DEPARTMENT OF CIVIL ENGINEERING

HONOURS OFFERED UNDER B.TECH. CIVIL ENGINEERING

HONOURS: CONSTRUCTION PROJECT MANAGEMENT AND COST ESTIMATION

S.No	Name of the Course	Total Learning Hours	Credit
1	Construction Planning & Cost Estimation (CEH4361)	45	3
2	Project Management & Scheduling (CEH4376)	45	3
3	Infrastructure Project Management (CEH4377)	45	3
4	Project management for managers (CEH4462)	45	3
Total Credits			**12**

CURRICULUM

B. TECH HONOURS IN CONSTRUCTION PROJECT MANAGEMENT AND COST ESTIMATION									
SEM	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
V	Honours	CEH4361	Construction Planning and Cost Estimation	3	0	0	3	0	3
VI	Honours	CEH4376	Project Management and Scheduling	3	0	0	3	0	3
VI	Honours	CEH4377	Infrastructure Project Management	3	0	0	3	0	3
VII	Honours	CEH4462	Project Management for Managers	3	0	0	3	0	3
TOTAL				**12**	**0**	**0**	**12**	**0**	**12**

L-Lecture T-Tutorial P-Practical C-Credit S-Self-study TCH-Total contact hours

HONOURS

COURSE TITLE	Course I - CONSTRUCTION PLANNING & COST ESTIMATION			CREDITS	3
COURSE CODE	CEH4361	COURSE CATEGORY	HONOURS	L-T-P-S	3-0-0-1
Version	1.0	Approval Details	33 ACM, 15.12.2021	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Map with multiple courses for 45 Hours per course. CIA calculated from Coursera platform. End Semester Examination should be conducted per course.

Course Description	The Construction Management specialization is curated for professionals in the construction and civil engineering industry looking to advance their careers. Through this specialization, students will gain comprehensive industry knowledge along with the latest trends and development within the industry. This 5-coursespecialization will cover the major facets of construction management including project initiation and planning, scheduling techniques and procedures, cost estimating and control, and construction project financials. After students complete this specialization, they will have gained significant skills and tools to stay relevant and ahead of the curve in the world of construction management.
Course Objective	The course should enable the students to 1. Know the role and responsibilities of a project manager 2. Gain knowledge about quantity measurement and cost estimation of a construction project. 3. Know about the importance of cost controlling and how to monitor project cash flow in a construction project 4. Know about the financial plans to be considered in a construction project 5. Learn about real estate finance and real estate project lifecycle.

Course Outcome	Upon completion of this course, the students will be able to 1. Perform a project assessment based on the business requirements. 2. Estimate the quantity of materials required for a construction project and execute cost estimation. 3. Apply cost control measures in a construction project. 4. Develop financial plans for a construction project. 5. Analyse the risks in the public private partnership projects.

Prerequisites: Nil

CO, PO AND PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	-	-	-	-	-	2	-	2	2	-	3	3	-	1	3
CO-2	2	1	-	2	1	2	1	2	-	-	3	3	3	2	3
CO-3	2	1	-	2	1	2	1	2	-	-	3	3	3	2	3
CO-4	2	1	-	2	1	2	1	2	-	-	3	3	3	2	3
CO-5	2	1	-	2	1	2	1	2	-	-	3	3	3	2	3

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: INITIATING AND PLANNING PROJECTS (7)

Project Management Overview Project Management Project Planning **-** What is a Project? - Stakeholders- Scope Matters- Authority vs. Influence	**CO-1** **BTL-2**

MODULE 2 CONSTRUCTION COST ESTIMATING (9)

Quantity Estimate Construction Cost Estimating and Cost Control Overview-Understanding Design in the Construction Industry-Introduction to the **Types of Cost Estimates** Overview of the Types of Cost Estimates, Cost Indices, Cost, Capacity Factor, Cost Estimates Quiz, Cost Estimates Work Problem**.** **Quantity Take-Off and Measurement** Measurement, Masonry, Glass Curtain Wall, Facade / Wall Finishes / Measurement Overview, Cut and Fill Process and Equipment, Cut and Fill Takeoff, Cut and Fill Software,	**CO-2** **BTL-3**

Introduction to Deep Foundations, Concrete Foundation and Concrete Properties, Concrete Formwork, Concrete Takeoff: Parking Lot Example, Concrete Takeoff: Skyscraper Example, Quantifying rebar Walkthrough, History of Structural Steel, Steel Sections in Design, Structural Steel Takeoff Example **Pricing** Cost of Materials and Formwork- Concrete Material: Reinforcing Steel and Concrete Money Component- Productivity Component and Examples- Estimating Equipment Costs- 1 practice Exercise-Pricing **Building the Estimate** Estimate Classification, Methods and Formats - Design Estimate project -Schematic Design Estimate Demo -Schematic Design: A Deeper Dive -Building and Finalizing the Estimate - Checks and Due Diligence -1 practice exercise -Building the Estimate. **Cost Estimation in Practice** Cost Estimating in General Practice -Tips in Cost Estimating and Cost Management-Roles and Responsibilities of Cost Managers -1 practice exercise -Cost Estimation.	
MODULE 3: PROCUREMENT, PROJECT CASH FLOW &COST CONTROL (12)	
Procurement General Procurement: Pre-Bid Estimate and Bid Documentation -Bid Stage, Bid Returns and Levelling -1 practice exercise Procurement **Post Contract and Cost Estimation within a Project** Cost Reporting Overview -Cost Reporting Examples-Change Orders and Communication **Construction Cost Control Methods** What is Cost Control -Defining Methods of Cost Control -1 practice exercise Cost Control **Earned Value Method (EVM)** Defining EVM- EVM Parameters -Performance Examples - EVM Favourable Performance - Calculating EVM -2 practice exercises Earned Value Method- Work Problem EVM. **Close Out Period** Close Out Punch List Review - Close Out Activities - 1 practice exercise -Close Out Period **Project Cash Flow** Cash Flow Method -Accrual Method -Contractor Cash Flow- Charting Cash Flow -Calculating Billing -Payment Cycle -Payment Cycle Drivers -Payment Cycle Delays -Schedule of Value - Accelerating Revenue -Front Loading -Delaying Expenses -1 practice Exercise-Project Cash Flow. **Technology Trends in Cost Estimating and Cost Control**	**CO-3** **BTL-3**

5D Estimating Systems (BIM) -Estimating Software in Action -Workflows -Implementation Perspective -Next Steps. **Program Cost Estimating Period** Program Cost Control -Defining the Cost of a Capital Program -Useful Tools for Cost Control- **1 practice exercise -** Cost Control for Large Programs. **Lean in Cost Control** Money and Estimate in Capital Project Delivery - Benchmarking and Normalization Process - Lean Design: Value - Lean in Cost Control - Lean Set Based Design - 1 practice exercise- Lean in Cost Control.	
MODULE 4 : CONSTRUCTION FINANCE & FINANCIAL PLANS FOR DEVELOPMENT PROJECTS	**(11)**
Introduction Construction Finance Course Introduction **The Mathematics of Money** Mathematics of Money - Project Evaluation -Computing Interest / Simple Interest Calculations -Compound Interest Calculations -Simple vs. Compound Interest Rate Example / Nominal and Effective Rate -Nominal Interest Rate Example and Minimum Attractive Rate of Return -Present and Future Value of Money -Future Value of a Uniform Series -Uniform Series -Uniform Series: A deeper dive -Equations for Uniform Series -Net Present Value (NPV) Example -Internal Rate of Return (IRR) Example -Mathematics Of Money -Case Study: Mathematics of Money **Real Estate Finance for Development Projects** Introduction to Financing Development Projects -Feasibility Study Example -- Project Parameters -Development Costs -"Comps" based Property Sale, Tax, Gain and Return -"Cap Rate" based Sale, Tax Gain and Return -Preview of "Discounted Cash Flow" Methods for Gain and Return-Framework for "Discounted Cash Flow" (DCF) Analysis "Net Present Value" DCF Method for Project Evaluation -Net Present Value (NPV) Examples -"Internal Rate of Return" (IRR) Method for Project Evaluation -NPV and IRR Analysis with Excel -Changing and Comparing Compounding Periods. **2 practice exercises** Real Estate Finance Development Projects **-** Feasibility Study: Estimating The Sales Price **Financial Plans for Development Projects** Introduction to Financial Plans for Development Projects- Debt Financing of Real Estate Projects-Construction Loan Example -Net Comprehensive Cash Flows for Sponsor and Lender -DCF Project Evaluation for Sponsor and Lender. -Introduction to Decision Tree Analysis - Decision Tree Example - Overview -Solving the Example in Excel -Analysis of the Tree Results -Decision Tree Example with Time Value of Cash-Analysis of the Tree Results with Time Value Considered	**CO-4** **BTL-3**

1 practice exercise Designing and Building Commercial Real Estate	
MODULE 5: PROJECT FINANCE AND PPP (6)	
Project Finance Global Project Finance Overview and by Sector -Stakeholders in Project Finance -Stakeholder Roles -Principles of Project Financing -Risk and Risk Allocation -Categories of Risk Allocation - Sponsor Perspectives - Structuring and Documentation -Completion Risks / Government Perspectives-Contract Parties -Contracts and Agreements **1 practice exercise** Project Finance **Risk In Project Finance** Project Parties, Timeline, and Finance -Borrowing Vs Partnering Case Study: Revenue generating case -Case Study: Developer land swap case / Identifying and Allocating Risk **1 practice exercise-** Risk in Project Finance **Public - Private Partnerships** Public Private Partnerships (P3) Concept and Key Elements -Project Types -Drivers, Value and Typical Structures of P3-Responsibilities and Risk Transfer in various P3 structures -Pursuits through full project lifecycle and P3 Success Factors -Benefits of P3 Getting on Board with P3: Case Studies -A Deeper Dive into P3 Case Studies **1 practice exercise-** Public Private Partnerships **Lean in Construction Financing** Identifying Risk -Waste Concept in Lean-Mitigating Risk through Lean Project Delivery Systems -How to Access Probability and Mitigate **1 practice exercise-** Lean in Construction Finance	**CO-5** **BTL-4**

TEXT BOOKS	
1.	Hans Ottosson. (2013). *Practical project management _ for building and construction,* CRC Press.
2.	Gregory K. Mislick, Daniel A. Nussbaum. (2015). *Cost Estimation_ Methods and Tools*, Wiley.
3.	M. A. Mian. (2011). *Project Economics and Decision Analysis*, Volume 1_ Determinisitic Models, PennWell Corp.
4.	Sengupta. (2002). *Construction Management*, Tata McGraw Hill.
5.	J.L. Sharma. (2002). *Construction Management and accounts*. Satya Publications.
6.	D. Lal . (2017). *Construction Management and P.W.D. Accounts*, S.K. Kataria& Sons.
REFERENCE BOOKS	
1.	Kumar NeerajJha. (2016) *Construction Project Management -Theory and Practice*, Pearson Publications, 2nd edition.
2.	Jimmie Hinze. (2015). *Construction Contracts*, McGraw hill education
3.	Martin Brook. (2004). *Estimating and Tendering for Construction Work*, Elsevier.
4.	Lukas Klee. (2015). *International Construction Contract Law*, Wiley.

5.	*The Construction Specifications Institute - Construction Contract Administration Practice Guidem,* John Wiley & Sons, 2011
E BOOKS	
1.	http://www.ebooksdirectory.com/googlesearch.php?q=construction%20management
2.	https://www.scribd.com/search?content_type=tops&page=1&query=construction%20%20management
MOOC	
1.	https://www.coursera.org/learn/initiating-planning
2.	https://www.coursera.org/learn/construction-cost-estimating
3.	https://www.coursera.org/learn/construction-finance

COURSE TITLE	Course II - CONSTRUCTION PROJECT MANAGEMENT & SCHEDULING			CREDITS	3
COURSE CODE	CEH4376	COURSE CATEGORY	HONOURS	L-T-P-S	3-0-0-1
Version	1.0	Approval Details	33 ACM, 15.12.2021	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Map with multiple courses for 45 Hours per course. CIA calculated from Coursera platform. End Semester Examination should be conducted per course.

Course Description	The Construction Management specialization is curated for professionals in the construction and civil engineering industry looking to advance their careers. Through this specialization, students will gain comprehensive industry knowledge along with the latest trends and development within the industry. This 5-coursespecialization will cover the major facets of construction management including project initiation and planning, scheduling techniques and procedures, cost estimating and control, and construction project financials. After students complete this specialization, they will have gained significant skills and tools to stay relevant and ahead of the curve in the world of construction management. Discover the key project scheduling techniques and procedures including; how to create a network diagram, how to define the importance of the critical path in a project network, and defining project activities float- discover the relationships connecting construction activities-describe the differences between calendar dates and work dates and teach how to deal with uncertainty in construction projects.
Course Objective	The course should enable the students to 1. Know about the Project Management, Construction Management and the various Project Delivery methods. 2. Gain knowledge on Sustainable Development in construction, Health and Safety in Construction Processes and the application of Building Information Management in the construction projects. 3. Learn how to build a project organization and the importance of project planning and scheduling 4. Know about the Scheduling techniques such as Critical Path Method and Program Evaluation Review technique. 5. Gain knowledge on Linear Construction Operations, Line of Balance, MS project and Primavera software.

Course Outcome	Upon completion of this course, the students will be able to 1. Apply the various Project Delivery methods in the construction projects. 2. Introduce the Health and Safety Processes in Construction and apply Building Information Management in the construction projects. 3. Apply project planning and scheduling concepts in the construction projects. 4. Apply the Scheduling techniques such as Critical Path Method and Program Evaluation Review technique in the construction projects. 5. Compute the latest dates by which each construction activities can be performed without increasing the cost of the projects.

Prerequisites: Nil

CO, PO AND PSO MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	-	-	-	-	-	2	-	2	2	-	3	3	2	-	3
CO2	-	-	2	2	1	2	1	2	-	-	3	3	2	-	3
CO3	2	3	1	2	2	-	-	-	-	-	2	3	3	1	3
CO4	2	3	1	2	2	-	-	-	-	-	2	3	3	1	3
CO5	2	3	1	2	2	-	-	-	-	-	2	3	3	1	3

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: CONSTRUCTION INDUSTRY & PROJECT DELIVERY (8)

Course Overview

Introduction to The Course Part 1 -Introduction to The Course Part 2

Construction Industry Overview

Introduction to the Engineering and Construction Industry-Construction Projects and Industry Characteristics- Challenges and Opportunities in the Construction Industry- Program Project and Construction Management Introduction-Construction Management and Project Management-Program Management and Summary- Construction vs Manufacturing Industry Basics- Compare and Contrast the Construction and Manufacturing Industries-The Future of the Construction Industry- Introduction to the EAC Life Cycle- The Cost of Change in the EAC Lifecycle- Key EAC Lifecycle Questions -1 practice exercise-Quiz on Construction Industry Overview.

CO-1

BTL-2

Project Delivery

Project Development Cycle Part 1-Project Development Cycle Part 2-Contract Types-Project Delivery Methods-Contracting Strategy Assessment-CM at Risk and CM as Agency-Alliance Contracting and Public Private Partnerships-Types of Surety Bonds-Purchasing a Surety Bond-Terminating a Surety Bond-Surety Loss Data-1 practice Exercise-Quiz on project delivery. **Lean Project Delivery** Project Delivery and the Theory of Lean-Lean Design and Delivery-Lean Design: Flow-1 practice exercise-Lean construction.	
MODULE 2: HEALTH, SAFETY & TECHNOLOGY TRENDS IN CONSTRUCTION (8)	
Sustainability in the Construction Industry Sustainability in Construction Industry-Safety in Construction Industry -Community Involvement in a Construction Project-Rating Systems for Construction Projects-The Envision Rating System-1 practice Exercise-Sustainability in construction. **Environment, Health and Safety of Construction Processes** Environmental, Health and Safety Practices-Barriers to Learning and Change-Safety Performance Models-Safety, Health and Environment Management Systems-Making EHS Work for You-1 practice exercise-EHS. **Building Information Modelling and Technology Trends in Construction** Technology Trends: Defining BIM-The Role of CM and Design Management-Technology and The Role of CM-Technology and The Role of Facility Management-Virtual Reality in Construction Management-1 practice Exercise-Technology trends in construction. **International View of Construction Projects** International Development and Project Risk-Cost Risks: Construction Projects-Cost Risks: Operations- ESPIRIT: A Framework for Understanding Risk-1 practice exercise-International development.	**CO-2** **BTL-3**
MODULE 3: PROJECT PLANNING (8)	

Role of a Construction Manager Being an Effective Project Manager-The Project Organizational Chart-Methods of Contracting-Potential Project Risks-Logistics and Planning-Bidding and Levelling Sheets-Change Order and Claim Management-1 practice exercise-Role of a project manager. **Introduction to Project Planning** Project Planning and Scheduling-The Project Planning Process-Work Breakdown Structure-Standard and Project Coding Part-Project Coding- Estimating Activity Duration Part 1-Estimating Activity Duration Part 2- Determining Job Logic-Activity Relationships- 2 practice exercises-Estimating Duration Work Problem- Quiz on Introduction to Project Planning.	**CO-3** **BTL-3**
MODULE 4 :CONSTRUCTION SCHEDULING (11)	
Introduction to Construction Scheduling Construction Scheduling Course Overview. **Bar (Gantt) Charts** Introducing Bar (Gantt) Charts-Using Bar (Gantt) Charts-Advantages and Disadvantages of Using Bar (Gantt) Charts-1 practice Exercise-Quiz on Gantt Chart. **Activity Precedence Diagrams** Introduction to Activity Precedence Diagrams-Recommendations for Building AON Diagrams-Examples of Activity Precedence (AON) Diagrams. **Types of Construction Activity Relationships** Activities in a Construction Project-Types of Relationships between Construction Activities-Start to Start Relationships-Finish to Finish Relationships-Multiple Relationships-1 practice Exercise-Quiz on Activity Relationships. **Forward and Backward Pass Calculations** Forward Pass Calculations- Backward Pass Calculations-Example 1: Activity on Node Diagram-Example 2: A ON and Forward/Backward Pass Calculations- 1 practice Exercise-Quiz on Activity Precedence Diagrams, Activity Relationships and Forward/Backward Passes. **Critical Path** Introduction to Critical Path-Critical Path in a Project Schedule-Determining the Number of Critical Paths in a Project-Imposing Lag Durations in Critical Path-Determining Critical Path in a Start to	

Start Relationship-Determining Critical Path in a Finish-to-Finish Relationship-1 practice Exercise-Critical Path Method. **Activity Floats** Types of Floats in a Construction Project-Activity Floats-Determining Total Float and Free Float-Introduction to the Interfering Float-Independent Float. **Understanding Work Dates and Calendar Dates** Understanding Work Days and Calendar Days-The Relationship between Calendar Days and Work Days-Charting Work Dates and Calendar Dates-1 practice Exercise-Quiz on Floats and Work Calendar days. **Activity on Arrow** Introduction to Activity on Arrow-Drawing an Activity on Arrow Diagram-Numbering Nodes on a Diagram-Practice Drawing Activity on Arrow Diagrams-Advanced Activity Diagrams-Adding a Key to an Activity on Arrow Diagram-Backward Pass Calculations-Determining the Duration of a Project-2 practice Exercises-Quiz on Activity on Arrow-Activity Diagram and Critical Path. **Program Evaluation & Review Technique (PERT) and Range Estimating** Program Evaluation and Review Technique-Probability of Completing a Project: Normal Distribution-PERT Probability Example-PERT Example on Completing a Project-PERT Calculations: Critical Activities-Applying PERT: Range Estimating.	**CO-4** **BTL-3**
MODULE 5: TECHNOLOGY APPLICATIONS FOR SCHEDULING (10)	
The Role of the Scheduler in Construction Management The Role of the Scheduler in Construction Projects-Ensuring a Project Stays on Track-Keeping Accurate Records of Project Progress-1 practice Exercise-Quiz on PERT and Role of Scheduler- **Linear Construction Operations and Line of Balance** Linear Construction Overview and Examples-Line of Balance (LOB)-LOB Diagram-LOB Example: Develop a Schedule-Visualizing LOB-2 practice Exercises-Quiz on Line of Balance-Line of Balance Diagram. **Technology Applications for Scheduling** Technology Applications: Getting Started-Software Applications Overview-MS Project Scheduling Overview-MS Project: A Deeper Dive-Primavera P6 Overview-Primavera P6Critical Path-Primavera	**CO-5** **BTL-4**

P6: Gantt Chart-Primavera P6 Importing Activities and Running Schedule-Schedule Analysis and Applications-Schedule Application: CustomToolsBuilding Information Management (BIM) Tools-Integration of the Model and ScheduleTools-1 practice Exercise-Quiz on Technology Applications. **Scheduling for Large Programs** Scheduling for Large Programs **Risk Allocation and Planning** Risk Allocation and Planning for Scheduling Overview-Risk Allocation: Defining Success-Risk Allocation Analysis-Sample Risk Profiles-Risk Assessment-Risk Allocation: Schedule and Concluding Remarks. **Lean Design in Construction Scheduling** Lean: Time and Schedule-Lean: Flow-Lean Design and Lean Scheduling-Lean Scheduling and Planning-1 practice exercise-Quiz on Large programs, Risk and Lean.	

TEXT BOOKS	
1.	Hans Ottosson. (2012). Practical project management for building and construction, CRC Press.
2.	Hans Sommer. (2010). *Project Management for Building Construction_*, Springer-Verlag Berlin Heidelberg.
3.	Sengupta. (2002). *Construction Management*, Tata McGraw Hill
4.	Andrew Baldwin, David Bordoli. (2014). *Handbook for Construction Planning and Scheduling*, Wiley.
5.	B C Punmia and K K Khandelwal . (2015). *Project Planning and Control*, Lakshmi Publications pvt Ltd.
REFERENCE BOOKS	
1.	*Code of Practice for Project Management for Construction and Development*, Third edition-The Chartered Institute of Building (2002)
2.	Gary R. Heerkens. (2001). *Project Management,* McGraw-Hill.
3.	Paul E Harris. (2006). *Planning & Scheduling Using Primavera Version 5.0 for Engineering & Construction*, Eastwood Harris Pty Ltd.
4.	Prof. Dr. Klaus Neumann, Dr. Christoph Schwindt, Dr. Jürgen Zimmermann (auth.). (2012). *Project Scheduling with Time Windows and Scarce Resources_ Temporal and Res,* Lecture Notes in Economics and Mathematical Systems.
E BOOKS	

1.	http://www.ebooksdirectory.com/googlesearch.php?q=construction%20management
2.	https://www.scribd.com/search?content_type=tops&page=1&query=construction%20%20management
MOOC	
1.	https://www.coursera.org/learn/construction-project-management
2.	https://www.coursera.org/learn/construction-scheduling

COURSE TITLE	Course III- INFRASTRUCTURE PROJECT MANAGEMENT			CREDITS	3
COURSE CODE	CEH4377	COURSE CATEGORY	HONOURS	L-T-P-S	3-0-0-1
Version	1.0	Approval Details	33 ACM, 15.12.2021	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignment/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Map with multiple courses for 45 Hours per course. CIA calculated from Coursera platform. End Semester Examination should be conducted per course.

Course Description	Scope, time, and cost management are at the heart of successful project management. This course will give you the tools to develop a project scope, schedule and budget and then status them to predict project performance. This course will provide you with the basic principles of urban infrastructure management that are fundamental for building prosperous cities that are sustainable, resilient and efficient. Many Project Managers focus only on the scope, schedule and budget. However, a successful project requires that you. This course will focus on the key support functions-manage risk, control the quality of the deliverables, engage and manage people and procure goods and services.
Course Objective	The course should enable the students to 1. Create a Project Scope Statement and to identify ways to control the scope of the project. 2. Develop Critical Path Schedule and review types of cost estimates and review budgets. 3. Focus on sustainability, resilience and efficiency of urban infrastructures. 4. Know about the risks involved in a construction project 5. Know about Risk Management Plan and Project Resource Management plan.

Course Outcome	Upon the completion of the course, the students will be able to 1. Create a Project Scope Statement and to identify the ways to control the scope of the project. 2. Perform a cost and schedule analysis. 3. Manage urban infrastructure system, Manage Urban Energy Systems and Manage urban transportation system 4. Perform a Qualitative Risk Analysis 5. Execute Risk Management Plan and Project Resource Management plan.

6. Prerequisites: Nil

7. CO, PO AND PSO MAPPING

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

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: SCOPE & WBS (9)

Course Introduction Introduction to Specialization- 8 readings-Course Icon Legend- Pre-Course Survey- Specialization Assignments -Peer Review Guidelines -Discussion Forum Guidelines - Accessibility and Accommodations Statement- General Course Information- Using, Editing, and Submitting Documents in this Course. **Project Scope Management** Introduction and Objectives- Scope Development - Part 1-Scope Development - Part 2 - Requirements Development- Scope Control Process- Kaz and Tom Weekly Conclusion Assignment Overview- **2 Readings-**Recommended Readings -Example Project Scope Statement - Electric Car Case. **Project Schedule Management** Introduction and Objectives- What is a WBS?- Work Packages- Steps for Creating a WBS- Case WBS- Kaz and Tom's Weekly Conclusions -Assignment Overview- **2 readings-** Recommended Readings -Example WBS and Dictionary - Electric Car Case.	**CO-1** **BTL-2**

MODULE 2 : PROJECT TIME MANAGEMENT (12)

Project Time Management Introduction and Objectives- Time Management- Critical Path Method Overview- Types of Diagrams- Activity on Node Example- Finding Critical Path- Forward Pass Diagram -Backward Pass Diagram -Total Slack- Free Slack -Things that can go wrong- Strategies for Dealing -Tools and Conclusion Kaz and Tom Weekly Conclusion Assignment Overview- 2 readings-Recommended Readings Example Project Schedule - Electric Car Case **Cost Estimation** Introduction and Objectives- Preparing an Estimate- Estimate Bases- Type of Estimates- Cost Baseline -Kaz and Tom Weekly Conclusion- Assignment Overview- 2 readings-Recommended Readings 1- Example Project Cost Estimate - Electric Car Case. **Earned Value Management** Introduction and Objectives- Monitoring Our Project- Calculating Earned Value 1- Calculating Earned Value 2- Creating a Forecast- Kaz and Tom Weekly Overview- Assignment Overview- 2 Readings-Recommended Readings- Example Calculations for Earned Value - Electric Car Case	**CO-2** **BTL-3**
MODULE 3 : URBAN INFRASTRUCTURE MANAGEMENT (9)	
Block 1 - Introduction to Urban Infrastructures Introduction to the MUI course-Key Challenges to Urban Infrastructures-The main urban infrastructure systems-The main dimensions of urban infrastructures- **Block 2 - Introduction to Principles of Urban Infrastructure Management** Introduction: What do urban infrastructure managers do? Managing stakeholders and related performance objectives- The main dimensions for urban infrastructure managers- Schools of thought in managing urban infrastructure systems. **Block 3 - Introduction to Urban Energy Management** Introduction to urban energy infrastructures- Understanding urban electricity systems- Managing the urban electricity system- Challenges and opportunities in urban energy systems-Managing Urban Energy Systems - Interview with an Expert from the Veolia group. **Block 4 - Introduction to Urban Transport Management** Introduction to urban transportation systems-Managing the urban transportation system- Car Postal- Broader challenges and new opportunities- Conclusion of the MUI MOOC-**2 practice exercises** - What did I learn in Block - Short answer assignment	**CO-3** **BTL-3**
MODULE 4 : PROJECT RISK & QUALITY MANAGEMENT (9)	

Introduction Course Icon Legend- Pre-Course Survey -Specialization Assignments -Peer Review Guidelines -Discussion Forum Guidelines -Accessibility and Accommodations Statement -General Course Information- Using, Editing, and Submitting Documents in this Course **Project Risk Management** Introduction and Objectives- Risk Management Processes -Identifying Risks- Developing a Risk Management Plan- Analyze and Prioritize Risks -Develop Risk Responses **Quality Assurance Plan** Introduction and Objectives -What is Quality Management? -Quality Management Plan -Cost of Quality- Tools for Assessing Quality- Control Quality.	**CO-4** **BTL-3**
MODULE 5 HUMAN RESOURCES & PROCUREMENT MANAGEMENT (6)	
Human Resources Management Plan Introduction and Objectives -Project Resource Management-Plan Resource Management -Estimate Activity Resources- Acquire Resources- Develop Team - Manage Team- Control Resources **Project Procurement Management** Introduction and Objectives- Project Procurement Management -Project Procurement Plan -Contract Types- Executing Procurement **Final Exam**	**CO-5** **BTL-4**

TEXT BOOKS

1.	A Guide to the Project Management Body of Knowledge *(PMBOK® Guide)* – Sixth Edition,2017 Project Management Institute
2.	Project Management Gary R. Heerkens, PMP,McGraw-Hill,2002
3.	Policy Guidance for Investment in Clean Energy Infrastructure Expanding Access to Clean Energy for Green Growth and Development
4.	El-Reedy, Mohamed Abdallah - Concrete and steel construction _ quality control and assurance (2013, CRC Press)

REFERENCE BOOKS

1.	Kumar NeerajJha. (2016). Construction Project Management -Theory and Practice, Pearson publications, 2nd edition.
2.	Anthony G. Bigio and Bharat Dahiya . (2004). *Urban Environment and Infrastructure Toward Livable Cities*, The International Bank for Reconstruction and Development/THE WORLD BANK

3.	Urizar M., Halim E.-S.A.. (2015). *Construction Supervision QC + HSE Management in Practice_ Quality Control*, OHS, and Environmental Performance Reference Guide.
4.	Ariaratnam, Samuel T. Rojas, Eddy M. (2009). *Building a Sustainable Future,* Construction Research Congress 2009 American Society of Civil Engineers.
E BOOKS	
1.	http://www.ebooksdirectory.com/googlesearch.php?q=construction%20management
2.	https://www.scribd.com/search?content_type=tops&page=1&query=construction%20management
MOOC	
1.	https://www.coursera.org/learn/scope-time-management-cost
2.	https://www.coursera.org/learn/managing-urban-infrastructures-1
3.	https://www.coursera.org/learn/project-risk-quality-management

COURSE TITLE	Course IV- PROJECT FORMULATION AND CONTRACT REGULATIONS (Batch I)			CREDITS	3
COURSE CODE	CEH4461	COURSE CATEGORY	HONOURS	L-T-P-S	3-0-0-0
Version	1.0	Approval Details	33 ACM, 15.12.2021	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Map with multiple courses for 45 Hours per course. CIA calculated from Coursera platform. End Semester Examination should be conducted per course.

Course Description	Project formulation and cost is an essential skill-set for many projects and in many contexts in our lives. Project investment appraisal Management is an ideal starting point if you need to manage projects. Contract laws the standard contract document and bidding process is the essential tool to execute project without any dispute and the processes of arbitration is also need for the project managers. It is essential to know more about the EPC, PPP, Infrastructure projects.
Course Objective	The course should enable the students to 1. Introduce Project Identification and financing of project. 2. Know about project investment appraisal. 3. Know about the standard contract document and the bidding process 4. Provides details about dispute, claim and arbitration. 5. Discusses the EPC.PPP and concession agreement.
Course Outcome	Upon completion of this course, the students will be able to 1. Identify project financing and costing and apply the principles of cash flow, time value of money and cost of capital in project 2. Identify the different aspects of project appraisal and examine the various methods of investment appraisal. 3. Distinguish the different elements and procedures in the preparation of contracts and NCB document. 4. Analyse the Potential contractual problems and the arbitration procedure 5. Compare the characteristics of various infrastructure projects, models and regulatory bodies.

Prerequisites: Nil

CO, PO AND PSO MAPPING															
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	-	2	2	-	3	3	2	2	3
CO2	-	-	2	2	1	2	1	2	-	-	3	3	2	2	3
CO3	-	-	-	2	2	2	-	2	1	2	2	3	1	2	3
CO4	-	-	-	2	2	2	-	2	1	2	2	3	2	2	3
CO5	-	-	-	2	2	2	-	2	1	2	2	3	2	2	3
1: Weakly related, 2: Moderately related and 3: Strongly related															

MODULE 1 : PROJECT FORMULATION AND COSTING (9)	
Generation and Screening of Project Ideas-Project Identification-Preliminary Analysis, Market, Technical, Financial, Economic and Ecological-Pre-Feasibility Report, various local approvals and clearances for land and building - Statutory Regulations for town and country planning, development control rules - Detailed Project report.Means of Finance -Key Financial Indicators, Project cash flows- components, basic principles of cash flow estimation, concept of time value of money.	**CO-1** **BTL-2**
MODULE 2 : PROJECT APPRAISAL (9)	
Market, Technical, and Environment appraisal, Financial, Economic appraisal - Cost of Capital-cost of production, working capital requirement -Net Present Value-Benefit Cost Ratio–Internal Rate of Return-Accounting Rate of Return- Urgency-payback period-Assessment of Various Methods-Indian and international Practice of Investment Appraisals.	**CO-2** **BTL-3**
MODULE 3: CONTRACT LAW AND BIDDING PROCESS (9)	
Introduction to construction law - civil and common law-common delivery methods-Comparison of Actions and Laws- Law Governing Contracts, - Indian contract act - Elements of Contracts- World bank procedure and guideline, National competitive bidding (NCB) document – various clauses, Prequalification-Bidding-Accepting-Evaluation of Tender from Technical, Contractual and commercial points of view – International standard contract document - FIDIC– Other standard forms of construction contracts.	**CO-3** **BTL-3**
MODULE 4: DISPUTE, CLAIM AND ARBITRATION (9)	

Contract and Related Issues-Consequences of Breach of Contract- Potential contractual problems, variations, claims, claim management, construction dispute boards Law of damages and extension of Time-Construction claims and Disputes-Mechanism of dispute Resolution-Agreements, subject Matter-Violations. Arbitration: Laws Related to Construction Arbitration in India-Present Status, opportunities and Challenges-Institutional Arbitration-Promotion of Arbitration-International Arbitration-Training of Arbitrators on Ethics-Appointment of Arbitrators- Conditions of Arbitrations-Powers and duties of Arbitrator-Rules of Evidence-Enforcement of Award Costs-Arbitration and conciliation(Amendment) Act - Insurance and Bonds.	**CO-4** **BTL-3**
MODULE 5: CONCEPT OF INFRASTRUCTURE PROJECTS (9)	
Types of projects – EPC, Design/Build contracts- Infrastructure development potential as per five year plans, central level and state level development, definition and characteristics of infrastructure projects and project stakeholders, Public Private Partnership – BOT models, model concession agreement, benefits -Technology Transfer and Foreign Collaboration-Scope of Technology Transfer. **Case studies on Design-Build project contracting.**	**CO-5** **BTL-4**
TEXT BOOKS	
1.	Prasanna Chandra. (2006). *Projects-Planning Analysis Selection Implementation & Review*, Tata Mc Graw Hill Publishing Co., Ltd., New Delhi.
2.	Jimmie Hinze. (2001). *Construction Contracts*, 2nd Edition, McGraw Hill.
3.	Gransberg, D.D., Koch, J.A., Molenaar, K.R. (2006). *Preparing for design-build projects*. ASCE Press.
REFERENCE BOOKS	
1.	Joy.P.K.. (2006). *Total Project Management - The Indian Context,* Chapters 3- 7, New Delhi, Macmillan India Ltd.
2.	Lukas Klee. (2015). *International Construction Contract Law*, Wiley & Sons.
3.	Arbitration and Conciliation Code, 1996.
4.	Joseph T. Bockrath, "Contracts and the Legal Environment for Engineers and Architects ", 6th Edition, McGraw Hill, 2000.
E BOOKS	

1.	http://www.ebooksdirectory.com/googlesearch.php?q=construction%20management
2.	https://www.scribd.com/search?content_type=tops&page=1&query=construction%20%20management
MOOC	
1.	https://nptel.ac.in/courses/110/107/110107081/#

COURSE TITLE	Course IV - PROJECT MANAGEMENT FOR MANAGERS			CREDITS	3
COURSE CODE	CEH4462	COURSE CATEGORY	HONOURS	L-T-P-S	3-0-0-0
Version	1.0	Approval Details	33 ACM, 15.12.2021	LEARNING LEVEL	BTL-3

ASSESSMENT SCHEME

First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project	Surprise Test / Quiz	Attendance	ESE
15%	15%	10%	5%	5%	50%

Map with multiple courses for 45 Hours per course. CIA calculated from Coursera platform. End Semester Examination should be conducted per course.

Course Description	Project management is an essential skill-set for many careers and in many contexts in our lives. Project Management is an ideal starting point if you need to manage projects at work or at home, while not necessarily being a formally trained project manager. It is also suitable if you are considering undertaking a project in the near future and are seeking to learn and apply essential project management knowledge and skills.
Course Objective	The course should enable the students to 1. Introduce Project Management, ConstructionManagement and types of organisations. 2. Know about capital budgeting, risk management and technical analysis of projects. 3. Know about the project team and time management 4. Provides details about probability models in network and crashing of network. 5. Discusses the project cost management, control and quality management.
Course Outcome	Upon completion of this course, the students will be able to 1. Perform a project assessment market demand analysis, financial analysis and project appraisal. 2. Execute capital budgeting and potential risk analysis. 3. Develop project time management scheme using CPM and PERT. 4. Create probability models in network and crashing of net work 5. Estimate the project cost and apply quality control measures with respective to procurement process.

Prerequisites: Nil

CO, PO AND PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	-	2	2	-	3	3	2	2	3

CO2	**-**	**-**	**2**	**2**	**1**	**2**	**1**	**2**	**-**	**-**	**3**	**3**	**2**	**2**	**3**
CO3	**2**	**3**	**1**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**3**	**2**	**3**
CO4	**2**	**3**	**1**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**3**	**2**	**3**
CO5	**2**	**3**	**1**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**3**	**2**	**3**

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: PROJECT MANAGEMENT & SELECTION	**(9)**
Introduction of Project Management-Project Success-Types of Structure Organizations-Project Management Office-Stakeholders Management-Types of Projects and Project Life Cycle-Project Life Cycle Phases & Project Appraisal-Methods of Project Selection- I-Methods of Project Selection- II-Methods of Project Selection (MCDM -I)-Methods of Project Selection (MCDM-II)-Methods of Project Selection (MCDM-III)-Market and Demand Analysis - I-Market and Demand Analysis - II-Financial Analysis	**CO-1** **BTL-2**
MODULE 2: CAPITAL BUDGETING& RISK MANAGEMENT	**(9)**
Capital Budgeting Techniques - I-Capital Budgeting Techniques - II-Financing of Projects-Risk Management - I-Risk Management - II-Risk Management (Control & Documentation)-Stand Alone Risk Analysis- I-Stand Alone Risk Analysis- II-Hillier Model-Simulation Analysis-Decision Tree Analysis- I-Decision Tree Analysis- II-Abandonment Analysis-Technical Analysis-Product Mix and Plant Capacity Analysis.	**CO-2** **BTL-3**
MODULE 3:PROJECT TEAM BUILDING & TIME MANAGEMENT	**(9)**
Project Team Building, Conflict and Negotiation-HRM Issues and time Management-Project Time Management- Introduction-Project Time Management (Project Scheduling)-Project time Management- Numbering of Nodes-Project Time Management- PERT Networks-Project Time Management- CPM-Project Time Management- Laddering in PERT/CPM-Probability Models in Networks- I-Probability Model in Networks- II-	**CO-3** **BTL-3**
MODULE 4: PROBABILITY MODEL IN NETWORKS&CRASHING OF NETWORKS(9)	
Probability Model in Networks- III-Probability Model in Networks- IV-Simulation of Networks-I-Simulation of Networks- II-Slacks & Floats- I- Slacks & Floats- II-Time and Cost Relationship-Crashing of Networks- I-Crashing of Networks II-Crashing of networks- III (Free Float Method)	**CO-4** **BTL-3**

MODULE 5: PROJECT COST MANAGEMENT &QUALITY MANAGEMENT (9)	
Crashing of Networks- IV-Introduction to Project Cost Management-Cost Control (Tools and Techniques)-Cost Estimation-Introduction to Quality Management-Cost of Quality-57 Quality Management (Source of variability and Six Sigma)-Quality Management (Six Sigma Tools) Procurement Management- I-Procurement Management- II and Project Termination	**CO-5** **BTL-4**

TEXT BOOKS	
1.	Roderick A. Munro and Govindarajan Ramu and Daniel J. Zrymiak. (2001). *The certified six sigma Green Belt Handboo*k, ASQ Quality Press and Infotech Standards India Pvt. Ltd.
2.	T. M. Kubiak and Donald W. Benbow. (2011). *The Certified Six Sigma Black Belt Handbook*, Pearson Publication.
3.	Mitra, Amitava. (2002). *Fundamentals of Quality Control and Improvement*, Wiley India Pvt Ltd.
4.	Montgomery, D C. (2011). *Statistical Quality Control: A modern introduction*, Wiley.
REFERENCE BOOKS	
1.	Forrest W. Breyfogle. (2011). *Implementing Six Sigma*, John Wiley & Sons, INC.
2.	Evans, J R and W M Lindsay. (2012). *An Introduction to Six Sigma and Process Improvement*, CENGAGE Learning.
3.	Howard S. Gitlow and David M. Levine. (2001). *Six Sigma for Green Belts and Champions*, Pearson Education, Inc.
4.	Montgomery, D C. (2001). *Design and Analysis of Experiments*, Wiley
E BOOKS	
1.	http://www.ebooksdirectory.com/googlesearch.php?q=construction%20management
2.	https://www.scribd.com/search?content_type=tops&page=1&query=construction%20%20management
MOOC	
1.	https://nptel.ac.in/courses/110/107/110107081/#