

**INTEGRAL UNIVERSITY**  
**DEPARTMENT OF CIVIL ENGINEERING**

**PROGRAMME:** M. TECH CONSTRUCTION TECHNOLOGY AND MANAGEMENT

**PROGRAM SPECIFIC OUTCOMES (PSO):**

**PSO-1:** Facilitate and develop knowledge based on construction engineering, management and research in the various fields of project management in the construction industry.

**PSO-2:** Able to become professionals such as Construction Managers and Entrepreneurs in the construction Industry.

**PSO-3:** To comprehend the ability to create, analyze, formulate and solve complex problems associated with construction technology and management.

**PROGRAM EDUCATIONAL OBJECTIVES (PEO):**

**PEO-1:** To facilitate appropriate theoretical concepts in dealing with practical based real-life problems associated with construction management and develop the necessary tools for the same.

**PEO-2:** To promote a skillset required for excellence in a particular profession to achieve desired project objectives in an organization.

**PEO-3:** To circulate the manner & ability to acquire, utilize the specific knowledge to deliver effective management-based solutions using latest tools and technique's.

**PEO-4:** To enhance and inculcate the concepts required to promote a, develop and finish large scale projects within a particular time frame successfully.

**PROGRAM OUTCOMES (PO):**

**PO1- Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

**PO2- Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**PO3- Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**PO4- Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**PO5- Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

**PO6- The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**PO7- Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**PO8- Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**PO9- Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**PO10- Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**PO11- Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO12- Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**COURSE: INFRASTRUCTURE PLANNING & CONTRACT MANAGEMENT****COURSE CODE: CE541****COURSE OBJECTIVES:**

- To develop knowledge of infrastructure planning.
- To develop knowledge o financial evaluation of project.
- To develop knowledge of project risk analysis.
- To enhance the knowledge of different private laws property laws and building by laws of local authority.
- To develop the knowledge of preparation of contract document, NIT for construction and procurement purpose.

**COURSE OUTCOMES (CO):***After the successful course completion, learners will develop following attributes:*

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	Able to do planning and appraisal of major infrastructure project and can prepare scheduling and management of planning activity.
<b>CO2</b>	Able to Understand the methodologies of economic analysis of public works and accounting for risk and uncertainty.
<b>CO3</b>	Able to Understand the time value of money, project cash flow, political and social perspective of infrastructure planning.
<b>CO4</b>	Able to Understand different public law, private law. Contract property law and building by laws of local authority.
<b>CO5</b>	Able to Prepare best contract document used for construction and procurement and will be well versed BOT, BOOT and EPC contract.

**CO-PO MAPPING:**

<b>CO</b>	<b>DESCRIPTION</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	Able to do planning and appraisal of major infrastructure project and can prepare scheduling and management of planning activity.	2	2	2	1	2	1	1	0	2	1	3	2
<b>CO2</b>	Able to Understand the methodologies of economic analysis of public works and accounting for risk and uncertainty.	1	2	1	2	1	1	2	0	2	1	3	2
<b>CO3</b>	Able to Understand the time value of money, project cash flow, political and social perspective of infrastructure planning.	1	2	1	1	2	1	1	0	2	1	2	2
<b>CO4</b>	Able to Understand different public law, private law. Contract property law and building by laws of local authority.	0	1	0	1	0	3	1	1	1	1	0	2
<b>CO5</b>	Able to Prepare best contract document used for construction and procurement and will be well versed BOT, BOOT and EPC contract.	2	0	0	1	2	0	1	1	1	1	1	1
3: Strong contribution, 2: average contribution, 1: Low contribution													

**COURSE: PROJECT MANAGEMENT IN CONSTRUCTION**  
**COURSE CODE: CE542**

**COURSE OBJECTIVES:**

- To make them understand the concepts of project management from Project initiation to project close out.
- To make them understand the need of scope management, activity sequencing to excite a project in due time.
- To enable them to response on situational based problems using quantitative methods to manage cost.
- To comprehend the fundamentals of recourse management, risk management, quality management in a project.
- To make them capable to analyze, apply & comment the project complexities based on procurement, contract management & risk control.

**COURSE OUTCOMES (CO):**

*After the successful course completion, learners will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Learner will be able to understand the concept of project based management techniques to deal with different project parameter involved in various stages of a project.
CO2	Based on the feasibility studies the learner will be able to create a scope statement that includes activity oriented network diagram to perform critical analysis.
CO3	Understand the concept of cost management principle based on situational based problems and to analyses the response for future in modifications.
CO4	Apply the Recourse management, Quality management & Risk management methods to develop risk management plan with utmost utilization of project resource & quality objectives.
CO5	Understand the concept of contract management, project procurement & value management for better analysis of a project and its growth.

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Learner will be able to understand the concept of project based management techniques to deal with different project parameter involved in various stages of a project.	3	0	0	0	0	0	0	0	0	0	3	3
CO2	Based on the feasibility studies the learner will be able to create a scope statement that includes activity oriented network diagram to perform critical analysis.	1	3	2	0	0	0	0	0	0	0	3	0
CO3	Understand the concept of cost management principle based on situational based problems and to analyses the response for future in modifications.	3	3	0	0	0	0	0	0	0	0	3	0
CO4	Apply the Recourse management, Quality management & Risk management methods to develop risk management plan with utmost utilization of project resource & quality objectives.	3	0	0	3	0	0	0	0	0	0	3	0
CO5	Understand the concept of contract management, project procurement & value management for better analysis of a project and its growth.	3	0	0	0	0	0	0	0	0	3	3	0
3: Strong contribution, 2: average contribution, 1: Low contribution													

**COURSE: CONSTRUCTION METHODS & EQUIPMENT MANAGEMENT****COURSE CODE: CE543****COURSE OBJECTIVES:**

- To develop knowledge of economics related matters of construction equipment.
- To develop the understanding of different types of construction equipments.
- To develop the understanding of working characteristics of different types of construction equipments.
- To develop the modeling and optimization techniques of construction equipment productivity.

**COURSE OUTCOMES (CO):***After the successful course completion, learners will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Given the utilization conditions, learner will be able to understand various cost components of construction equipment and analyze available alternatives.
CO2	Knowing the project specification, learner will be able to identify types of construction equipment required and find out most suitable or combination of construction equipment.
CO3	Knowing the process associated with concrete mix production, learner will be able to understand the requirements and can supervise the setting up a concrete or asphalt mix production plant as well laying of concrete mix.
CO4	Given the conditions of construction activity, learner will be able to understand different methods of productivity optimization and prepare required activity optimization plan.
CO5	Depending upon construction site characteristics, learner will be able to analyze construction equipment safety requirements & accident data and prepare construction equipment safety plan.

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Given the utilization conditions, learner will be able to understand various cost components of construction equipment and analyze available alternatives.	1	3	3	3	0	0	0	0	0	0	3	2
CO2	Knowing the project specification, learner will be able to identify types of construction equipment required and find out most suitable or combination of construction equipment.	3	0	3	3	1	0	0	0	0	0	2	2
CO3	Knowing the process associated with concrete mix production, learner will be able to understand the requirements and can supervise the setting up a concrete or asphalt mix production plant as well laying of concrete mix.	2	0	3	1	0	0	0	0	0	0	0	2
CO4	Given the conditions of construction activity, learner will be able to understand different methods of productivity optimization and prepare required activity optimization plan.	3	0	3	3	0	0	0	0	0	0	3	3
CO5	Depending upon construction site characteristics, learner will be able to analyze construction equipment safety requirements & accident data and prepare construction equipment safety plan.	0	3	3	2	0	3	0	0	0	0	2	0

3: Strong contribution, 2: average contribution, 1: Low contribution

**COURSE: URBAN TRANSPORTATION SYSTEM PLANNING**  
**COURSE CODE: CE544**

**COURSE OBJECTIVES:**

- To develop the understanding of Transport Planning and its characteristics.
- To gain knowledge about different types of Transportation systems along with their design as well as logistics optimization techniques.

**COURSE OUTCOMES (CO):**

*After the successful course completion, learners will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Learner will acquire knowledge about fundamentals of transportation system, hierarchy of roads; will be acquainted about fundamentals of demand & supply.
CO2	Learner will learn basics of transportation networks and will be able to conduct traffic surveys.
CO3	Learner will learn fundamentals of four stage transport planning process & travel demand management measures.
CO4	Learner will understand about basics of public transport & can to basic designing of transport facilities.
CO5	Learner will understand the fundamentals of freight transport in India & logistics involved cost.

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Learner will acquire knowledge about fundamentals of transportation system, hierarchy of roads; will be acquainted about fundamentals of demand & supply.	2	1	3	2	0	0	0	0	0	1	1	0
CO2	Learner will learn basics of transportation networks and will be able to conduct traffic surveys.	2	2	1	2	2	0	0	0	0	0	0	0
CO3	Learner will learn fundamentals of four stage transport planning process & travel demand management measures.	2	2	0	0	2	0	0	0	0	1	1	0
CO4	Learner will understand about basics of public transport & can to basic designing of transport facilities.	3	2	1	0	2	0	2	0	0	0	0	0
CO5	Learner will understand the fundamentals of freight transport in India & logistics involved cost.	1	0	0	0	0	1	2	0	0	1	2	0
3: Strong contribution, 2: average contribution, 1: Low contribution													

**COURSE: TENDER, CONTRACT & SPECIFICATION PREPERATION & FIELD WORK****COURSE CODE: CE 545****COURSE OBJECTIVES:**

- To make the students aware regarding general procedure of Bidding in construction industry.
- To impart the practical knowledge of tender formation, tender invitation and its award based on legal guidelines.
- To make them aware about the concept of Building feasibility and valuation.

**COURSE OUTCOMES (CO):***After the successful course completion, learners will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
CO1	To make the students familiar with the past and recent trends of tender formation, evaluation and award.
CO2	Learner will be able to understand the information based on feasibility studies on account of building specifications, regulations and guidelines.

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	To make the students familiar with the past and recent trends of tender formation, evaluation and award.	3	2	1	3	2	2		2	2	3	1	2
CO2	Learner will be able to understand the information based on feasibility studies on account of building specifications, regulations and guidelines.	3	2	1	3	2	2		2	2	3	2	2
3: Strong contribution, 2: average contribution, 1: Low contribution													

**COURSE: INFRASTRUCTURAL ECONOMICS & FINANCE****COURSE CODE: CE546****COURSE OBJECTIVES:**

- To make them understand the economical factor used in the construction industry.
- To enable them to deal with risk associated with capital budgeting & Contract Administration.
- To impart the knowledge of capital management using financial methods.
- Learner should be able to identify need and implication of organizational Strategy
- To impart the basic knowledge about corporate Strategy & Social Responsibility.

**COURSE OUTCOMES (CO):***After the successful course completion, learners will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Gather background information about construction accounting and determine its effect on a project evaluation.
CO2	Describe and explain the features of inflation, taxation & contract bidding to enhance the performance of a construction project.
CO3	Understand the concept of international finance to accomplish performance appraisal through Capital management tools
CO4	Identify the need of strategy formulation & their implementation to understand External and Internal factors in organization.
CO5	Describe and explain the Basic features of corporate strategy & social responsibility.

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Gather background information about construction accounting and determine its effect on a project evaluation.	3	0	0	3	0	0	0	0	0	0	3	0
CO2	Describe and explain the features of inflation, taxation & contract bidding to enhance the performance of a construction project.	3	0	3	0	0	0	0	0	0	0	3	0
CO3	Understand the concept of international finance to accomplish performance appraisal through Capital management tools	3	0	0	3	0	0	0	0	0	0	3	0
CO4	Identify the need of strategy formulation & their implementation to understand External and Internal factors in organization.	3	0	3	0	0	0	0	0	0	0	3	0
CO5	Describe and explain the Basic features of corporate strategy & social responsibility.	2	0	3	0	0	1	0	0	0	0	3	0
3: Strong contribution, 2: average contribution, 1: Low contribution													

**COURSE: QUALITY & SAFETY MANAGEMENT IN CONSTRUCTION**  
**COURSE CODE: CE547**

**COURSE OBJECTIVES:**

- To develop concept of quality general and in construction in particular.
- To develop the understanding of different levels of quality and its significance.
- To develop concept of safety and its need in construction field.
- To develop the understanding of different guidelines regarding safety at construction site.

**COURSE OUTCOMES (CO):**

*After the successful course completion, learners will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Knowing the fundamentals of quality regimes, learners will understand the sequential development of quality approach and are able to compare the different quality levels
CO2	Given the requirements of structure, material and machinery used, learner will understand about different tools and techniques of quality management and able to develop a quality plan
CO3	Knowing the international requirements of quality protocols, learner will understand quality assurance in construction and be able to develop quality assurance plan
CO4	Knowing the principles of Total Quality Management, learner will understand the necessity of health & safety of occupants at workplace and be able to analyze the hazard potential for prevailing conditions
CO5	Given the site conditions, learner will understand the legal requirements for safety and be able to develop safety plan for construction site

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Knowing the fundamentals of quality regimes, learners will understand the sequential development of quality approach and are able to compare the different quality levels	3	0	3	0	0	0	0	0	0	0	0	3
CO2	Given the requirements of structure, material and machinery used, learner will understand about different tools and techniques of quality management and able to develop a quality plan	3	0	3	0	0	0	0	0	0	0	0	3
CO3	Knowing the international requirements of quality protocols, learner will understand quality assurance in construction and be able to develop quality assurance plan	0	0	3	0	0	3	0	0	0	0	0	3
CO4	Knowing the principles of Total Quality Management, learner will understand the necessity of health & safety of occupants at workplace and be able to analyze the hazard potential for prevailing conditions	0	0	0	0	0	3	0	3	0	0	0	3
CO5	Given the site conditions, learner will understand the legal requirements for safety and be able to develop safety plan for construction site	0	0	0	0	0	3	0	3	0	0	0	3
3: Strong contribution, 2: average contribution, 1: Low contribution													



**COURSE: MODERN CONSTRUCTION TECHNIQUES**  
**COURSE CODE: CE548**

**COURSE OBJECTIVES:**

- To develop the understanding between construction and technology.
- To develop the understanding of different needs of a building and its modern solutions.
- To make learner abreast with latest construction techniques.
- To make learner abreast with latest materials used in construction.

**COURSE OUTCOMES (CO):**

*After the successful course completion, learners will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Knowing the modern requirements, learner will understand the developments in the area of concrete use and be able to design concrete mix as per requirements
CO2	Knowing the modern construction techniques, learner will be aware of developments in structural framing, building components etc and be able to plan for construction incorporating modern developments
CO3	Knowing about different kinds of form works and fire resistance needs, learner will be able to understand the requirement of National building code and able to apply provisions of it
CO4	Given the utilization conditions, learner will develop the understanding of sustainable building construction practices and be able to prepare plan giving due importance
CO5	Knowing past experiences, learner will develop the understanding about situational requirements and be able to suggest technologically driven solutions

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Knowing the modern requirements, learner will understand the developments in the area of concrete use and be able to design concrete mix as per requirements	3	0	3	0	0	0	0	0	0	0	3	0
CO2	Knowing the modern construction techniques, learner will be aware of developments in structural framing, building components etc and be able to plan for construction incorporating modern developments	0	0	3	0	3	0	3	0	0	0	0	3
CO3	Knowing about different kinds of form works and fire resistance needs, learner will be able to understand the requirement of National building code and able to apply provisions of it	3	0	3	0	0	3	0	0	0	0	0	0
CO4	Given the utilization conditions, learner will develop the understanding of sustainable building construction practices and be able to prepare plan giving due importance	0	0	3	0	0	3	3	0	0	0	0	3
CO5	Knowing past experiences, learner will develop the understanding about situational requirements and be able to suggest technologically driven solutions	0	0	3	3	0	3	0	0	0	0	0	3
3: Strong contribution, 2: average contribution, 1: Low contribution													

**COURSE: ADVANCED PAVEMENT AND ENGINEERING LAB**  
**COURSE CODE: CE549**

**COURSE OBJECTIVES:**

- To make the students aware regarding general construction practices used in past and in construction of pavement.
- To impart the practical knowledge of pavement construction using various experiments based on bitumen samples and binders
- To make them aware about the transportation ergonomics.

**COURSE OUTCOMES (CO):**

*After the successful course completion, learners will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
CO1	To make the students familiar with the past and recent trends of pavement construction & modern equipment's using experiments.
CO2	Learner will be able to understand the information based on pavement type, material, binders and Grade of Aggregates.

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	To make the students familiar with the past and recent trends of pavement construction & modern equipment's using experiments.	3	2	1	3	3	1	1	1	2	3	0	2
CO2	Learner will be able to understand the information based on pavement type, material, binders and Grade of Aggregates.	3	2	1	3	2	1	1	1	2	3	0	2
3: Strong contribution, 2: average contribution, 1: Low contribution													

**COURSE: READY MIX CONCRETE DESIGN & QUALITY CONTROL**  
**COURSE CODE: CE641**

**COURSE OBJECTIVES:**

- To develop knowledge of Ready mix concrete production as a quality control manager as well as concrete production plant manager
- To develop the understanding of different preproduction elements like source selection etc.
- To develop the understanding of different constituent material and its behavior
- To develop the understanding of concrete production and its delivery.

**COURSE OUTCOMES (CO):**

*After the successful course completion, learners will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
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

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Knowing the principals of strength and durability of concrete, learner will be able to distinguish between alternatives and can select suitable material	3	0	0	0	0	2	1	1	0	0	0	2
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	0	0	3	3	0	0	0	0	0	0	1	1
CO3	Given the properties cement and aggregates, learner will be able to prepare a quality assurance plan and ensure the application of it	3	0	3	3	0	0	0	0	0	0	0	0
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	3	0	3	3	0	0	0	0	0	0	0	0
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	3	0	0	0	0	3	0	3	0	0	0	3
3: Strong contribution, 2: average contribution, 1: Low contribution													

**COURSE: REPAIR AND REHABILITATION OF STRUCTURES****COURSE CODE: CE642****COURSE OBJECTIVES:**

- To make them understand the concept of maintenance and repair in various structures
- To enable them to response towards the quality assurance of concrete in construction
- To comprehend the fundamentals of advance materials and their types for Structural repair works.
- To identify and justify the solution based on structural exposure conditions
- To make them capable to analyze, apply & comment the various rehabilitation measures and methods used in Building Maintenance.

**COURSE OUTCOMES (CO):***After the successful course completion, learners will develop following attributes:*

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	Learner will be able to understand the concept of damage and its Repair using maintenance techniques
<b>CO2</b>	The learner will be able to identify and apply the suitable quality assurance measures using appropriate ways to overcome the harmful effects of concrete in structures
<b>CO3</b>	Understand the various types of material and their end usage in repairing and rehabilitating the structures using latest techniques.
<b>CO4</b>	To facilitate the need to understand the different strength parameters of a structure as per its exposure conditions
<b>CO5</b>	Understand the concept of structural aging, demolition, seismic strengthening to overcome damage using modern rehabilitation techniques.

**CO-PO MAPPING:**

<b>CO</b>	<b>DESCRIPTION</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	Learner will be able to understand the concept of damage and its Repair using maintenance techniques	3	0	2	0	0	0	1	0	0	0	0	3
<b>CO2</b>	The learner will be able to identify and apply the suitable quality assurance measures using appropriate ways to overcome the harmful effects of concrete in structures	1	3	2	0	0	3	0	0	0	0	0	0
<b>CO3</b>	Understand the various types of material and their end usage in repairing and rehabilitating the structures using latest techniques.	2	0	3	0	3	0	0	0	0	0	0	1
<b>CO4</b>	To facilitate the need to understand the different strength parameters of a structure as per its exposure conditions	1	3	3	0	0	2	0	0	0	0	0	0
<b>CO5</b>	Understand the concept of structural aging, demolition, seismic strengthening to overcome damage using modern rehabilitation techniques.	2	0	3	0	0	0	0	0	0	1	0	3
3: Strong contribution, 2: average contribution, 1: Low contribution													

**COURSE: PREFABRICATED & PRECAST STRUCTURES**  
**COURSE CODE: CE643**

**COURSE OBJECTIVES:**

- To develop the concept of Prefabricated & Precast Structures
- To develop the understanding of Prefabricated & Precast Structures and be able to perform analysis and design of different components with regard to implementation.

**COURSE OUTCOMES (CO):**

*After the successful course completion, learners will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Knowing the modern requirements, learner will understand the developments in the area of prefabrication and be able to design classify different systems.
CO2	Knowing the structural behavior of precast systems, learner will be aware of requirements and be able to design a prefabricated member
CO3	Knowing about different prefabrication systems , learner will be able to understands the requirement of each member and able to apply provisions of it
CO4	Given the joint conditions, learner will catagorised the joint and be able to prepare the detailing of structural connections
CO5	Given the condition of utilization, learner will develop the understanding about production, transportation and erection of prefabricated structures

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Knowing the modern requirements, learner will understand the developments in the area of prefabrication and be able to design classify different systems.	3	0	3	0	0	0	0	0	0	0	0	3
CO2	Knowing the structural behavior of precast systems, learner will be aware of requirements and be able to design a prefabricated member	3	0	3	0	0	0	0	0	0	0	0	3
CO3	Knowing about different prefabrication systems , learner will be able to understands the requirement of each member and able to apply provisions of it	3	0	3	0	0	0	0	0	0	0	0	3
CO4	Given the joint conditions, learner will catagorised the joint and be able to prepare the detailing of structural connections	3	0	3	0	0	0	0	0	0	0	0	3
CO5	Given the condition of utilization, learner will develop the understanding about production, transportation and erection of prefabricated structures	3	0	3	0	0	0	0	0	0	0	0	3
3: Strong contribution, 2: average contribution, 1: Low contribution													

**COURSE: SOLID AND HAZARDOUS WASTE MANAGEMENT**  
**COURSE CODE: CE644**

**COURSE OBJECTIVES:**

- To introduce about the construction and demolition waste and its effect on environment
- To give the knowledge of transformation of solid waste.
- To give the knowledge site assessment and characteristics where waste can be dumped
- To give the knowledge of treatment of construction and demolition waste.
- To give the knowledge of disposal of construction and demolition waste.

**COURSE OUTCOMES (CO):**

*After the successful course completion, learners will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
CO1	To enable the student to identify the key origin, quantum and respective properties
CO2	To identify the waste disposal techniques.
CO3	To recognize the method of treatment of waste.
CO4	Enable the student how to recover, identify of waste and its transformation.
CO5	Enable the student to learn the effect on ground water and its remedial treatment.

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	To enable the student to identify the key origin, quantum and respective properties	1	2	3	1	2	1	2	1	0	0	0	0
CO2	To identify the waste disposal techniques.	1	2	2	1	3	3	1	2	0	0	0	0
CO3	To recognize the method of treatment of waste.	1	2	3	2	2	2	3	1	0	0	0	0
CO4	Enable the student how to recover, identify of waste and its transformation.	2	1	2	1	2	1	2	1	0	0	0	0
CO5	Enable the student to learn the effect on ground water and its remedial treatment.	1	1	2	1	1	2	3	3	0	0	0	0
3: Strong contribution, 2: average contribution, 1: Low contribution													

**COURSE: TRANSPORTATION ECONOMICS**  
**COURSE CODE: CE647**

**COURSE OBJECTIVES:**

- To study various econometrics factors governing development of transportation infrastructures.
- To gain knowledge about long-term planning as well as decision making in transportation infrastructures.

**COURSE OUTCOMES (CO):**

*After the successful course completion, learners will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Learner will be able to understand basics of transportation cost modeling and relate the cost of transportation with demand and its elasticity.
CO2	Learner will be able to have basic knowledge of demand forecasting methods and will be able to analyze elasticity of demand.
CO3	Learner will be able to understand the concept of transport pricing and its types.
CO4	Learner will be able to understand regulations when dealing with transport costing.
CO5	Learner will be able to chose appropriate alternative for transportation based on performance levels, impact and cost benefits ratios.

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Learner will be able to understand basics of transportation cost modeling and relate the cost of transportation with demand and its elasticity.	3	2	0	0	0	0	0	0	1	0	0	1
CO2	Learner will be able to have basic knowledge of demand forecasting methods and will be able to analyze elasticity of demand.	0	0	3	0	0	1	1	0	2	2	1	0
CO3	Learner will be able to understand the concept of transport pricing and its types.	3	2	1	1	1	0	0	1	1	0	0	0
CO4	Learner will be able to understand regulations when dealing with transport costing.	2	0	0	0	0	1	1	0	2	0	0	0
CO5	Learner will be able to chose appropriate alternative for transportation based on performance levels, impact and cost benefits ratios.	0	2	0	0	0	0	1	1	1	0	0	1
3: Strong contribution, 2: average contribution, 1: Low contribution													

**COURSE: PRINCIPLES OF AFFORDABLE HOUSING****COURSE CODE: CE648****COURSE OBJECTIVES:**

- To give the knowledge of Affordable Housing and give an idea about current trends and its feasibility
- To give an idea of role of financial institution in Affordable Housing Sector
- To have a knowledge of Various alternative building materials that can be used in construction.
- To apply the knowledge of low cost term in Infrastructure services specially sanitation, energy etc
- To give the knowledge of various schemes launched by central Govt and Central Govt for urban poor.

**COURSE OUTCOMES (CO):***After the successful course completion, learners will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
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.

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	To enable the student to understand the meaning of Affordability and trends in present scenario.	1	1	1	1	2	3	2	1	1	0	0	0
CO2	To enable the student to understand the role of financial institutions in promotion of Affordable Housing.	1	2	1	2	1	2	1	1	1	0	0	0
CO3	To give the Knowledge of use of Alternative construction material in low cost housing.	1	1	1	1	2	1	1	1	1	0	0	0
CO4	To impart the knowledge of low cost sanitation and its optimization.	1	2	2	2	2	1	1	1	1	0	0	0
CO5	To give the knowledge of various schemes started by State Govt. and Central Govt.	1	1	2	3	2	2	1	2	1	0	0	0
3: Strong contribution, 2: average contribution, 1: Low contribution													



**COURSE: BUILDING SERVICES & MAINTENANCE MANAGEMENT**  
**COURSE CODE: CE649**

**COURSE OBJECTIVES:**

- To make them understand the concepts of Building services and its management in various structures using suitable techniques
- To make them understand the need to manage extensive building services and their provisions
- To enable them to response on situational based problems using suitable formwork methods as per the building requirement.
- To comprehend the fundamentals of functional planning and space optimization in a Building.
- To make them capable to analyze, apply & comment the various engineering services used in a Building construction and Maintenance.

**COURSE OUTCOMES (CO):**

*After the successful course completion, learners will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Learner will be able to understand the concept of Prefabrication techniques to deal with different building complexities such as fire protection and space.
CO2	The learner will be able to identify and apply the suitable tools to overcome the heating and cooling effects and plumbing services in Building Construction.
CO3	Understand the concept of various types of Formwork services and its design to analyses the response based on common formwork and false work systems.
CO4	To facilitate the need to understand the functional parameters and their planning as per the required space in a building.
CO5	Understand the concept of Engineering services such as Lifts, effective water management systems and Management information systems for better analysis of a Building life cycle.

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Learner will be able to understand the concept of Prefabrication techniques to deal with different building complexities such as fire protection and space.	3	0	0	0	0	0	3	0	0	0	1	2
CO2	The learner will be able to identify and apply the suitable tools to overcome the heating and cooling effects and plumbing services in Building Construction.	1	3	2	0	0	3	0	0	0	0	0	0
CO3	Understand the concept of various types of Formwork services and its design to analyses the response based on common formwork and false work systems.	2	3	0	0	3	1	0	0	0	0	0	0
CO4	To facilitate the need to understand the functional parameters and their planning as per the required space in a building.	3	0	0	0	0	3	3	0	0	0	0	0
CO5	Understand the concept of Engineering services such as Lifts, effective water management systems and Management information systems for better analysis of a Building life cycle.	2	0	0	0	0	2	0	0	0	3	0	2
3: Strong contribution, 2: average contribution, 1: Low contribution													

**COURSE: CONSTRUCTION INFORMATION SYSTEMS**  
**COURSE CODE: CE650**

**COURSE OBJECTIVES:**

- To make them understand the need of an effective management information system.
- To apply the knowledge based on application of MIS to overcome the project management problems.
- To make them understand the importance of effective planning and scheduling in construction industry using latest information tools.
- To make them capable enough to select suitable information tool to impart financial information as per the market type.
- To make them capable to perform audit in terms of quality assurance and its control using Software.

**COURSE OUTCOMES (CO):**

*After the successful course completion, learners will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Learner will be able to understand the basic knowledge of information system to ensure better management in an Organization.
CO2	Understand the need of automation in planning, scheduling and monitoring using latest information models.
CO3	Develop an innovative tool to safeguard & improve simulation methods to control the project Information.
CO4	Create an Integrated construction management tool to enhance the user Knowledge and capability to overcome construction challenges.
CO5	Understand the need of Audit in a Project Life cycle to ensure Quality objectives using various information tools.

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Learner will be able to understand the basic knowledge of information system to ensure better management in an Organization.	3	0	0	0	0	1	0	3	0	0	3	2
CO2	Understand the need of automation in planning, scheduling and monitoring using latest information models.	3	0	3	0	0	0	0	0	0	3	2	0
CO3	Develop an innovative tool to safeguard & improve simulation methods to control the project Information.	3	0	3	0	0	0	0	0	0	0	3	0
CO4	Create an Integrated construction management tool to enhance the user Knowledge and capability to overcome construction challenges.	3	3	0	2	1	0	0	0	0	0	2	0
CO5	Understand the need of Audit in a Project Life cycle to ensure Quality objectives using various information tools.	3	0	0	0	0	0	0	2	2	1	0	3
3: Strong contribution, 2: average contribution, 1: Low contribution													

**COURSE: SUSTAINABLE DESIGN & VALUE ANALYSIS****COURSE CODE: CE653****COURSE OBJECTIVES:**

- To make them understand the need to bring sustainability & to develop sustainable architecture.
- To comprehend the fundamentals of green building to attain sustainability.
- To make them understand the need of solar panels along with IGBC rating system & guidelines.
- To make them understand the Valuation of a Buildings using latest methods.
- To make them capable to perform life cycle cast analysis pertaining to environ mate protection.

**COURSE OUTCOMES (CO):***After the successful course completion, learners will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
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.

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Learner will be able to understand the basic knowledge of sustainability & its challenges in construction industry.	3	0	0	0	0	3	0	1	0	0	2	0
CO2	Understand the need of energy efficient buildings to mitigate the harmful effects of non-ecofriendly materials.	3	0	0	0	0	2	3	0	0	0	0	1
CO3	Develop an innovative tool to safeguard & improve sustainable structures as per the national guidelines.	3	0	0	0	0	3	3	0	0	0	0	0
CO4	Create economic feasibility analysis to perform Value analysis of Buildings.	3	0	0	3	0	0	0	0	0	0	3	0
CO5	Understand the environmental social & management methods to economize infrastructure & society using life cycle cost analysis.	3	0	0	3	0	0	0	0	0	0	3	0

3: Strong contribution, 2: average contribution, 1: Low contribution

**COURSE: DIRECTED STUDY**  
**COURSE CODE: CE654**

**COURSE OUTCOMES (CO):**

*After the successful course completion, learners will develop following attributes:*

COURSE OUTCOME (CO)	DESCRIPTION
CO1	To make the students aware regarding practical life-based problems associated with construction site to excel in a particular field of learning and gather the required data for further research.

**CO-PO MAPPING:**

CO	DESCRIPTION	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	To make the students aware regarding practical life-based problems associated with construction site to excel in a particular field of learning and gather the required data for further research.	3	2	2	3	2	2	1	1	3	3	1	3
3: Strong contribution, 2: average contribution, 1: Low contribution													

**COURSE: M TECH DISSERTATION**  
**COURSE CODE: CE699**

**COURSE OUTCOMES (CO):**

*After the successful course completion, learners will develop following attributes:*

<b>COURSE OUTCOME (CO)</b>	<b>DESCRIPTION</b>
<b>CO1</b>	Work as an individual and select a research-based problem
<b>CO2</b>	Review the literature based on the chosen research-oriented problem
<b>CO3</b>	Formulate a specific methodology for the attainment of various research objectives
<b>CO4</b>	Application of various tools and techniques to analyze and provide necessary tools for the proposed research
<b>CO5</b>	Prepare and present the dissertation report

**CO-PO MAPPING:**

<b>CO</b>	<b>DESCRIPTION</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	Work as an individual and select a research-based problem	3	2	2	2	2	2	1	1	3	2	0	2
<b>CO2</b>	Review the literature based on the chosen research-oriented problem	3	2	2	3	2	2	1	1	3	2	0	2
<b>CO3</b>	Formulate a specific methodology for the attainment of various research objectives	3	2	2	2	2	2	1	1	3	2	0	2
<b>CO4</b>	Application of various tools and techniques to analyze and provide necessary tools for the proposed research	3	2	3	3	3	2	1	1	3	2	2	2
<b>CO5</b>	Prepare and present the dissertation report	3	2	2	2	2	2	1	1	3	2	3	2
3: Strong contribution, 2: average contribution, 1: Low contribution													