare students to excel in various educational program or to succeed in industry / technical profession through further education/training;

**b) Core Competence:** To provide students with a solid foundation in mathematical, scientific fundamentals required to solve E&T related problems;

**c) Breadth:** To train students with a breadth of scientific knowledge to comprehend, analyze, design & create novel products and solutions for real life problems;

**d) Professionalism:** To inculcate in students professional/ethical attitude, effective team work skills, multidisciplinary approach and to relate engineering issues to a broader context;

**e) Learning Environment:** To provide students with academic environment of excellence, leadership, ethical guidelines and life-long learning needed for a long / productive career.

In addition to above DBATU graduate is expected to be

1. Taking pride in their profession and have commitment to highest standards of ethical practices,
2. Able to design structural system that is safe, economical and efficient.
3. Capable of using modern tools efficiently in all aspects of professional practices.
4. Dealing successfully with real life civil engineering problems and achieve practical solutions based on a sound science and engineering knowledge.
5. Shall represent the highest standards of Structural engineering and related technical disciplines.
6. Shall be engage in continuous research, development and exchange of knowledge for professional development.
7. Be honest in their control and performing their duties and promote effective use of resources through open, honest and impartial services to the public.
8. Act in such a manner which will uphold the honour, integrity, or dignity of the engineering profession, and avoid knowingly engaging in business or professional practices of a fraudulent, dishonest or unethical nature.
9. Recognize that the lives, safety, health and welfare of the general public are dependent upon engineering, decision and practices.
10. Continue their professional development throughout their careers and provide opportunities for the professional development.

## 11. Table A: Credit Structure for PG program in Engineering

| Course Category | Provided |
|---|---|
| Program Core Course (PCC) | 15 |
| Program Elective Course (PEC) | 12 |
| Experiential Learning Courses (ELC) | 40 |
| Humanities Social Science and Management (HSSM-IKS/VEC/AEC) | 8 |
| Open Elective (OE) Other than a particular program | 3 |
| Multidisciplinary Minor (MDM) | 3 |
| **TOTAL** | **81** |

# *Dr. Babasaheb Ambedkar Technological University, Lonere*

## Teaching & Evaluation Scheme for M. Tech. in Civil Engineering with Specialization in Construction Technology and Management

| Sr. No. | Course Code | Course Title | Teaching Scheme | | | Evaluation Scheme | | | | Credit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | ISE | MSE | ESE | Total | |
| **Semester- I** | | | | | | | | | | |
| 1 | MCVCTMPCT 101 | Management and Project Planning | 3 | -- | -- | 20 | 20 | 60 | 100 | 3 |
| 2 | MCVCTMPCT 102 | Cost and Quality Management | 3 | -- | -- | 20 | 20 | 60 | 100 | 3 |
| 3 | MCVCTMPCT 103 | Contract Administration and Management | 3 | -- | -- | 20 | 20 | 60 | 100 | 3 |
| 4 | MCVCTMPET 104 | Program Elective-I | 3 | -- | -- | 20 | 20 | 60 | 100 | 3 |
| 5 | MCVCTMPET 105 | Program Elective-II | 3 | -- | -- | 20 | 20 | 60 | 100 | 3 |
| 6 | MCVCTMELL 106 | PG Lab-I | -- | -- | 4 | 25 | -- | 25 | 50 | 2 |
| 7 | MCVCTMHMP 107 | Communication Skills | 2 | -- | -- | 25 | -- | 25 | 50 | 2 |
| 8 | MCVCTMAUP 108 | YOGA for Stress Management | -- | -- | 1 | AU | -- | -- | -- | AU |
| | | **Total** | **17** | **0** | **05** | **150** | **100** | **350** | **600** | **19** |
| **Semester- II** | | | | | | | | | | |
| 1 | MCVCTMPCT 201 | Project Economics and Finance | 3 | -- | -- | 20 | 20 | 60 | 100 | 3 |
| 2 | MCVCTMPCT 202 | Construction Safety | 3 | -- | -- | 20 | 20 | 60 | 100 | 3 |
| 3 | MCVCTMPET 203 | Elective-III (Departmental) | 3 | -- | -- | 20 | 20 | 60 | 100 | 3 |
| 4 | MCVCTMPET 204 | Elective-IV (Departmental) | 3 | -- | -- | 20 | 20 | 60 | 100 | 3 |
| 5 | MCVCTMOET 205 | Elective-V (Open) | 3 | -- | -- | 20 | 20 | 60 | 100 | 3 |
| 6 | MCVCTMELP 206 | PG Lab-II | -- | -- | 4 | 25 | -- | 25 | 50 | 2 |
| 7 | MCVCTMELP 207 | Mini-Project | -- | -- | 8 | 25 | -- | 25 | 50 | 4 |
| 8 | MCVCTMELP 208 | Indian Knowledge System | 3 | -- | -- | 20 | 20 | 60 | 100 | 3 |
| | | **Total** | **18** | **02** | **12** | **170** | **120** | **410** | **700** | **24** |

### Type of course:

| | |
|---|---|
| Program Core: **PC** | Program Elective: **PE** |
| Open Elective: **OE** (Other than particular program) | Ability Enhancement Course: **AE** |
| Modern Indian Language: **MIL** | Humanities, Management, language and Commerce: **HM** |
| Experiential Learning Courses: **EL** | Multidisciplinary Minor Courses: **MD** |
| **ABBRIVATIONS**: **ISE**-INSEMESTER EVALUATION, **MSE**-MID SEMESTER EVLUATION, **ESE** -END SEMESTER EVALUATION | |

*Dr. Babasaheb Ambedkar Technological University, Lonere*

## Teaching & Evaluation Scheme for M. Tech. in Civil Engineering with Specialization in Construction Technology and Management

| Sr. No. | Course Code | Course Title | Teaching Scheme | | | Evaluation Scheme | | | | Credit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | ISE | MSE | ESE | Total | |
| **Semester-III** | | | | | | | | | | |
| | | | | | | | | | | |
| 1 | MCVCTMMDP 301 | MOOC/SWAYAM/ NPTEL PLATFORM COURSES/Self Study.(It is desirable to choose one course from each of PE,OE &AE.) | 3 | -- | -- | 20 | 20 | 60 | 100 | 03 |
| 2 | MCVCTMMDP 302 | | 3 | -- | -- | 20 | 20 | 60 | 100 | 03 |
| 3 | MCVCTMHMP 303 | | 3 | -- | -- | 20 | 20 | 60 | 100 | 03 |
| 4 | MCVCTMELP 304 | Seminar-I | -- | -- | 4 | 25 | -- | 25 | 50 | 02 |
| 5 | MCVCTMELP 305 | Project Stage-I | -- | -- | 20 | 50 | -- | 50 | 100 | 10 |
| | | **TOTAL** | **9** | **--** | **24** | **135** | **60** | **255** | **450** | **21** |
| **Semester-IV** | | | | | | | | | | |
| 1 | MCVCTMELP 401 | Project Stage -II | -- | -- | 40 | 100 | -- | 100 | 200 | 20 |
| | | **TOTAL** | -- | -- | -- | **100** | -- | **100** | **200** | **20** |

| **Internship** |
|---|
| Students can take Industry Internship along with Dissertation Stage –I. Students must maintain regular reporting with Dissertation supervisor regarding status of Dissertation<br><br>**Dissertation Stage I and Synopsis Approval Presentation:**<br>It is a course requirement under the guidance of faculty Supervisor. PG student from second year is required to do innovative and research oriented applied work related to various theory and laboratory courses. Dissertation work may cover analytical formulation, experimentation or survey based project or combination of these. Student are encouraged to undertake an interdisciplinary type project. |

## *Dr. Babasaheb Ambedkar Technological University, Lonere*

| Sr.No. | Multidisciplinary Minor Courses |
|---|---|
| A | MOOC/SWAYAM/ NPTEL -Project Management and Intellectual Property Rights (Self Study) Student may select this course either from MOOC/SWAYAM/ NPTEL pool or any other approved reputed source. The submission of course completion certificate is mandatory.<br>**MCVENEMDT301/302,MCVENEHMT 303 -** Institute has to take care of registration of subjects with detailed syllabus in first two weeks of beginning of the semester with exam department of DABATU. |

| Sr.No. | Program Elective-I | Program Elective-II |
|---|---|---|
| A | Advanced Construction Materials and Techniques | Construction Disaster Management |
| B | Advanced Construction Equipment | Applications of Statistical Methods |
| C | Retrofitting of Structures | Advanced Sustainable Building Technology |

| Sr.No. | Program Elective-III | Program Elective-IV | Open Elective |
|---|---|---|---|
| A | Architecture and Town planning | Construction Disaster Management | Research Methodology |
| B | Operation Research | Applications of Statistical Methods | Infrastructure Development |
| C | Value Engineering and Valuation | Advanced Sustainable Building Technology | |

| Sr.No. | Multidisciplinary Minor | Indian Knowledge System |
|---|---|---|
| A | MOOC/SWAYAM/ NPTEL | History of Construction Technology In India |
| B | Project Management and Intellectual Property Rights (Self Study) | |

## Teaching & Evaluation Scheme for M. Tech. in Civil Engineering with Specialization in Construction Technology and Management

| Sr. No. | Course Code | Course Title | Teaching Scheme | | | Evaluation Scheme | | | | Credit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | ISE | MSE | ESE | Total | |
| **Semester- I** | | | | | | | | | | |
| 1 | MCVCTMPCT 101 | Management and Project Planning | 3 | -- | -- | 20 | 20 | 60 | 100 | 3 |
| 2 | MCVCTMPCT 102 | Cost and Quality Management | 3 | -- | -- | 20 | 20 | 60 | 100 | 3 |
| 3 | MCVCTMPCT 103 | Contract Administration and Management | 3 | -- | -- | 20 | 20 | 60 | 100 | 3 |
| 4 | MCVCTMPET 104 | Program Elective-I | 3 | -- | -- | 20 | 20 | 60 | 100 | 3 |
| 5 | MCVCTMPET 105 | Program Elective-II | 3 | -- | -- | 20 | 20 | 60 | 100 | 3 |
| 6 | MCVCTMELL 106 | PG Lab-I | -- | -- | 4 | 25 | -- | 25 | 50 | 2 |
| 7 | MCVCTMHMP 107 | Communication Skills | 2 | -- | -- | 25 | -- | 25 | 50 | 2 |
| 8 | MCVCTMAUP 108 | YOGA for Stress Management | -- | -- | 1 | AU | -- | -- | -- | AU |
| | | **Total** | **17** | **0** | **05** | **150** | **100** | **350** | **600** | **19** |

### Type of course:

| | |
|---|---|
| Program Core: **PC** | Program Elective: **PE** |
| Open Elective: **OE** (Other than particular program) | Ability Enhancement Course: **AE** |
| Modern Indian Language: **MIL** | Humanities, Management, language and Commerce: **HM** |
| Experiential Learning Courses: **EL** | Multidisciplinary Minor Courses: **MD** |
| **ABBRIVATIONS**: **ISE**-INSEMESTER EVALUATION, **MSE**-MID SEMESTER EVLUATION, **ESE** -END SEMESTER EVALUATION | |

| SUBJECT CODE | | CREDITS |
|---|---|---|

| MCVCTMPCT101 | Management and Project Planning | | | 3 | | | |
|---|---|---|---|---|---|---|---|
| Teaching Work Load/week( Hrs.) | | | | Examination Scheme( Marks) | | | |
| Lecture | Tutorial | Laboratory | Total | ISE | MSE | ESE | Total |
| 3 | - | - | 3 | 20 | 20 | 60 | 100 |

| **Course Objectives** | |
|---|---|
| CO1 | To gain a comprehensive understanding of foundational principles in project management. |
| CO2 | To develop the ability to accurately estimate resource needs for project success. |
| CO3 | To master solving complex challenges in resource allocation and leveling through the application of network diagram methodologies. |

| **Course Outcomes: Students will be able to** | |
|---|---|
| CO1 | Highlight the contributions of Henry Fayol, Fredrick Taylor, Abraham Maslow, Elton Mayo |
| CO2 | Classify organizations into various forms, explain the concept of project Life cycle, jolt |
| CO3 | Optimize a network manually as well as with using software. |
| CO4 | Highlight the various domains of construction management as regards to mobilization, |
| CO5 | Study the methods of a construction system and hence measure works. |

# Course Contents

| **Module 1** | **General Management** | **Hrs. 6** |
|---|---|---|
| Comparison between traditional management and modern scientific management, Contribution of Taylor, Fayol, Maslow, Mayo and Mcgregor, Management functions, Management styles, Objectives of Management, Management techniques & use, organizations, forms of organizations. | | |
| **Module 2** | **Project Management** | **Hrs. 8** |
| Project life cycle, concept of s-curve between time and cost of project, planning for achieving time, cost, quality, safety requirements of projects, project feasibility reports based on socio-techno-economic-environmental impact analysis, project clearance procedures and necessary documentation for major works like dam, highway, railway, airport, multi-storied structures, ports, tunnel, Qualities, role, and responsibilities of projects Manager, Role of Project Management Consultants on major projects. | | |
| **Module 3** | **Construction Scheduling & Controlling** | **Hrs. 6** |
| Construction Scheduling, LOB technique, Mass haul diagrams. Precedence Network Analysis, Activity cost and time estimation in Bar Chart, CPM, PERT, RPM, Work break down structure, Applications for major construction projects, Monitoring and Control of construction project, Resource Leveling and Smoothening | | |
| **Module 4** | **Cost Analysis** | **Hrs. 6** |
| Direct and Indirect cost, Cost analysis, cost curve, optimization and crashing of network for civil engineering projects, updating of network. Torsion | | |

| Module 5 | Construction Management |
|---|---|
| Job layout, Site mobilization – Demobilization, Mass housing, small scale industries, Co-ordinating, communicating & reporting techniques, Organizing and monitoring of the construction work with respect to cost-time schedules, Staffing its Nature and purpose, selection, appraisal, organizational development. Application of managing information software (MIS), Primavera, Web based project management to construction management, MSP managed service Providers. | |

| Guidelines for Assignments: | |
|---|---|
| 1 | The candidate shall perform minimum Six assignments consisting theoretical as well as numerical aspects of the Course. |

| Text Books: | |
|---|---|
| 1 | T. R. Banga and S. C. Sharma, Industrial Engineering and Management including Production Management, Khanna Publishers |
| 2 | Khanna O P, Industrial Engineering and Management, Dhanpat Rai Publication. |
| 3 | P.S. Gahlot & B. M. Dhir, Construction Planning & management, New Age int. (p) Ltd. |
| 4 | K Nagrajan, Project Management, New Age International Ltd. |
| 5 | Barrie – Paulson, Professional Construction Management, McGraw Hill Institute Edition |

| Reference Books: | |
|---|---|
| 1 | Ahuja H. N, John Wiely, Project Management, New York. |
| 2 | Sengupta and Guha, Construction Management and Planning, Tata McGraw Hill publication. |

| SUBJECT CODE | Cost and Quality Management | | | | | | CREDITS |
|---|---|---|---|---|---|---|---|
| MCVCTMPCT102 | | | | | | | 3 |
| Teaching Work Load/week( Hrs.) | | | | Examination Scheme( Marks) | | | |
| Theory | Tutorial | Laboratory | Total | ISE | MSE | ESE | Total |
| 3 | - | - | 3 | 20 | 20 | 60 | 100 |

| Course Objectives | |
|---|---|
| CO1 | To explore the principles and applications of various formwork systems in construction projects. |
| CO2 | To gain comprehensive knowledge of steel construction methods and the intricacies of pre-stressed concrete design. |
| CO3 | To evaluate the criteria for selecting construction equipment based on project requirements and site conditions. |

| Course Outcomes: Students will be able to | |
|---|---|
| CO1 | Study the methods of a construction system and hence measure works. |

| | |
|---|---|
| CO2 | Apply control concepts for improving the quality of construction. |
| CO3 | Maintain the records of quality assurance processes and audits. |
| CO4 | Know various quality improvements techniques. |
| CO5 | Implement safety policies, methods, training provided on any ISO approved construction policies. |

# Course Contents

| **Module 1** | **Construction Costing** | **Hrs. 8** |
|---|---|---|
| Costing of construction Works, different methods of costing, types of costs, demand and supply, cost elements in a project, Analysis of rates, Non-scheduled items of work, Cost estimation for a small construction job, Purpose, methods and stages of cost control, cost monitoring, cost forecasting methods. | | |
| **Module 2** | **Cash Flow and Payment of Works** | **Hrs. 8** |
| Determining the funds required for a construction job, preparing cash flow statements, Cash inflow and outflow during contract period, Project expectations and performance models. Precautions in custody of cash, Maintenance of temporary advance and advance account, different types of payment, first running advance and final payments. | | |
| **Module 3** | **Preparation of Bill and Report** | **Hrs. 6** |
| Preparation of bills for payment, measurement book, mode of payment, running account bill, Ledger and Cash book details, Arbitration, Completion report of the project; Checking of Plan, Details of various works and issue of completion report of the project. | | |
| **Module 4** | **Quality and Quality Assurance** | **Hrs. 6** |
| Necessity for improving Quality in the context of Global Challenges, Factors influencing construction quality, Concept of Quality Control, Quality Management and Total Quality Management (TQM), Designing of quality manuals, checklists and inspection reports, installing the quality assurance system, monitoring and control. 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. | | |
| **Module 5** | **Quality Systems** | **Hrs. 8** |
| Introduction, Quality system standard, ISO 9000, ISO 14000 and QS 9000 family of standards & requirements, Preparing Quality System Documents, Quality related training, Implementing a Quality system, Bench-marking quality, Design of Quality manuals, checklist and inspection reports, Nonlinear Analysis. | | |

| **Guidelines for Assignments:** | |
|---|---|
| **1** | The candidate shall perform minimum Six assignments consisting theoretical as well as numerical aspects of the Course. |

| **Text Books:** |
|---|

| | |
|---|---|
| **1** | Chitkara, K.K. Construction Project Management, Tata-McGraw Hil |
| **2** | P. S. Gahlot & B. M. Dhir, Construction Planning & management, New Age int. (p) Ltd. |
| **3** | Mueller, F.W. Integrated cost and schedule control for construction projects. |
| **4** | Gopalakrishanan, P, Sundaresan, Material Management- an Integrated Approach, Prentice Hall. |
| **5** | Datta, material Management procedures, Text and Cases, 2e. Prentice Hall |

| **Reference Books:** | |
|---|---|
| **1** | Dobbler and Bart, Purchasing and supplies Management, Text and Cases, 6e. |
| **2** | ISO 9000, ISO 14000 and QS 9000 standards and certifications. |
| **3** | Schedule of rates, specification manuals etc from PWD. |

| SUBJECT CODE | Contract Administration and Management | | | CREDITS | | | |
|---|---|---|---|---|---|---|---|
| MCVCTMPET103 | | | | 3 | | | |
| Teaching Work Load/week( Hrs.) | | | | Examination Scheme( Marks) | | | |
| Theory | Tutorial | Laboratory | Total | ISE | MSE | ESE | Total |
| 3 | - | - | 3 | 20 | 20 | 60 | 100 |

| **Course Objectives** | |
|---|---|
| CO1 | To understand how to choose the right construction equipment for different projects and locations |
| CO2 | To study the characteristics and benefits of using sustainable materials in construction. |
| CO3 | To learn techniques for ensuring high-quality standards in construction work. |
| CO4 | To explore how site conditions affect the choice of construction methods and materials. |

| **Course Outcomes: Students will be able to** | |
|---|---|
| CO1 | Study the methods of a construction system and hence measure works. |
| CO2 | Apply control concepts for improving the quality of construction. |
| CO3 | Maintain the records of quality assurance processes and audits. |
| CO4 | Know various quality improvements techniques. |
| CO5 | Implement safety policies, methods, training provided on any ISO approved construction policies. |

## Course Contents

| **Module 1** | **Contracts Administration** | **Hrs. 8** |
|---|---|---|
| Professional ethics, standard forms of building contracts, conditions of contracts, Contract formation, contracts with various stakeholders on a major Construction projects, rights of owners, adjoining owners and third parties, project management consultants, contractor, contract performance, contract correspondence and contract closure, Global tenders and B.O.T. System. | | |
| **Module 2** | **Contract System and Acts** | **Hrs. 8** |
| Various types, Importance & clauses of contract, The Indian Contract Act (1872): Objectives of the act, Definition of the contract, Valid, Voidable, and Void contracts, Sale of Goods Act. | | |

| Module 3 | Construction Claims, Injunctions and Bailment | Hrs. 6 |
|---|---|---|
| Extra items and causes of claims, Types of construction claims, documentation, settlement of claims, and extension of time, Injunctions, Types:- temporary, perpetual, mandatory, Indemnity & Guarantee- difference between the two, Contracts of Guarantee & Indemnity, Consideration for Guarantee, Surety's liability, discharge of surety, Bailment- Nature of transaction, delivery of bailee. | | |
| **Module 4** | **Arbitration Awards & Dispute Resolving boards** | **Hrs. 6** |
| Indian Arbitration Act, arbitration agreement, conduct of arbitration, power and duties of arbitrator, rules of evidence/ preparation and publication of awards, methods of enforcement, impeding and award, Limitations of arbitration in the Indian context (DRB s) Dispute resolving boards-necessity, formation, functioning advantages, Causes of disputes and importance of role of various stakeholders in prevention of disputes, Alternate Dispute Resolution methods- mediation, conciliation. | | |
| **Module 5** | **Industrial Act and Labour Laws, Administration of Incentive Schemes** | **Hrs. 8** |
| Industrial Dispute Acts, payment of wages act, Minimum Wages Act, Indian Trade Union Act, and Workmen's Compensation Act. Labour welfare fund act 1953, Necessity, Merit rating, job evaluation, installation, modification and maintaining and incentive scheme based on implementation experience. | | |

| **Guidelines for Assignments:** | |
|---|---|
| **1** | The candidate shall perform minimum Six assignments consisting theoretical as well as numerical aspects of the Course. |

| **Text Books:** | |
|---|---|
| **1** | B. N Dutta, Estimating and Costing in Civil Engineering: Theory and Practice Published S. Dutta & Company, Lucknow. |
| **2** | B. S. Patil, Civil Engineering Contracts and Estimates -Universities Press (India) Private Limited, |
| **3** | Joseph T. Bockrath, Contracts and the Legal Environment for Engineers and Architects, McGraw Hill, 2000. |
| **4** | Kwaku, A., Tenah, P.E. Jose M. Guevara, P.E., Fundamentals of Construction Management and Organisation, Printice Hall, 1985.M.M.Tripathi Private Ltd., Bombay, 1982. |
| **5** | Gajaria G.T., Laws Relating to Building and Engineering Contracts in India, |

| **Reference Books:** | |
|---|---|
| **1** | Jimmie Hinze, Construction Contracts, McGraw Hill, 2001. |
| **2** | Jack Meredith & Samuel Mantel, Project Management: A managerial approach, Wiley India. |
| **3** | Dennis Lock, Project Management, Gower Publishing England. |
| **4** | The Indian Contract Act (9 of 1872), 1872- Bare Act- 2006 edition, Professional Book Publishers. |

| SUBJECT CODE | (Program Elective-I ) | CREDITS |
|---|---|---|

| MCVCTMPET104A | Advanced Construction Materials and Techniques | | | | | | 3 |
|---|---|---|---|---|---|---|---|
| Teaching Work Load/week( Hrs.) | | | | Examination Scheme( Marks) | | | |
| Theory | Tutorial | Laboratory | Total | ISE | MSE | ESE | Total |
| 3 | - | - | 3 | 20 | 20 | 60 | 100 |

| **Course Objectives** | |
|---|---|
| CO1 | To understand how to choose the right construction equipment for different projects and locations |
| CO2 | To study the characteristics and benefits of using sustainable materials in construction. |
| CO3 | To learn techniques for ensuring high-quality standards in construction work. |
| CO4 | To explore how site conditions affect the choice of construction methods and materials. |

| **Course Outcomes: Students will be able to** | |
|---|---|
| CO1 | Understand the construction metals and alloys |
| CO2 | Learn to use waste material in construction process |
| CO3 | Know about special concrete and their applications |
| CO4 | Understand construction systems for High Rise structures |
| CO5 | Learn design and requirement of different types of formwork |

## Course Contents

| **Module 1** | **Metals & Alloy** | **Hrs. 8** |
|---|---|---|

Types of structural steels, special steel, alloy steel, stainless steel, light gauge steel, Corrosion of concrete in various environments, Corrosion of reinforcing steel, methods/treatments to overcome the corrosion, Electro-chemical process, Ferro- cement, material and properties, fibers and composites, Architectural use and Aesthetics of composites, Adhesives and sealants, Structural elastomeric bearings and resilient seating. Moisture barriers, Glass facade, materials and techniques, Use of titanium dioxide, transparent Aluminum.

| **Module 2** | **Use of Waste Materials** | **Hrs. 8** |
|---|---|---|

Material composition and properties, production, storage, distribution, testing, acceptance criteria, applications, limitations of use, economic consideration, and recent development related to the following materials to be studied: Fly Ash, coal ash, Blast furnace slag, Red mud, Waste glass, Rice husk.

| **Module 3** | **Special Concrete** | **Hrs. 6** |
|---|---|---|

Light weight concrete, high strength concrete, Fly ash concrete, Fibre reinforced concrete, Sulphur impregnated concrete, Polymer Concrete, High performance fiber reinforced concrete, Self-Compacting-Concrete, Geo Polymer Concrete, Ready mixed concrete, Silica fume concrete.

**Special concrete operations**

Shortcrete, grouting, grunting, under water concreting, hot and cold weather concrete, pumpabale concrete, special concreting methods.

| Module 4 | High Rise Structure & Prefabricated structure | Hrs. 6 |
|---|---|---|
| Construction systems for High Rise structures, Special techniques required for construction and maintenance, Prefabricated Construction techniques & System planning for pre-casting, selection of equipment for fabrication, transport and erection, quality measures, safety measure during erection. | | |
| **Module 5** | **Formwork Design** | **Hrs. 8** |
| Design and requirement of different types of formwork, Types of formwork: Timber, steel, aluminum, scaffoldings, jump form, modular shuttering, Doka shuttering. Mivan technology and its applications and safety measures for tall structures, slip form, vertical slip forming, lifting techniques, horizontal slip forming, and safety measures for tall structures. | | |

| **Guidelines for Assignments:** | |
|---|---|
| **1** | The candidate shall perform minimum Six assignments consisting theoretical as well as numerical aspects of the Course. |

| **Text Books:** | |
|---|---|
| **1** | Rangawala S.C, Engineering Materials, Charotar Publications |
| **2** | S. K. Duggal, Building Materials, , New Age International Publications |
| **3** | Bruntley L. R, Building Materials Technology Structural Performance & Environmental Impact, , McGraw Hill Inc Construction Technology, Vol I - IV, R Chudley, Longman Group Construction Ltd |
| **4** | Verghese, Building Material, PHI EEE New Delhi -2012 |
| **5** | Ashby, M. F. and Jones, Engineering Materials: An introduction to Properties, applications and designs |

| **Reference Books:** | |
|---|---|
| **1** | Jerry Irvine, Advanced Construction Techniques, CA Rocketr, 1984 |

| SUBJECT CODE | (Program Elective-I ) | CREDITS |
|---|---|---|

| MCVCTMPET104B | Advanced Construction Equipment | 3 |
|---|---|---|

| Teaching Work Load/week( Hrs.) | | | | Examination Scheme( Marks) | | | |
|---|---|---|---|---|---|---|---|
| Theory | Tutorial | Laboratory | Total | ISE | MSE | ESE | Total |
| 3 | - | - | 3 | 20 | 20 | 60 | 100 |

| **Course Objectives** | |
|---|---|
| CO1 | To understand how to choose the right construction equipment for different projects and locations |
| CO2 | To study the characteristics and benefits of using sustainable materials in construction. |
| CO3 | To learn techniques for ensuring high-quality standards in construction work. |
| CO4 | To explore how site conditions affect the choice of construction methods and materials. |

| **Course Outcomes: Students will be able to** | |
|---|---|
| CO1 | Learn about different construction equipment. |
| CO2 | Learn about different pumps used in construction process |
| CO3 | Understand about excavating equipment. |
| CO4 | Understand about compacting equipment. |
| CO5 | Learn about cranes and crushers used in construction process. |

## Course Contents

| **Module 1** | **Introduction** | **Hrs. 8** |
|---|---|---|
| Identification, Planning, Equipment management in projects, various costs associated with equipments, Maintenance management, Replacement, Cost control of equipment, Depreciation Analysis, Fundamentals of earthwork operations-Earth moving operations, Types of Earthwork Equipment, Tractors, Motor Graders, Scrapers, Front end waders, Earth Movers Equipment for Dredging, Trenching, Tunneling, Drilling, Blasting, Equipment for compaction-Erection. | | |
| **Module 2** | **Pumps** | **Hrs. 8** |
| Types of pumps used in construction, Equipment for Dewatering and Grouting, Foundation and Pile Driving Equipment, Forklifts and Related Equipment, Portable Material Bins, Conveyors. | | |
| **Module 3** | **Excavating Equipment** | **Hrs. 6** |
| Power shovels; size, basic parts, selection, factors affecting output, Draglines: - types, size, basic parts, and effect of job and management conditions on the output of dragline.Shortcrete, grouting, grunting, under water concreting, hot and cold weather concrete, pumpabale concrete, special concreting methods. | | |
| **Module 4** | **Hauling & Compacting Equipment** | **Hrs. 6** |
| Clamshells – clamshell buckets, Hoes- basic parts working ranges, Bulldozers-types, moving earth with bull dozers. Types of compacting equipments, Such as tamping rollers, smooth wheel rollers, pneumatic tyred rollers, and Hoisting equipments: Chain, hoist, fork trucks. | | |

| Module 5 | Cranes and Crushers | Hrs. 8 |
|---|---|---|
| Classification, derrick crane, mobile crane, Tower crane, Hydraulic crane, overhead or gantry crane, Safety in crane operation, Use of cranes in steel construction, Use of cranes in concrete construction. Crushers - Types, primary, secondary, tertiary crushers, jaw, gyratory, stone crushers, hammer mills, roll crushers, rod and ball mills screening aggregate, revolving, vibrating screens. | | |

| Guidelines for Assignments: | |
|---|---|
| 1 | The candidate shall perform minimum Six assignments consisting theoretical as well as numerical aspects of the Course. |

| Text Books: | |
|---|---|
| 1 | Patrick Powers. J., Construction Dewatering: New Methods and Applications, John Wiley & Sons, 1992. |
| 2 | Peter. H. Emmons, "Concrete repair and maintenance illustrated", Golgotha Publications Pvt. Ltd., 2001.Press, 2008. |
| 3 | Robertwade Brown, Practical foundation engineering hand book, McGraw Hill Publications, 1995. |
| 4 | Sankar, S. K. and Saraswati, S., Construction Technology, Oxford University Press, New Delhi, 2008. |

| SUBJECT CODE | (Program Elective-I ) | | | CREDITS | | | |
|---|---|---|---|---|---|---|---|
| MCVCTMPET104C | Retrofitting of Structures | | | 3 | | | |
| Teaching Work Load/week( Hrs.) | | | | Examination Scheme( Marks) | | | |
| Theory | Tutorial | Laboratory | Total | ISE | MSE | ESE | Total |
| 3 | - | - | 3 | 20 | 20 | 60 | 100 |

| Course Outcomes: Students will be able to | |
|---|---|
| CO1 | Understand factors of Serviceability and Durability of Structures. |
| CO2 | Determine crack width, effect of crack on materials, effect of moisture on structures. |
| CO3 | Understand methods for protection of steel structures and masonry structures. |
| CO4 | Understand various materials and methodologies used for repairing of structures. |
| CO5 | Understand and implement techniques used for repairing and maintenance of structure. |

## Course Contents

| Module 1 | Serviceability and Durability | Hrs. 8 |
|---|---|---|
| Quality Assurance for Concrete Construction, Permeability, Thermal Properties and Cracking, Distress Monitoring, Causes for Distress, Effects of Climate, Temperature, Chemicals, Wear and Erosion, Design and Construction Errors, Corrosion Mechanism, Effects of Cover Thickness and Cracking.<br>**Non Destructive Testing:** Ultrasonic and Sonic Test, Rebound Hammer Test, Strength Evaluation of Existing | | |

Structures.

| Module 2 | Cracks in Structures | Hrs. 8 |
|---|---|---|

Causes, Thermal and Shrinkage cracks, Cracks due to Vegetation and Trees, Foundation Movements, Types and their Fatality, Diagnosis Techniques for Repair.

**Moisture Penetration**

Sources of Dampness, Moisture Movement from Ground, Reasons for Ineffective Damping, Leakage in Concrete Slabs, Pitched Roofs, Dampness in Solid Walls, Condensation, Remedial treatments, Chemical Coatings

| Module 3 | Steel Structures and Masonry | Hrs. 6 |
|---|---|---|

Types and Causes of Deterioration, Preventive Measures, Repair Procedure, Brittle Failure, Defects in Connections, Welded Joints: Test for Defects; Mechanism of Corrosion , Methods of Corrosion Protection, Corrosion Inhibitors, Corrosion Resistant Steels, Coatings, Cathodic Protection. Design and Fabrication Errors, Distress during Erection.

**Masonry Structures**

Discoloration and Weakening of Stones, Preservation, Chemical Preservatives, Brick Masonry Structures, Distress and Remedial Measures.

| Module 4 | Materials for Repairs | Hrs. 6 |
|---|---|---|

Essential Parameters for Repair Material, Premixed Cement Concrete and Mortar, Sulphur Infiltrated Concrete, Fiber Reinforced Concrete, Special Elements for Accelerated Strength Gain, Expansive Cement, Polyester Resin.

**Polymer Concrete:** Physical and Mechanical Properties, General Guidelines and Precautions for Use, Field Application

**Polymer Modified Concrete:** Physical and Mechanical Properties, General Guidelines and Precautions for Use, Field Application, Epoxy Concrete and Mortar: Epoxies, Physical and Mechanical Properties, General Guidelines and Precautions for Use, Field Application.

**Surface Coatings:** Essential Parameters, Types, Characteristics

| Module 5 | Maintenance and repair strategies | Hrs. 8 |
|---|---|---|

Definitions: Maintenance, Repair and Rehabilitation, Facets of Maintenance, Importance of Maintenance, Preventive Measures on Various Aspects Inspection, Assessment Procedure for Evaluating a Damaged Structure, Causes of Deterioration, Testing Techniques.

**Techniques for Repairs**

Repairs using Mortars and Dry Packs**,** Concrete Replacement, Surface Impregnation, Rust Eliminators and Polymers Coating for Rebar during Repair Foamed Concrete, Vacuum Concrete, Gunite and Shotcrete, Injection: Epoxy, Resin, Polymer Modified Cement Slurry; Shoring and Underpinning. Propping and Supporting: False Work, Requirement of Good False Work, Design Brief for False Work, Execution Procedure.

**Strengthening of Existing Structures**

| |
|---|
| General Principle, Relieving Loads, Stress Reduction, Strengthening of Super Structures (Beam, Column, Slab including Joints) for Tension, Compression, Flexural, and Shear respectively, Jacketing (RCC, Plate, Fiber ,Wrap), Bonded Overlays, Reinforcement Addition, Strengthening the Substructures, Increasing the Load Capacity of Footing, Strengthening of Masonry Structure. |

| **Guidelines for Assignments:** | |
|---|---|
| **1** | The candidate shall perform minimum Six assignments consisting theoretical as well as numerical aspects of the Course. |

| **Text Books:** | |
|---|---|
| **1** | M. S. Shetty, "Concrete Technology- Theory and Practice", S. Chand and Company, New Delhi, 1992 |
| **2** | "Concrete Technology" by M.L. Gambhir |
| **3** | Raikar, R.N., "Learning from failures – Deficiencies in Design ", Construction and Service – R & D Centre (SDCPL), Raikar Bhavan, Bombay, 1987 |
| **4** | SP25-84, "Hand book on causes and prevention of cracks on buildings", Indian standards. |
| **5** | Santhakumar, A.R., " Training Course notes on Damage Assessment and repair in Low Cost Housing "," RHDC–NBO " Anna University, July, 1992. |

| **Reference Books:** | |
|---|---|
| **1** | Denison Campbell, Allen and Harold Roper, "Concrete structures", Materials, Maintenance and Repair, Longman Scientific and technical UK, 1991. |
| **2** | Johnson. S.M., "Deterioration, maintenance and repair of structures", McGraw-Hill book company, New York, 1965. |
| **3** | R. T. Allen and S. C. Edwards, "Repair of concrete structures", Blakie and Sons, UK, 1987. |

| SUBJECT CODE | (Program Elective-II ) | CREDITS |
|---|---|---|
| MCVCTMPET105A | Construction Disaster Management | 3 |

| Teaching Work Load/week( Hrs.) | | | | Examination Scheme( Marks) | | | |
|---|---|---|---|---|---|---|---|
| Theory | Tutorial | Laboratory | Total | ISE | MSE | ESE | Total |
| 3 | - | - | 3 | 20 | 20 | 60 | 100 |

| **Course Outcomes: Students will be able to** | |
|---|---|
| CO1 | Understand the definition, causes, and impacts of natural disasters, and their connection to global warming and climate change. |
| CO2 | Analyze the role of human activities in causing manmade disasters and their consequences on modern society. |
| CO3 | Comprehend disaster management policies, legal frameworks, and the roles of governmental and non-governmental organizations in disaster response. |
| CO4 | Develop knowledge of emergency management programs, public awareness strategies, and the use of technology in disaster preparedness. |

| | |
|---|---|
| CO5 | Implement pre-, during-, and post-disaster measures using structural and non-structural mitigation techniques to reduce disaster risks. |

## Course Contents

| Module 1 | Disasters in Construction | Hrs. 8 |
|---|---|---|
| Definition of Disaster, hazard, global and Indian scenario, general perspective, importance of study in human life, Direct and indirect effects of disasters, long term effects of disasters. Introduction to global warming and climate change. Natural Disasters - Natures and extent of disasters, natural calamities such as earthquake, floods, drought, coasts hazards, cloud burst, Avalanches, Cyclone, landslides etc. | | |
| **Module 2** | **Manmade Disasters** | **Hrs. 8** |
| Chemical and industrial hazards, nuclear hazards, fire hazards, etc., Role of growing population and subsequent industrialization, urbanization and changing lifestyle of human beings in frequent occurrences of manmade disasters. | | |
| **Module 3** | **Aspect and Management** | **Hrs. 6** |
| Objective of disaster management policy, Paradigm shift in disaster management, Policy and administration: Importance and principles of disaster management policies, command and coordination in disaster management. Financing relief expenditure, legal aspects, rescue operations, casualty management, and risk management, study of flowchart showing the entire process, Ways to raise finance for relief expenditure, role of government agencies and NGO's in this process, Legal aspects related to finance raising as well as overall management of disasters. Various NGO's and the works they have carried out in the past on the occurrence of various disasters, Ways to approach these teams, International relief aid agencies and their role in extreme events. | | |
| **Module 4** | **Emergency Management Program & Public Awareness** | **Hrs. 6** |
| Administrative setup and organization, Hazard analysis, training of personnel, information management, emergency facilities and equipment necessary. Importance of public awareness, Preparation and execution of emergency management program , Scope and responsibilities of National Institute of Disaster Management (NIDM) and National disaster management authority (NDMA) in India, Methods and measures to avoid disasters, Management of casualties, set up of emergency facilities, importance of effective communication amongst different agencies in such situations, Use of Internet and softwares for effective disaster management, Applications of GIS, Remote sensing and GPS in this regard. | | |
| **Module 5** | **Disaster Management** | **Hrs. 8** |
| Pre-disaster, during disaster and post-disaster measures in some events in general Structural mapping: Risk mapping, assessment and analysis, sea walls and embankments, Bio shield, shelters, early warning and communication, Non Structural Mitigation: Community based disaster preparedness, risk transfer and risk financing, capacity development and training, awareness and education, contingency plans, Do's and don'ts | | |

| |
|---|
| in case of disasters and effective implementation of relief aids, Disaster Management for high rise building structures, bridges, chimney, dams, earthquake. |

| **Guidelines for Assignments:** | |
|---|---|
| **1** | The candidate shall perform minimum Six assignments consisting theoretical as well as numerical aspects of the Course. |

| **Text Books:** | |
|---|---|
| **1** | S. Vaidyanathan, Ikon Books, An Introduction to Disaster Management, Natural Disasters and Man Made Hazards. |
| **2** | Seetharaman, Construction Engineering and Management, Umesh Publ. |
| **3** | K Nagarajan, Project Management, New Age International Ltd. |
| **4** | Jack Pinkowski, Disaster Management Handbook, CRC Press (Taylor and Francis group). |

| SUBJECT CODE | (Program Elective-II ) | CREDITS |
|---|---|---|
| MCVCTMPET105B | Applications of Statistical Methods | 3 |

| Teaching Work Load/week( Hrs.) | | | | Examination Scheme( Marks) | | | |
|---|---|---|---|---|---|---|---|
| Theory | Tutorial | Laboratory | Total | ISE | MSE | ESE | Total |
| 3 | - | - | 3 | 20 | 20 | 60 | 100 |

| **Course Outcomes: Students will be able to** | |
|---|---|
| CO1 | Understand fundamental probability concepts, rules, and various theoretical distributions for real-world applications. |
| CO2 | Learn sampling methods, quality control techniques, and statistical measures for effective analysis in construction projects. |
| CO3 | Apply statistical tests like t-test, chi-square, and ANOVA to evaluate hypotheses and assess data distribution. |
| CO4 | Analyze relationships between variables using correlation, regression, and multivariate techniques for resource management. |
| CO5 | Utilize simulation techniques and mathematical models to identify, analyze, and mitigate risks in construction and project management. |

## Course Contents

| **Module 1** | **Probability and Distributions** | **Hrs. 8** |
|---|---|---|
| Probability theory and its importance, Definition of probability, Rules of Probability, The Baye's theorem, Random variable, Probability distribution, Mean or Expectation of Random variable, Properties of Mean of Expectation. Distributions: Theoretical probability Distributions: Binomial Distribution, Poisson distribution. Normal Distribution, Exponential Distribution, Beta, Gamma. | | |
| **Module 2** | **Sampling** | **Hrs. 8** |

| | | |
|---|---|---|
| Sampling and sampling distribution: Probability samples, Non-probability samples, sample Random sampling, Other sampling schemes, sampling distribution and standard error, some Sampling and Quality control, Use of concepts of standard deviation, coefficient of variance, range in quality control of concreting and similar such activities. | | |
| **Module 3** | **Testing Hypothesis** | **Hrs. 6** |
| Sampling of distribution, Test based on Normal Distribution, students- t test, chi square, K-S test for goodness of fit and distribution, Analysis of variance- one way & two way classification. | | |
| **Module 4** | **Correlation and Regression Analysis** | **Hrs. 6** |
| Correlation types, co-efficients, Bi-variate Frequency Distribution, Scatter Diagram, Correlation Analysis, Regression and Multivariate Analysis, Multiple Regression Analysis, Non linear Regression, Use of regression analysis in resources management. | | |
| **Module 5** | **Simulation** | **Hrs. 8** |
| Simulation, Types, case studies in construction using simulation techniques, simulation software's used, Griffi's waiting line Method.<br>Use of mathematical models based on probabilistic and statistical methods, simulation in risk identification, analysis and mitigation of project risk, EOQ in civil engineering, Sensitivity analysis, ABC analysis. | | |

| **Guidelines for Assignments:** | |
|---|---|
| **1** | The candidate shall perform minimum Six assignments consisting theoretical as well as numerical aspects of the Course. |

| **Text Books:** | |
|---|---|
| **1** | Montgomery and Runger, Applied Statistics and Probability for Engineers, Wiley, India. |
| **2** | Miller, Freund-Hall, Probability and Statistics for Engineers, Prentice India Ltd. 2009 |
| **3** | Sampling techniques-Cochran, Wiley Series, 2008. |
| **4** | David S. Moore, Statistics-Concepts and Controversies, Freeman Company, New York. |

| **Reference Books:** | |
|---|---|
| **1** | Applied Statistics for Civil and Environmental Engineers by Kottegoda.- Stratford Books**.** |

| SUBJECT CODE | (Program Elective-II ) | CREDITS |
|---|---|---|
| MCVCTMPET105C | Advanced Sustainable Building Technology | 3 |

| Teaching Work Load/week( Hrs.) | | | | Examination Scheme( Marks) | | | |
|---|---|---|---|---|---|---|---|
| Theory | Tutorial | Laboratory | Total | ISE | MSE | ESE | Total |
| 3 | - | - | 3 | 20 | 20 | 60 | 100 |

| **Course Outcomes: Students will be able to** | |
|---|---|
| CO1 | Critically review the quantitative data and draw results from it using probability and statistics |
| CO2 | Model a construction system, so the maximum output from a particular input may be obtained |
| CO3 | Correlate and hence develop linear regression equation between various civil engineering parameters |
| CO4 | Apply Griffi's waiting line models and other such models to decide the optimum number of servicing units required for a prime mover (sizing-matching operation) |
| CO5 | Predict the performance of a particular system, based on past performance using simulation and other tool |

## Course Contents

| **Module 1** | **Concept of Green Building** | **Hrs. 8** |
|---|---|---|
| Sustainable Development concept, Buildings and climate, important considerations for the design of sustainable buildings, Green Building Assessment, Current version of the LEED rating system. | | |
| **Module 2** | **Energy and Buildings** | **Hrs. 8** |
| The design of a sustainable building, Lighting - day lighting; Ventilation - natural ventilation; Indoor air quality; Passive and Active systems for energy production and conservation, Elements of successful design of a building envelope. | | |
| **Module 3** | **Sustainable Building Materials** | **Hrs. 6** |
| Environmental issues related to building materials, Local, Building materials from agricultural waste and Industrial waste. | | |
| **Module 4** | **Cost Effective Techniques for Sustainable Building** | **Hrs. 6** |
| Stabilized Mud blocks, Stone masonry blocks, solid and hollow concrete blocks, Selection of building blocks, Ferro- Concrete, Properties and Uses, Practical aspects. | | |
| **Module 5** | **Alternative sustainable Roofing Systems & Environmental Techniques** | **Hrs. 8** |
| Concepts in Roofing alternatives, Filler slab roofs, Composite Slab panel roofs, hollow block roofs, Masonry Domes. Waste water Management, Rain water harvesting and conservation, recycling, waste water treatment processes, external drainage system in building. | | |

| **Guidelines for Assignments:** |
|---|

| | |
|---|---|
| **1** | The candidate shall perform minimum Six assignments consisting theoretical as well as numerical aspects of the Course. |

| **Text Books:** | |
|---|---|
| **1** | K. S. Jagadish, B. V. V. Reddy, "Alternative Building Materials and Technologies", New Age International Publishers |
| **2** | Gevorkian ,"Green Buildings" Mac Graw hill. |
| **3** | P. N. Balaguru and S.P. Shah, "Fibre reinforced Cement Composites", McGraw Hill. |
| **4** | The engineering guide to LEED- new construction-sustainable construction for engineer's haselbach. |
| **5** | D. J. Hannant, John Wiley and Sons, Fibre cements and Fibre Concretes. |

| **Reference Books:** | |
|---|---|
| **1** | A. M. Neville, Properties of Concrete, ELBS, Longman. |
| **2** | Miller G. T Jr Living in the environment, Cengage Publisher. |
| **3** | Cunningham W, Principles of Environmental Science, TMH |
| **4** | Harris CE, Prichard MS, Rabins MJ, Engineering Ethics, Cengage Pub. |

| SUBJECT CODE | PG Laboratory -I | | | | | CREDITS | |
|---|---|---|---|---|---|---|---|
| MCVCTMELL 106 | | | | | | 2 | |
| Teaching Work Load/week( Hrs.) | | | | Examination Scheme( Marks) | | | |
| Theory | Tutorial | Laboratory | Total | ISE | MSE | ESE | Total |
| 0 | 0 | 4 | 2 | 25 | -- | 25 | 50 |

# Course Contents

| **Laboratory Work: The students are expected to perform any three experiments out of list given below and submit report of it.** | |
|---|---|
| EXP.1 | Minimum Two site visits to study construction techniques and use of major construction equipment associated with ongoing major construction works, Visit Report to be submitted. |
| EXP.2 | Minimum one site visit to Ready Mix Concrete Plant use for major construction, Visit report to be submitted. |
| EXP.3 | To prepare study report on Earthquake Resistant Building Construction. |

| SUBJECT CODE | Communication Skill | | | | | CREDITS | |
|---|---|---|---|---|---|---|---|
| MCVCTMHMP 107 | | | | | | 2 | |
| Teaching Work Load/week( Hrs.) | | | | Examination Scheme( Marks) | | | |
| Theory | Tutorial | Laboratory | Total | ISE | MSE | ESE | Total |
| 2 | 0 | 0 | 2 | 25 | -- | 25 | 50 |

| Course Outcomes: Students will be able to | |
|---|---|
| CO1 | Understand the preliminary information of various masonry structures including materials of construction, basic properties and parameters. |
| CO2 | Understand the compressive strength of masonry structures under various conditions and situation. |
| CO3 | Determine strength of masonry structure in flexure, shear, bond and factors affecting. |
| CO4 | Design the load bearing masonry buildings. |
| CO5 | Design the earthquake resistant masonry structures. |

# Course Contents

| Module 1 | Language for Technical Purpose and Presentation Tools | Hrs.6 |
|---|---|---|
| Technical vocabulary, Sentence structures, Microsoft office, Graphical presentations, Preparation, Understanding audience, Use of presentation tools, Presentation, nonverbal techniques, handling questions, Demo presentations | | |
| **Module 2** | **Formal Written Communication** | **Hrs. 3** |
| Drafting Letters, e-Mails, Memos, Notices, Circulars, Schedules. | | |
| **Module 3** | **Project Research Proposals and Reports** | **Hrs.6** |
| Research Proposal: Essentials, Abstract, Aims, Background & significance, Design & methods, Writing a sample proposal.Project Report: Types of reports, Planning a report, Collection & organization of information, Structure & style, Proofreading etc. Writing a sample report. | | |
| **Module 4** | **Project Research Proposals and Reports** | **Hrs.6** |
| Research Proposal: Essentials, Abstract, Aims, Background & significance, Design & methods, Writing a sample proposal.Project Report: Types of reports, Planning a report, Collection & organization of information, Structure & style, Proofreading etc. Writing a sample report. | | |
| **Module 5** | **Business Meetings** | **Hrs.6** |
| Understanding role of meetings, planning meetings, developing meeting agendas, scheduling meetings, conducting meetings effectively, Taking notes and publishing minutes and concluding meetings, action plans, Demo meetings. | | |


| Text Books: | |
|---|---|
| **1** | S. Hariharan, et.al. Soft Skills; MJP Publishers, 2010. |
| **2** | John Seely, Oxford Guide to Effective Writing and Speaking; Oxford University Press, 2009. |
| **3** | Thomas N. Huckin and Leslie A. Olsen, Technical Writing and Professional Communication |
| **4** | for Nonnative Speakers of English; Tata McGraw Hills, International Edition, 1991. |
| **5** | Jeff Butterfield,Soft Skills for Everyone,cengage Learning India Private Limited,2010 |

| Reference Books: | |
|---|---|
| 1 | L. Ann Masters & Harold R. Wallace, Personal Development for Life & Work,10e,Cengage |
| 2 | Learning India Private Limited,2011. |

| SUBJECT CODE | | | YOGA for Stress Management | | | | CREDITS |
|---|---|---|---|---|---|---|---|
| MCVCTMAUP 108 | | | | | | | AUDIT |
| Teaching Work Load/week( Hrs.) | | | | Examination Scheme( Marks) | | | |
| Theory | Tutorial | Laboratory | Total | ISE | MSE | ESE | Total |
| 0 | 0 | 2 | 2 | AU | AU | AU | AU |

| Course Objectives | |
|---|---|
| CO1 | Understand the physiological and psychological aspects of stress and its impact on overall well-being. |
| CO2 | Learn and practice specific yoga postures, breathing exercises, and relaxation techniques to alleviate stress. |
| CO3 | Explore the connection between mindfulness, meditation, and stress reduction, fostering mental clarity. |
| CO4 | Discover holistic practices that promote better sleep, nutrition, and overall lifestyle habits for stress management. |
| CO5 | Develop practical skills to manage stress in daily life, enhancing resilience and promoting emotional balance. |

| Course Outcomes: Students will be able to | |
|---|---|
| CO1 | Recognize the signs and sources of stress, understanding its effects on mental and physical well-being. |
| CO2 | Master a variety of yoga techniques, including postures, breathing, and meditation, to effectively manage stress. |
| CO3 | Acquire relaxation strategies that promote calmness, reduce anxiety, and enhance overall mental clarity. |
| CO4 | Incorporate healthy habits inspired by yoga principles to foster better sleep, nutrition, and self-care routines. |
| CO5 | Develop practical skills to navigate and cope with stress, enhancing emotional balance and promoting a more harmonious life. |

# Course Contents

| Module 1 | Introduction to Yoga for Stress Management | Hrs. 6 |
|---|---|---|
| Stress according to Western perspective Stress Eastern Perspective Developmental process: Western and Eastern Perspective Stress Hazards and Yoga | | |
| **Module 2** | **Meeting the challenges of Stress** | **Hrs. 6** |
| Introduction to Stress Physiology Stress, Appetite and Dietary management- Modern and Yogic perspective Sleep and Stress: understanding the relationship for effective management of stress | | |
| **Module 3** | **Stress Assessment methods** | **Hrs. 6** |

| | | |
|---|---|---|
| A valuable tool toward stress management Role of Yoga in prevention and management of stress related disorders – a summary of research evidence Concept of stress and its management - perspectives from Patanjali Yoga Sutra - Part 1/Part 2/ Part 3 | | |
| **Module 4** | **Stress Management** | **Hrs.6** |
| Concept of stress and its management - perspectives from Bhagavad Gita - Part 1 / Part 2 / Part 3 | | |
| **Module 5** | **Yoga practices for Stress Management** | **Hrs. 8** |
| Bio-Psycho-Socio-Spiritual model of stress management Yoga practices for Stress Management Breathing practices , Asana practices- Tadasana, Ardhakati Chakrasana, Ardha Chakrasana, Trikonasana, Vrikshasana, Vakarasana, Janu Sirshasana, Ushtrasana, Sashankasana, Ardhamatseyndrasana, Paschimottanasana, Poorvottanasana, Gomukhasana, Makarasana, Bhujangasana, Salambha Shalabahasana, Dhanurasana, Setubandhasana, Sarvangasana, Mastyasana, Deep Relaxation Technique (DRT),etc. | | |

| **Text Books:** | |
|---|---|
| **1** | H R Nagendra and R Nagarathna. Yoga for Promotion of Positive Health. Swami Vivekananda Yoga Prakashana. 2011. |
| **2** | Contrada, R., & Baum, A. (Eds.). The handbook of stress science: Biology, psychology, and health. Springer Publishing Company. 2010 |
| **3** | Al'Absi, M. (Ed.). Stress and addiction: Biological and psychological mechanisms. Elsevier. 2011. |
| **4** | Van den Bergh, O. Principles, and practice of stress management. Guilford Publications. 2021. |
| **5** | Swami Muktibodhananda, Hatha Yoga Pradipika, Bihar Scool of Yoga, 1998 |

| **Reference Books:** | |
|---|---|
| **1** | Swami Satyananda Saraswati, Four Chapters on Freedom, Bihar Scool of Yoga, 1975 |
| **2** | Swami Tapasyananda, Srimad Bhagavat Gita, Sri Ramakrishna Math, 2012 |
| **3** | **NPTEL Course-**Yoga for Stress Management-Dr H R Nagendra, Dr Mithila M V, Dr Rajesh Nair,Swami Vivekananda Yoga Anusandhana Samsthana https://onlinecourses.swayam2. ac.in/aic23_ge10/preview#:~:te xt=In%20this%20course%20we %20intend,meeting%20the%20 challenges%20of%20stress |

# *Dr. Babasaheb Ambedkar Technological University, Lonere*

## Teaching & Evaluation Scheme for M. Tech. in Civil Engineering with Specialization in Construction Technology and Management

| Sr. No. | Course Code | Course Title | Teaching Scheme | | | Evaluation Scheme | | | | Credit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | ISE | MSE | ESE | Total | |
| **Semester- II** | | | | | | | | | | |
| 1 | MCVCTMPCT 201 | Project Economics and Finance | 3 | -- | -- | 20 | 20 | 60 | 100 | 3 |
| 2 | MCVCTMPCT 202 | Construction Safety | 3 | -- | -- | 20 | 20 | 60 | 100 | 3 |
| 3 | MCVCTMPET 203 | Elective-III (Departmental) | 3 | -- | -- | 20 | 20 | 60 | 100 | 3 |
| 4 | MCVCTMPET 204 | Elective-IV (Departmental) | 3 | -- | -- | 20 | 20 | 60 | 100 | 3 |
| 5 | MCVCTMOET 205 | Elective-V (Open) | 3 | -- | -- | 20 | 20 | 60 | 100 | 3 |
| 6 | MCVCTMELP 206 | PG Lab-II | -- | -- | 4 | 25 | -- | 25 | 50 | 2 |
| 7 | MCVCTMELP 207 | Mini-Project | -- | -- | 8 | 25 | -- | 25 | 50 | 4 |
| 8 | MCVCTMELP 208 | Indian Knowledge System | 3 | -- | -- | 20 | 20 | 60 | 100 | 3 |
| | | **Total** | **18** | **02** | **12** | **170** | **120** | **410** | **700** | **24** |

### Type of course:

| | |
|---|---|
| Program Core: **PC** | Program Elective: **PE** |
| Open Elective: **OE** (Other than particular program) | Ability Enhancement Course: **AE** |
| Modern Indian Language: **MIL** | Humanities, Management, language and Commerce: **HM** |
| Experiential Learning Courses: **EL** | Multidisciplinary Minor Courses: **MD** |
| **ABBRIVATIONS**: **ISE**-INSEMESTER EVALUATION, **MSE**-MID SEMESTER EVLUATION, **ESE** -END SEMESTER EVALUATION | |

| SUBJECT CODE | Project Economics and Finance | CREDITS |
|---|---|---|
| MCVCTMPCT 201 | | 3 |

| Teaching Work Load/week( Hrs.) | | | | Examination Scheme( Marks) | | | |
|---|---|---|---|---|---|---|---|
| Theory | Tutorial | Laboratory | Total | ISE | MSE | ESE | Total |
| 3 | - | - | 3 | 20 | 20 | 60 | 100 |

| **Course Objectives** | |
|---|---|
| CO1 | To analyze project requirements and formulate effective project proposals. |
| CO2 | To develop monitoring and control strategies to ensure project objectives are met. |
| CO3 | To apply financial management principles to assess project viability and performance. |

| **Course Outcomes: Students will be able to** | |
|---|---|
| CO1 | Highlight the basic principles of economics |
| CO2 | Estimate the working capital required on a construction project |
| CO3 | Manage cash and credit of suppliers |
| CO4 | Demonstrate the impact of exchange rate fluctuations on international projects |
| CO5 | Perform capital budgeting and project portfolio analysis |

## Course Contents

| **Module 1** | **Principles of Economics** | **Hrs. 8** |
|---|---|---|
| Importance of the economic background to measurement, objectives of business firm, Factors bearing on size of firms, Motives to growth, Obstacles to growth of firms, Study of present economy. | | |
| **Module 2** | **Capital** | **Hrs. 8** |
| Analysis of need working capital, Estimation of requirements of working capital, Credit Management, Cash Management, Managing payments to suppliers and out standings. | | |
| **Module 3** | **Economic Analysis** | **Hrs. 6** |
| Cost implication to different forms of construction and maintenance and maintenance and replacement lives of material, Installation and running cost of services, Capital investment in project, Cost analysis by traders and by functional element, Cost planning techniques, Cost control during design and Construction, Depreciation, Various Appraisal Criteria Methods. Break-even analysis, Cash flow analysis, Risk Analysis and Management Practice, Role of Lender's Engineer. | | |
| **Module 4** | **Financial Planning and Budgeting** | **Hrs. 6** |
| Long term finance planning, Stock, Borrowings, Debentures, Loan Capital, Public Deposit, Dividend Policies, Bonus Shares, Market value of shares, Reserves, Over and under capitalization. | | |

| | | |
|---|---|---|
| Budget: Budgetary control system. Types of budgets, Procedure for master budgets, Budget manual, Cash now forecast. | | |
| **Module 5** | **Corporate Finance & Construction Accounts** | **Hrs. 8** |
| Corporate tax planning, Public policies on ICRA grading of exchange, World financial market, Role of financing institutes in Construction, CIDC- grading of construction entities, Venture Capital Financing- Indian Venture Capital scenario, SEBI regulation, Problems of expansion and merger of companies.<br>Accounting process, preparation of profit and loss account and balance sheet as per the companies Act, 1956, preparation of contract accounts for each project, methods of recording and reporting site accounts between project office and head office, Ratio Analysis, Escrow Account for PPP Project. | | |

| **Guidelines for Assignments:** | |
|---|---|
| **1** | The candidate shall perform minimum Six assignments consisting theoretical as well as numerical aspects of the Course. |

| **Text Books:** | |
|---|---|
| **1** | Prasanna Chandra, Projects planning, Analysis Selection, Implementation and Review , Tata McGraw Hill, New Delhi |
| **2** | Oliver, Lianabel, The cost management toolbox, A Managers guide to controlling costs and boosting profits, Tata McGraw Hill |
| **3** | Singh H., Construction Management and Accounts, Tata McGraw Hill, New Delhi. |
| **4** | Cormican D., Construction Management, Planning and finance, Constru. Press, London. |
| **5** | Brealey R. A., "Principles of Corporate Finance, Tata McGraw Hill, New Delhi. |

| **Reference Books:** | |
|---|---|
| **1** | Leland T. Blank., Anthony Tarquin, Engineering Economy, McGraw Hill. |
| **2** | David Bedworth, Sabah Randhawa, Engineering Economics ,McGraw Hill |
| **3** | Bruggeman., Fishr, Real Estate, Finance and investment, McGraw Hill. |
| **4** | Block Hirt, Foundations of Financial Management, McGraw Hill. |
| **5** | Burner, Case studies in finance, McGraw Hill |

| SUBJECT CODE | Construction Safety | CREDITS |
|---|---|---|
| MCVCTMPCT 202 | | 3 |

| Teaching Work Load/week( Hrs.) | | | | Examination Scheme( Marks) | | | |
|---|---|---|---|---|---|---|---|
| Theory | Tutorial | Laboratory | Total | ISE | MSE | ESE | Total |
| 3 | - | - | 3 | 20 | 20 | 60 | 100 |

| **Course Outcomes: Students will be able to** | |
|---|---|
| CO1 | Learn about the causes construction accidents. |
| CO2 | Understand the different construction safety management. |
| CO3 | Learn about the safety measures in civil structures. |
| CO4 | Study and understand the various safety concepts, requirements applied to construction Project |
| CO5 | Learn about the safety training program and safety polices. |

## Course Contents

| **Module 1** | **Construction Accidents** | **Hrs. 8** |
|---|---|---|

Accidents and their Causes, Human Factors in Construction Safety, Costs of Construction Injuries, Occupational and Safety Hazard Assessment, Legal Implications Accident Prevention: Principles of accident prevention; job safety analysis; fault tree analysis; accident management.

| **Module 2** | **Construction Safety Management** | **Hrs. 8** |
|---|---|---|

Introduction to Construction Safety and Safety Technology Government's policy in industrial safety, safety & health legislation in India, Construction Sites (Safety) Regulations, Codes of practice, 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.

| **Module 3** | **Safety in Typical Civil Structures** | **Hrs. 6** |
|---|---|---|

Safety of accidents on various construction sites such as buildings, dams, tunnels, bridges, roads, water Tanks, Retaining walls, etc. safety at various stages of construction, Critical factors for failure, Prevention of accidents, Regular Inspection and monitoring, Safety measures..

| **Module 4** | **Safety in Use of Construction Equipment & Designing for Safety** | **Hrs. 6** |
|---|---|---|

Vehicles, cranes, hoist and lifts etc., Safety of scaffolding and working platforms, Safety in Erection and closing operation, Safety while using electrical appliances, Explosives.

Workplace ergonomics, first aid and emergency preparedness, Safety Culture, Safe Workers, Safety and First Line Supervisors, Safety and Middle Managers, Top Management Practices, Company Activities and Safety, Safety Personnel, Sub contractual Obligation, Project Coordination and Safety Procedures , Workers Compensation.

| Module 5 | Safety Training Programmes and Safety Policies |
|---|---|
| Construction Safety Management and Accident Prevention Safety training, safety policy, Safety Meetings, safety committees, safety inspection, safety audit, reporting accidents and dangerous occurrences, Safety Incentives. Problem areas in Construction Safety, Elements of an Effective Safety Programme , Job-Site Safety Assessment, , Methods, equipment, and training provided on any ISO approved Construction Company, safety in office. | |

| Guidelines for Assignments: | |
|---|---|
| 1 | The candidate shall perform minimum Six assignments consisting theoretical as well as numerical aspects of the Course. |

| Text Books: | |
|---|---|
| 1 | Safety Management in Construction Industry – A manual for project managers. NICMAR Mumbai. |
| 2 | Davies V. S. Thomasin ,K, Thomas, Construction Safety Handbook – (Telford, London.) |
| 3 | ISI for safety in Construction – Bureau of Indian Standards. |
| 4 | Giri maldi and Simonds, Safety management – (AITBS, New Delhi) |
| 5 | Construction Safety Manual - Published by National Safety Commission of India |

| SUBJECT CODE | (Program Elective-III ) Architecture and Town planning | CREDITS |
|---|---|---|
| MCVCTMPET 203A | | 3 |

| Teaching Work Load/week( Hrs.) | | | | Examination Scheme( Marks) | | | |
|---|---|---|---|---|---|---|---|
| Theory | Tutorial | Laboratory | Total | ISE | MSE | ESE | Total |
| 3 | - | - | 3 | 20 | 20 | 60 | 100 |

| Course Outcomes: Students will be able to | |
|---|---|
| CO1 | Understand the principles of architecture and the role of urban planners in integrating function and aesthetics in design. |
| CO2 | Learn objectives, stages, and regulations of town planning with a focus on urban and rural development. |
| CO3 | Apply principles of environmental art and design in urban landscapes with emphasis on materials, |
| CO4 | Develop master planning strategies incorporating zoning, density, safety, and urban financing while adhering to municipal acts |
| CO5 | Design for various climatic conditions using passive and active energy controls, and analyze urban renewal and site planning through case studies of planned towns. |

## Course Contents

| Module 1 | Architecture Design | Hrs. 6 |
|---|---|---|
| Introduction history & concept of Architecture, Principles of architecture, an analysis, integration for function and aesthetics, Role of "urban planner and architect" in planning and designing, Architectural composition and elements | | |

| | | |
|---|---|---|
| of design. | | |
| **Module 2** | **Town Planning** | **Hrs. 8** |
| Objectives, scheme, planning for transportation and utility services, stages in town development, Urban renewal & planning for rural development, Surveys-site Analysis, Development control, zoning regulations, Layout regulations, Urban planning standards, green belt. | | |
| **Module 3** | **Landscaping** | **Hrs. 6** |
| Objectives, scope, Environmental art and design for urban landscape, objectives, principles, elements, material, soft landscaping, hard landscaping, and garden styles: modern and historical, water body conservation and creation, Layout design concepts, Plant characteristics & planting design, Environmental considerations in landscape planning. | | |
| **Module 4** | **Concept of Master Plan & Town planning legislations and municipal acts** | **Hrs. 6** |
| Structure plan, detailed town planning scheme and action plan, Estimating future needs, planning standards for different land use allocation for commerce, industries, public amenities, open areas etc, Planning concepts-application of anthropometry and space standards, Interrelationships of functions, planning standards for density distributions, density zones, Safety standards, planning standards for traffic network, standard of roads, Building Rules & Regulations, Integration of building services, Plan implementation. Planning of control development schemes, urban financing, land acquisition, slum clearance schemes, and pollution control aspects and planning agencies for various levels of planning, their organization and purpose, CIDCO-MHADA-MIDC. | | |
| **Module 5** | **Climate Responsive Design and Site Planning** | **Hrs. 8** |
| Factors that determine climate, Characteristics of climate types, Design for various climate types, Passive and active energy controls. Urban renewal- conservation, Issues related to site choice, unwanted site. Study of planned towns like New Mumbai, Gandhinagar, Chandigarh, New Delhi. | | |

| **Guidelines for Assignments:** | |
|---|---|
| **1** | The candidate shall perform minimum Six assignments consisting theoretical as well as numerical aspects of the Course. |

| **Text Books:** | |
|---|---|
| **1** | G. K .Hiraskar, “Town planning”, Dhanpatrai Publication 2002 |
| **2** | S. Rangwala, “Town planning”, Charotar Publishing House Pvt. Ltd., 2009 |
| **3** | G Muthu, Shobha, Mohan, “Principles of Architecture” 2006 MRTP act 1966 |
| **4** | UDPFI guidelines, ministry of urban affairs and employment, Govt. & India. |
| **5** | Koenigsbeger, “Manual of tropical housing and building”, Universities Press (India) |

| Reference Books: | |
|---|---|
| 1 | Sustainable Building - Design Manual: Sustainable Building Design Practices, 2009 TERI |
| 2 | Shah, Kale, Patki, "Building Drawing", Tata McGraw-Hill Education, 5th edition |
| 3 | Gevorkian, "Green Buildings", Mc Graw hill. |
| 4 | Haselbach, "The engineering guide to LEED", new construction-sustainable construction for engineers, The McGraw-Hill, 2008. |
| 5 | Satish Chandra Agarwala , "Architecture & Town Planning", Dhanpat Rai & Co (P) Ltd. |

| SUBJECT CODE | (Program Elective-III ) Operation Research | | | | | | CREDITS |
|---|---|---|---|---|---|---|---|
| MCVCTMPET 203B | | | | | | | 3 |
| Teaching Work Load/week( Hrs.) | | | | Examination Scheme( Marks) | | | |
| Theory | Tutorial | Laboratory | Total | ISE | MSE | ESE | Total |
| 3 | - | - | 3 | 20 | 20 | 60 | 100 |

| Course Outcomes: Students will be able to | |
|---|---|
| CO1 | Understand the theoretical workings of the simplex method, the relationship between a linear program and its dual, including strong duality and complementary slackness. |
| CO2 | Perform sensitivity analysis to determine the direction and magnitude of change of a model's optimal solution as the data change. |
| CO3 | Solve specialized linear programming problems like the transportation and assignment problems; solve network models like the shortest path, minimum spanning tree, and maximum flow problems. |
| CO4 | Understand the applications of integer programming. |
| CO5 | Understand the applications of a queuing model and compute important performance measures |

## Course Contents

| Module 1 | Introduction to Operations Research | Hrs. 6 |
|---|---|---|
| Introduction, Use of Operations Research in Civil Engineering and Managerial Decision making process, Structure of the Mathematical Model, Limitations of Operations Research, Identification of civil engineering systems and their methods of analysis, Introduction to Optimization Techniques and their application in Engineering Planning, Design and Construction, Multivariable optimization with and without constraints, Gradient vector and Hessian Matrix, Gradient techniques, steepest ascent/decent technique, Newton's Method, Lagrange Multiplier Technique, Objective function and constraints, convex and concave functions, regions and sets | | |
| **Module 2** | **Linear Programming** | **Hrs. 8** |
| Introduction, Linear Programming Problem, Requirements of LPP, Mathematical Formulation of LPP, Graphical | | |

| | | |
|---|---|---|
| method, Simplex Method Penalty Cost Method or Big M-method, Two Phase Method, duality, Sensitivity Analysis, Civil engineering applications. | | |
| **Module 3** | **Transportation Problem** | **Hrs. 6** |
| Formulation, solution, unbalanced Transportation problem, finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: the stepping stone method and MODI method. | | |
| **Module 4** | **Integer, Dynamic and Non-Linear programming** | **Hrs. 6** |
| Integer programming Introduction, Types of Integer Programming Problems, Gomory's cutting plane Algorithm, Branch and Bound Technique, Introduction to Decomposition algorithms.<br>Dynamic programming Multi stage decision processes, Principle of optimality, Recursive equation, Application of D.P., Decision theory.<br>Non-Linear programming: Single variable unconstrained optimization –Local & Global optima, Uni-modal Function- Sequential Search Techniques: Dichotomous, Fibonacci, Golden Section methods. | | |
| **Module 5** | **Simulation and Queuing Theory and Game Theory** | **Hrs. 8** |
| Introduction, Methodology of Simulation, Basic Concepts, Simulation Procedure, Application of Simulation Monte-Carlo Method: Introduction, Monte- Carlo Simulation, Applications of Simulation, Advantages of Simulation, Limitations of Simulation.<br>Queuing Theory, Simulation, Sequencing model, n jobs through 2, 3 and M machines, Competitive games, rectangular game, saddle point, minimax, maximin method of optimal strategies, value of the game. Solution of games with saddle points, dominance principle, Rectangular games without saddle point – mixed strategy for 2 X 2 games. | | |

| **Guidelines for Assignments:** | |
|---|---|
| **1** | The candidate shall perform minimum Six assignments consisting theoretical as well as numerical aspects of the Course. |

| **Text Books:** | |
|---|---|
| **1** | Taha, H.A. "Operations Research - An Introduction", Prentice Hall, (7th Edition), 2002. |
| **2** | Ravindran, A, Phillips, D. T and Solberg, J. J. "Operations Research: Principles and Practice", John Willey and Sons, 2nd Edition, 2009. |
| **3** | Hiller, F. S. and Liebermann, G. J. "Introduction to Operations Research", Tata McGraw Hill, 2002. |
| **4** | S. D. Sharma, Operations Research, KedarNath Ram Nath-Meerut. |
| **5** | KantiSwarup, P. K. Gupta and Man Mohan, Operations Research, Sultan Chand & Sons |

| **Reference Books:** | |
|---|---|
| **1** | Sustainable Building - Design Manual: Sustainable Building Design Practices, 2009 TERI |

| | |
|---|---|
| **2** | Shah, Kale, Patki, "Building Drawing", Tata McGraw-Hill Education, 5th edition |
| **3** | Gevorkian, "Green Buildings", Mc Graw hill. |
| **4** | Haselbach, "The engineering guide to LEED", new construction-sustainable construction for engineers, The McGraw-Hill, 2008. |
| **5** | Satish Chandra Agarwala , "Architecture & Town Planning", Dhanpat Rai & Co (P) Ltd. |


| SUBJECT CODE | (Program Elective-III ) | CREDITS |
|---|---|---|
| MCVCTMPET 203C | Value Engineering and Valuation | 3 |

| Teaching Work Load/week( Hrs.) | | | | Examination Scheme( Marks) | | | |
|---|---|---|---|---|---|---|---|
| Theory | Tutorial | Laboratory | Total | ISE | MSE | ESE | Total |
| 3 | - | - | 3 | 20 | 20 | 60 | 100 |

| **Course Outcomes: Students will be able to** | |
|---|---|
| CO1 | Understand the concept and importance of value Engineering |
| CO2 | Learn the job planning. |
| CO3 | Understand the concept of function analysis. |
| CO4 | Learn value analysis and management. |
| CO5 | Use of Life cycle costing for the construction project |

## Course Contents

| **Module 1** | **Value** | **Hrs. 6** |
|---|---|---|
| Meaning of value, basic and secondary functions, factor contributing to value such as aesthetic, ergonomic, technical, economic etc., Difference between value engineering, value analysis & value management, Habits, roadblocks, attitudes & their relevance in value engineering. | | |
| **Module 2** | **Job Plan** | **Hrs. 8** |
| Definition & Terms related to Value Engineering Job Plan, Various versions of job plan, Phases involved in job plan. | | |
| **Module 3** | **Function Analysis** | **Hrs. 6** |
| Function- Definition, Role of function in achieving value, Types of function, Function Analysis System Techniques (FAST), Graphical function Analysis | | |
| **Module 4** | **Value Analysis** | **Hrs. 6** |
| Principles of value analysis, Benefits & applications of value analysis, Methods for improving the effectiveness of value analysis. | | |
| **Module 5** | **Life cycle costing and Valuation** | **Hrs. 8** |
| Life cycle costing, Forecasting of Capital as well as operating & maintenance costs, time value, present worth analysis, DCF methods, ROR analysis, sensitivity analysis, Different methods of performing value engineering . Types of value, purposes of valuation factors affecting value, Different methods of valuation for different types of | | |

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|---|
| assets such as land and building, horticulture, historical places, Valuation Report: Valuation Report, contents, standard formats, Case study of any one report. |

| **Guidelines for Assignments:** | |
|---|---|
| **1** | The candidate shall perform minimum Six assignments consisting theoretical as well as numerical aspects of the Course. |

| **Text Books:** | |
|---|---|
| **1** | O. P. Khanna Industrial Engg. & Mgt., Dhanpat Rai Publ. |
| **2** | T. R. Banga, S. C. Sharma Industrial Organization & Engg. Economics, Khanna Publ. |
| **3** | B.N. Dutta, Estimating and Costing in Civil Engineering: Theory and Practice Published S. Dutta & Company, Lucknow. |
| **4** | M. Chakraborty, Estimating, Costing Specifications & valuation in Civil Engineering Published By: Author. |
| **5** | G. S .Birdie Estimating and Costing |

| **Reference Books:** | |
|---|---|
| **1** | Rangwala, Estimating and Costing , Charotar Publishing House |
| **2** | P. T. Joglekar, Practical Information for Quantity Surveyors, Property valuers, Architects Engineers and Builders, Pune Vidyarthi Griha Prakashan, 2008 reprint |
| **3** | Gevorkian, "Green Buildings", Mc Graw hill. |
| **4** | Haselbach, "The engineering guide to LEED", new construction-sustainable construction for engineers, The McGraw-Hill, 2008. |
| **5** | Satish Chandra Agarwala , "Architecture & Town Planning", Dhanpat Rai & Co (P) Ltd. |

| SUBJECT CODE | (Program Elective-IV ) | CREDITS |
|---|---|---|
| MCVCTMPET 204A | Resource Management | 3 |

| Teaching Work Load/week( Hrs.) | | | | Examination Scheme( Marks) | | | |
|---|---|---|---|---|---|---|---|
| Theory | Tutorial | Laboratory | Total | ISE | MSE | ESE | Total |
| 3 | - | - | 3 | 20 | 20 | 60 | 100 |

| **Course Outcomes: Students will be able to** | |
|---|---|
| CO1 | Understand the resource requirements of different kinds of civil engineering projects. |
| CO2 | Know different techniques of classification and codification of materials. They will be able to understand the purchase and procurement procedures and get acquainted with the concept of MRP, EOQ, JIT, MMS, QC, etc. |
| CO3 | Understand the different kinds of equipments and knowledge gained will help them to make optimum utilization of equipments on construction site. |
| CO4 | Realize the importance of recruiting and retaining the relevant, enthusiastic and hardworking staff |

| | |
|---|---|
| CO5 | Understand the concepts, aspects, techniques and practices of the human resource management. |

## Course Contents

| Module 1 | Materials Management | Hrs. 6 |
|---|---|---|
| Importance of materials management and its role in construction industry-scope, objectives and functions, integrated approach to materials management, Role of materials manager. | | |
| **Module 2** | **Material Planning and Analysis** | **Hrs. 8** |
| Classification and Codification of materials of construction, ABC analysis-Procedure and its use, Standardization in materials and their management, Procurement, identification of sources of procurement, vendor analysis, Vendor analysis concept of (MRKP) Material requirement planning, planning, purchase procedure, legal aspects. | | |
| **Module 3** | **Inventory Management & Materials Management Systems** | **Hrs. 6** |
| Inventory Control techniques. EOQ, Advantages and limitation of use of EOQ, Periodic ordering, order point control, safety stock, stock outs, application of ABC analysis in inventory control, Stores Management: Receipt and inspection, care and safety in handling, loss on storage, wastage, Bulk purchasing, site layout and site organization, scheduling of men, materials and equipment.<br>**Applications of MMS**<br>Materials Management Systems in materials planning, procurement, inventory, control, cost control etc | | |
| **Module 4** | **Equipment Management** | **Hrs. 6** |
| Working out number of construction equipment required based on the individual equipment work cycle, and based on the total time available and quantum of work, working out the total hourly cost and the cost per unit of item for the various construction machinery, Concept of equipment log book, Concept of equipment selection based on optimal used. | | |
| **Module 5** | **Human Resource Development** | **Hrs. 8** |
| Flow diagram of human resource development and human resource management, Training, competency development, capacity building of resources required at grass root level and at the managerial level in construction. | | |

| **Guidelines for Assignments:** | |
|---|---|
| **1** | The candidate shall perform minimum Six assignments consisting theoretical as well as numerical aspects of the Course. |

| **Text Books:** | |
|---|---|
| **1** | K. S. Menon, Purchasing and Inventory Control , Wheeler Publication |
| **2** | Dr. Mahesh Verma, Construction equipment planning and applications |
| **3** | Peurifoy, Construction planning, equipment and methods, Tata McGraw Hill pub. |
| **4** | Biswajeet Pattanayak, Human Resource Management |
| **5** | Bohlander & Snell, Managing Human Resources |

| Reference Books: | |
|---|---|
| 1 | Sustainable Building - Design Manual: Sustainable Building Design Practices, 2009 TERI |
| 2 | Shah, Kale, Patki, "Building Drawing", Tata McGraw-Hill Education, 5th edition |
| 3 | Gevorkian, "Green Buildings", Mc Graw hill. |
| 4 | Haselbach, "The engineering guide to LEED", new construction-sustainable construction for engineers, The McGraw-Hill, 2008. |
| 5 | Satish Chandra Agarwala , "Architecture & Town Planning", Dhanpat Rai & Co (P) Ltd. |

| SUBJECT CODE | (Program Elective-IV ) Building Environment and Services | | | | | | CREDITS |
|---|---|---|---|---|---|---|---|
| MCVCTMPET 204B | | | | | | | 3 |
| Teaching Work Load/week( Hrs.) | | | | Examination Scheme( Marks) | | | |
| Theory | Tutorial | Laboratory | Total | ISE | MSE | ESE | Total |
| 3 | - | - | 3 | 20 | 20 | 60 | 100 |

| Course Outcomes: Students will be able to | |
|---|---|
| CO1 | Understand the important of Energy and Conservation of energy in facility design. |
| CO2 | Outline the Principles and objectives of Energy Management and Energy Auditing. |
| CO3 | Describe the technologies, codes and policies for energy conservation in buildings |
| CO4 | Design of energy efficient buildings and environment friendly building. |
| CO5 | Explain the Energy Saving Opportunities in Various Building facilities and Services |

## Course Contents

| Module 1 | Acoustics and Lighting | Hrs. 6 |
|---|---|---|
| Acoustical Designs, Noise and its control, Natural and artificial Light in Building, Lighting, Measurement, Design of Lighting system | | |
| **Module 2** | **Material Planning and Analysis** | **Hrs. 8** |
| Thermal properties of buildings, Thermal insulation and insulating material, Thermal design of enclosures, Thermal environment inside building, cooling & heating loads, Centralized Systems of air-conditioning. | | |
| **Module 3** | **Electrical Services** | **Hrs. 6** |
| Electric wiring system in building, conductor, cable & conduits, Elevators, Escalators and conveyer, Design, Type, Location, bye- laws etc | | |
| **Module 4** | **Water Supply Systems** | **Hrs. 6** |
| Domestic and commercial Hot water and water supply system for multi-storeyed buildings, Swimming | | |

| | | |
|---|---|---|
| pools-Design criteria, Springboards, pressure filters for recirculation, maintenance.<br>Drainage system: Nature of Drainage phenomenon, Ant siphon & vent piping - Installation, pipe joinery, External drainage System in building, Design aspects of Sewage Treatment Plants. | | |
| **Module 5** | **Fire Fighting in Buildings & Other services and Approvals** | **Hrs. 8** |
| Controlling features in architectural planning Norms for fire prevention and mitigation measures, Fire rating of materials, Fire control devices.<br>Gas services & distribution piping, Roof water harvesting & water conservation, Approval of authorities for water supply. | | |

| **Guidelines for Assignments:** | |
|---|---|
| **1** | The candidate shall perform minimum Six assignments consisting theoretical as well as numerical aspects of the Course. |

| **Text Books:** | |
|---|---|
| **1** | National Building code, Bureau of Indian standard |
| **2** | V .O.Kusen &C.M.Harris, Acoustical designing in Architecture, John.Wiley & Son. |
| **3** | R. L. Suri, Acoustic designing & practice, Asia Publishing House. |
| **4** | B. Govoni, Main climate & Architecture, Elsvire Publishing co |
| **5** | J. P Van Stratten, Thermal Performance of Building, Elsvier Publishing Co. |

| **Reference Books:** | |
|---|---|
| **1** | Functional requirement of building (other than Industrial Building), BIS Handbook |

| SUBJECT CODE | (Program Elective-IV ) | CREDITS |
|---|---|---|
| MCVCTMPET 204C | Risk Analysis and Decision Making | 3 |

| Teaching Work Load/week( Hrs.) | | | | Examination Scheme( Marks) | | | |
|---|---|---|---|---|---|---|---|
| Theory | Tutorial | Laboratory | Total | ISE | MSE | ESE | Total |
| 3 | - | - | 3 | 20 | 20 | 60 | 100 |

| **Course Outcomes: Students will be able to** | |
|---|---|
| CO1 | Understand the important of Energy and Conservation of energy in facility design. |
| CO2 | Outline the Principles and objectives of Energy Management and Energy Auditing. |
| CO3 | Describe the technologies, codes and policies for energy conservation in buildings |
| CO4 | Design of energy efficient buildings and environment friendly building. |
| CO5 | Explain the Energy Saving Opportunities in Various Building facilities and Services |

# Course Contents

| Module 1 | Introduction to Risk Management | Hrs. 6 |
|---|---|---|
| Importance of risk, development of risk management system, Identifying risk events, cost of risk, types of risk and classification, Benefits of risk management, responsibilities of those involved in risk management, Risk management standards, decision making strategies effects of tax laws, government rulings, conflict resolution, money, time and technical risks, Risks in the context of global project teams. | | |
| **Module 2** | **Risk Analysis and Management for Projects (RAMP)** | **Hrs. 8** |
| Probability distribution, Stages in Investment life cycle, Determination of NPV and its standard deviation for perfectly co-related, moderately co-related and uncorrelated cash. | | |
| **Module 3** | **Risk Analysis Techniques** | **Hrs. 6** |
| Sensitivity analysis, Uncertainty, cost factors and benefit factors, Scenario analysis, 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, Entrepreneurial risks, pure risks, Contract review and legal conflicts. | | |
| **Module 4** | **Risk Mitigation & Policies** | **Hrs. 8** |
| By elimination, reducing, transferring, avoiding, absorbing or pooling, Residual risk, mitigation of unqualified risk, Coverage of risk through CIDC's .<br>Actuarial Society of India programs: 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), Transit Insurance policy (LOPCE) Loss of performance of construction equipment policy. | | |
| **Module 5** | **Risk Management and Internal Control** | **Hrs. 8** |
| Internal audit works, control systems, Auditing risk management, setting up internal audit function | | |

| **Guidelines for Assignments:** | |
|---|---|
| **1** | The candidate shall perform minimum Six assignments consisting theoretical as well as numerical aspects of the Course. |

| **Text Books:** | |
|---|---|
| **1** | National Building code, Bureau of Indian standard |
| **2** | V .O.Kusen &C.M.Harris, Acoustical designing in Architecture, John.Wiley & Son. |
| **3** | R. L. Suri, Acoustic designing & practice, Asia Publishing House. |
| **4** | B. Govoni, Main climate & Architecture, Elsvire Publishing co |

| | |
|---|---|
| **5** | Ian Cameron, Raghu Raman Process Systems Risk Management Elsevier Academic Press |

| **Reference Books:** | |
|---|---|
| **1** | Seetharaman, Construction Engineering and Management Umesh Publications |

| SUBJECT CODE | (Open Elective-V) | | | | | | CREDITS |
|---|---|---|---|---|---|---|---|
| MCVCTMOET 205A | Research Methodology | | | | | | 3 |
| Teaching Work Load/week( Hrs.) | | | | Examination Scheme( Marks) | | | |
| Theory | Tutorial | Laboratory | Total | ISE | MSE | ESE | Total |
| 3 | 0 | 0 | 3 | 20 | 20 | 60 | 100 |

| **Course Outcomes: Students will be able to** | |
|---|---|
| CO1 | Understand concept of research, its types, methods, detailed procedure to identify and solve a |
| CO2 | Understand various mathematical techniques useful in research work. |
| CO3 | Understand various sampling techniques useful in research work. |
| CO4 | Understand various techniques for correlating and predicting different parameters with each other |
| CO5 | Design the experiments for research work. |

# Course Contents

| **Module 1** | | **Hrs. 6** |
|---|---|---|
| Introduction, meaning of research, objectives, types and role of scientific and engineering related research in advancing the knowledge, defining a research problem, formulation of a hypothesis, research design and features of good design, methods of data collection, approaches and techniques for data acquisition, processing, analyses and synthesis, Designing a questionnaire, Interpretation of results, Report Writing, Aspects of literature review, Different ways of communication and dissemination of research results. | | |
| **Module 2** | | **Hrs. 6** |
| Descriptive Statistics, Probability and Distribution: Basic statistical concepts, Measures of central tendency and dispersion, Elements of Probability, Addition and multiplication theorems of probability, Examples, probability distributions, Binomial, Poisson and normal distributions. | | |
| **Module 3** | | **Hrs. 6** |
| Sampling Techniques: Random sampling, simple random sampling and stratified random sampling, Non-sampling errors. | | |
| **Module 4** | | **Hrs.6** |
| Correlation and Regression: Product moment correlation coefficient and its properties. Simple linear regression and multiple linear regressions, Statistical Inference: Statistical hypotheses, Error Types, level of | | |

| | | |
|---|---|---|
| significance, Chi-square Test and F distributions. Central limit theorem, Tests for the mean, equality of two means, variance, large sample tests for proportions, Confidence interval. | | |
| **Module 5** | **Approach to conduct Structural Audits** | **Hrs.10** |
| Design of Experiments: Analysis of variance. Data Classification, Completely randomized, randomized block, Factorial experiments, Yates technique<br>Multivariate Data Analysis: Multivariate normal distributions. Mean vector, variance, covariance matrix and correlation matrix, Stepwise regression, Selection of best subject of variables, Classification and discrimination problems, Factor analysis, and Principal component analysis. Data analysis using software's | | |

| **Guidelines for Term Work:** | |
|---|---|
| | Student shall critically read recent three to four journal articles within the broader field of their prospective specializations to identify research and knowledge gaps and accordingly formulate specific research questions. On the basis of these research questions student will retrieve additional relevant information and prepare well-articulated and content rich introductory problem description as well as proposed research methodology notes. The subject teacher and research guide of the student shall assess this jointly. |

| **Text Books:** | |
|---|---|
| **1** | Gupta S. C. and Kapoor V. K, "Fundamentals of Mathematical Statistics", Sultan Chand & Company New Delhi. |
| **2** | Gupta S. C. and Kapoor V. K, "Fundamentals of Applied Statistics", Sultan Chand & Com. N.Delhi. |
| **3** | Montogomery D. C., "Probability and Applied Statistics for Engineers", Wiley Int.Student Edition |
| **4** | Walpole Ronald E, Myers Raymond H and Myers Sharon L, "Probability & Statistics for Engineers and Scientists", 6thEdition, Prentice Hall. |
| **5** | Ross S. M., "Introduction to Probability and Statistics for Engineers and Scientists", 3rd Edi, Elsevier |

| **Reference Books:** | |
|---|---|
| **1** | Johnson R. and Wichern, "Applied Multivariate Statistical Analysis", 3rd Edi, Prentice Hall India |
| **2** | Douben K. J., "Research Methodologies – Principles and Guidelines of Applied Scientific Research", UNESCO-IHE Lecture Notes LN0317/06/01, Delft, the Netherlands. |
| **3** | Holtom D. and E. Fisher, "Enjoy Writing Your Science Thesis - a Step by Step Guide to Planning and Writing Dissertations and Theses for Undergraduate and Graduate Science Students", Imperial College Press. ISBN 1-86094-207-5, London, UK. |
| **4** | Kumar R., "Research Methodology- a Step-by-step Guide for Beginners", Sage Publi.. ISBN 0-7619-6213-1. London, UK. |
| **5** | Johnson R. and Wichern, "Applied Multivariate Statistical Analysis", 3rd Edi, Prentice Hall India |

| SUBJECT CODE | (Open Elective-V) | CREDITS |
|---|---|---|
| MCVCTMOET 205B | Infrastructure Development | 3 |

| Teaching Work Load/week( Hrs.) | | | | Examination Scheme( Marks) | | | |
|---|---|---|---|---|---|---|---|
| Theory | Tutorial | Laboratory | Total | ISE | MSE | ESE | Total |
| 3 | 0 | 0 | 3 | 20 | 20 | 60 | 100 |

| **Course Outcomes: Students will be able to** | |
|---|---|
| CO1 | Understand the fundamentals of wave propagation in soil media. |
| CO2 | Apply theory of vibrations to solve dynamic soil problems & to calculate the dynamic properties of |
| CO3 | Analyze the behaviour of a machine foundation resting on the surface and embedded foundation. |
| CO4 | Analyze the block foundation under different modes of vibrations. |
| CO5 | Understand the principles of design of foundations for reciprocating and impact machines as per IS |

# Course Contents

| **Module 1** | **Construction Industry** | **Hrs. 6** |
|---|---|---|
| Nature, characteristics, size and structure, Role of infrastructure development in employment generation and improving of the National economy. | | |
| **Module 2** | **Infrastructure Policies and Agencies** | **Hrs. 6** |
| Indian government policy, Five year plan of government, Various Agencies associated with infrastructure development in India as regards various sectors. | | |
| **Module 3** | **Status of Infrastructure Development in India** | **Hrs. 6** |
| Roads and buildings, communication, water supply, irrigation, power energy sectors, ports and aviation, health and educational services, rural development.<br>Issues related with infrastructure development, Government sector management, public sector management, private sector management. | | |
| **Module 4** | **Funding and Consultant** | **Hrs.6** |
| Funding and managing infrastructure projects, role, and responsibility of project management consultants. | | |
| **Module 5** | **Project Development** | **Hrs.10** |
| BOT projects, PPP projects, related to role of government, concern Construction Company, benefits and limitations | | |

| **Guidelines for Assignments:** | |
|---|---|
| | The candidate shall perform minimum six assignments consisting theoretical as well as numerical aspects of the Course. |

| Text Books: | |
|---|---|
| **1** | Rakesh Mohan, India Infrastructure Report. |
| **2** | Infrastructure Today – Magazine. |
| **3** | Document of five year plans, published by Govt. of India. |
| **4** | CE & CR Magazine. |

| SUBJECT CODE | PG Laboratory –II | | | | | | CREDITS |
|---|---|---|---|---|---|---|---|
| MCVCTMELL 206 | | | | | | | 2 |
| Teaching Work Load/week( Hrs.) | | | | Examination Scheme( Marks) | | | |
| Theory | Tutorial | Laboratory | Total | ISE | MSE | ESE | Total |
| 0 | 0 | 4 | 2 | 25 | -- | 25 | 50 |

# Course Contents

| **Laboratory Work: The students are expected to perform any three experiments out of list given below and submit report of it.** | |
|---|---|
| 1 | One site visit to study the feasibility aspects, Tendering procedures, accounting systems, funds raising and other financial management aspects, billing procedures etc. associated with on-going major construction work-visit report to be submitted. |
| 2 | Collection and study of Tender notices, tender documents of contract document associated with Civil Engineering works. |
| 3 | Study and use of various computer software s, use in the field associated with Project |
| 4 | Management (MSP or Primavera). |
| 5 | Web based project management |

| SUBJECT CODE | Mini -Project | | | | | | CREDITS |
|---|---|---|---|---|---|---|---|
| MCVCTMELL 207 | | | | | | | 4 |
| Teaching Work Load/week( Hrs.) | | | | Examination Scheme( Marks) | | | |
| Theory | Tutorial | Laboratory | Total | ISE | MSE | ESE | Total |
| 0 | 0 | 8 | 4 | 25 | -- | 25 | 50 |

# Course Contents

**Laboratory Scheme:**

Mini project shall be based on one of the topic chosen in consultation with the supervisor. Mini project may be interdisciplinary nature. Areas of recent techno-management development shall be explored. Research innovations may be considered as prospective areas. Mini project may be related with main project to explore possibilities of continuation further and to study the pre-requisites.

| SUBJECT CODE | History of Construction Technology in India | CREDITS |
|---|---|---|
| MCVCTMELP 208 | | 3 |

| Teaching Work Load/week( Hrs.) | | | | Examination Scheme( Marks) | | | |
|---|---|---|---|---|---|---|---|
| Theory | Tutorial | Laboratory | Total | ISE | MSE | ESE | Total |
| 3 | - | - | 3 | 20 | 20 | 60 | 100 |

| **Course Objectives** | |
|---|---|
| CO1 | To understand the evolution of ancient Indian construction techniques and materials across different historical periods. |
| CO2 | To explore traditional construction materials and their sourcing, processing, and environmental adaptability. |
| CO3 | To analyze the engineering principles, structural systems, and architectural innovations in ancient Indian monuments. |
| CO4 | To examine methods for documenting, preserving, and adapting ancient construction knowledge for modern applications. |

| **Course Outcomes: Students will be able to** | |
|---|---|
| CO1 | Learn historical advancements in construction technology in India. |
| CO2 | Iidentify and evaluate the properties and uses of traditional Indian construction materials. |
| CO3 | Ddevelop skills in analysing structural and architectural principles used in ancient Indian buildings. |
| CO4 | Explain the influence of colonial powers. |
| CO5 | Uunderstand preservation techniques and apply conservation principles to historical structures. |

# Course Contents

| **Module 1** | **Introduction** | **Hrs. 8** |
|---|---|---|
| Evolution of construction techniques through time - Early Indus Valley Civilization, Vedic and Post-Vedic Era, British Raj, Late 20th Century Developments (Materials, Notable Structures, Technology and Techniques). Traditional Construction Materials - Local materials, Techniques for sourcing and processing materials, Material durability and environmental adaptability. Engineering Principles in Ancient Construction. | | |
| **Module 2** | **Construction Techniques of Ancient Structures** | **Hrs. 8** |
| Building Types in Ancient India, Temple Architecture: Techniques and Symbolism, Construction of Forts, Palaces, and Stepwells, Earthquake-Resistant and Sustainable Practices - Damping systems and flexibility for seismic resilience, Sustainability of materials and energy-efficient practices, Examples of earthquake-resistant ancient buildings. | | |
| **Module 3** | **Structural Analysis of Monumental Structures** | **Hrs. 6** |

| | | |
|---|---|---|
| Case Studies in Ancient Structural Engineering, Load-Bearing Structures and Their Stability, Foundation Systems and Their Evolution, Column and Beam Constructions. | | |
| **Module 4** | **Colonial Era Construction and European Influence** | **Hrs. 6** |
| Impact of British, Portuguese, and French influences on construction, introduction of modern materials like steel and concrete, development of railways, bridges, and public infrastructure, influence of European architectural styles on Indian construction | | |
| **Module 5** | **Preservation of Ancient Indian Construction** | **Hrs. 6** |
| Documentation of Ancient Construction Knowledge, Restoration and Conservation Techniques, Impact and Influence of Ancient Techniques on Modern Construction, Practical Applications | | |

| **Text Books:** | |
|---|---|
| **1** | Building Construction and Materials" by Dr. S.K. Duggal |
| **2** | Indian Architecture: Hindu, Buddhist, and Jain" by Percy Brown |
| **3** | Structural Analysis of Historical Constructions" by Paulo B. Lourenço and Francisco Milani |
| **4** | Principles of Structural Stability Theory" by Alexander Chajes |
| **5** | Conservation of Architectural Heritage" by C.A. Brebbia and R. Laing |

| **Reference Books:** | |
|---|---|
| **1** | Colonial Modernities: Building, Dwelling and Architecture in British India and Ceylon" by Peter Scriver and Vikramaditya Prakash |
| **2** | An Encyclopaedia of Indian Archaeology" edited by A. Ghosh |
| **3** | Modern Architecture in India: Post-Independence Perspective" by Jon Lang |

# *Dr. Babasaheb Ambedkar Technological University, Lonere*

## Teaching & Evaluation Scheme for M. Tech. in Civil Engineering with Specialization in Construction Technology and Management

| Sr. No. | Course Code | Course Title | Teaching Scheme | | | Evaluation Scheme | | | | Credit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | ISE | MSE | ESE | Total | |
| **Semester-III** | | | | | | | | | | |
| | | | | | | | | | | |
| 1 | MCVCTMMDP 301 | MOOC/SWAYAM/ NPTEL PLATFORM COURSES/Self Study.(It is desirable to choose one course from each of PE,OE &AE.) | 3 | -- | -- | 20 | 20 | 60 | 100 | 03 |
| 2 | MCVCTMMDP 302 | | 3 | -- | -- | 20 | 20 | 60 | 100 | 03 |
| 3 | MCVCTMHMP 303 | | 3 | -- | -- | 20 | 20 | 60 | 100 | 03 |
| 4 | MCVCTMELP 304 | Seminar-I | -- | -- | 4 | 25 | -- | 25 | 50 | 02 |
| 5 | MCVCTMELP 305 | Project Stage-I | -- | -- | 20 | 50 | -- | 50 | 100 | 10 |
| **TOTAL** | | | **9** | **--** | **24** | **135** | **60** | **255** | **450** | **21** |

| SUBJECT CODE | Multidisciplinary Minor Courses | CREDITS |
|---|---|---|
| MCVCTMMDP 301<br>MCVCTMMDP 302<br>MCVCTMHMP 303 | | 3 |

| Teaching Work Load/week( Hrs.) | | | | Examination Scheme( Marks) | | | |
|---|---|---|---|---|---|---|---|
| Theory | Tutorial | Laboratory | Total | ISE | MSE | ESE | Total |
| 3 | 0 | 0 | 3 | 20 | 20 | 60 | 100 |

# Course Contents

| Sr.No. | Multidisciplinary Minor Courses |
|---|---|
| A | MOOC/SWAYAM/ NPTEL -Project Management and Intellectual Property Rights (Self Study) Student may select this course either from MOOC/SWAYAM/ NPTEL pool or any other approved reputed source. The submission of course completion certificate is mandatory. MCVENEMDT301/302,MCVENEHMT 303 - Institute has to take care of registration of subjects with detailed syllabus in first two weeks of beginning of the semester with exam department of DABATU. |

| SUBJECT CODE | Seminar I | CREDITS |
|---|---|---|
| MCVCTMELP 304 | | 2 |

| Teaching Work Load/week( Hrs.) | | | | Examination Scheme( Marks) | | | |
|---|---|---|---|---|---|---|---|
| Theory | Tutorial | Laboratory | Total | ISE | MSE | ESE | Total |
| 0 | 0 | 4 | 2 | 25 | -- | 25 | 50 |

# Course Contents

| Guidelines for Seminar |
|---|
| Seminar I shall be presented on one of the advanced topics chosen in consultation with the supervisor. Students must study latest literature. The concepts must be clearly understood and presented by the student. The student should use all modern methods of presentation. The student expects minimum 03 presentations within period of semester. A hard copy of the report should be submitted before delivering the seminar. A copy of the report in soft form must be submitted to the Supervisor along with other details, if any. |

| SUBJECT CODE | Dissertation Stage-I | CREDITS |
|---|---|---|
| MCVCTMELP 302 | | 10 |

| Teaching Work Load/week( Hrs.) | | | | Examination Scheme( Marks) | | | |
|---|---|---|---|---|---|---|---|
| Theory | Tutorial | Laboratory | Total | ISE | MSE | ESE | Total |
| 0 | 0 | 20 | 10 | 50 | -- | 50 | 100 |

# Course Contents

| Internship |
|---|
| Students can take Industry Internship along with Dissertation Stage –I. Students must maintain regular reporting with Dissertation supervisor regarding status of Dissertation<br><br>**Dissertation Stage I and Synopsis Approval Presentation:**<br>It is a course requirement under the guidance of faculty Supervisor. PG student from second year is required to do innovative and research oriented applied work related to various theory and laboratory courses. Dissertation work may cover analytical formulation, experimentation or survey based project or combination of these. Student are encouraged to undertake an interdisciplinary type project.<br>**Dissertation Stage I and Synopsis Approval Presentation:**<br>It is a course requirement under the guidance of faculty Supervisor. PG student from second year is required to do innovative and research oriented applied work related to various theory and laboratory courses. Dissertatio work may cover analytical formulation, experimentation or survey based project or combination of these. Studer are encouraged to undertake an interdisciplinary type project.<br>• **Synopsis:** |

It is expected from the student to carry out exhaustive literature survey with consultation of his/her Supervisor fo not less than 15 reputed national, international journal and conference papers. Student should present the Synops Submission Presentation (SSP) with literature survey report to justify about the research gap, innovativeness, applicability, relevance and significance of the work. Student shall undertake project work after approval of synopsis.

- **Dissertation Stage I presentation:**

It is expected that student shall present preliminary results from his/her work during the semester with report as per prescribed format. If student is not showing satisfactory performance, then he/she will be given grace period of 2 weeks. After 2 weeks student will be again evaluated with grade penalty. The student should deliver minimum 02 ISE presentations during semester.

## *Dr. Babasaheb Ambedkar Technological University, Lonere*

### Teaching & Evaluation Scheme for M. Tech. in Civil Engineering with Specialization in Construction Technology and Management

| Sr. No. | Course Code | Course Title | Teaching Scheme | | | Evaluation Scheme | | | | Credit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | ISE | MSE | ESE | Total | |
| **Semester-IV** | | | | | | | | | | |
| 1 | MCVCTMELP 401 | Dissertation Stage- II | -- | -- | 40 | 100 | -- | 100 | 200 | 20 |
| | | **TOTAL** | -- | -- | 40 | **100** | -- | **100** | **200** | **20** |

| SUBJECT CODE | Dissertation Stage-II | | | CREDITS |
|---|---|---|---|---|
| MCVCTMELP 401 | | | | 20 |
| Teaching Work Load/week( Hrs.) | | | | Examination Scheme( Marks) | | | |
| Theory | Tutorial | Laboratory | Total | ISE | MSE | ESE | Total |
| 0 | 0 | 40 | 20 | 100 | -- | 100 | 200 |

## Course Contents

### Dissertation Stage-II

In Project Stage - II, the student shall complete the remaining part of the project, which will consist of the simulation/ analysis/ synthesis/ implementation / fabrication of the proposed project work, work station, conducting experiments and taking results, analysis and validation of results and drawing conclusions.

It is mandatory to publish the paper on the state of the art on the chosen topic in international conference/ journal. The student shall prepare the duly certified final report of project work in standard format for satisfactory completion of the work duly signed by the concerned guide and head of the department/institute.