

I - SEMESTER

| BUILDING MANAGEMENT(STUDIO 1) | | | |
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| Course Code | MCPM101 | CIE Marks | 50 |
| Teaching Hours/Week (L:P:SDA) | 02:05:00 | Viva Marks | 50 |
| Total Hours of Pedagogy | 112 | Total Marks | 100 |
| Credits | 06 | | |
| Course Learning objectives: | | | |
| <ul style="list-style-type: none"> • To get an overview of the site layout and organization. • To know the working principles and operation and maintenance of HVAC, firefighting, and lifts. • To understand the integrated building system • To study the WBS for services and analyze cost estimates. • To study the time schedules for the installation of services in buildings. | | | |
| Module-1 | | | |
| The site (Layout and Organization). Site inputs planning. Site works planning, Temporary construction lighting .Electricity on building site .Winter and Monsoon Construction. Site cost control techniques. Site quality control operations, Quality control of concreting and steel. Improving site productivity .Site accounts. Demolition | | | |
| Teaching-Learning Process | <i>Direct method:</i> Lecture supported by conventional method of Blackboard and chalk to introduce the concept of site organization fundamentals in building services, Discussions, Debate, Industry interactions, and research paper/news paper reading and inferences from the same. | | |
| Module-2 | | | |
| Introduction to the building services, (HVAC, firefighting and vertical transportation) by the faculty and book review. Introduction to NBC and relevant IS codes. | | | |
| Teaching-Learning Process | <i>Direct method:</i> Lecture supported by conventional method of Blackboard and chalk to introduce the concept of HVAC and fire fighting based on NBC and relevant IS codes <i>ICT and Digital support:</i> Video to demonstrate the process of HVAC and fire fighting. Power point presentation to elaborate Modelling of HVAC. <i>Site visit:</i> To understand the installation and other planning parameters. | | |
| Module-3 | | | |
| Case studies and industrial visits related to the building techniques, building services, Installation operation and maintenance, analysing the details. | | | |
| Teaching-Learning Process | <i>ICT and Digital support:</i> Video to demonstrate the Building services .Power point presentation to elaborate different building services and its installation process, operation and maintenance <i>Collaborative and Cooperative learning:</i> Students should work as group work. Compilation of Integrated building services , | | |
| Module-4 | | | |
| Preparation of work breakdown structure and estimates. | | | |
| Teaching-Learning Process | <i>Direct method:</i> Lecture supported by conventional method of Blackboard and chalk to introduce the concept of work breakdown structure and analysis of cost estimates. Discussions, Debate, Industry interactions, and research paper/news paper reading and inferences from the same. <i>ICT and Digital support:</i> Video to demonstrate the process of integrated building system. Power point presentation to elaborate integrated building system. | | |
| Module-5 | | | |

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| Preparation of time schedules related to installation of services in building. | |
| Teaching-Learning Process | <i>Collaborative and Cooperative learning: Students should work as a group and present the compilation of work starting with introduction , Creating activity schedules and estimates.</i> |
| Assessment Details (both CIE and SEE) | |
| <p>The weightage of Continuous Internal Evaluation (CIE) is 50% and for Viva voce is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in Viva is 50% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course if the student secures not less than 50% in the sum total of the CIE (Continuous Internal Evaluation) and Viva-Voce taken together.</p> <p>Continuous Internal Evaluation:</p> <p>CIE marks shall be awarded by a committee comprising of Principal/Dean, PG Course Coordinator/HOD and Guide/Co-guide of the department. The CIE marks awarded for PSC (professional supportive course), shall be based on the progress of the student throughout the semester, presentation skills in seminars and submission of the report.</p> <p>Viva voce Examination:</p> <ol style="list-style-type: none"> 1. The student needs to submit his/her report done throughout the semester, including the data collection for the Viva examination, at least one day prior to the Viva examination to the PG course coordinator/HOD. 2. The Viva-voce will be evaluated by two external examiners appointed by the University along with PG Course coordinator/ guide/ co-guide or an internal examiner. 3. The viva-voce marks awarded for PSC (Professional supportive course), shall be based on the evaluation of report submission, presentation skill and performance in Question-and-Answer session in the ratio 30:10:10. 4. The viva-voce marks list generated is to be signed by both internal and external examiners and submitted to VTU in the sealed cover through the Principal of the institution. | |
| Suggested Learning Resources: | |
| Books | |
| <ol style="list-style-type: none"> 1. Frederick S. Merritt, Jonathan T. Ricketts, Building design and construction Handbook, McGraw-Hill Inc., 5th edition, 1994 2. Fred hall and Roger Greeno, Building Services Handbook, Routledge, 7th edition, 2013 3. M.David Egan, Architectural Acoustics, J. Ross Pub., 2007 4. Gurcharan Singh, Jagdish Singh, Water Supply & Sanitary Engineering, Standard Publishers Distributors, 2007 5. Shri V.K. Jain, Fire Safety in Buildings, New age publishers, 2010 6. BIS, National Building Code 2005, New Delhi, 2005. 7. Heating , ventilation and air conditioning by James E Braumberg | |
| Web links and Video Lectures (e-Resources): | |

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| <p>NPTEL Lecture - Inputs to scheduling: https://youtu.be/psls4kgau8c</p> <p>Work Breakdown Structure in project management https://www.youtube.com/watch?v=9mOXdcgdf_U</p> |
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Skill Development Activities Suggested

- Guest Lecture from expert.
- Case Studies :
To choose building projects (High rise buildings) where scope of services to be learnt is more .

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

| Sl. No. | Description | Blooms Level |
|---------|--|--------------|
| C01 | To understand the techniques of site organization and management | L2 |
| C02 | To understand the working principles and maintenance of HVAC, Firefighting and lifts. | L2 |
| C03 | Students will be able to understand importance and typical services installations inside the building. | L2 |
| C04 | To compile WBS structure for services installation and relevant cost estimate | L4 |
| C05 | To compile time schedules for installation of services in buildings. | L4 |

Program Outcome of the CPM Program:

| Sl. No. | Description | POs |
|---------|---|-----|
| 1 | Acquire outstanding fundamental knowledge in the field of Construction Project Management. | P01 |
| 2 | Encompass the ability to work in collaboration with interdisciplinary teams. | P02 |
| 3 | Demonstrate creativity in the problem-solving process through professional quality graphic presentations and technical drawings. | P03 |
| 4 | Acquire outstanding knowledge & software skills for design, construction, resources management and scheduling & Monitoring of projects. | P04 |
| 5 | Understanding the diverse needs of values and systems of society and providing sustainable solutions. | P05 |
| 6 | Demonstrate design solutions that integrate contextual, social, economic, cultural, ethical, environmental concerns. | P06 |
| 7 | Ability to do independent/option-based research and exploration of advanced and emerging topics. | P07 |
| 8 | Appraise professional standards and ethical responsibilities as a team member. | P08 |

Mapping of COS and POS

| | P01 | P02 | P03 | P04 | P05 | P06 | P07 | P08 |
|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| C01 | H | M | L | H | 0 | H | L | L |
| C02 | H | L | M | L | 0 | 0 | L | 0 |
| C03 | H | L | M | L | 0 | 0 | L | 0 |
| C04 | H | L | M | L | 0 | 0 | L | 0 |
| C05 | H | L | M | L | 0 | 0 | L | 0 |

H - High , M - Medium, L - Low

I-SEMESTER

| PROJECT MANAGEMENT-I | | | |
|---|---|-------------|-----|
| Course Code | MCPM102 | CIE Marks | 50 |
| Teaching Hours/Week (L:P:SDA) | 02:02:00 | SEE Marks | 50 |
| Total Hours of Pedagogy | 64 | Total Marks | 100 |
| Credits | 4 | Exam Hours | 3 |
| Course Learning objectives: | | | |
| <ul style="list-style-type: none"> To study the basic concepts of project management. To know the stakeholder's role in projects and their responsibilities. To study and create project schedules as per concepts of PERT and CPM. To perform project crashing and other planning methodologies. To introduce basic concepts and techniques for monitoring and controlling of projects. | | | |
| Module-1 | | | |
| Introduction to Project, its Stages, and Construction Project management: Project, Organization, Need for management of building/construction projects, Principles and Objectives of Project Management, brief understanding about study areas in Project Management. Types of Construction Projects. Project, program and portfolio management. | | | |
| Teaching-Learning Process | <p>Direct method: The lecture supported by the conventional method of Blackboard and chalk to introduce the concepts. Discussions, Debate, Industry interactions, and research paper/news paper reading and inferences from the same.</p> <p>Blended learning: Power point presentation to elaborate more on key topics/online video's.</p> | | |
| Module-2 | | | |
| BASICS OF PROJECT MANAGEMENT: Project Life Cycle, Types of projects, Phase of the project, project management and its relevance, stakeholders of a project, structure of project organization, management levels, Failures and success of a project. | | | |
| Teaching-Learning Process | <p>Direct method: Lecture supported by conventional method of Blackboard and chalk to introduce the concepts Discussions, Debate, Industry interactions, and research paper/new s paper reading and inferences from the same.</p> <p>ICT and Digital support: Power point presentation to elaborate more on key topics.</p> | | |
| Module-3 | | | |
| ROLES OF PROJECT MANAGER: Roles & Responsibilities of Project/ Construction Managers, Scope Management Construction: Scope Planning, Definition, Verification and Control Project Management Stages: Project planning, project scheduling and project controlling. | | | |
| Teaching-Learning Process | <p>Direct method: Lecture supported by conventional method of Blackboard and chalk to introduce the concepts</p> <p>Blended learning: Power point presentation to elaborate more on key topics.</p> | | |
| Module-4 | | | |
| PROJECT PLANNING& SCHEDULING: Introduction, Time Cost and Resource management, project planning, Work Breakdown Structure (W.B.S.), Planning terminologies, Network Theories CPM, PERT, Project crashing. | | | |

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| Teaching-Learning Process | <p>Direct method: Lecture supported by conventional method of Blackboard and chalk to introduce the concepts</p> <p>Blended learning: Power point presentation to elaborate more on key topics.</p> |
| Module-5 | |
| <p>PROJECT MONITORING AND CONTROL: Introduction, Scope verification & control, Schedule control , Cost control, Quality control, Performance reporting, Risk control and contract administration.</p> | |
| Teaching-Learning Process | <p>Collaborative and Cooperative learning: Students should work on individual work. The research and learning are be shared with the class.</p> <p>Site visits.</p> |
| <p>Assessment Details (both CIE and SEE)</p> <p>The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.</p> <p>Continuous Internal Evaluation:</p> <p>Three Unit Tests each of 20 Marks</p> <ol style="list-style-type: none"> 1. First test at the end of 5th week of the semester 2. Second test at the end of the 10th week of the semester 3. Third test at the end of the 13th week of the semester <p>Two assignments each of 10 Marks</p> <ol style="list-style-type: none"> 4. First assignment at the end of 4th week of the semester 5. Second assignment at the end of 9th week of the semester <p>Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for 20 Marks(duration 01 hours)</p> <ol style="list-style-type: none"> 6. At the end of the 13th week of the semester <p>The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be scaled down to 50 marks</p> <p>Semester End Examination:</p> <p>Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (duration 03 hours)</p> <ol style="list-style-type: none"> 1. The question paper will have ten questions. Each question is set for 20 marks. 2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module. <p>The students have to answer 5 full modules, selecting one full question from each module. Marks scored by the student will be scale down to 50 Marks</p> | |

Suggested Learning Resources:**Books**

1. Association for Project Management, 2012. A PM body of knowledge. Buckinghamshire: Association for Project Management.
2. Guide, A., 2017. Project Management Body of Knowledge (PMBOK®GUIDE). Project Management Institute.
3. Dr. K.G. Krishnamurthy and S. V. Ravindra, 2008. Construction and Project Management.
4. Hendrickson, C., Hendrickson, C.T. and Au, T 1989. Project management for construction: Fundamental concepts for owners, engineers, architects, and builders .Chris Hendrickson.
5. Chris,H.,2003.Project Management for Construction:FundamentalConceptsforOwners,Engineers,ArchitectsandBuilders. Department of Civil and Environmental Engineering.
6. Punmia, B.C. and Khandelwal,K.K.,2002.Project Planning and Control with PERT&CPM. Firewall media.
7. Jha, K.N., 2015.Construction Project Management: Theory and Practice. Pearson Education India.
8. Chitkara, K.K., 1998.Construction project management. Tata McGraw-Hill Education.

Web links and Video Lectures (e-Resources):

NPTEL Lecture

<https://www.youtube.com/watch?v=RQNZWCl6eXI&list=PLBd76GK9sWTwVXm9FIVHOTXXbGY2vZR8z>

NPTEL Lecture

<https://www.youtube.com/watch?v=RjOA7AxOVj8>**Skill Development Activities Suggested**

- Guest Lecture from expert.
- Case Studies :
Visiting construction sites / organization office to understand management techniques followed To manage projects.

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

| Sl. No. | Description | Blooms Level |
|---------|---|--------------|
| C01 | Understand the basic concepts of Project Management. | L2 |
| C02 | Describe the construction project lifecycle and phases. | L2 |
| C03 | Demonstrate the ability to perform project scheduling. | L3 |
| C04 | Develop time schedules for the project. | L5 |
| C05 | Apply risk management strategies to generate reports. | L3 |
| C06 | Predict the delays in project timeline. | L4 |

Program Outcome of the CPM Program:

| Sl. No. | Description | POs |
|---------|---|-----|
| 1 | Acquire outstanding fundamental knowledge in the field of Construction Project Management. | P01 |
| 2 | Encompass the ability to work in collaboration with interdisciplinary teams. | P02 |
| 3 | Demonstrate creativity in the problem-solving process through professional quality graphic presentations and technical drawings. | P03 |
| 4 | Acquire outstanding knowledge & software skills for design, construction, resources management and scheduling & Monitoring of projects. | P04 |
| 5 | Understanding the diverse needs of values and systems of society and providing sustainable solutions. | P05 |
| 6 | Demonstrate design solutions that integrate contextual, social, economic, cultural, ethical, environmental concerns. | P06 |
| 7 | Ability to do independent/option-based research and exploration of advanced and emerging topics. | P07 |
| 8 | Appraise professional standards and ethical responsibilities as a team member. | P08 |

Mapping of COS and POS

| | P01 | P02 | P03 | P04 | P05 | P06 | P07 | P08 |
|------------|----------|----------|----------|----------|----------|----------|----------|----------|
| CO1 | H | 0 | L | 0 | M | H | M | M |
| CO2 | H | H | M | 0 | M | M | M | L |
| CO3 | H | L | L | M | H | L | H | M |
| CO4 | 0 | L | M | H | L | L | M | M |
| CO5 | M | L | M | M | M | M | H | H |
| CO6 | M | M | L | H | H | M | M | M |

H - High , M - Medium, L - Low

I-SEMESTER

| CONTRACT MANAGEMENT | | | |
|--|---|-------------|-----|
| Course Code | MCPM103 | CIE Marks | 50 |
| Teaching Hours/Week (L:P:SDA) | 03:00:01 | SEE Marks | 50 |
| Total Hours of Pedagogy | 48 + 16(SDA) | Total Marks | 100 |
| Credits | 4 | Exam Hours | 3 |
| Course Learning objectives: | | | |
| <ul style="list-style-type: none"> • Introduction to construction contracts. Understanding of Indian contract Act 1872. • To familiarize about forms of contract, procedures for inviting tenders, scrutiny and comparison Of tender documents. • Understanding about conditions of contract, contract pricing, performance and closure. • Introduction to general conditions and special conditions of contract. Understanding model forms of contract. • Introduction to FIDIC contracts, EPC Contracts, Design Build contract. | | | |
| Module-1 | | | |
| CONSTRUCTION CONTRACTS: Indian Contract Act (1872): Definition of the contract as per the ACT. Valid, Voidable, Void contracts, Objectives of the act. Clauses 1 to 75- Contract formation, contract performance, valid excuses for non-performance, Breach of contract, effects of breach-understanding the Clauses and applying them to situations/scenarios on construction projects. | | | |
| Teaching-Learning Process | <p>Direct method: Lecture supported by conventional method of Blackboard and chalk to introduce the concepts. , Discussions, Debate, Industry interactions, and research paper/news paper reading and inferences from the same.</p> <p>Blended learning: Power point presentation and webinars.</p> | | |
| Module-2 | | | |
| CONTRACT FORMATION: Standard forms of contracts, methods of inviting tenders, pre-bid meetings, prequalification system, scrutiny of tenders and comparative statement. | | | |
| Teaching-Learning Process | <p>Direct method : : Lecture supported by conventional method of Blackboard and chalk to introduce the concepts</p> <p>ICT and Digital support: : Power point presentation to elaborate more on key topics.</p> | | |
| Module-3 | | | |
| CONTRACT FORMATION: conditions of contracts, contracts with various stakeholders on a major construction project, contract pricing by the client, project management consultants and the contractor, contract performance, contract correspondence and contract closure. | | | |
| Teaching-Learning Process | <p>Direct method: Lecture supported by conventional method of Blackboard and chalk to introduce the concepts</p> <p>Blended learning: Power point presentation to elaborate more on key topics.</p> | | |
| Module-4 | | | |
| CONTRACT CONDITIONS: a) General condition and Particular conditions, b) Conditions of Ministry of Statistician Program Implementation- Government of India. Model forms of contract. | | | |
| Teaching-Learning Process | <p>Direct method: Lecture supported by conventional method of Blackboard and chalk to introduce the concepts</p> <p>Blended learning: Power point presentation and webinars.</p> | | |

| Module-5 | |
|---|---|
| FIDIC: ICE conditions-Introduction, FIDIC conditions- evolution of FIDIC document, types based on whether design is of employer or contractor, Design & Build contract, EPC contract, short forms of contract- Colour Code. Various conditions of Red Book. | |
| Teaching-Learning Process | <p>Direct method: Lecture supported by conventional method of Blackboard and chalk to introduce the concepts</p> <p>Collaborative and Cooperative learning: Students should work on as individual work. The research and learning to be share with the class.</p> |

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

Three Unit Tests each of 20 Marks

First test at the end of 5th week of the semester

1. Second test at the end of the 10th week of the semester
2. Third test at the end of the 13th week of the semester.

Two assignments each of 10 Marks

3. First assignment at the end of 4th week of the semester
4. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for 20 Marks(duration 01 hours)

5. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be scaled down to 50 marks

Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (duration 03 hours)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.

The students have to answer 5 full modules, selecting one full question from each module. Marks scored by the student will be scale down to 50 Marks.

Suggested Learning Resources:

Books

1. Clough,R.H.,Sears,G.A.,Sears,S.K.,Segner,R.O.andRounds,J.L.,2015.ConstructionContracting:APracticalGuidet o Company Management. John Wiley & Sons.
2. Building and Engineering contracts Law and Practice by P.C. Makranda
3. Digest of Indian Contract Act 1872(2011onwards)
4. Law of contract Part I and Part II,Dr.R.K. Bangia-2005Edition,AllahabadLawAgency
5. Standard General Conditions for Domestic Contracts-2001Edition-Published by Ministry Of Statistics and Program Implementation, Government of India.
6. FIDIC Document (1999).

Web links and Video Lectures (e-Resources):

NPTEL Lecture
<https://www.youtube.com/watch?v=RQNZWCl6eXI&list=PLBd76GK9sWTwVXm9FIVHOTXXbGY2vZR8z>

Web Link
<https://www.udemy.com/course/contracts-management-in-construction-projects/>

Skill Development Activities Suggested

- Guest Lecture from expert.
- Interviews from contract management experts

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

| Sl. No. | Description | Blooms Level |
|---------|--|--------------|
| C01 | Describe the construction contracts and its silent features. | L1 |
| C02 | Explain the methods of inviting tenders, scrutiny and award of contract. | L1 |
| C03 | Summarize and interpret the conditions of contract. | L2 |
| C04 | Describe the contracts framed by the government. | L1 |
| C05 | Interpret and classify the international contracts | L2 |

Program outcome of the CPM program

| Sl. No. | Description | POs |
|---------|---|-----|
| 1 | Acquire outstanding fundamental knowledge in the field of Construction Project Management. | PO1 |
| 2 | Encompass the ability to work in collaboration with interdisciplinary teams. | PO2 |
| 3 | Demonstrate creativity in the problem-solving process through professional quality graphic presentations and technical drawings. | PO3 |
| 4 | Acquire outstanding knowledge & software skills for design, construction, resources management and scheduling & Monitoring of projects. | PO4 |
| 5 | Understanding the diverse needs of values and systems of society and providing sustainable solutions. | PO5 |
| 6 | Demonstrate design solutions that integrate contextual, social, economic, cultural, ethical, environmental concerns. | PO6 |
| 7 | Ability to do independent/option-based research and exploration of advanced and emerging topics. | PO7 |
| 8 | Appraise professional standards and ethical responsibilities as a team member. | PO8 |

Mapping of COS and POS

| | P01 | P02 | P03 | P04 | P05 | P06 | P07 | P08 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| C01 | H | L | M | L | 0 | 0 | L | 0 |
| C02 | H | L | L | L | 0 | 0 | L | 0 |
| C03 | H | L | L | M | 0 | 0 | L | 0 |
| C04 | H | L | L | L | 0 | 0 | L | 0 |
| C05 | H | L | L | L | 0 | 0 | L | 0 |

H – High , M – Medium, L - Low

I-SEMESTER

| ADVANCED MATERIALS AND CONSTRUCTION TECHNIQUES | | | |
|--|--|-------------|-----|
| Course Code | MCPM104 | CIE Marks | 50 |
| Teaching Hours/Week (L:P:SDA) | 02:00:02 | SEE Marks | 50 |
| Total Hours of Pedagogy | 32 +32(SDA) | Total Marks | 100 |
| Credits | 3 | Exam Hours | 3 |
| Course Learning Objectives: | | | |
| <ul style="list-style-type: none"> • Describe the manufacturing, properties and uses cements. Understand its application in construction activities. • Understand the uses and application of specialized concrete. • Introduction to large span structures and methods to construct it. • Introduction to bridges and its basic structural details. • Learning about special structures like silos, chimneys. Its transportation, handling and erection. | | | |
| Module-1 | | | |
| Lime, Pozzolana cement, Raw materials, Manufacturing Process, Properties, and uses. Fibers- metal and synthetic, Properties and applications. Fiber-reinforced plastics, Matrix materials, Fibers organic and synthetic, Properties, and applications. Building materials from agro and industrial wastes, Types of agro wastes, Types of industrial and mine wastes, Properties and applications. Masonry blocks using industrial wastes. Construction and demolition wastes | | | |
| Teaching-Learning Process | <p>Direct method: Lecture supported by conventional method of Blackboard and chalk to introduce the concepts. , Discussions, Debate, Industry interactions, and research paper/news paper reading and inferences from the same</p> <p>Blended learning: Power point presentation and webinars.</p> | | |
| Module-2 | | | |
| Definition & Introduction, General properties, Advantages, Disadvantages, Applications, High density concrete, Shrinkage compensating concrete, Mass concrete, Roller compacted concrete. Light weight concrete, High strength concrete, Ultra-high strength concrete (reactive powder concrete), High workability concrete/Self compacting concrete, Fiber reinforced concrete, Polymer-concrete composites. | | | |
| Teaching-Learning Process | <p>Direct method : : Lecture supported by conventional method of Blackboard and chalk to introduce the concepts</p> <p>ICT and Digital support: : Power point presentation to elaborate more on key topics.</p> | | |
| Module-3 | | | |
| Conceptual understanding of various large span structures; Principles, methods of fast track of construction projects. | | | |
| Teaching-Learning Process | <p>Direct method: Lecture supported by conventional method of Blackboard and chalk to introduce the concepts</p> <p>Blended learning: Power point presentation to elaborate more on key topics.</p> | | |
| Module-4 | | | |
| Bridges, types of construction of special type of bridges such as cable stayed bridge, suspension and prestressed bridge, construction of foundation and super structure. | | | |
| Teaching-Learning Process | <p>Direct method: Lecture supported by conventional method of Blackboard and chalk to introduce the concepts</p> <p>Blended learning: Power point presentation and webinars.</p> | | |

Module-5

Techniques of construction for continuous concreting operation in tall buildings of various shapes and varying sections – cooling towers, silos, chimney – erection techniques of tall structures – erection of articulated structures – aerial transporting, handling, erecting light weight components on tall structures, In-situ pre-stressing in high rise structures. Composite construction of steel and concrete. Rapid construction techniques.

Teaching-Learning Process

Direct method: Lecture supported by conventional method of Blackboard and chalk to introduce the concepts

Collaborative and Cooperative learning: Students should work on as individual work. The research and learning to be share with the class.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

Three Unit Tests each of 20 Marks (duration 01 hour 30 min)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 13th week of the semester.

Two assignments each of 10 Marks

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for 20 Marks(duration 01 hours)

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be scaled down to 50 marks

Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (duration 03 hours)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.

The students have to answer 5 full modules, selecting one full question from each module. Marks scored by the student will be scale down to 50 Marks.

Suggested Learning Resources:

Books

1. S.S.Ataev, "Construction Technology", Mir Publishers
2. P. Dyanchenko & S. Mirotvorsky, "Prefabrication of Reinforced Concrete", Mir Publishers
3. Henrick Nissen, "Industrial Building and Modular Design", Cement Concrete Association, London.
4. R.Chudley, "Construction Technology", (Vol. I to IV) Longman
5. Robert wade Brown, "Practical foundation engineering handbook Graw Hill Publications.
6. Patrick Powers. J., "Construction Dewatering: New Methods and Applications", John Wiley & Sons.
7. Roy Chudley & Roger Greeno, "Advanced Construction Techniques", Pearson Prentice Hall
8. Peurifoy, "Construction Planning, Equipment & Method", Tata Mc Graw Hill Pub.

SankarS, SaraswatiS, "Construction Technology", Oxford University Press

Web links and Video Lectures (e-Resources):

NPTEL Lecture

https://www.youtube.com/watch?v=RSnNrQUTEnY&list=PLyqSpQzTE6M_k_G-Lwpb4UUxYUQ-garG1<https://www.youtube.com/watch?v=2B7DhQvL8kw&list=PLwdnzlV3ogoVGSUhjx4VzW-dGz7DqQFoj>

Web Link

https://onlinecourses.nptel.ac.in/noc19_ce44/preview**Skill Development Activities Suggested**

- Guest Lecture from expert.
- Site visits to major construction sites which have specialized materials and construction techniques.

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

| Sl. No. | Description | Blooms Level |
|---------|---|--------------|
| C01 | Describe the properties of cement and explain its manufacturing process. | L1 |
| C02 | Compare the construction materials and extract the relevant information | L1 |
| C03 | Describe the concepts of long span structures | L1 |
| C04 | Classify different types of special structures and summarize its construction techniques. | L2 |
| C05 | Devise schedules to fast track construction projects. | L4 |

Program Outcomes of the CPM Program

| Sl. No. | Description | POs |
|---------|---|-----|
| 1 | Acquire outstanding fundamental knowledge in the field of Construction Project Management. | PO1 |
| 2 | Encompass the ability to work in collaboration with interdisciplinary teams. | PO2 |
| 3 | Demonstrate creativity in the problem-solving process through professional quality graphic presentations and technical drawings. | PO3 |
| 4 | Acquire outstanding knowledge & software skills for design, construction, resources management and scheduling & Monitoring of projects. | PO4 |
| 5 | Understanding the diverse needs of values and systems of society and providing sustainable solutions. | PO5 |
| 6 | Demonstrate design solutions that integrate contextual, social, economic, cultural, ethical, environmental concerns. | PO6 |
| 7 | Ability to do independent/option-based research and exploration of advanced and emerging topics. | PO7 |
| 8 | Appraise professional standards and ethical responsibilities as a team member. | PO8 |

Mapping of COS and POS

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| C01 | M | L | M | M | L | 0 | M | 0 |
| C02 | H | L | L | L | 0 | L | M | 0 |
| C03 | H | L | L | L | 0 | 0 | L | 0 |
| C04 | H | L | L | L | 0 | 0 | L | 0 |
| C05 | H | M | M | M | 0 | M | L | 0 |

H – High , M – Medium, L - Low

Elective-1

| CONSTRUCTION ENVIRONMENTAL MANAGEMENT | | | |
|---|---|-------------|-----|
| Course Code | MCPM115A | CIE Marks | 100 |
| Teaching Hours/Week (L:P:SDA) | 2:00:02 | Viva Marks | 00 |
| Total Hours of Pedagogy | 48 | Total Marks | 100 |
| Credits | 3 | Exam Hours | --- |
| Course Learning objectives: | | | |
| <ul style="list-style-type: none"> The student will understand the role of EM in construction. Classical EM principles will be emphasized and practical applications for construction managers, contractors, and other construction functions will be described. | | | |
| Module-1 | | | |
| An integrative methodology & Effective prevention at preconstruction stage: Local regulation of CEM. Qualitative analysis of construction pollution. Construction pollution measurements . | | | |
| Teaching-Learning Process | <i>ICT and Digital support: Videos and PPT's to understand the basic concepts of Environmental engineering.</i> | | |
| Module-2 | | | |
| Project scheduling together with EM using the Construction Pollution Index (CPI). A pseudo-resource approach for CPI leveling. CPI leveling using GA. Introduction to DEMAP and DEMAN. CEM reports. Site waste material management plan | | | |
| Teaching-Learning Process | <i>Collaborative and Cooperative Learning: Students should work in a group to understand value analysis through case studies.</i> | | |
| Module-3 | | | |
| Effective control at the construction stage: General construction waste. CEM construction technologies. CEM materials. Management methods. Incentive reward programs. Barcoding technologies in CEM. | | | |
| Teaching-Learning Process | <i>Collaborative and Cooperative Learning: Students should work in a group to understand life cycle costing through case studies.</i> | | |
| Module-4 | | | |
| Addressing air quality in the CEMP. Addressing noise in the CEM. Site contamination. Addressing water quality in the CEM. Implementation of the environmental report during construction. | | | |
| Teaching-Learning Process | <i>ICT and Digital support: Videos and PPTs to explain the various phases involved in the methodology of VE.</i> | | |
| Module-5 | | | |
| Effective reduction at post construction Contaminated land remediation. Salvaging, Recycling. Disposing of non-hazardous demolition and construction waste. Wastage audit at site. Online waste exchange approach plan. | | | |
| Teaching-Learning Process | <i>Collaborative and Cooperative learning: Students should work in a group to apply value engineering at the different phase of construction.</i> | | |

ASSESSMENT DETAILS (BOTH CIE AND VIVA-VOCE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for viva-voce examination is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in viva voce examination is 50% of the maximum marks. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% in the sum total of the CIE (Continuous Internal Evaluation) and viva voce marks taken together.

Continuous Internal Evaluation:

CIE marks shall be awarded by a committee comprising of Principal/Dean, PG Course Coordinator/HOD and Guide/Co-guide of the department. The CIE marks awarded for PSC (professional supportive course), shall be based on the progress of the student throughout the semester, presentation skills in seminars and submission of the report.

Viva-voce Examination:

1. The student needs to submit his/her report done throughout the semester, including the data collection for the Viva examination, at least one day prior to the Viva examination to the PG course coordinator/HOD.
2. The Viva-voce will be evaluated by external examiners appointed by the University along with PG Course coordinator/ guide/ co-guide or an internal examiner.
3. The viva-voce marks awarded for PEC (Professional elective course), shall be based on the evaluation of report submission, presentation skill and performance in Question-and-Answer session in the ratio 30:10:10.
4. The viva-voce marks list generated is to be signed by both internal and external examiners and submitted to VTU in the sealed cover through the Principal of the institution.

Suggested Learning Resources:**Books**

1. Jain,R.K.andRao,S.S.,2008.Industrialsafety,health and environment management systems.Romesh Chander Khanna.
2. Ferrett,E.andHughes,P.,2015.Introductiontohealthandsafetyinconstruction:FortheNEBOSHnational certificate in construction health and safety. Routledge.
3. Basudev Panda,2013Industrial Safety, Health Environment and Security. Laxmi Publications; First Ed.
4. Li,H.andChen,Z.,2007.Environmental Management in Construction: A Quantitative Approach.
5. Griffith,A.,1994.Environmental management in construction. Macmillan International Higher Education.
6. Uren,S.andGriffiths,E.,2000.Environmental management in construction.
7. Rapp,R.R.andBenhart,B.L.ed.,2015.Construction Site Planning and Logistical Operations:Site-FocusedManagementforBuilders.PurdueUniversityPress.
8. Dr.K.G.Krishnamurthy and S.V.Ravindra,2008.Construction and Project Management.
9. Barrie,D.S.andPaulson,B.C.,1984.Professional construction management. New York: McGraw-Hill.
10. Ritz,G.J.,1994.Total construction project management.
11. Toole,T.M.,2002.Construction site safety roles.
JournalofConstructionEngineeringandManagement,128(3),pp.203-210.

Web links and Video Lectures (e-Resources):

1. NPTEL Lecture 07: environmental Engineering Concepts <https://youtu.be/mJoaZ4GeywI>
2. <https://www.gordian.com/resources/environmental-engineering-for-construction/>

Skill Development Activities Suggested

- Guest lectures
- Learning EM by applying it to real time live projects at every stage of construction.

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

| Sl. No. | Description | Blooms Level |
|---------|--|--------------|
| C01 | Illustrate the concepts of Environmental engineering, identify the advantages, applications | L4 |
| C02 | Discuss various phases of value engineering. Analyze the function, approach of function and evaluation of function. Determine the worth and value. | L2 |
| C03 | Apply EM to construction company business and industry technical situations | L3 |
| C04 | Appraise the Environmental engineering operation in maintenance and repair activities | L4 |
| C05 | Develop the Environmental engineering team and discuss the Environmental management case studies. | L3 |

Program Outcome of this course:

| Sl. No. | Description | POs |
|---------|---|-----|
| 1 | Acquire outstanding fundamental knowledge in the field of Construction Project Management. | PO1 |
| 2 | Encompass the ability to work in collaboration with interdisciplinary teams. | PO2 |
| 3 | Demonstrate creativity in the problem-solving process through professional quality graphic presentations and technical drawings. | PO3 |
| 4 | Acquire outstanding knowledge & software skills for design, construction, resources management and scheduling & Monitoring of projects. | PO4 |
| 5 | Understanding the diverse needs of values and systems of society and providing sustainable solutions. | PO5 |
| 6 | Demonstrate design solutions that integrate contextual, social, economic, cultural, ethical, environmental concerns. | PO6 |
| 7 | Ability to do independent/option-based research and exploration of advanced and emerging topics. | PO7 |
| 8 | Appraise professional standards and ethical responsibilities as a team member. | PO8 |

Mapping of COS and POs:

| | P01 | P02 | P03 | P04 | P05 | P06 | P07 | P08 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| C01 | H | M | M | L | M | H | H | H |
| C02 | H | M | M | L | H | H | M | H |
| C03 | H | H | M | H | H | H | H | H |
| C04 | H | H | M | H | H | H | H | H |
| C05 | H | M | H | M | M | M | M | H |

H - High , M - Medium, L - Low

Elective-2

| VALUE ENGINEERING IN CONSTRUCTION MANAGEMENT | | | |
|--|---|-------------|-----|
| Course Code | MCPM115B | CIE Marks | 100 |
| Teaching Hours/Week (L:P:SDA) | 2:00:02 | Viva Marks | 00 |
| Total Hours of Pedagogy | 48 | Total Marks | 100 |
| Credits | 3 | Exam Hours | --- |
| Course Learning objectives: | | | |
| <ul style="list-style-type: none"> The student will understand the role of VE in construction. Classical VE principles will be emphasized and practical applications for construction managers, contractors, and other construction functions will be described. | | | |
| Module-1 | | | |
| VALUE ENGINEERING | | | |
| Definition, Importance to Contractors, Potential VE Applications Value: basic and secondary functions, factor contributing to value such as aesthetic, ergonomic, technical, economic: identifying reasons or unnecessary costs | | | |
| Teaching-Learning Process | <i>ICT and Digital support: Videos and PPT's to understand the basic concepts of value engineering.</i> | | |
| Module-2 | | | |
| VALUE ANALYSIS | | | |
| 10 Commandments of value analysis; value analysis team; principles of value analysis, elements of a job plan viz. orientation, Information, presentation. Implementation, follow-up action, benefits of value analysis, various applications; assessing effectiveness of value analysis. | | | |
| Teaching-Learning Process | <i>Collaborative and Cooperative learning: Students should work in a group to understand value analysis through case studies.</i> | | |
| Module-3 | | | |
| LIFE CYCLE COSTING | | | |
| 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. | | | |
| Teaching-Learning Process | <i>Collaborative and Cooperative learning: Students should work in a group to understand life cycle costing through case studies.</i> | | |
| Module-4 | | | |
| VE METHODOLOGY | | | |
| Orientation phase, Information phase, Function Analysis phase, Creative Phase, Evaluation Phase, Development Phase, Presentation Phase, implementation Phase. | | | |
| Teaching-Learning Process | <i>ICT and Digital support: Videos and ppts to explain the various phase involved in the methodology of VE.</i> | | |
| Module-5 | | | |
| APPLICATION OF VALUE ENGINEERING TO A CONSTRUCTION PROJECT | | | |
| VE during the Planning Phase of a Construction Project, VE during the Design Phase of a Construction Project, VE during the Construction Phase of a Construction Project | | | |
| Teaching-Learning Process | <i>Collaborative and Cooperative learning: Students should work in a group to apply value engineering at the different phase of construction.</i> | | |

ASSESSMENT DETAILS (BOTH CIE AND VIVA-VOCE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for viva-voce examination is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in viva voce examination is 50% of the maximum marks. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% in the sum total of the CIE (Continuous Internal Evaluation) and viva voce marks taken together.

Continuous Internal Evaluation:

CIE marks shall be awarded by a committee comprising of Principal/Dean, PG Course Coordinator/HOD and Guide/Co-guide of the department. The CIE marks awarded for PSC (professional supportive course), shall be based on the progress of the student throughout the semester, presentation skills in seminars and submission of the report.

Viva-voce Examination:

5. The student needs to submit his/her report done throughout the semester, including the data collection for the Viva examination, at least one day prior to the Viva examination to the PG course coordinator/HOD.
6. The Viva-voce will be evaluated by external examiners appointed by the University along with PG Course coordinator/ guide/ co-guide or an internal examiner.
7. The viva-voce marks awarded for PEC (Professional elective course), shall be based on the evaluation of report submission, presentation skill and performance in Question-and-Answer session in the ratio 30:10:10.
8. The viva-voce marks list generated is to be signed by both internal and external examiners and submitted to VTU in the sealed cover through the Principal of the institution.

Suggested Learning Resources:**Books**

Value Engineering: Analysis and Methodology by Del Younke.

Web links and Video Lectures (e-Resources):**3. NPTEL Lecture 07: Value Engineering Concepts**

<https://youtu.be/mJoaZ4GeywI>

4. <https://www.gordian.com/resources/value-engineering-for-construction/>**Skill Development Activities Suggested**

- Guest lectures
- Learning VE by applying it to real time live projects at every stage of construction.

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

| Sl. No. | Description | Blooms Level |
|---------|--|--------------|
| CO1 | Illustrate the concepts of value engineering, identify the advantages, applications | L4 |
| CO2 | Discuss various phases of value engineering. Analyze the function, approach of function and evaluation of function. Determine the worth and value. | L2 |
| CO3 | Apply VE to construction company business and industry technical situations | L3 |
| CO4 | Appraise the value engineering operation in maintenance and repair activities | L4 |
| CO5 | Develop the value engineering team and discuss the value engineering case studies. | L3 |

Program Outcome of this course:

| Sl. No. | Description | POs |
|---------|---|-----|
| 1 | Acquire outstanding fundamental knowledge in the field of Construction Project Management. | PO1 |
| 2 | Encompass the ability to work in collaboration with interdisciplinary teams. | PO2 |
| 3 | Demonstrate creativity in the problem-solving process through professional quality graphic presentations and technical drawings. | PO3 |
| 4 | Acquire outstanding knowledge & software skills for design, construction, resources management and scheduling & Monitoring of projects. | PO4 |
| 5 | Understanding the diverse needs of values and systems of society and providing sustainable solutions. | PO5 |
| 6 | Demonstrate design solutions that integrate contextual, social, economic, cultural, ethical, environmental concerns. | PO6 |
| 7 | Ability to do independent/option-based research and exploration of advanced and emerging topics. | PO7 |
| 8 | Appraise professional standards and ethical responsibilities as a team member. | PO8 |

Mapping of COS and POs:

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|------------|----------|----------|----------|----------|----------|----------|----------|----------|
| CO1 | H | M | M | L | M | H | H | H |
| CO2 | H | M | M | L | H | H | M | H |
| CO3 | H | H | M | H | H | H | H | H |
| CO4 | H | H | M | H | H | H | H | H |
| CO5 | H | M | H | M | M | M | M | H |

H - High , M - Medium, L - Low

Elective-3

| LEAN CONSTRUCTION | | | |
|--|---|-------------|-----|
| Course Code | MCPM115C | CIE Marks | 100 |
| Teaching Hours/Week (L:P:SDA) | 2:00:02 | Viva Marks | 00 |
| Total Hours of Pedagogy | 48 | Total Marks | 100 |
| Credits | 3 | Exam Hours | --- |
| Course Learning objectives: | | | |
| <ul style="list-style-type: none"> The student will understand the CONCEPT OF LEAN construction. Lean construction principles will be emphasized and practical applications for construction managers, contractors, and other construction functions will be described. | | | |
| Module-1 | | | |
| Introduction and overview of the construction project management - Review of Project Management & Productivity Measurement Systems - construction project phases - The problems with current construction management techniques | | | |
| Teaching-Learning Process | <i>ICT and Digital support: Videos and PPT's to understand the basic concepts of value engineering.</i> | | |
| Module-2 | | | |
| Introduction to lean management - Toyota's management principle-Evolution of lean in construction industry - Production theories in construction –Lean construction value - Value in construction - Target value design - Lean project delivery system- Forms of waste in construction | | | |
| Teaching-Learning Process | <i>Collaborative and Cooperative Learning: Students should work in a group to understand value analysis through case studies.</i> | | |
| Module-3 | | | |
| Concepts in lean thinking – Principles of lean construction – Variability and its impact – Traditional construction and lean construction – Traditional project delivery - Lean construction and workflow reliability – Work structuring – Production control. | | | |
| Teaching-Learning Process | <i>Collaborative and Cooperative Learning: Students should work in a group to understand life cycle costing through case studies.</i> | | |
| Module-4 | | | |
| Value Stream Mapping – Work sampling – Last planner system – Flow and pull based production– Last Planner System – Look ahead schedule – constraint analysis – weekly planning meeting-Daily Huddles – Root cause analysis – Continuous improvement – Just in time. | | | |
| Teaching-Learning Process | <i>ICT and Digital support: Videos and ppts to explain the various phase involved in the methodology of VE.</i> | | |
| Module-5 | | | |
| LEAN IMPLEMENTATION IN CONSTRUCTION INDUSTRY | | | |
| Lean construction implementation- Enabling lean through information technology - Lean in design -Design Structure - BIM (Building Information Modelling) - IPD (Integrated Project Delivery) –Sustainability through lean construction approach | | | |
| Teaching-Learning Process | <i>Collaborative and Cooperative learning: Students should work in a group to apply value engineering at the different phase of construction.</i> | | |

ASSESSMENT DETAILS (BOTH CIE AND VIVA-VOCE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for viva-voce examination is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in viva voce examination is 50% of the maximum marks. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% in the sum total of the CIE (Continuous Internal Evaluation) and viva voce marks taken together.

Continuous Internal Evaluation:

CIE marks shall be awarded by a committee comprising of Principal/Dean, PG Course Coordinator/HOD and Guide/Co-guide of the department. The CIE marks awarded for PSC (professional supportive course), shall be based on the progress of the student throughout the semester, presentation skills in seminars and submission of the report.

Viva-voce Examination:

9. The student needs to submit his/her report done throughout the semester, including the data collection for the Viva examination, at least one day prior to the Viva examination to the PG course coordinator/HOD.
10. The Viva-voce will be evaluated by external examiners appointed by the University along with PG Course coordinator/ guide/ co-guide or an internal examiner.
11. The viva-voce marks awarded for PEC (Professional elective course), shall be based on the evaluation of report submission, presentation skill and performance in Question-and-Answer session in the ratio 30:10:10.
12. The viva-voce marks list generated is to be signed by both internal and external examiners and submitted to VTU in the sealed cover through the Principal of the institution.

REFERENCES:

1. Corfe, C. and Clip, B., Implementing lean in construction: Lean and the sustainability agenda, CIRIA, 2013.
2. Shang Gao and Sui Pheng Low, Lean Construction Management: The Toyota Way, Springer, 2014.
3. Dave, B., Koskela, L., Kiviniemi, A., Owen, R., and Tzortzopoulos, P., Implementing lean in construction: Lean construction and BIM, CIRIA, 2013.
4. Ballard, G., Tommelein, I., Koskela, L. and Howell, G., Lean construction tools and techniques, 2002.
5. Salem, O., Solomon, J., Genaidy, A. and Luegring, M., Site implementation and Assessment of Lean Construction Techniques, Lean Construction Journal, 2005

Web links and Video Lectures (e-Resources):**5. NPTEL Lecture 07: Lean construction**

<https://www.gordia.com/resources/lean-construction>

Skill Development Activities Suggested

- Guest lectures

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

| Sl. No. | Description | Blooms Level |
|---------|---|--------------|
| C01 | Illustrate the concepts of Lean engineering, identify the advantages, applications | L4 |
| C02 | Discuss various phases of Lean engineering. Analyze the function, approach of function and evaluation of function. Determine the worth and value. | L2 |
| C03 | Apply LE to construction company business and industry technical situations | L3 |
| C04 | Appraise the Lean engineering operation in maintenance and repair activities | L4 |
| C05 | Develop the Lean engineering team and discuss the value engineering case studies. | L3 |

Program Outcome of this course:

| Sl. No. | Description | POs |
|---------|---|-----|
| 1 | Acquire outstanding fundamental knowledge in the field of Construction Project Management. | P01 |
| 2 | Encompass the ability to work in collaboration with interdisciplinary teams. | P02 |
| 3 | Demonstrate creativity in the problem-solving process through professional quality graphic presentations and technical drawings. | P03 |
| 4 | Acquire outstanding knowledge & software skills for design, construction, resources management and scheduling & Monitoring of projects. | P04 |
| 5 | Understanding the diverse needs of values and systems of society and providing sustainable solutions. | P05 |
| 6 | Demonstrate design solutions that integrate contextual, social, economic, cultural, ethical, environmental concerns. | P06 |
| 7 | Ability to do independent/option-based research and exploration of advanced and emerging topics. | P07 |
| 8 | Appraise professional standards and ethical responsibilities as a team member. | P08 |

Mapping of COS and POs:

| | P01 | P02 | P03 | P04 | P05 | P06 | P07 | P08 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| C01 | H | M | M | L | M | H | H | H |
| C02 | H | M | M | L | H | H | M | H |
| C03 | H | H | M | H | H | H | H | H |
| C04 | H | H | M | H | H | H | H | H |
| C05 | H | M | H | M | M | M | M | H |

H – High , M – Medium, L - Low

I- SEMESTER

| PM SOFTWARES 1 | | | |
|--|---|-------------|-----|
| Course Code | MCPML106 | CIE Marks | 50 |
| Teaching Hours/Week (L:P:SDA) | 00:02:00 | Term work | 50 |
| Total Hours of Pedagogy | 32 | Total Marks | 100 |
| Credits | 3 | | |
| <p>Course Learning objectives:</p> <ul style="list-style-type: none"> • To understand the work environment of MS Project. • To create a project template and assign a calendar. • To Create a work breakdown structure. • To develop resources for project and assign them to activities and manage the resources. • Prepare a project baseline and compare them with actual progress. | | | |
| Module-1 | | | |
| Getting Started with Microsoft Project: Identify Project Management Concepts Navigate the Microsoft Project Environment | | | |
| Teaching-Learning Process | <i>Blended learning: Power point presentation and webinars.</i> | | |
| Module-2 | | | |
| Defining a Project: Create a New Project Plan Define a Project Assign a Project Calendar. | | | |
| Teaching-Learning Process | <i>Blended learning: Power point presentation and webinars.</i> | | |
| Module-3 | | | |
| Creating and Organizing Tasks: Add Tasks to a Project Plan, Import Tasks from Other Programs Create a Work Break down Structure, Define Task Relationships ,Schedule Tasks | | | |
| Teaching-Learning Process | <i>Blended learning: Power point presentation and webinars.</i> | | |
| Module-4 | | | |
| Managing Project Plan Resources: Add Resources to a Project Plan Create a Resource Calendar Enter Costs for Resources Assign Resources to Tasks, Resolve Resource Conflicts | | | |
| Teaching-Learning Process | <i>Blended learning: Power point presentation and webinars.</i> | | |
| Module-5 | | | |
| Finalizing a Project Plan: Optimize a Project Plan, Set a Baseline, and Share a Project Plan. | | | |
| Teaching-Learning Process | <i>Blended learning: Power point presentation and webinars.</i> | | |

Assessment Details (both CIE and Viva voce)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 50% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

CIE marks shall be awarded by a committee comprising of Principal/Dean, PG Course Coordinator/HOD and Guide/Co-guide of the department. The CIE marks awarded for PSC (professional supportive course), shall be based on the progress of the student throughout the semester, presentation skills in seminars and submission of the report.

Semester End Examination:

Viva-voce Examination:

1. The student needs to submit his/her report done throughout the semester, including the data collection for the Viva examination, at least one day prior to the Viva examination to the PG course coordinator/HOD.
2. The term work will be evaluated by external examiners appointed by the University along with PG Course coordinator/ guide/ co-guide or an internal examiner.
3. The term work marks list generated is to be signed by both internal and external examiners and submitted to VTU in the sealed cover through the Principal of the institution.

Suggested Learning Resources:

Books

1. Marmel,E.,2011.Microsoft Project 2007 Bible(Vol.767).John Wiley& Sons.
2. Larson, E. and Gray, C., 2013. Project management: The managerial process with MS project. McGraw-Hill Education.
3. Biafore,B.,2013.Microsoftproject2013:Themissingmanual.“O’ReillyMedia,Inc.”.
4. Ambriz, R. and Landa, M., 2014. Dynamic Scheduling® WithMicrosoft®Project2013: TheBook By and For Professionals .J. Ross Publishing.

Web links and Video Lectures (e-Resources):

Video Tutorial

https://www.youtube.com/watch?v=5v_42_4Vl2o

Web Link https://www.tutorialspoint.com/ms_project/index.htm

Skill Development Activities Suggested

- Guest Lecture from expert.
- Attending webinars.

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

| Sl. No. | Description | Blooms Level |
|---------|---|--------------|
| C01 | Understand the Microsoft project software environment | L1 |
| C02 | Develop project plan and assign calendars. | L6 |
| C03 | Develop tasks and create work breakdown structure | L6 |
| C04 | Create resources and modify it. | L6 |
| C05 | Modify the project plan to reach the targets and create project baselines | L6 |

Program Outcomes of the CPM Program:

| Sl. No. | Description | POs |
|---------|---|-----|
| 1 | Acquire outstanding fundamental knowledge in the field of Construction Project Management. | PO1 |
| 2 | Encompass the ability to work in collaboration with interdisciplinary teams. | PO2 |
| 3 | Demonstrate creativity in the problem-solving process through professional quality graphic presentations and technical drawings. | PO3 |
| 4 | Acquire outstanding knowledge & software skills for design, construction, resources management and scheduling & Monitoring of projects. | PO4 |
| 5 | Understanding the diverse needs of values and systems of society and providing sustainable solutions. | PO5 |
| 6 | Demonstrate design solutions that integrate contextual, social, economic, cultural, ethical, environmental concerns. | PO6 |
| 7 | Ability to do independent/option-based research and exploration of advanced and emerging topics. | PO7 |
| 8 | Appraise professional standards and ethical responsibilities as a team member. | PO8 |

Mapping of COS and POS

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| C01 | H | M | L | H | 0 | L | L | 0 |
| C02 | H | 0 | L | H | 0 | L | L | 0 |
| C03 | H | 0 | L | H | 0 | L | L | 0 |
| C04 | H | 0 | L | H | 0 | 0 | L | 0 |
| C05 | H | 0 | L | H | 0 | 0 | L | 0 |

H - High , M - Medium, L - Low

I – SEMESTER (Online)

| RESEARCH METHODOLOGY AND IPR | | |
|---|---|--------------------|
| Course Code | MRMI 107 | ONLINE COURSE |
| Credits | PP | (ONLINE.VTU.AC.IN) |
| <p>Course Learning objectives:</p> <ul style="list-style-type: none"> • To understand the meaning of research. Types and research approaches • To develop understanding of conducting literature review, its methodology and reviewing the Existing literature. • To familiarize about sampling techniques and data collection methods. • To study about testing of hypothesis. • To learn about interpreting the data and report writing. | | |
| Module-1 | | |
| <p>Research Methodology: Introduction, Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research, and Problems Encountered by Researchers in India</p> <p>Defining the Research Problem: Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, and Illustration.</p> | | |
| Teaching-Learning Process | <p>Direct method: <i>Lecture supported by conventional method of Blackboard and chalk to introduce the concepts</i></p> <p>Blended learning: <i>Power point presentation and webinars.</i></p> | |
| Module-2 | | |
| <p>Reviewing the literature: Place of the literature review in research, bringing clarity and focus to your research problem, improving research methodology, broadening knowledge base in research area, Enabling contextual findings, How to review the literature, searching the existing literature, reviewing the selected literature, Developing atheoretical framework, Developing a conceptual framework, Writing about the literature reviewed.</p> <p>Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs.</p> | | |
| Teaching-Learning Process | <p>Direct method : <i>Lecture supported by conventional method of Blackboard and chalk to introduce the concepts</i></p> <p>ICT and Digital support: <i>Power point presentation to elaborate more on key topics.</i></p> | |
| Module-3 | | |
| <p>Design of Sampling: Introduction, Sample Design, Sampling and Non-sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs.</p> <p>Measurement and Scaling: Qualitative and Quantitative Data, Classifications of Measurement Scales, Goodness of Measurement Scales, Sources of Error in Measurement Tools, Scaling , Scale Classification Bases, Scaling Technics, Multi-dimensional Scaling, Deciding the Scale.</p> <p>Data Collection: Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method of or Data Collection, Case Study Method.</p> | | |
| Teaching-Learning Process | <p>Direct method: <i>Lecture supported by conventional method of Blackboard and chalk to introduce the concepts</i></p> <p>Blended learning: <i>Power point presentation to elaborate more on key topics.</i></p> | |

| Module-4 | |
|--|---|
| <p>Testing of Hypotheses: Hypothesis, Basic Concepts Concerning Testing of Hypotheses, Testing of Hypothesis, Test Statistics and Critical Region, Critical Value and Decision Rule, Procedure for Hypothesis Testing, Hypothesis Testing for Mean, Proportion, Variance, for Difference of Two Mean, for Difference of Two Proportions, for Difference of Two Variances, P-Value approach, Power of Test, Limitations of the Tests of Hypothesis.</p> <p>Chi-square Test: Test of Difference of more than Two Proportions, Test of Independence of Attributes, Test of Goodness of Fit, Cautions in Using Chi Square Tests.</p> | |
| Teaching-Learning Process | <p><i>Direct method: Lecture supported by conventional method of Blackboard and chalk to introduce the concepts</i></p> <p><i>Blended learning: Power point presentation and webinars.</i></p> |
| Module-5 | |
| <p>Interpretation and Report Writing: Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports.</p> <p>Intellectual Property: The Concept.</p> | |
| Teaching-Learning Process | <p><i>Direct method: Lecture supported by conventional method of Blackboard and chalk to introduce the concepts</i></p> <p><i>Collaborative and Cooperative learning: Students should work on as individual work. The research and learning to be share with the class.</i></p> |

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

Three Unit Tests each of 20 Marks (duration 01 hour 30 min)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 13th week of the semester.

Two assignments each of 10 Marks

1. First assignment at the end of 4th week of the semester
 2. Second assignment at the end of 9th week of the semester
- Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for 20 Marks(duration01 hours)
3. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be scaled down to 50 marks.

Semester End Examination: ONLINE

. Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (duration 03 hours)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.

The students have to answer 5 full modules, selecting one full question from each module. Marks scored by the student will be scale down to 50 Marks.

Suggested Learning Resources:

Books

1. Research Methodology: Methods and Techniques, C.R. Kothari, Gaurav Garg, New Age International, 4th Edition, 2018.
2. Research Methodology a step-by-step guide for beginners. (For the topic Reviewing the literature under module 2), Ranjit Kumar, SAGE Publications, 3rd Edition, 2011.
3. Study Material (For the topic Intellectual Property under module 5), Professional Programme Intellectual Property Rights, Law and Practice, The Institute of Company Secretaries of India,
4. Statutory Body Under an Act of Parliament, September 2013.
5. Research Methods: The concise knowledge base, Trochim, Atomic Dog Publishing, 2005.

Conducting Research Literature Reviews: From the Internet to Paper, Fink A, Sage Publications, 2009.

Web links and Video Lectures (e-Resources):

NPTEL Lecture

<https://www.youtube.com/watch?v=rz30rRfManE&list=PLdj5pVg1kHiOypKNUm00NKOfvoIThAv4N>

Web Link https://onlinecourses.nptel.ac.in/noc22_ge08/preview

Skill Development Activities Suggested

- Guest Lecture from expert.
- Attending webinars.

Course outcome (Course Skill Set)

At the end of the course, the student will be able to:

| Sl. No. | Description | Blooms Level |
|---------|---|--------------|
| C01 | Explain about meaning of research, its objectives, and its types. | L1 |
| C02 | Describe selecting a research problem and defining it | L1 |
| C03 | Explain the process of literature review, and improving research methodology | L1 |
| C04 | Interpret the necessary data to develop a conceptual framework and theoretical framework | L2 |
| C05 | Explain about conducting surveys, data collection and choosing appropriate methods of data collection | L1 |
| C06 | Use hypothesis techniques to extrapolate data from samples. | L3 |
| C07 | Interpret the data and write research reports. | L2 |

Program Outcomes of the CPM Program:

| Sl. No. | Description | POs |
|---------|---|-----|
| 1 | Acquire outstanding fundamental knowledge in the field of Construction Project Management. | PO1 |
| 2 | Encompass the ability to work in collaboration with interdisciplinary teams. | PO2 |
| 3 | Demonstrate creativity in the problem-solving process through professional-quality graphic presentations and technical drawings. | PO3 |
| 4 | Acquire outstanding knowledge & software skills for design, construction, resources management and scheduling & Monitoring of projects. | PO4 |
| 5 | Understanding the diverse needs of values and systems of society and providing sustainable solutions. | PO5 |
| 6 | Demonstrate design solutions that integrate contextual, social, economic, cultural, ethical, environmental concerns. | PO6 |
| 7 | Ability to do independent/option-based research and exploration of advanced and emerging topics. | PO7 |
| 8 | Appraise professional standards and ethical responsibilities as a team member. | PO8 |

Mapping of COS and POS

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| C01 | H | M | M | M | 0 | L | H | L |
| C02 | H | M | M | M | 0 | L | H | L |
| C03 | H | M | M | M | 0 | 0 | H | 0 |
| C04 | H | 0 | M | M | 0 | 0 | H | 0 |
| C05 | H | H | M | M | 0 | 0 | H | L |
| C06 | H | L | M | M | 0 | 0 | H | 0 |
| C07 | H | L | M | M | 0 | 0 | H | L |

H – High , M – Medium, L - Low