# SYLLABUS

**OF**

## *M. TECH*

***(Construction Technology and Management)***

## *II YEAR*

**DEPARTMENT OF CIVIL ENGINEERING**

# INTEGRAL UNIVERSITY LUCKNOW

# SYLLABI AND EVALUATION SCHEME (Full Time)

# M. Tech. (Construction Technology & Management)

# (w.e.f. 2020-21)

## Semester – III

| S. No. | Course Category | Code No | Name of Subject | Periods | | | Credits | Evaluation Scheme | | | | Subject Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | C | Continuous Assessment (CA) | | | Exam ESE | |
| | | | | | | | | UE | TA | Total | | |
| 1 | DE | | Elective –I | 3 | 1 | - | 4 | 40 | 20 | 60 | 40 | 100 |
| 2 | DE | | Elective –II | 3 | 1 | - | 4 | 40 | 20 | 60 | 40 | 100 |
| 3 | DC | CE653 | Sustainable Design & Value Analysis | 3 | 1 | - | 4 | 40 | 20 | 60 | 40 | 100 |
| 4 | DC | CE654 | Directed Study | - | - | - | 4 | - | - | - | 100 | 100 |
| 5 | DC | CE699 | M.Tech Dissertation | - | - | - | 4 | - | - | 60 | 40 | 100 |
| **Total** | | | | | | | **20** | | | | | **500** |

## Semester – IV

| S. No. | Course Category | Code No | Name of Subject | Periods | | | Credits | Evaluation Scheme | | | | Subject Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | C | Continuous Assessment (CA) | | | EXAM ESE | |
| | | | | | | | | UE | TA | Total | | |
| 1 | DC | CE699 | M.Tech Dissertation | - | - | - | 4 | - | - | 60 | 40 | 100 |
| 2 | DC | CE699 | M.Tech Dissertation | - | - | - | 4 | - | - | 60 | 40 | 100 |
| 3 | DC | CE699 | M.Tech Dissertation | - | - | - | 4 | - | - | 60 | 40 | 100 |
| 4 | DC | CE699 | M.Tech Dissertation | - | - | - | 4 | - | - | 60 | 40 | 100 |
| **Total** | | | | | | | **16** | | | | | **400** |

**TA-** Teacher Assessment; **ESE –** End Semester Examination; **CT-** Cumulative Test.
Note: Duration of ESE shall be 03 (Three) hours per subject

## M. Tech (Construction Technology & Management)

**List of the Elective Paper:**

**Elective – I**

| | |
|---|---|
| CE544 | Urban Transportation System Planning |
| CE641 | Ready Mix Concrete Design and Quality Control |
| CE642 | Maintenance & Rehabilitation of Structures |
| CE643 | Prefabricated Structures |
| CE644 | Solid & Hazardous Waste Management |

**Elective – II**

| | |
|---|---|
| CE647 | Transportation Economics |
| CE648 | Principles of Affordable Housing |
| CE649 | Building Services & Maintenance Management |
| CE650 | Construction Information Systems |

# Integral University, Lucknow

| **Effective from Session:** 2016-17 | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Course Code** | CE641 | **Title of the Course** | Ready Mix Concrete Design and Quality Control | **L** | **T** | **P** | **C** |
| **Year** | 2nd | **Semester** | 3rd | 3 | 1 | 0 | 4 |
| **Pre-Requisite** | NIL | **Co-requisite** | NIL | | | | |
| **Course Objectives** | • To develop knowledge of Ready mix concrete production as a quality control manager as well as concrete production plant manager<br>• To develop the understanding of different preproduction elements like source selection etc.<br>• To develop the understanding of different constituent material and its behavior<br>• To develop the understanding of concrete production and its delivery. | | | | | | |

| **Course Outcomes** | |
|---|---|
| **CO1** | Knowing the principals of strength and durability of concrete, learner will be able to distinguish between alternatives and can select suitable material |
| **CO2** | Knowing the quality requirement of concrete making materials, Learner will be able to satisfy it by following sampling procedure and design the concrete mix with required attributes |
| **CO3** | Given the properties cement and aggregates, learner will be able to prepare a quality assurance plan and ensure the application of it |
| **CO4** | Given the properties fine aggregates, mixing water and concrete, learner will be able to prepare quality assurance plan and perform quality verification using different tests |
| **CO5** | Given the production and delivery conditions, learner will be able to calculate the effective production on RMC plant and optimize delivery schedule with financial efficiency |

| **Unit No.** | **Title of the Unit** | **Content of Unit** | **Contact Hrs.** | **Mapped CO** |
|---|---|---|---|---|
| 1 | Material Properties | Cement; Introduction, Portland cement, chemical composition of raw materials, composition of Cement clinker, Hydration of cement, rate of hydration, water requirement for hydration. Aggregates; Introduction, classification of aggregates, characteristic of fine aggregate and coarse aggregate. Water; Introduction, basic properties. Concrete Admixtures; Introduction, effect on strength/characteristics of concrete, physical and chemical properties. Concrete; Introduction, water-cement ratio, gel-space ratio, strength of concrete, maturity, Permeability. | 08hrs | CO1 |
| 2 | Pre-Qualification of Source | Procurement, Storage and Sampling: Source selection, sampling, storage and precautions for cement, aggregates, water, concrete admixtures and concrete. Mix design, Combined grading of aggregates, Moisture content of aggregates, Mix proportion per batch of mixing plant, admixtures for concrete and its use. | 08hrs | CO2 |
| 3 | Quality Control | Testing/checking of materials and test/check frequency Cement; Physical tests- Fineness, Soundness, Standard consistency, Setting time, Compressive strength, Chemical Analysis, Status of Stock record.<br>Test on Coarse/Fine Aggregate; Alkali reactivity, Chloride and Sulphate, Deleterious Material, Crushing Value, Abrasion value, Impact value, 10% fines value, Soundness, Size and Gradation, Flakiness/elongation value. | 08hrs | CO3 |
| 4 | Testing of Material | Specific gravity and water absorption, Density and moisture content, Freedom from impurities. Water; Physical and chemical test, cleaning of storage tanks, Storage adequacy. Concrete; Weigh Mixture, batching plant, Small concrete mixture, vibrators, calibration of Mixtures and Plant. Laboratory Tests Slump test, compressive strength test, Flexural Modules, NDT, Permeability test. | 08hrs | CO4 |
| 5 | Machine Use Optimization | Lead time, plant capacity, TM capacity, working hour, TM availability, city/Govt restrictions. | 08hrs | CO5 |

**Reference Books:**


"Properties of Concrete", Naville, A.M., Longman, India

"Concrete Technology", Naville, A.M., Longman, India

"Concrete Technology", Gambhir, M.L., TMH, New Delhi, India


**e-Learning Source:**

https://nptel.ac.in/courses/105102012/

IS:2430-1986 (Reaffirmed-2005)

IS:2386-1963 (Reaffirmed-2002)

IS:1199-1959 (Reaffirmed-2004)

| | Course Articulation Matrix: (Mapping of COs with POs and PSOs) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PO-PSO CO** | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| **CO1** | 3 | 0 | 0 | 0 | 0 | 2 | 1 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 0 |
| **CO2** | 0 | 0 | 3 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| **CO3** | 3 | 0 | 3 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **CO4** | 3 | 0 | 3 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **CO5** | 3 | 0 | 0 | 0 | 0 | 3 | 0 | 3 | 0 | 0 | 0 | 3 | 0 | 0 | 0 |

**1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

| | |
|---|---|
| **Name & Sign of Program Coordinator** | **Sign & Seal of HoD** |

# Integral University, Lucknow

| **Effective from Session:** 2019-20 | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Course Code** | CE648 | **Title of the Course** | Principles of Affordable Housing | **L** | **T** | **P** | **C** |
| **Year** | 2nd | **Semester** | 3rd | 3 | 1 | 0 | 4 |
| **Pre-Requisite** | NIL | **Co-requisite** | NIL | | | | |
| **Course Objectives** | • To give the knowledge if Affordable Housing and give an idea about current trends and its feasibility<br>• To give an idea of role of financial institution in Affordable Housing Sector<br>• To have knowledge of various alternative building materials that can be used in construction.<br>• To apply the knowledge of low cost term in Infrastructure services specially sanitation, energy etc<br>• To give the knowledge of various schemes launched by central Govt and Central Govt for urban poor. | | | | | | |

| **Course Outcomes** | |
|---|---|
| **CO1** | To enable the student to understand the meaning of Affordability and trends in present scenario |
| **CO2** | To enable the student to understand the role of financial institutions in promotion of Affordable Housing |
| **CO3** | To give the Knowledge of use of Alternative construction material in low cost housing. |
| **CO4** | To impart the knowledge of low cost sanitation and its optimization |
| **CO5** | To give the knowledge of various schemes started by State Govt. and Central Govt. |

| **Unit No.** | **Title of the Unit** | **Content of Unit** | **Contact Hrs.** | **Mapped CO** |
|---|---|---|---|---|
| 1 | Introduction and Overview | Introduction and overview, current trends in affordable housing, project feasibility, affordable housing policy, practice and issues, affordable housing development process. | 08hrs | CO1 |
| 2 | Financial Planning | Financing affordable housing, site planning, architecture and cost of new and rehabilitated affordable housing, nonprofit housing development, future of affordable housing production. | 08hrs | CO2 |
| 3 | Alternative Building Materials for Low Cost Housing | Introduction, substitutes of scarce materials, industrial wastes, agricultural waste, strategies for promotion of alternative building materials. | 08hrs | CO3 |
| 4 | Low Cost Infrastructural Services | Introduction, present scenario, low cost sanitation, domestic waste disposal, water supply, energy. | 08hrs | CO4 |
| 5 | Housing Scenario for Urban Poor | Approaches and strategies for housing urban poor, Adoption of innovative and cost effective construction Technology. | 08hrs | CO5 |

**Reference Books:**


"handbook of low cost housing",Lal A.K, New Age Publications

"principles of Low cost housing",Sonikya Wole, Springer

"making more affordable: the role of intermediate tenures", Monk Sarah, Jhon Wiley Inc.


**e-Learning Source:**

https://nptel.ac.in/courses/124107001/

https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/124107001/lec4.pdf

| | **Course Articulation Matrix: (Mapping of COs with POs and PSOs)** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PO-PSO CO** | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| **CO1** | 1 | 1 | 1 | 1 | 2 | 3 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| **CO2** | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| **CO3** | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| **CO4** | 1 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| **CO5** | 1 | 1 | 2 | 3 | 2 | 2 | 1 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |

**1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

| **Name & Sign of Program Coordinator** | **Sign & Seal of HoD** |
|---|---|

# Integral University, Lucknow

| **Effective from Session:** 2018-19 | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Course Code** | CE653 | **Title of the Course** | Sustainable Design & Value Analysis | **L** | **T** | **P** | **C** |
| **Year** | 2nd | **Semester** | 3rd | | | | |
| **Pre-Requisite** | Nil | **Co-requisite** | Nil | | | | |
| **Course Objectives** | • To make them understand the need to bring sustainability & to develop sustainable architecture.<br>• To comprehend the fundamentals of green building to attain sustainability.<br>• To make them understand the need of solar panels along with IGBC rating system & guidelines.<br>• To make them understand the Valuation of a Buildings using latest methods.<br>• To make them capable to perform life cycle cast analysis pertaining to environ mate protection. | | | | | | |

| **Course Outcomes** | |
|---|---|
| **CO1** | Learner will be able to understand the basic knowledge of sustainability & its challenges in construction industry. |
| **CO2** | Understand the need of energy efficient buildings to mitigate the harmful effects of non-ecofriendly materials. |
| **CO3** | Develop an innovative tool to safeguard & improve sustainable structures as per the national guidelines. |
| **CO4** | Create economic feasibility analysis to perform Value analysis of Buildings. |
| **CO5** | Understand the environmental social & management methods to economize infrastructure & society using life cycle cost analysis. |

| **Unit No.** | **Title of the Unit** | **Content of Unit** | **Contact Hrs.** | **Mapped CO** |
|---|---|---|---|---|
| 1 | Introduction to Concept of Sustainability | Sustainability, challenges in sustainable construction, design construction and equipment, materials and systems, maintenance and conservation, waste materials, site waste management, re-use and recycling of materials. | 08 Hrs | CO1 |
| 2 | Energy Efficiency and Concept of Green Buildings | Energy efficient buildings, concepts of green and sustainable buildings, natural lighting, methods of ensuring natural ventilation, rainwater harvesting, norms of city development authorities for rainwater harvesting, various legislations concerned to green building. | 08 Hrs | CO2 |
| 3 | Delivery of Green Buildings and Energy Efficiency | Solar panels, solar HVAC systems, legislations for alternative energy resources, sustainable building designs, functional planning of green buildings, rating system, BEE norms for energy efficient buildings, case studies. | 08 Hrs | CO3 |
| 4 | Economic Performance Analysis | Cost-Benefit analysis, economic feasibility analysis; advanced conceptual estimating techniques, quick methods of determining approximate costs of a project, Valuation of Buildings. | 08 Hrs | CO4 |
| 5 | Life Cycle Cost Analysis | Life cycle cost analysis- technique of economic evaluation that sums the costs of initial investments, replacements, operations, maintenance and repair investments, case studies, real-time analysis of life cycle costs of buildings. | 08 Hrs | CO5 |

**Reference Books:**


"Sustainable Facades: Design Methods for High-Performance Building Envelopes", Ajla Aksamija, Jhon Wiley & Sons Inc

"Sustainable Construction: Green Building Design and Delivery", Charles J. Kibert, Jhon Wiley & Sons Inc.

"Construction Cost Analysis and Estimating", Phillip F. Ostwald, Prentice Hall.


**e-Learning Source:**

https://nptel.ac.in/courses/105102195/
https://nptel.ac.in/courses/107103081/

**Course Articulation Matrix: (Mapping of COs with POs and PSOs)**

| **PO-PSO CO** | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 0 | 0 | 0 | 0 | 3 | 0 | 1 | 0 | 0 | 2 | 0 | 3 | 2 | 2 |
| **CO2** | 3 | 0 | 0 | 0 | 0 | 2 | 3 | 0 | 0 | 0 | 0 | 1 | 3 | 3 | 2 |
| **CO3** | 3 | 0 | 0 | 0 | 0 | 3 | 3 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 1 |
| **CO4** | 3 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3 | 2 | 3 |
| **CO5** | 3 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3 | 3 | 3 |

**1-0Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

| **Name & Sign of Program Coordinator** | **Sign & Seal of HoD** |
|---|---|

# Integral University, Lucknow

| **Effective from Session:** 2016-17 | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Course Code** | CE654 | **Title of the Course** | Directed Study | **L** | **T** | **P** | **C** |
| **Year** | 2nd | **Semester** | 4th | 0 | 0 | 0 | 4 |
| **Pre-Requisite** | NIL | **Co-requisite** | NIL | | | | |
| **Course Objectives** | • To make learner aware about the latest technology and engineering practices in industries. | | | | | | |

| **Course Outcomes** | |
|---|---|
| **CO1** | Awareness regarding the latest technology, engineering methodology and practices being used in industries. |

| | **Course Articulation Matrix: (Mapping of COs with POs and PSOs)** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PO-PSO CO** | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| **CO1** | 3 | 0 | 0 | 2 | 3 | 3 | 0 | 0 | 3 | 3 | 0 | 3 | 1 | 1 |

**1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

| | |
|---|---|
| **Name & Sign of Program Coordinator** | **Sign & Seal of HoD** |

# Integral University, Lucknow

| **Effective from Session:** 2019-20 | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Course Code** | CE699 | **Title of the Course** | M Tech dissertation | **L** | **T** | **P** | **C** |
| **Year** | 2nd | **Semester** | 3rd and 4th | 0 | 0 | 0 | 20 |
| **Pre-Requisite** | ------ | **Co-requisite** | ------ | | | | |
| **Course Objectives** | • To develop individuality and problem analysis skill.<br>• To nurture ability to perform literature review.<br>• To improve critical thinking ability for formulation of plan.<br>• To develop skill to use various engineering and technological tools.<br>• To develop skill to think critically on research results.<br>• To enhance the writing skill for research paper and dissertation. | | | | | | |

| **Course Outcomes** | |
|---|---|
| **CO1** | Capability to work independently on a research-based problem. |
| **CO2** | Skill to perform review of available literature effectively to present research gap. |
| **CO3** | Aptitude to plan methodology for the attainment of various research objectives. |
| **CO4** | Competency to apply of various engineering and technological tools to carry research. |
| **CO5** | Ability to conclude work using critical thinking. |
| **CO6** | Proficiency in preparing presentation and report. |

| **Unit No.** | **Content of Unit** | **Contact Hrs.** | **Mapped CO** |
|---|---|---|---|
| 1 | Undergo industrial training in any respective industry in order to get familiar with the latest technology, engineering techniques and practices being used in the industry. Have to absorb some skill from the training identifying the area of improvement. The concepts/skills must be clearly understood and presented by the student. A hard copy of the report should be submitted to the Department after the completion of directed study. | 03hrs | CO1, CO2, CO3, CO4, CO5 and CO6 |

| | **Course Articulation Matrix: (Mapping of COs with POs and PSOs)** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PO-PSO CO** | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| **CO1** | 0 | 0 | 0 | 3 | 3 | 0 | 0 | 3 | 3 | 3 | 0 | 3 | 0 | 3 |
| **CO2** | 0 | 0 | 0 | 3 | 3 | 0 | 0 | 3 | 3 | 3 | 0 | 3 | 0 | 3 |
| **CO3** | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 3 | 3 | 0 | 3 | 0 | 3 |
| **CO4** | 0 | 0 | 0 | 3 | 3 | 0 | 0 | 0 | 3 | 0 | 0 | 3 | 0 | 3 |
| **CO5** | 0 | 0 | 0 | 3 | 3 | 0 | 0 | 3 | 3 | 3 | 0 | 3 | 0 | 3 |
| **CO6** | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 3 | 3 | 3 | 0 | 3 | 0 | 3 |

**1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

| | |
|---|---|
| **Name & Sign of Program Coordinator** | **Sign & Seal of HoD** |