

KUMARAGURU COLLEGE OF TECHNOLOGY

An autonomous Institution affiliated to Anna University, Chennai

COIMBATORE – 641 049.

M.E., CONSTRUCTION PLANNING AND MANAGEMENT

REGULATION 2024



CURRICULUM AND SYLLABI

I to IV Semesters

Department of Civil Engineering

VISION

Department of Civil Engineering is striving to become as a world class Academic Centre for quality education and research in diverse areas of Civil Engineering, with a strong social commitment

MISSION

- Producing highly competent and technologically capable professionals and motivated young academicians
- Providing quality education in undergraduate and post graduate levels, with strong emphasis on professional ethics and social commitment.
- Developing a scholastic environment for the state of art research, resulting in practical applications
- Undertaking professional consultancy services in diverse areas of Civil Engineering

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The Program Educational Objectives of Construction Planning and Management Postgraduate Program are to prepare the graduates:

PEO1: Equip graduates with comprehensive knowledge and advanced skills in construction planning and management to efficiently strategize and execute projects in dynamic industry environments.

PEO2: Prepare graduates to lead and innovate in the construction sector by leveraging cutting-edge technologies and methodologies in planning, scheduling, and resource optimization.

PEO3: Develop graduates' abilities in critical thinking, communication, and decision-making to foster collaborative and ethical practices in multidisciplinary construction projects.

PROGRAM OUTCOMES (POs)

Graduates of the Construction Planning and Management Postgraduate Program should have the ability to:

PO1: Conduct independent research and apply analytical approaches to solve complex problems in construction planning and management.

PO2: Prepare and present detailed technical documents, plans, and reports with precision and clarity, suitable for professional and academic contexts.

PO3: Demonstrate advanced mastery of planning and management techniques, integrating innovative strategies to address challenges in construction projects.

PO4: Evaluate and integrate legal, economic, and social considerations, ensuring comprehensive and informed decision-making in construction planning and management processes.

PO5: Assess and manage critical aspects such as cost, time, quality, safety, and resource allocation, optimizing project performance and outcomes.

PO6: Incorporate sustainability, ethical considerations, and global best practices into construction planning and decision-making to promote responsible and future-oriented project management.

M.E. Construction Planning and Management - Curriculum

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Semester III									
S.No	Course code	Course Title	Course Mode	Course Type	L	T	P	J	C
1	24CPXXX	Professional Elective-IV	Embedded	PE	2	0	0	2	3
2	24CPXXX	Professional Elective-V	Theory	PE	3	0	0	0	3
3	24CPXXX	Professional Elective-VI	Theory	PE	3	0	0	0	3
4	24CPJ601	Industrial Training *	Project	PR	0	0	0	0	2
5	24CPJ602	Project Phase-I	Project	PR	0	0	0	20	10
Total Credits									21
Total Contact Hours/week									30
*Mandatory for a minimum period of ONE month during II semester vacation									
Semester IV									
S.No	Course code	Course Title	Course Mode	Course Type	L	T	P	J	C
1	24CPJ603	Project Phase-II	Project	PR	0	0	0	40	20
Total Credits									20
Total Contact Hours/week									40
PROFESSIONAL ELECTIVES									
TRACK-1 CONSTRUCTION MANAGEMENT									
S.No	Course code	Course Title	Course Mode	Course Type	L	T	P	J	C
1	24CPC001	Construction Economics and Finance Management	Embedded	PE	2	0	0	2	3
2	24CPC002	Value Engineering and Valuation	Embedded	PE	2	0	0	2	3
3	24CPE003	Digital Transformation in Construction Planning	Theory	PE	3	0	0	0	3
4	24CPC004	Quantitative Analysis in Construction	Embedded	PE	2	0	2	0	3
5	24CPE005	Organizational Behaviour	Theory	PE	3	0	0	0	3
6	24CPE006	Risk Management in Construction	Theory	PE	3	0	0	0	3
7	24CPE007	Supply Chain Management and Logistics in Construction	Theory	PE	3	0	0	0	3

TRACK-2 TECHNOLOGY PLANNING AND MANAGEMENT									
S.No	Course code	Course Title	Course Mode	Course Type	L	T	P	J	C
8	24CPE008	Building Services and Facility Management	Theory	PE	3	0	0	0	3
9	24CPC009	Planning and Design of Energy Efficient Buildings	Embedded	PE	2	0	0	2	3
10	24CPC010	Real Estate Practices and Management	Embedded	PE	2	0	0	2	3
11	24CPE011	Sustainable Construction Management	Theory	PE	3	0	0	0	3
12	24CPE012	Health Monitoring of Structures	Theory	PE	3	0	0	0	3
13	24CPE013	Shoring, Scaffolding and Formwork	Theory	PE	3	0	0	0	3
TRACK-3 INDUSTRY DRIVEN									
S.No	Course code	Course Title	Course Mode	Course Type	L	T	P	J	C
14	24CPC014	Construction Site Planning and Control	Embedded	PE	2	0	0	2	3
15	24CPC015	Maintenance And Management Of Engineering Assets	Embedded	PE	2	0	0	2	3
16	24CPC016	Smart Infrastructure System	Embedded	PE	2	0	0	2	3
17	24CPC017	Lean Construction Concepts, Tools and Practices.	Embedded	PE	2	0	0	2	3

Semester-wise Credits	
Semester - I	20
Semester - II	20
Semester - III	21
Semester - IV	20
Total Credits	81

Course types	Credits
Basic Science	4
Engineering Science	6
Professional Core	21
Professional Electives	18
Project/Internship	32
Total Credits	81

SEMESTER -I

24MAI501	STATISTICAL METHODS FOR ENGINEERS (Common to CN, EN, MB, CP)	L	T	P	J	C
		3	0	2	0	4
BS		SDG		9,10,13		
Pre-requisite courses		-		Data Book / Code book (If any)		Statistical Tables

Course Objectives:	
The purpose of taking this course is to:	
1	learn key statistical concepts and apply estimation techniques
2	perform hypothesis testing for large and small samples
3	build knowledge in using correlations techniques and regression models
4	develop student's skills in experimental design and multivariate data analysis

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	apply different method and techniques to estimate statistical parameters	Ap
CO 2	apply various statistical methods for hypothesis testing of sample data	Ap
CO 3	apply hypothetical testing to compare and assess the independence of attributes	Ap
CO 4	apply multiple and partial correlation analysis, least squares regression in determining the factors relating engineering data	Ap
CO 5	analyse the effectiveness of experimental designs through Analysis of Variance	An
CO 6	apply the multivariate concepts and compute covariance and correlation matrices	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Mastering Sustainable Practices	Applying advanced techniques and innovative technology	Evaluate solution considering public health and environmental factors	adopting advanced design tools for project	Technological advancement for complex engineering solutions	Community involvement through appropriate design standards
1	3	3	3		3	
2	3	3	3			

Theory Hours: 45	Tutorial Hours: 0	Practical Hours: 30	Project Hours: 0	Total Hours: 75
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Learning Resources	
Textbooks:	
- Devore, J.L., Probability and statistics for Engineering and the Sciences, Thomson and Duxbury, Singapore, 9th Edition, 2015. - Freund J.E., Mathematical Statistics, Prentice Hall of India, 5th Edition, 2001. - Gupta S.C, and Kapur J.N., Fundamentals of Mathematical Statistics, 10th Revised Edition, 2000, Sultan & Chand, Publishers, New Delhi, Reprint 2002.	
Reference books & Weblinks:	
- Johnson, R.A., and Wichern, D.W., Applied Multivariate Statistical Analysis, Pearson Education, Asia, 6th Edition, 2007. - Johnson. R. A., Miller & Freund's Probability and Statistics for Engineers, 7th Edition, Pearson Education, Delhi, 2005. - Spiegel, M.R. and Stephens, L.J. Schaum's outlines, Statistics, Tata McGraw-Hill, 3rd Edition, 2000.	
Online Resources (Weblinks)	
https://www.khanacademy.org/math/statistics-probability https://archive.nptel.ac.in/courses/103/106/103106120/ https://onlinecourses.nptel.ac.in/noc21_ma74/preview	

Assessment (Embedded course)
SA, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE) Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by			
Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)	
1. Mr. Ramesh V.S., STEPS Knowledge Services Private Limited, Coimbatore. 2. Mr.Jayakumar Venkatesan, Valles Marineris International Private Limited- Chennai. 3. Mr. Imran Khan, GE Transportation Company, Bangalore	1. Dr.T.Govindan, Government College of Engineering, Srirangam, Trichy. 2. Dr.C.Porkodi, PSG College of Technology, Coimbatore. 3. Dr.P.Paramanathan, Amrita Vishwa Vidyapeetham, Coimbatore.	1. Dr. R.Marudhachalam, Mathematics 2. Dr. R. Rajkumar, Mathematics	
Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	Date	24.08.2024

24INT501	RESEARCH METHODOLOGY AND IPR	L	T	P	J	C
		3	0	0	0	3
ES		SDG		9		

Pre-requisite courses	-	Data Book / Code book (If any)	-
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Course Objectives:	
The purpose of taking this course is to:	
1	equip students with the knowledge and skills necessary to design, conduct and critically evaluate research
2	draft research reports and present effective research findings
3	foster an understanding of intellectual property rights and ethical considerations essential for successful research and innovation

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	apply the scientific method and research planning steps to formulate research problems and objectives	Ap
CO 2	analyse different research designs and ethical considerations to classify research types and ensure ethical integrity	An
CO 3	evaluate the structure and components of research reports to organize and present research findings effectively	E
CO 4	interpret data collection tools and statistical methods to visualize and analyse biological research data	An
CO 5	create a research proposal incorporating IPR principles to develop innovative and ethically sound research plans	C

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Evaluate Sustainable Practices	Apply advanced techniques and innovative technology	Evolve solution considering public health and environmental factors	Adopt design/project management tools	Use of technological advancement to solve engineering problems	Knowledge dissemination to community
1	3	3		3	3	
2	3	3		3		
3	3			3		3
4	3	3		3		3
5	3	3		3		

6	2	2		3	3	
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Course Content									
INTRODUCTION TO RESEARCH METHODS Definition and Objectives of Research, Scientific Method, Various Steps in Scientific Research, Research Planning, Selection of a Problem for Research, Formulation of Selected Problems, Purpose of the Research, Formulation of Research Objectives, Formulation of Research Questions, Hypotheses Generation and Evaluation, Literature Search and Review Process.			9 Hours						
RESEARCH DESIGN AND ETHICS Types and Methods of Research, Classification of Research, Research Ethics: Informed Consent, Confidentiality, Data Protection, Sampling Techniques, Methods of Collecting Primary Data, Use of Secondary Data, Experimentation, Design of Experiments, Survey Research, Construction of Questionnaires, Pilot Studies, and Pre-tests, Data Collection Methods, Processing, Editing, Classification, and Coding Validity, Reliability, Ethical Dilemmas and Solutions.			9 Hours						
RESEARCH REPORTS Components of Research Articles, Manuscripts, Thesis, and Review Papers, Preparation of Thesis Documents: Referencing, In-text Citations, Tools like Endnote, Mendeley, Writing Techniques: CARS Model, Organizing Literature Review, Materials, and Methods, Critical Thinking for Writing the Discussion Section. Case Study: Comparison of Research Articles with and without Referencing Tools			9 Hours						
DATA COLLECTION AND ANALYSIS FOR RESEARCH Tools for Data Collection: Clinical Trials, Surveys, Questionnaires, Observational Methods, Data Management and Preparation, Overview of Statistical Concepts, Descriptive Statistics: Mean, Median, Mode, Variance, Standard Deviation, Data Visualization Techniques. Case Study: Journal Club on Research Papers Published in Tier 1 Journals.			9 Hours						
INTELLECTUAL PROPERTY RIGHTS (IPR) AND RESEARCH GRANTS Introduction to Intellectual Property Rights: Patents, Trademarks, Copyrights, Trade Secrets, Importance of IPR in Research and Innovation, developing a Research Proposal: Components, Do's and Don'ts, Writing Winning Research Proposals, Peer Review, and Feedback, Finalizing Research Plans. Case Study: Evaluating Successful Research Proposals and Understanding the Role of IPR.			9 Hours						
Theory Hours:	45	Tutorial Hours:	0	Practical Hours:	0	Project Hours:	0	Total Hours:	45

Learning Resources	
Textbooks:	
1.	Cooper, D. R., Schindler, P. S., & Sharma, J. K. (2012). Business Research Methods (11th ed.). Tata McGraw Hill Education.
2.	Hazari, A. (2023). Research Methodology for Allied Health Professionals. Springer Nature Singapore.

3. Goh, K. M. (2023). *Research Methodology in Bioscience and Biotechnology*. Springer.
4. Ganguli, P. (2017). *Intellectual Property Rights: Unleashing the Knowledge Economy*. McGraw Hill Education.

References:

1. AJIET. (n.d.). *Lecture Notes on Research Methodology & Intellectual Property Rights*. Retrieved from <https://www.ajiet.edu.in/img/basic-science/21RMI56%20notes.pdf>
2. Oxford University Press. (n.d.). *Handbook of Intellectual Property Research: Lenses, Methods, and Perspectives*. Retrieved from <https://academic.oup.com/book/41122>
3. Goddard, W., & Melville, S. (2004). *Research Methodology: An Introduction for Science & Engineering Students*. Juta and Company Ltd.
4. Kumar, R. (2014). *Research Methodology: A Step-by-Step Guide for Beginners* (4th ed.). SAGE Publications

Online Resources (Weblinks)

1. <https://academic.oup.com/jiip/article-abstract/19/5/460/7595847?redirectedFrom=fulltext&login=false>
2. <https://academic.oup.com/jiip/issue/>

Assessment (Theory course)

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
		Dr.K.Ram, Biotechnology Dr.P.A.Prabakaran, Department of Civil Engineering
Recommended by BoS on	13.08.2024	
Academic Council Approval	No: 27	Date 24.08.2024

24CPT501	Resource Management and Control in Construction		L	T	P	J	C
3			0	0	0	3	
PC			SDG		8,9,11,12		
Pre-requisite courses	-	Data Book / Code book (If any)			-		

Course Objectives:	
The purpose of taking this course is to:	
1	Learn key concepts and identify cost-reduction opportunities in construction projects.
2	Assess asset valuation techniques and apply life cycle costing strategies.
3	Use value engineering principles to optimize outcomes and enhance project value.
4	Conduct project work applying value engineering to identify cost-saving opportunities.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Identify the different types of resources in the construction industry.	U
CO 2	Estimate manpower requirements, evaluate labor productivity, and implement control measures.	An
CO 3	Select and estimate construction materials and equipment	An
CO 4	Prepare a Work Breakdown Structure (WBS) for a construction project and monitor project time and cost.	Ap
CO 5	Determine optimum project time and cost while assessing project performance.	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Mastering Sustainable Practices	Applying advanced techniques and innovative technology	Evaluate solution considering public health and environmental factors	adopting advanced design tools for project management & research	technological advancement for complex engineering solutions	Community involvement through appropriate design standards
1			3	3		3
2	3				3	
3	2	2		3		2
4	3	2		2		
5	2		2		2	3

Course Content

RESOURCE PLANNING Definition of Resource - Types of resources used in a construction project - manpower, Equipment, Material, Money, Time - Categorization of these resources - Study of different types of construction projects - variations in the scope/nature of these projects and their specific resource requirements - Resources required for different types of construction projects.	9 Hours
MANPOWER MANAGEMENT Planning Construction Manpower – Different categories of Manpower - Direct and Indirect Workers Requirement– Establishing Worker’s Productivity Standards – Manpower Scheduling – Project Manpower Grouping – Allocating Labour during execution stage	9 Hours
MATERIALS AND EQUIPMENT Planning Construction Material – ABC Classification of Construction Materials – Material Usage – Material Provisioning Process – Transportation, Delivery and Distribution- Materials Productivity Control and Documentation. Planning Construction Equipment: Planning, selecting and acquisition of equipment by optimistic choice with respect to cost, Time, Source and handling.	9 Hours
TIME AND COST MANAGEMENT Project work breakdown, Determining Activities Involved, Activity Duration and Costs, Planning Construction time and cost, Classification of Construction Costs, forecasting time buffers and contingencies for scheduling.	9 Hours
RESOURCE ALLOCATION AND LEVELLING Problems in Time-cost trade-off – Project Crashing – Resource allocation, Resource loading, Resource levelling & Smoothing Problems- Representation in Gantt Chart - Cumulative Cost Graph - S Curve – Earned Value Problems.	9 Hours

Theory	Tutorial	Practical	Project	Total
Hours: 45	Hours: 0	Hours: 0	Hours: 0	Hours: 45

Learning Resources
Textbooks:
1. Sharma , S C., Construction equipment management , Khanna publishers, Delhi, 2016. 2. Kumar Neeraj Jha Construction project management , Pearson publishers, 2015. 3. Andrew,D., Szilagg, Hand Book of Engineering Management, 1982. 4. Prasanna Chandra. <i>Projects – Planning, Analysis, Selection, Implementation Review</i> . McGraw Hill Publishing Company Ltd., New Delhi, 2019
Reference books & Weblinks:
1. Chitkara, K.K. Construction Project Management. Tata McGraw Hill Education, 2016. 2. C. R. L. C. M. Chai. Construction Management: Principles and Practice. Routledge, 2021. 3. David I. Cleland and Roland Gareis, Global Project Management Handbook, McGraw-Hill, 2006.
Online Resources:
1. https://archive.nptel.ac.in/courses/105/106/105106149/ 2. https://onlinecourses.nptel.ac.in/noc23_mgl24/preview 3. https://www.projectmanager.com/blog/quick-guide-resource-management

Assessment (Embedded course)			
CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE), Lab Workbook, Experimental Cycle tests, viva-voce, etc.			
Course Curated by			
Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)	
1. Er. G. Srinivasa Rao, Saipem India Pvt Ltd 2. Er. Anirudhen, Geotechnical Solutions Pvt.Ltd	1. Dr. Sagar Malsane, NICMAR, Pune, smalsane@nicmar.ac.in 2. Dr. S. Manikandaprabhu alias Saravanan, SRMIST	1. Dr. P.A.Prabakaran AP/Civil 2. Ms.U.Sindhu Vaardini AP/Civil 3. Mr.P.Aswin Bharath AP/Civil 4. Ms.S.Chitra AP/Civil	
Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	Date	24.08.2024

24CPT502 PC	Construction Equipment Planning and Automation	L	T	P	J	C
		3	0	0	0	3
		SDG		9,12,13		

Pre-requisite courses	-	Data Book / Code book (If any)	-
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Course Objectives:

The purpose of taking this course is to:

1	Equip students with the knowledge and skills to effectively manage construction equipment for enhanced project efficiency and productivity.
2	Develop an understanding of different types of construction equipment and their applications in tasks such as earthwork, tunnelling, and demolition
3	Introduce students to the latest automation technologies in construction, highlighting their role in improving construction operations and reducing project costs.
4	Provide insights into the use of robotics and automation systems in various construction processes, including material handling, bricklaying, and structural work.
5	Prepare students to evaluate and apply emerging technologies such as drones and 3D printing, transforming how construction projects are planned and executed.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	apply knowledge of construction equipment management to plan efficient equipment utilization in construction projects.	Ap
CO 2	analyze earthwork equipment to select the most suitable machinery for various tasks.	An
CO 3	apply tunnelling and demolition techniques to ensure safe and effective equipment use	Ap
CO 4	analyze automation technologies to enhance efficiency and reduce costs in construction.	An
CO 5	apply robotic technologies to improve accuracy and safety in construction tasks.	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Independent Research and Development	Technical Report and documentation	Mastery over domain specialization	Regulatory and Economic Analysis	Holistic Project Management	Sustainable and Ethical Practices
1	3	2	2			
2		2		2	3	
3	2			3		2
4			3		2	3
5	2		2	2		

Course Content	
CONSTRUCTION EQUIPMENT MANAGEMENT Distinctive characteristics of construction equipment - Necessity of construction equipment - Importance of equipment in construction projects, -Trends and innovations in construction equipment - Identification – Planning - Equipment Management in Projects - Maintenance Management – Replacement – Equipment Productivity Analysis-Cost Control of Equipment - Depreciation Analysis – Safety Management.	9 Hours
EQUIPMENT FOR EARTHWORK Fundamentals of Earth Work Operations- Types of earth work equipment- Tractors, Motor Graders, Scrapers, Loaders, Earth Movers	9 Hours
TUNNELING & DEMOLITION Equipment for Dredging, Trenching, Tunnelling, Drilling, Blasting - Equipment for Compaction - Erection Equipment - Types of pumps used in Construction - Equipment for Dewatering and Grouting – Foundation and Pile Driving Equipment –Equipment for Demolition	9 Hours
AUTOMATION IN CONSTRUCTION INDUSTRY Emerging Trends in Automation in Construction - Need, Challenges and Benefit of automation- Automated equipment and machinery for construction- Automation in Canal lining -Automation in Highway Construction- Automation in concrete technology. Drones: Photogrammetry, Project Monitoring- real time data, aerial mapping, land survey, quantity survey, quality survey, structural health monitoring survey, under water survey.	9 Hours
CONSTRUCTION ROBOTS Robotics – Introduction - Benefits of Robotics in construction industry with respect to time, cost, quality, safety - Robotics Applications - Brick laying – Demolition -Material Handling -Structural steel cutting -Rebar tying/bending - Form work production - 3D printing parts and objects of homes, buildings, bridges and road.	9 Hours
Theory Hours: 45	Tutorial Hours: 0
Practical Hours: 0	Project Hours: 0
Total Hours: 45	

Learning Resources
Textbooks:
1. Majrouhi Sardroud, J. (2011). Automated Management of Construction Projects. LAP Lambert Academic Publishing. 2. Majrouhi Sardroud, J. (2014). Automation in Construction Management. Scholars' Press.

3. Jha, K. N. (2011). Construction Project Management, Theory & Practice. Pearson Education India.
4. Peurifoy, R. L. (2011). Construction Planning, Methods and Equipment. McGraw Hill.
5. Varma, M. (n.d.). Construction Equipment and Its Planning and Application. Metropolitan Book Co.
References:
1. BIM and Construction Management: Proven Tools, Methods, and Workflows By Brad Hardin, Dave McCool, John Wiley & Sons
2. Enhancing BIM Methodology with VR Technology, Open access peer
3. Robotics and Automation in Construction, Open access peer- reviewed edited volume
4. Automation in Construction Management: Automated management of Construction Materials Using RFID Technology, Javad Majrouhi Sardroud, Scholars' Press
Online Resources (Weblinks)
1. Construction Equipment - Planning and Management. (n.d.). Construction Equipment. Retrieved from https://www.constructionequipment.com/
2. Equipment Management in Construction. (n.d.). CEM Solutions. Retrieved from https://www.cemsolutions.com/
3. Automation in Construction Industry – Key Trends. (n.d.). Autoweek. Retrieved from https://www.autoweek.com/technology/

Assessment (Theory course)
SA, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Course Curated by			
Expert(s) from Industry		Expert(s) from Higher Education Institution	Internal Expert(s)
1. Mr. Ravi Verma Senior Vice President, Construction and Infrastructure Finance, JCB India 2. Mr. Amit Sharma Vice President, Project Management, TATA Projects Ltd.		1. Dr. P.K. Viswanathan Professor, Department of Civil Engineering, IIT Madras 2. Dr. S. S. Rathi Head, Department of Construction Management, NICMAR, Pune	1. Dr. P.A.Prabakaran AP/Civil 2. Ms.U.Sindhu Vaardini AP/Civil 3. Mr.P.Aswin Bharath AP/Civil 4. Ms.S.Chitra AP/Civil
Recommended by BoS on		13.08.2024	
Academic Council Approval		No: 27	Date 24.08.2024

24CPI503	Legal Aspects of Construction Planning	L	T	P	J	C
		2	0	0	2	3
PC		SDG		9,10		

Pre-requisite courses	-	Data Book / Code book (If any)	-
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Course Objectives:	
The purpose of taking this course is to:	
1	Provide a comprehensive understanding of modern construction contracts and legal frameworks.
2	Explore advanced documentation techniques and contract types used in the construction industry.
3	Examine the role of e-procurement and digital tools in enhancing tender processes.
4	Analyze various dispute resolution methods and their application in construction projects.
5	Discuss current tax laws and labor regulations affecting construction compliance and management.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Analyse modern construction contracts and legal frameworks.	An
CO 2	Evaluate advanced contract documentation and global implications.	Ap
CO 3	Apply e-procurement and digital tendering.	Ap
CO 4	Analyse dispute resolution methods in construction.	An
CO 5	Create strategies for tax and labour law compliance.	E
CO 6	Create contract management principles and practices in a comprehensive project report	C

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
Course Outcomes (CO)	Mastering Sustainable Practices	Applying advanced techniques and innovative technology	Evaluate solution considering public health and environmental factors	Adopting advanced design tools for project management & research	Technological advancement for complex engineering solutions	Community involvement through appropriate design standards
1	2	2				
2	2	3	2	2		
3		3	2			
4		2	3	2		
5		2			3	
6	1	2	2		3	2

Course Content	
MODERN CONSTRUCTION CONTRACTS AND LEGAL FRAMEWORKS Definition of Contract - Contract Law Evolution - Legal Issues - Standard Forms (FIDIC, NEC, AIA) - General & Special Conditions - E-contracts - Smart Contracts - Contract Pricing - Role of Consultants & Contractors.	6 Hours
ADVANCED CONTRACT DOCUMENTATION Contract Types (Design-Build, EPC, PPP) - Contract Documents (BIM, Digital Twins) - Indian & International Clauses - Global Contract Administration - Law of Torts - FIDIC Case Studies - Concession Agreements - PPP Projects.	6 Hours
E-PROCUREMENT AND TENDERS IN THE DIGITAL ERA Prequalification - E-Bidding - Tender Evaluation - Digital Contract Formation - Global Tendering (World Bank, ADB) - Local Transparency - Tamil Nadu Tenders Act.	6 Hours
DISPUTE RESOLUTION AND ARBITRATION Dispute Resolution (Mediation, Arbitration, Litigation) - Construction Arbitration - E-Contracts - Blockchain in Arbitration - Arbitrator Role & Ethics - Arbitration Conditions - Arbitration & Conciliation Act 1996 - Digital Dispute Tools - Case Study.	6 Hours
CURRENT TAX LAWS, LABOUR REGULATIONS, AND COMPLIANCE GST Impact - E-Invoicing - Custom Duties - Planning Laws - Property Laws - Agency Law - Local Government E-Approval - Environmental Compliance - Social Security - Labour Laws - Digital Compliance - Workmen's Compensation Act 1923 - Indian Factory Act 1948 - Tamil Nadu Factory Rules 1950 - Child Labour Act 1986	6 Hours
PROJECT COMPONENT Create a construction contract incorporating standard forms (FIDIC, NEC, AIA) and analyze its legal implications. Assess contract pricing, stakeholder roles, and dispute resolution mechanisms, culminating in a Detailed Project Report (DPR) that synthesizes their findings and recommendations for effective contract management.	30 Hours

Theory	Tutorial	Practical	Project	Total
Hours: 30	Hours: 0	Hours: 30	Hours: 0	Hours: 60

Learning Resources
Textbooks:
1. L.S. Ranaga Rao Contract Management and Dispute Resolutions Engineering staff College of India January 2008. 2. C. J. Schexnayder and R. E. Mayo, Construction Management Fundamentals, McGraw Hill, New Delhi.2003
Reference books & Weblinks:
3. General Conditions of Contract, Central Public Works Department, New Delhi,2010 S. Ranaga Rao, Contract Management & Dispute Resolutions, Engineering staff College of India, January 2008 4. D.S. Berrie and B.c. Paulson, Professional construction management including C.M.,Design construct and general contracting ,McGraw Hill International, Third Edition 1992. 5. V. K. Raina, Construction & Contract Management Practices ,SPD, New Delhi Gajaria G.T., Laws Relating to Building and Engineering Contracts in India, M.M.Tripathi Private Ltd., Bombay, 1982 6. Jimmie Hinze, Construction Contracts, McGraw Hill, 2001 7. Joseph T. Bockrath, Contracts and the Legal Environment for Engineers and Architects, McGraw Hill, 2000. 8. Kwaku, A., Tenah, P.E. Jose M.Guevara, P.E., Fundamentals of Construction Management and Organisation, Printice Hall, 1985. 9. Patil. B.S, Civil Engineering Contracts and Estimates, Universities Press (India) Private Limited, 2006

Online Resources:

1. <https://archive.nptel.ac.in/courses/129/106/129106006/>
2. <https://www.udemy.com/course/law-of-contract-as-under-indian-contract-act-1872/?couponCode=NVDIN35>
3. <https://courses.ledx.law/courses/contract-law/>

Assessment (Embedded course)

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE), Project Review, viva-voce, etc.

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)	
1. Dr.C. Velan, Taramani, velan62@yahoo.com 2. Mr. K. M. Nanthan, Planning Manager south Factories, L&T, rkmnnn@lntecc.com	1. Dr. S. Anandh, SRMIST 2. Dr. S. Kamal, University college of Engineering, Ramnad, kamalselva21@gmail.com	1. Dr. P.A.Prabakaran AP/Civil 2. Ms.U.Sindhu Vaardini AP/Civil 3. Mr.P.Aswin Bharath AP/Civil	
Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	Date	24.08.2024

24CPT504	SYSTEM INTEGRATION IN MANAGEMENT		L	T	P	J	C
			3	0	0	0	3
PC			SDG		9,11,12,13		
Pre-requisite courses		-	Data Book / Code book (If any)			-	

Course Objectives:	
The purpose of taking this course is to:	
1	Identify the different systems used for enclosing buildings and understand the importance of material selection.
2	Understand the qualities of building enclosures that contribute to maintaining good indoor environmental quality.
3	Acquire knowledge on how mechanical, plumbing, electrical, and HVAC systems work together in high-rise buildings.
4	Recognize the importance of planning for maintenance to ensure the longevity and performance of building components.

Course Outcomes		
After successful completion of this course, the students shall be able to:		Revised Bloom's Taxonomy Levels (RBT)
CO 1	<i>Apply</i> the principles of structural integration <i>to organize</i> material selection and specification for building enclosures.	Ap
CO 2	<i>Analyse</i> the environmental factors affecting interior quality <i>to distinguish</i> effective systems for weather resistance, thermal control, and air quality.	An
CO 3	<i>Evaluate</i> the integration of mechanical, electrical, and plumbing systems <i>to recommend</i> optimized solutions for infrastructure development projects	E
CO 4	<i>Assess</i> maintenance strategies <i>to justify</i> the use of low-maintenance materials and construction methods for long-term durability.	E
CO 5	<i>Design</i> safety systems for fire prevention and hazard control <i>to develop</i> comprehensive plans for pollution-free and hazard-free construction execution.	C

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Mastering Sustainable Practices	Applying advanced techniques and innovative technology	Evaluate solution considering public health and environmental factors	adopting advanced design tools for project management & research	technological advancement for complex engineering solutions	Community involvement through appropriate design standards
1	2	3	2	2	2	
2	2	2	3	2	2	
3	2	3	2	3	3	2
4	3	2	2	2	2	
5	2	2	3	2	2	3
6	1	3		2		

Course Content	
STRUCTURAL INTEGRATION Systems for enclosing Buildings, Functional aesthetic system, materials selection, and specification.	9 Hours
ENVIRONMENTAL FACTORS AND SERVICES Qualities of enclosure necessary to maintain a specified level of interior environmental quality – Weather resistance – Thermal infiltration – Acoustic Control –Transmission reduction – Air quality.	9 Hours
SERVICE INTEGRATION Mechanical, Plumbing – Electricity –Vertical circulation and their interaction- HVAC systems in Buildings and Implementation techniques in High Rise Buildings – Technological demands on construction management in infrastructure development projects.	9 Hours
MAINTENANCE Component longevity in terms of operation performance and resistance to deleterious forces – Planning systems for least maintenance materials and construction – Access for maintenance – Feasibility for replacement of damaged components –Maintenance free exposed and finished surfaces.	9 Hours
SAFETY ASPECTS Ability of systems to protect fire – preventive systems – fire escape system design – planning for pollution free construction- environmental constraints – Hazard free Construction execution for High Rise Buildings.	9 Hours

Theory Hours:	45	Tutorial Hours:	0	Practical Hours:	0	Project Hours:	0	Total Hours:	45
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Learning Resources
Textbooks:
1. Ching, F. D. K., & Binggeli, C. (2018). <i>Architecture: form, space, and order</i> (4th ed.). Wiley. 2. Dorsey, J. M. (2019). <i>Building envelopes: Design and performance</i> (2nd ed.). Wiley.

3. McQuiston, F. C., Parker, J. D., & Spitler, J. D. (2016). <i>Heating, ventilating, and air conditioning: Analysis and design</i> (7th ed.). Wiley.
Reference books & Weblinks:
1. Moser, D. (2020). <i>Facilities maintenance: Repair, renovation, and reconstruction</i> (3rd ed.). Cengage Learning.
2. Searle, R. (2017). <i>Building safety: Principles and practice</i> (2nd ed.). Routledge.
Online Resources:
1. https://archive.nptel.ac.in/courses/105/102/105102176/
2. https://www.coursera.org/learn/field-bim

Assessment (Theory course)
CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Course Curated by			
Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)	
1. Mr. Jayasankar k, Ultra Tech cement Limited, jayasankar2411@gmail.com 2. Er. T. Gurusamy, GHAA Associates guru.epmc@gmail.com	1. Dr. V. R. Prasath Kumar, SRMIST 2. Dr. S. Shanmugapriya, Coimbatore Institute of Technology	1. Dr. P.A.Prabakaran AP/Civil 2. Ms.U.Sindhu Vaardini AP/Civil 3. Mr.P.Aswin Bharath AP/Civil 4. Ms.S.Chitra AP/Civil	
Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	Date	24.08.2024

24CPP505	Managerial Skill Workshop		L	T	P	J	C
0			0	2	0	1	
ES			SDG		3,4,8,10,17		
Pre-requisite courses	-	Data Book / Code book (If any)			Nil		

Course Objectives:	
The purpose of taking this course is to:	
1	To equip students with essential career management skills, including interview techniques, group discussions, and goal setting.
2	To develop personal effectiveness through time management, stress handling, and problem-solving strategies.
3	To enhance leadership and team management abilities through motivation, conflict resolution, and decision-making skills.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Demonstrate effective managerial and soft skills for professional success	Ap
CO 2	Develop and practice leadership and team management techniques in organizational settings	Ap
CO 3	Construct a personalized career development plan and apply strategies to overcome setbacks	C

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Mastering Sustainable Practices	Applying advanced techniques and innovative technology	Evaluate solution considering public health and environmental factors	adopting advanced design tools for project management & research	technological advancement for complex engineering solutions	Community involvement through appropriate design standards
1	3			3		2
2	3		2	3	2	3
3		3	3	3	3	3

Course Content

1. Mock Interview Simulation 2. Group Discussion Practice 3. Career Roadmap Activity 4. Case Study on Career Setbacks 5. Time Management Matrix Activity 6. Stress Triggers & Coping Strategy Journal 7. Problem-Solving through Case Analysis 8. Positive Self-Talk and Affirmation Exercise 9. Team Building Game 10. Leadership Style Self-Assessment 11. Conflict Management Role Play 12. Feedback Circle 13. Personality Type Assessment 14. Emotional Intelligence Assessment 15. Self-Reflection Journal Activity	30 Hours
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Theory	Tutorial	Practical	Project	Total
Hours: 0	Hours: 0	Hours: 30	Hours: 0	Hours: 30

Learning Resources

Textbooks:

1. Gopalaswamy Ramesh & Mahadevan Ramesh – *The ACE of Soft Skills* (Pearson Education, 2010)
2. Barun K. Mitra – *Personality Development and Soft Skills* (Oxford University Press, 2016)

Reference books & Weblinks:

3. **Wallace and Masters** – *Personal Development for Life and Work* (Cengage Learning, 10th Edition, 2011)
4. **Stephen R. Covey** – *The 7 Habits of Highly Effective People* (Simon & Schuster, 1989)
5. **Harold R. McAlindon** – *Managing Yourself: Personal Effectiveness in the Workplace* (McGraw Hill)

Online Resources:

1. <https://www.mindtools.com>
2. <https://www.coursera.org/browse/personal-development/career-development>
3. <https://www.linkedin.com/learning/topics/soft-skills>
4. <https://www.16personalities.com>

Assessment (Practical course)

Activity and Learning Task(s), Model Lab, Mini project, MCQ, End Semester Examination (ESE),

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
1. Dr. K. M. Nanthan, L&T, R KMNNN@Intecc.com 2. Dr. G Muneeswaran, L&T, gmeswar@Intecc.com	1. Dr. Nikhil Bugalia, IIT Madras, nbugalia@civil.iitm.ac.in 2. Dr. N.Pannirselvam, SRM IST	1. Dr. P.A.Prabakaran AP/Civil 2. Ms.U.Sindhu Vaardini AP/Civil 3. Mr.P.Aswin Bharath AP/Civil 4. Ms.S.Chitra AP/Civil
Recommended by BoS on	13.08.2024	
Academic Council Approval	No: 27	Date 24.08.2024

SEMESTER -II

24CPI506	Project Formulation and Appraisal		L	T	P	J	C
2			0	0	2	3	
PC			SDG		9,10,13		
Pre-requisite courses	-	Data Book / Code book (If any)			Statistical Tables		

Course Objectives:	
The purpose of taking this course is to:	
1	Understand the fundamentals of project formulation, including capital investments and feasibility analysis.
2	Learn essential project costing techniques, such as cash flow estimation and financial evaluation.
3	Apply project appraisal methods, including NPV, IRR, and payback period, for informed decision-making.
4	Gain knowledge of project financing, exploring various funding sources and cost-benefit analysis.
5	Develop expertise in managing risks and structuring projects through private sector participation and PPP models.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Analyze project concepts and capital investments by preparing a preliminary analysis and prefeasibility report.	An
CO 2	Apply project costing principles to calculate cash flows, present value, and cost of capital.	Ap
CO 3	Evaluate appraisal methods using NPV, IRR, and BCR to determine their effectiveness.	E
CO 4	Analyze project financing options by comparing financial indicators and evaluating cost-benefit analysis	An
CO 5	Apply private sector participation concepts by explaining different PPP models.	Ap
CO 6	Integrate formulation, costing, appraisal, and financing into a project, concluding with a detailed project report (DPR)	C

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Mastering Sustainable Practices	Applying advanced techniques and innovative technology	Evaluate solution considering public health and environmental factors	adopting advanced design tools for project management & research	technological advancement for complex engineering solutions	Community involvement through appropriate design standards
1	3			3		2
2	3		2	3	2	3
3		3	3	3	3	3
4		3	1	3	3	
5	3			3		2
6		3		3	2	3

Course Content	
PROJECT FORMULATION Project – Concepts – Generation and Screening of Project Ideas – Project identification – Preliminary Analysis, Market, Technical, Financial, Economic and Ecological – Prefeasibility Report and its Clearance, Detailed Project Report – Different Project Clearances required- Case studies for Feasibility Report and DPR	6 Hours
PROJECT COSTING Project Cash Flows– Principles – Types – New Project and Replacement Project – Biases in Cash flow Estimation – Present Value – Future Value – Single amount - Annuity – Cost of Capital – Proportions-	6 Hours
PROJECT APPRAISAL NPV – BCR – IRR – ARR – Urgency – Pay Back Period – Assessment of Various Methods – Indian Practice of Investment Appraisal – International Practice of Appraisal – Selection of a Project and Risk Analysis in Practice.	6 Hours
PROJECT FINANCING Project Financing – Means of Finance – Financial Institutions – Special Schemes – Key Financial Indicators – financial cost-benefit analysis, social-cost benefit analysis	6 Hours
PRIVATE SECTOR PARTICIPATION Private sector participation in Infrastructure Development Projects – Different PPP models; Project Structuring, Financing aspects, Appraisal, Risk Assessment and Risk management.	6 Hours
PROJECT COMPONENT Workout project with define project concepts, conduct a preliminary analysis, and prepare a prefeasibility report to identify stakeholders. They will estimate costs, evaluate appraisal methods like NPV and IRR, analyze financial indicators, and assess risks. The final deliverable is a detailed project report (DPR) that synthesizes all aspects of infrastructure project management.	30 hours

Theory Hours: 30	Tutorial Hours: 0	Practical Hours: 0	Project Hours: 30	Total Hours: 60
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Learning Resources	
Textbooks:	
6. Prasanna Chandra, Projects – Planning, Analysis, Selection, Implementation Review, McGraw Hill Publishing Company Ltd., New Delhi. 2019. 7. Steven J. Peterson. “Construction Accounting and Financial Management”, Pearson Education International 8. Raina V.K, “Construction Management Practice – The inside Story”, Tata McGraw Hill Publishing Limited, 2019.	
Reference books & Weblinks:	
9. Barcus, S.W. and Wilkinson.J.W., Hand Book of Management Consulting Services, McGraw Hill, New York, 1995. 10. Joy P.K., Total Project Management - The Indian Context, New Delhi, Macmillan India Ltd., 2017. 11. United Nations Industrial Development Organisation (UNIDO) Manual for the Preparation of Industrial Feasibility Studies, (IDBI Reproduction) Bombay, 2007 12. Kumar Neeraj Jha “Construction Project Management”, Pearson Education International, New Delhi.	
Online Resources:	
5. http://rkarnal.ignou.ac.in/Ignou-RC-Karnal/userfiles/file/MEDS-044%20(%20English) 6. https://www.ihmnotes.in/assets/Docs/Ignou/TS-03/Unit-21%20Project%20Formulation%20&%20Apprais 7. https://www.readyratios.com/reference/appraisal/project_appraisal.html	

Assessment (Embedded course)
CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE), Project Review, viva-voce, etc.

Course Curated by			
Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)	
1.Er. T. Gurusamy, GHAA Associates guru.epmc@gmail.com 2.Er. Midhun Kumar V, Uniconsys Pvt Ltd	1. Dr. S.Kandasamy, Vel Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Technology, Chennai, drskandasamy@veltech.edu.in 2. Dr. K.Yogeswari, B.S. Abdur Rahman Crescent Institute of Science and technology, yogeswari@crescent.education	1. Dr. P.A.Prabakaran AP/Civil 2. Ms.U.Sindhu Vaardini AP/Civil 3. Mr.P.Aswin Bharath AP/Civil 4. Mr. S.Chitra AP/Civil	
Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	Date	24.08.2024

24CPT507	Quality Health and Safety Management		L	T	P	J	C
3			0	0	0	3	
PC			SDG		9,11,12,13		
Pre-requisite courses	-	Data Book / Code book (If any)	-				

Course Objectives:	
The purpose of taking this course is to:	
1	Learn to create and evaluate effective safety programmes for construction sites.
2	Understand the responsibilities of owners and designers in ensuring safety during construction.
3	Explore the causes and economic impacts of construction accidents and the importance of hazard assessments.
4	Gain skills in developing quality management plans and applying techniques to improve construction quality.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	<i>Apply the elements of an effective safety program to organize safety assessments and meetings on construction sites.</i>	Ap
CO 2	<i>Analyze the roles and responsibilities in safety management to distinguish between the duties of different personnel in ensuring site safety</i>	An
CO 3	<i>Evaluate the causes and impacts of construction accidents to recommend strategies for minimizing human and financial losses.</i>	E
CO 4	<i>Assess the factors influencing construction quality to justify the implementation of quality management guidelines</i>	E
CO 5	<i>Design a comprehensive QA/QC program to develop robust inspection procedures that ensure high construction quality.</i>	C

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Mastering Sustainable Practices	Applying advanced techniques and innovative technology	Evaluate solution considering public health and environmental factors	adopting advanced design tools for project management & research	technological advancement for complex engineering solutions	Community involvement through appropriate design standards
1	3					
2		2		3		
3	3	2	3		2	3
4	2	2	2			3
5	3	2	2	2	2	3

Course Content	
SAFETY PROGRAMMES Problem Areas in Construction Safety –Elements of an Effective Safety Programme –Job-Site Safety Assessment –Safety Meetings –Safety Incentives – Owner’s responsibility for safety – Owner preparedness – Role of designer in ensuring safety – Safety clause in design document	9 Hours
DESIGNING FOR SAFETY Safety Culture –Safe Workers –Safety and First Line Supervisors –Safety and Middle Managers – Top Management Practices –Safety Personnel –Sub contractual Obligation –Project Coordination and Safety Procedures –Workers Compensation.	9 Hours
CONSTRUCTION ACCIDENTS Accidents and their Causes –Human Factors in Construction Safety –Costs of Construction Injuries –Occupational and Safety Hazard Assessment –Safety in Construction Contracts – Legal Implications.	9 Hours
QUALITY MANAGEMENT Introduction –Definitions and objectives –Factors influencing construction quality – Dimensions of Quality –Quality plan –Quality Management Guidelines –Quality circles- Quality Policy, Objectives and methods in Construction industry -Consumers satisfaction, Ergonomics – Taguchi’s concept of quality –Codes and Standards –Documents –Contract and construction programming.	9 Hours
QUALITY ASSURANCE AND CONTROL Objectives –Techniques and needs of QA/QC Inspection procedures - Processes and products – Total QA / QC programme and cost implication –Different aspects of quality –Appraisals, Factors influencing construction quality –Critical, major failure aspects and failure mode and effect analysis.	9 Hours

Theory	Tutorial	Practical	Project	Total
Hours: 45	Hours: 0	Hours: 0	Hours: 0	Hours: 45

Learning Resources
Textbooks:
1. D. L. Goetsch, <i>Construction Safety and the OSHA Standards</i> , 8th ed. Pearson, 2021. ISBN: 978-0134859651. 2. R. T. Liston, <i>Total Quality Management in Construction</i> , 1st ed. Taylor & Francis, 2008. ISBN: 978-0415390960. 3. G. M. Winch, <i>Managing Construction Projects</i> , 2nd ed. Wiley-Blackwell, 2010. ISBN: 978-1405192793.
Reference books & Weblinks:
4. P. J. B. Benenson, <i>Accident Prevention Manual for Business & Industry</i> , 15th ed. National Safety Council, 2016. ISBN: 978-0879123183. 5. A. T. G. K. W. H. Chua, <i>Safety Management in Construction: A Systems Approach</i> . London: Routledge, 2016. ISBN: 978-1138690540. 6. R. K. P. R. V. Gupta, <i>Quality Management for the Technology Sector</i> . New Delhi: SAGE Publications, 2014. ISBN: 978-9351500524.
Online Resources:
1. https://www.coursera.org/learn/lean-management-fundamental 2. https://www.coursera.org/learn/quality-improvement-and-management 3. https://archive.nptel.ac.in/courses/105/102/105102206/

Assessment (Theory course)
CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Course Curated by			
Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)	
1. Mr. M. Suman Dhas, L&T, Chennai 2. Dr. A. Kallarpiran, SEED for Safety	1. Dr. Ramesh Kannan. M, Anna University (CEG), rameshkannan@annauniv.edu 2. Dr. K.S. Anandh, SRMIST	1. Ms.U.Sindhu Vaardini AP/Civil 2. Dr. P.A.Prabakaran AP/Civil 3. Mr.P.Aswin Bharath AP/Civil	
Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	Date	24.08.2024

24CPT508	Construction Planning Scheduling and Control	L	T	P	J	C
		3	0	0	0	3
PC		SDG		9,11,12		

Pre-requisite courses	-	Data Book / Code book (If any)	-
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Course Objectives:	
The purpose of taking this course is to:	
1	Define project scope and budgets using project management principles tailored for construction projects.
2	Develop effective schedules by applying techniques like CPM and PERT to ensure timely project delivery.
3	Optimize resource utilization through advanced allocation methods and constraint management.
4	Enhance project data accuracy using modern information management tools and techniques.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply project management principles to define scope and budget in construction projects.	Ap
CO 2	Analyze scheduling techniques like CPM and PERT to create effective project timelines.	An
CO 3	Apply resource allocation methods to optimize resource use and manage constraints.	Ap
CO 4	Evaluate cost estimation techniques to develop accurate project budgets.	E
CO 5	Apply information management tools to improve the accuracy and flow of project data.	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Independent Research and Development	Technical Report and documentation	Mastery over domain specialization	Regulatory and Economic Analysis	Holistic Project Management	Sustainable and Ethical Practices
1	3		2			3
2		2			2	
3		2		2		
4	2	3	3	3	2	2
5	3		2	3	2	2
6	3	3	3	3	3	3

Course Content									
INTRODUCTION AND SCOPE OF PROJECT MANAGEMENT Construction Management Context - Construction Industry Characteristics - Domestic & Global Markets - Project Definition - Nature of Construction Projects - Project Life Cycle - Project Management Principles - Functions - Project Scope Management - Cost Estimation Elements - Estimating Methods - Project Budgeting - Modern Bidding Practices				9 Hours					
ADVANCED PROJECT PLANNING AND SCHEDULING Bar Chart Planning - CPM Network Construction - Activities, Events, Logic - Time Computations - Critical Path Method - Floats - PERT Network - Time Estimates - Beta Distribution - Expected Time - Standard Deviation - Probability of Time Targets - Project Management Software Introduction				9 Hours					
RESOURCE ALLOCATION AND OPTIMIZATION Resource Aggregation Diagrams - Early & Late Start - Resource Smoothing - Activity Start Time Manipulation - Resource Levelling - Constraints Management - Activity Prioritization - Sorting Rules - Minimum Project Duration with Resource Constraints - Resource Optimization Tools				9 Hours					
MODERN PROJECT COST ESTIMATION Types of Project Costs - Costs Associated with Facilities - Cost Structuring Methods - Client & Contractor Estimates - Construction Cost Estimates - Joint Costs Allocation - Historical Cost Data - Cost Indices - Application of Indices - Engineer's List of Quantities - Operating Costs Estimation - Cost Estimation Software				9 Hours					
INFORMATION MANAGEMENT IN PROJECTS Types of Project Information - Accuracy & Use - Computerized Information Management - Conceptual Models of Databases - Centralized Databases - Database Management Systems - Applications and Programs - Information Transfer & Flow - Digital Tools for Information Management				9 Hours					
Theory Hours:	45	Tutorial Hours:	0	Practical Hours:	0	Project Hours:	0	Total Hours:	45

Learning Resources	
Textbooks:	

1. Punmia B C and Khandelwal K K, “Project Planning and Control with PERT and CPM”, Laxmi Publications, 2016. 2. Dr.S.Seetharaman, “Construction Engineering and Management”, Umesh Publications, 2015. 3. Kumar Neeraj Jha, Construction Project Management – Theory and Practice, Pearson Publications – Dorling Kindersley (India) Pvt. Ltd.
References:
1. Chris Hendrickson and Tung Au, Project Management for Construction – Fundamental Concepts for Owners, Engineers, Architects and Builders, Prentice Hall, Pittsburgh. 2. Chitkara, K.K. Construction Project Management: Planning, Scheduling and Control, Tata McGraw-Hill Publishing Company, New Delhi. 3. Frederick E. Gould, Construction Project Management, Wentworth Institute of Technology, Vary E. Joyce, Massachusetts Institute of Technology. 4. Choudhury.S, Project Management, Tata McGraw-Hill Publishing Company, New Delhi
Online Resources (Weblinks)
1. Project planning and control: https://onlinecourses.nptel.ac.in/noc22_ce59/preview 2. Construction Scheduling: https://www.coursera.org/learn/construction-scheduling 3. Construction Project Management: https://www.coursera.org/learn/construction-project-management

Assessment (Embedded course)
SA, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE) Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by			
Expert(s) from Industry		Expert(s) from Higher Education Institution	Internal Expert(s)
1. Mr. Anil Mehta Director of Financial Planning and Analysis Shapoorji Pallonji Group 2. Mr. Ravi Verma Senior Vice President, Construction and Infrastructure Finance, JCB India.		1. Dr. Ramesh Kannan. M, Anna University (CEG), rameshkannan@annauniv.edu 2. Dr. S. Kamal, University college of Engineering, Ramnad, kamalselva21@gmail.com	1. Dr.. P. A. Prabakaran AP/Civil 2. Ms. U. Sindhu Vaardini AP/Civil 3. Mr. P. Aswin Bharath AP/Civil 4. Ms. S. Chitra AP/Civil
Recommended by BoS on		13.08.2024	
Academic Council Approval		No: 27	Date24.08.2024

24CPP509	BIM Studio			L	T	P	J	C
				0	0	4	0	2
ES				SDG		9,10,13		
Pre-requisite courses		-	Data Book / Code book (If any)			Nil		

Course Objectives:	
The purpose of taking this course is to:	
1	To introduce Building Information Modelling (BIM) concepts and tools.
2	To equip students with practical skills in BIM modelling, scheduling, and construction management..
3	To provide hands-on experience in 4D simulations, quantity take off, risk analysis, and safety planning using industry-relevant BIM tools.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply fundamental Building Information Modeling (BIM) techniques to develop models and extract project data for construction management.	Ap
CO 2	Analyze construction workflows by performing clash detection, scheduling, and resource planning using BIM-based methods.	An
CO 3	Evaluate BIM applications for quantity takeoff, cost estimation, and project progress tracking.	E

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
Course Outcomes (CO)	Mastering Sustainable Practices	Applying advanced techniques and innovative technology	Evaluate solution considering public health and environmental factors	adopting advanced design tools for project management & research	technological advancement for complex engineering solutions	Community involvement through appropriate design standards
1	3			3		2
2	3		2	3	2	3
3		3	3	3	3	3

Course Content	
Introduction to BIM 1. Introduction to BIM Concepts and Tools 2. Basic Modelling and Project Navigation in BIM Software BIM Uses and Tools 3. Model a Simple Building Using Building Information Modelling (BIM) 4. Design a Basic Equipment Information System for a Construction Project. 5. Explore BIM Tools and Workflows for Construction Planning 6. Perform Quantity Take-Off and Cost Estimation BIM for Project Management 7. Track Virtual Progress of a Small Construction Project 8. Schedule and Plan Using 4D BIM 9. Develop Construction Safety Plans Using BIM 10. Use Cloud-Based BIM for Coordination and Clash Detection Capstone Project and Case Study 11. Analyze a Case Study on BIM for Construction Management 12. Capstone Project: Model Development and Presentation 13. Preparation of Work Breakdown Structure 14. Drafting a Project Scope Statement 15. Creating a Project Network Diagram 16. Performing PERT Time Analysis 17. Allocating Resources to Project Activities 18. Drawing a Resource Aggregation Chart 19. Estimating Construction Item Costs 20. Preparing a Project Budget Sheet 21. Creating a Project Information Tracker 22. Organizing Project Reports and Documentation	60 Hours

Theory	Tutorial	Practical	Project	Total
Hours: 0	Hours: 0	Hours: 60	Hours: 0	Hours: 60

Learning Resources
Textbooks:
1. Eastman, C., Teicholz, P., Sacks, R., & Liston, K. (2011). BIM handbook: A guide to building information modelling for owners, managers, designers, engineers, and contractors. Wiley. 2. McGinnis, D. S., & Eastman, M. A. (2018). Building information modelling: Planning and managing construction projects with 4D CAD and simulations. CRC Press. 3. Mordue, S., Swaddle, P., & Philp, D. (2013). Building information modelling for dummies. Wiley. 4. Holzer, D. (2016). The BIM manager's handbook: A guide to implementing BIM in your organization. Wiley. 5. Tickoo, S. (2023). Revit architecture 2023 for beginners: A tutorial approach. CADCIM Technologies.
Reference books & Weblinks:
1. Kirby, L., Kim, M., & Krygiel, E. (2023). Mastering Autodesk Revit 2023 for architecture. Wiley. 2. McDonough, W. J. (2017). BIM for building owners and developers: Making a business case for using BIM on projects. Wiley. 3. Underwood, J., & Isikdag, U. (2011). Building information modelling: BIM in current and future practice. Wiley-Blackwell. 4. Dhanak, A. S. (2020). Construction management and BIM: A case study approach. CRC Press. 5. Sears, S. K., Sears, G. A., Clough, R. H., & Sears, I. J. (2015). Construction project management: A practical guide to field construction management (9th ed.). Pearson.

Online Resources:

1. BIM Forum : <https://www.bimforum.org/>
2. National Institute of Building Sciences (NIBS) – BIM : <https://www.nibs.org/>
3. BIM 360 – Autodesk <https://www.autodesk.com/bim-360/>

Assessment (Practical course)

Activity and Learning Task(s), Model Lab, Mini project, MCQ, End Semester Examination (ESE),

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
1. Dr. K. M. Nanthan, L&T, R KMNNN@lntec.com 2. Dr. G Muneeswaran, L&T, gmeswar@lntec.com	1. Dr. Nikhil Bugalia, IIT Madras, nbugalia@civil.iitm.ac.in 2. Dr. N.Pannirselvam, SRM IST	1. Dr. P.A.Prabakaran AP/Civil 2. Ms.U.Sindhu Vaardini AP/Civil 3. Mr.P.Aswin Bharath AP/Civil 4. Ms.S.Chitra AP/Civil
Recommended by BoS on	13.08.2024	
Academic Council Approval	No: 27	Date 24.08.2024

SEMESTER -III

24CPJ601	INDUSTRIAL TRAINING	L	T	P	J	C
		0	0	0	0	2
PR		SDG		4, 9		

Pre-requisite courses	Nil	Data Book / Code book (If any)	NA
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Course Objectives:	
The purpose of taking this course is to:	
1	To train the students in the field work to have firsthand knowledge of practical problems related to construction management in carrying out engineering tasks

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Identify and describe the Construction Management organization and understand the various functions of the construction activities.	An
CO 2	Participate in real-life construction projects	Ap
CO 3	Prepare the detailed technical report and present efficiently	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium - 2, Weak-1)					
	1	2	3	4	5	6
	Independently carry out research / investigation and work	Write and present a substantial technical report/document	Demonstrate a degree of mastery over the area	Analyze and solve complex structural engineering problems	Use modern/advanced techniques, tools and skills	Communicate with larger community, to design and document complex problems
1	1	2	1	2	3	3
2	1	2	1	2	3	3
3	1	2	1	2	3	3

Course Content	
INTERNSHIP The students individually undertake training in reputed engineering companies or in Research Labs doing construction management during the summer vacation for a specified duration of one month. At the end of the training, a detailed report on the work done should be submitted within ten days from the commencement of the semester. The students will be evaluated through a viva-voce examination by a team of internal staff.	1 month duration

Theory 0	Tutorial 0	Practical 0	Project 0	Total 0
Hours:	Hours:	Hours:	Hours:	Hours:

Assessment (Practical course)
Lab Workbook, Experimental Cycle tests, viva-voce.

Course Curated by			
Expert(s) from Industry	Expert(s) from Higher Education Institution		Internal Expert(s)
Dr. V. Govindaraj Head R&D, L&T Construction, Chennai.	.		1. Dr. P.A.Prabakaran AP/Civil 2. Ms.U.Sindhu Vaardini AP/Civil 3. Mr.P.Aswin Bharath AP/Civil 4. Ms.S.Chitra AP/Civil
Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	Date	24.08.2024

24CPJ602	PROJECT PHASE - I	L	T	P	J	C
		0	0	0	20	10
PR		SDG		4, 9		

Pre-requisite courses	Nil	Data Book / Code book (If any)	Nil
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Course Objectives:	
The purpose of taking this course is to:	
1	To identify a specific problem for the current need of the society and collect information related to the same through a detailed review of literature.
2	To develop the methodology to solve the identified problem
3	To train the students in preparing project reports and to face reviews and viva-voce examinations

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply the knowledge gained from theoretical and practical courses in solving problems and recognize the importance of literature review.	An
CO 2	To develop the methodology to solve the identified problem and perform investigation	Ap
CO 3	Prepare project reports and present findings of the work	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium - 2, Weak-1)					
	1	2	3	4	5	6
	Independently carry out research / investigation and work	Write and present a substantial technical report/ document	Demonstrate a degree of mastery over the area	Analyze and solve complex structural engineering problems	Use modern/ advanced techniques, tools and skills	Communicate with larger community, to design and document complex problems
1	1	2	1	2	3	3
2	1	2	1	2	3	3
3	1	2	1	2	3	3

Course Content	
The student individually works on a specific topic approved by the head of the division under the guidance of a faculty member who is familiar in this area of interest. The	300 Hours

student can select any topic which is relevant to the area of construction management. The topic may be experimental / analytical / industry problem. At the end of the semester, a detailed report on the work done should be submitted which contains clear definition of the identified problem, detailed literature review related to the area of work and methodology for carrying out the work. The students will be evaluated through a viva-voce examination by a panel of examiners including one external examiner.	
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Theory 0	Tutorial 0	Practical 0	Project 300	Total 300
Hours:	Hours:	Hours:	Hours:	Hours:

Assessment (Practical course)
Lab Workbook, Experimental Cycle tests, viva-voce.

Course Curated by			
Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)	
1. Dr. K. M. Nanthan, L&T, R KMNNN@Intecc.com	1. Dr. H Jane Helena, Anna University, Chennai, jane@annauniv.edu 2. Dr. S. Kamal, BITS Trichy, kamalselva21@gmail.com	1. Dr. P.A.Prabakaran AP/Civil 2. Ms.U.Sindhu Vaardini AP/Civil 3. Mr.P.Aswin Bharath AP/Civil	
Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	Date	24.08.2024

SEMESTER -IV

24CPJ603	PROJECT PHASE - II	L	T	P	J	C
		0	0	0	40	20
PR		SDG		4, 9		

Pre-requisite courses	Nil	Data Book / Code book (If any)	NIL
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Course Objectives:	
The purpose of taking this course is to:	
1	To solve the identified problem based on the formulated methodology.
2	To develop skills to analyze and discuss the test results, and make conclusions

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	To solve the identified problem based on the formulated methodology.	An
CO 2	To develop skills to analyse and discuss the test results, and make conclusions	An
CO 3	Demonstrate the research findings and present the solutions of the thesis work.	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium - 2, Weak-1)					
	1	2	3	4	5	6
	Independently carry out research / investigation and work	Write and present a substantial technical report/document	Demonstrate a degree of mastery over the area	Analyze and solve complex structural engineering problems	Use modern/ advanced techniques, tools and skills	Communicate with larger community, to design and document complex problems
	1	2	1	2	3	2
	2	1	2	1	2	3
	3	1	2	1	3	3
						2

Course Content	
The student should continue the Phase I work on the selected topic as per the formulated methodology under the same supervisor / undergo internship. At the end of the semester, after completing the work to the satisfaction of the supervisor and review committee, a detailed report should be prepared and submitted to the head of	600 Hours

the department. The students will be evaluated based on the report and the viva-voce examination by a panel of examiners including one external examiner.	
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Theory 0	Tutorial 0	Practical 0	Project 600	Total 600
Hours:	Hours:	Hours:	Hours:	Hours:

Assessment (Practical course)
Lab Workbook, Experimental Cycle tests, viva-voce.

Course Curated by			
Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)	
1. Er. P. Jahanathan, UCON PT Structural System, Pvt. Ltd., jegan@utraconindia.com	1. Dr. Ramesh Kannan. M, Anna University (CEG), rameshkannan@annauniv.edu 2. Dr. Rajasekaran C , NITK, bcrajasekaran@nitk.edu.in	1. Dr. P.A.Prabakaran AP/Civil 2. Ms.U.Sindhu Vaardini AP/Civil 3. Mr.P.Aswin Bharath AP/Civil	
Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	Date	24.08.2024

PROFESSIONAL ELECTIVES

24CPC001	CONSTRUCTION ECONOMICS AND FINANCE MANAGEMENT	L	T	P	J	C
		2	0	0	2	3
PE		SDG		9		
Pre-requisite courses		Data Book / Code book (If any)				

Course Objectives:

The purpose of taking this course is to:

1	Introduce students to the fundamental principles of engineering economics.
2	Equip students with tools for analyzing economic alternatives in construction.
3	Understand the impact of taxation and inflation on project finance.
4	Provide knowledge on sources of finance and working capital management.
5	Develop skills to analyze financial performance using management accounting.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply basic principles of engineering economics to solve problems involving time value of money.	Ap
CO 2	Analyze economic alternatives using methods like Present Worth and Rate of Return to make informed decisions	An
CO 3	Evaluate the impact of taxation and inflation on construction project profitability and financial planning.	E
CO 4	Compare different sources of finance and their suitability for managing working capital in construction project.	C
CO 5	Interpret financial statements and cash flows using management accounting techniques to assess project performance	An
CO 6	Develop a comprehensive financial analysis for a construction project by applying the learned techniques to real-world case studies	C

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Independent Research and Development	Technical Report and documentation	Mastery over domain specialization	Regulatory and Economic Analysis	Holistic Project Management	Sustainable and Ethical Practices
1	2		2	1		
2		2		2		3
3	2	3	3			
4			2	2		3
5		3			2	2
6		2	3		2	

Course Content	
BASIC PRINCIPLES Engineering economics: Basic principles – Time value of money, Quantifying alternatives for decision making, Cash flow diagrams, Equivalence – Single payment in the future (P/F, F/P), Present payment compared to uniform series payments (P/ A, A/P),	6 Hours
ECONOMIC ANALYSIS Comparing alternatives- Present Worth Analysis, Annual Worth Analysis, Future Worth Analysis, Rate of Return Analysis (ROR), Benefit/Cost Analysis, Break Even Analysis.	6 Hours
TAXATION AND INFLATION Taxation – Evaluation of profit before and after tax –Risks and uncertainties and management decision in capital budgeting – Value Added Tax (VAT) – Inflation.	6 Hours
FUNDS MANAGEMENT Project Finance – Sources of finance - Long-term and short -term finance, Working Capital Management, Inventory valuation, Mortgage Financing	6 Hours
FUNDAMENTALS OF MANAGEMENT ACCOUNTING Management accounting, Financial accounting principles- basic concepts, Financial statements – accounting ratios - funds flow statement – cash flow statement.	6 Hours
PROJECT - Students will work on real-world case studies and projects, focusing on the financial analysis of construction projects. - The project work includes applying the techniques learned in the course to evaluate a construction project's economic viability and financial performance	30 Hours

Theory Hours:	30	Tutorial Hours:	0	Practical Hours:	30	Project Hours:	0	Total Hours:	60
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Learning Resources	
Textbooks:	
1. Gould, F. E., “Managing the Construction Process”, 4th ed., Pearson Education, 2012. 2. Harris, F., McCaffer, R. and Edum-Fotwe, F., “Modern Construction Management”, 6th ed., Wiley India, New Delhi, 2006. 3. Jha, K. N., “Construction Project Management, Theory and Practice”, Pearson, New Delhi, 2011.	
References:	
1. Peurifoy, R. L. and Oberlender, G. D., “Estimating Construction Costs”, 5th ed., Tata McGraw-Hill, New Delhi, 2004. 2. Blank, L. and Tarquin, A. Engineering Economy, 9th Edn. Mc-Graw Hill Book Co., 2023. 3. Collier, C.A. and Glagola, C.R. Engineering Economics and Cost Analysis, 3rd Edn. Addison Wesley Education Publishers., 1998. 4. Patel, B M Project management- Financial Evaluation with Strategic Planning, Networking and Control, 2nd Edn. Vikas Publishing House Pvt. Ltd. New Delhi, 2010. 5. Shrivastava, U.K., Construction Planning and Management, 2nd Edn. Galgotia Publications Pvt. Ltd. New Delhi., 2001. 6. Steiner, H.M. Engineering Economic Principles, 2nd Edn. Mc-Graw Hill Book, 1996	
Online Resources (Weblinks)	
1. Construction Economics Resources: https://www.cii.org 2. Financial Analysis for Construction Projects: https://www.projectmanagement.com 3. Engineering Economics Tools: https://www.engineeringeconomy.com	

Assessment (Embedded course)
SA, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE) Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by			
Expert(s) from Industry		Expert(s) from Higher Education Institution	Internal Expert(s)
1. Mr. Ravi Verma Senior Vice President, Construction and Infrastructure Finance, JCB India 2. Mr. Anil Mehta Director of Financial Planning and Analysis Shapoorji Pallonji Group		1. Dr. R. K. Sharma Professor, Department of Civil Engineering, IIT Madras 2. Dr. S. S. Rathi Head, Department of Construction Management, NICMAR, Pune	1. Dr. P.A.Prabakaran AP/Civil 2. Ms.U.Sindhu Vaardini AP/Civil 3. Mr.P.Aswin Bharath AP/Civil 4. Ms.S.Chitra AP/Civil
Recommended by BoS on		13.08.2024	
Academic Council Approval		No: 27	Date 24.08.2024

24CPC002	Value Engineering and Valuation		L	T	P	J	C
2			0	0	2	3	
PE			SDG		9,11,12,13		
Pre-requisite courses	-	Data Book / Code book (If any)			-		

Course Objectives:	
The purpose of taking this course is to:	
1	Learn key concepts and identify cost-reduction opportunities in construction projects.
2	Assess asset valuation techniques and apply life cycle costing strategies.
3	Use value engineering principles to optimize outcomes and enhance project value.
4	Conduct project work applying value engineering to identify cost-saving opportunities.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply the principles of value engineering to identify and reduce unnecessary costs in construction projects.	Ap
CO 2	Analyze the application of value engineering during different phases of a construction project.	An
CO 3	Evaluate methods of asset valuation for different types of construction assets.	An
CO 4	Analyze value engineering methodology to enhance construction project value.	Ap
CO 5	Examine life cycle cost analysis methods to minimize long-term costs in construction projects.	Ap
CO 6	Complete a project applying value engineering principles to identify cost-saving opportunities.	C

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Mastering Sustainable Practices	Applying advanced techniques and innovative technology	Evaluate solution considering public health and environmental factors	adopting advanced design tools for project management & research	technological advancement for complex engineering solutions	Community involvement through appropriate design standards
1		2			3	2
2	3		2			
3				3		1
4			2			3
5					3	
6	3	2	3		3	

Course Content	
VALUE ENGINEERING Value Engineering-Definition-Importance to Contractors-Potential VE Applications-Value-basic and secondary functions- identifying reasons or unnecessary costs- Different methods of performing value engineering-Methodology	6 Hours
APPLICATION OF VALUE ENGINEERING VE during the Planning Phase of a Construction Project - VE during the Design Phase of a Construction Project-VE during the Construction Phase of a Construction Project	6 Hours
VALUATION AND ITS REPORT Types of value-purposes of valuation factors affecting value-Different methods of valuation for different types of assets such as land and building-horticulture-historical places Valuation Report-contents-standard formats-Case study of any one Report	6 Hours
VE METHODOLOGY Orientation phase - Information phase- Function Analysis phase - Creative Phase - Evaluation Phase -Development Phase- Presentation Phase- implementation Phase	6 Hours
VALUE ANALYSIS & LIFE CYCLE COSTING 10 Commandments of value analysis-value analysis team- principles-elements of job plan-Forecasting of Capital as well as operating & maintenance costs-DCF methods-sensitivity analysis.	6 Hours
PROJECT COMPONENT The project work for the course, involves an overview of key principles and methodologies, along with a literature review on existing applications. Students will plan their projects by defining scope and goals, gather and analyze data for cost-saving opportunities, and apply value engineering principles throughout various phases. The project concludes with a final report and presentation, emphasizing practical applications in construction management.	30 hours

Theory	Tutorial	Practical	Project	Total
Hours: 30	Hours: 0	Hours: 0	Hours: 30	Hours: 60

Learning Resources
Textbooks:
1. Prasanna Chandra, Projects – Planning, Analysis, Selection, Implementation Review, McGraw Hill Publishing Company Ltd., New Delhi, 2019. 2. Benjamin S. Blanchard and Wolter J. Fabrycky, Systems Engineering and Analysis, Pearson, 5th Edition, 2011. 3. Robert J. Chapman, Project Risk Analysis and Management, John Wiley & Sons, 2016.
Reference books & Weblinks:
1. Thomas L. Saaty, Decision Making for Leaders: The Analytic Hierarchy Process for Decisions in a Complex World, RWS Publications, 2005. 2. G. Michael PhD, Value Engineering: A Plan for Invention, The Society of American Value Engineers, 2014. 3. David I. Cleland and Roland Gareis, Global Project Management Handbook, McGraw-Hill, 2006.
Online Resources:
1. https://www.tn.gov/tdot/engineering-division/engineering-production-support/value-engineering.html 2. Value Engineering: A Practical Guide - Construction Industry Research and Information Association (CIRIA)

Assessment (Embedded course)

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE), Lab Workbook, Experimental Cycle tests, viva-voce, etc.

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)	
1. Dr. C B Amarnath, Expert strategist, LnT pvt,ltd, chennai. amar.changeagent@gmail.com 2. Mr. Dhanasekar, Project Manager, NEXUS Castles, pvt ltd,Chennai. nexuscastles@gmail.com	1. Dr. L. Krishnaraj, SRMIST, 2. Dr. K. Yogeswari, Professor, Department of Civil Engineering, B.S.A. crescent Institute of Science and Technology	1. Dr. P.A.Prabakaran AP/Civil 2. Ms.U.Sindhu Vaardini AP/Civil 3. Mr.P.Aswin Bharath AP/Civil 4. Ms.S.Chitra AP/Civil	
Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	Date	24.08.2024

24CPC003	Digital Transformation in Construction Planning	L	T	P	J	C
		3	0	0	0	3
PE		SDG		9,10,13		
Pre-requisite courses		-		Data Book / Code book (If any)		Nil

Course Objectives:	
The purpose of taking this course is to:	
1	comprehend the concept and significance of digital transformation within the construction sector.
2	gain proficiency in utilizing Building Information Modeling (BIM) for various construction phases.
3	explore diverse digital tools and technologies used in construction practices.
4	develop expertise in data management and analytics for informed construction decision-making.
5	devise and execute effective digital transformation strategies for construction projects and organizations.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	analyze the impact of digital transformation on construction industry processes and outcomes.	An
CO 2	apply BIM principles and tools to enhance design, construction, and facility management.	Ap
CO 3	evaluate and select appropriate digital tools and technologies for specific construction tasks.	E
CO 4	utilize data collection, analysis, and visualization techniques to optimize construction projects.	An
CO 5	develop and implement comprehensive digital transformation strategies for construction organizations.	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Mastering Sustainable Practices	Applying advanced techniques and innovative technology	Evaluate solution considering public health and environmental factors	adopting advanced design tools for project management & research	technological advancement for complex engineering solutions	Community involvement through appropriate design standards
1	3			3		2
2	3		2	3	2	3
3		3	3	3	3	3
4		3	1	3	3	

5	3			3		2
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Course Content	
INTRODUCTION TO DIGITAL TRANSFORMATION Understanding digital transformation - Role of digital transformation in construction - Evolution of digital tools in construction - Impact of digital transformation on construction practices - Challenges in implementing digital transformation - Future trends in digital construction - Digital transformation and sustainability - Role of government and policy in digital transformation - Digital transformation and project management	9 Hours
BIM IMPLEMENTATION Introduction to BIM - BIM in design and construction - BIM for facility management - BIM standards and protocols - BIM tools - BIM and sustainability - BIM and cost estimation - BIM and risk management - Future trends in BIM-	9 Hours
DIGITAL TOOLS AND TECHNOLOGIES IN CONSTRUCTION Introduction to digital tools in construction - Drones in construction - Virtual and augmented reality in construction - IoT in construction - AI and machine learning in construction - Digital twin technology - GIS and remote sensing in construction	9 Hours
DATA MANAGEMENT AND ANALYTICS IN CONSTRUCTION Introduction to data management in construction - Data collection methods in construction - Data storage and security in construction - Big data in construction - Data analytics in construction - Predictive analytics in construction - Data visualization in construction - Role of cloud computing in construction - Future trends in data management and analytics - Legal and ethical considerations in data management	9 Hours
PRIVATE SECTOR PARTICIPATION Developing a digital transformation strategy - Role of leadership in digital transformation - Change management in digital transformation - Training and skill development for digital transformation - Measuring the success of digital transformation - Role of innovation and creativity in digital transformation - Digital transformation and business models	9 Hours

Theory	Tutorial	Practical	Project	Total
Hours: 45	Hours: 0	Hours: 0	Hours: 0	Hours: 45

Learning Resources
Textbooks:
1. Bruno Daniotti, Marco Gianinetto, Stefano Della Torre. "Digital Transformation of the Design, Construction and Management Processes of the Built Environment". Springer Cham. 2020. 2. Jennifer Whyte, Dragana Nikolić. "Virtual Reality and the Built Environment". 2 nd Edition, Routledge, 2018.
Reference books & Weblinks:
1. Chuck Eastman, Paul Teicholz, Rafael Sacks, and Kathleen Liston "BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers and Contractors". Wiley, 2018 2. Brad Hardin, Dave McCool. "BIM and Construction Management: Proven Tools, Methods, and Workflows". 2 nd Edition. Wiley. 2015. 3. Rogers, D. L. (2016). The Digital Transformation Playbook: Rethink Your Business for the Digital Age. Columbia University Press.
Online Resources:
1. https://esoftware.com/construction/product/digital-transformation-in-construction/ 2. https://academy.rics.org/distance-learning/building-information-modelling-bim/certificate-bim-implementation-and-management

3.	https://www.ucl.ac.uk/civil-environmental-geomatic-engineering/digital-transformation-built-environment-aligning-technology-business
4.	https://www.lsba.org.uk/Home/CourseDetail?courseId=506451

Assessment (Theory course)
CAT, Activity and Learning Task(s)* , Mini project, MCQ, End Semester Examination (ESE)

Course Curated by			
Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)	
1. Dr. K. M. Nanthan, L&T, R KMNNN@Intecc.com 2. Dr.C.Velan,Ascendas, Taramani, velan62@yahoo.com	3. Dr. Senthilkumar. V, IIT Palakkad, senthil@iitpkd.ac.in 4. Dr. Ramesh Kannan. M, Anna University (CEG), rameshkannan@annauniv.edu	1. Dr. P.A.Prabakaran AP/Civil 2. Ms.U.Sindhu Vaardini AP/Civil 3. Mr.A.Aswin Bharath AP/Civil 4. Ms.S.Chitra AP/Civil	
Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	Date	24.08.2024

24CPC004	Quantitative Analysis in Construction	L	T	P	J	C
		2	0	2	0	3
PE		SDG		9,11,12,13		

Pre-requisite courses	-	Data Book / Code book (If any)	-
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Course Objectives:

The purpose of taking this course is to:

1	Equip students with quantitative tools and techniques to address optimization and decision-making challenges in construction management.
2	Develop the ability to formulate and solve linear programming and allocation models for construction-related problems.
3	Enable students to analyze and recommend solutions using decision theories under various risk scenarios.
4	Enhance operational efficiency in construction projects through job sequencing and replacement programming.
5	Apply simulation modelling techniques to evaluate the impact of strategic decisions in construction management.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	apply the concepts of Linear Programming to solve construction-related optimization problems.	Ap
CO 2	evaluate allocation models to optimize resource distribution in construction projects using transportation and assignment methods.	E
CO 3	evaluate decision theories to recommend the best course of action under various risk scenarios in construction management.	E
CO 4	apply job sequencing and replacement schedules to improve operational efficiency in construction management	Ap
CO 5	apply simulation models to assess the impact of different strategies in construction	Ap
CO 6	demonstrate the application of quantitative techniques by solving practical problems in construction management	E

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Independent Research and Development	Technical Report and documentation	Mastery over domain specialization	Regulatory and Economic Analysis	Holistic Project Management	Sustainable and Ethical Practices
1	2			3		2
2		3	2		1	3
3		3		2	3	
4	3		3	2	2	
5		2		3		2
6	2		2		3	

Course Content	
LINEAR PROGRAMMING Meaning of Linear Programming – General Mathematical Formulation of LPP – Graphical Analysis – Simplex Method – Two-phase Method – Advantage and Limitations of LPP	6 Hours
ALLOCATION MODELS IN CONSTRUCTION Transportation Model – Introduction – Formulation of Transportation Problem (TP) – Transportation Algorithm (MODI Method) – the Initial Basic Feasible Solution – Moving Towards Optimality – Assignment Models – Hungarians Algorithm: (Concept of Opportunity costs).	6 Hours
DECISION THEORIES Decision-making under certainty – uncertainty and risk situations – Influence diagram and fundamental objectives hierarchy – Imperfect information – sequential decisions – Analytical Hierarchical Process Theory	6 Hours
JOB SEQUENCING AND REPLACEMENT PROGRAMMING Johnsons Algorithm for n Jobs and Two machines – n Jobs and Three Machines – Replacement of assets that deteriorate with time – replacement of assets which fail suddenly	6 Hours
SIMULATIONS MODELLING Introduction - Methodology of Simulation – Basic Concepts –Simulation Procedure – Application of Simulation – Monte-Carlo Simulation – Limitations	6 Hours
LIST OF EXPERIMENTS - Solving Linear Programming Problems, - Solving Transportation Problem - Solving Assignment Models	30 Hours

- Solving Network Flow Models - Solving Decision making Problems in Project Management - Solving AHP – Pairwise Comparison Matrix - Solving Simulation Problems					
Theory	Tutorial	Practical	Project	Total	
Hours: 30	Hours: 0	Hours: 30	Hours: 0	Hours: 60	

Learning Resources	
Textbooks:	
- S.L. Tang, Irtishad U. Ahmad, Syed M. Ahmed & Ming Lu, Quantitative Techniques for Decision Making in Construction, Hong Kong University Press - C.M. Tam, Thomas K. L. Tong & H. Zhang, “Decision Making and Operations Research Techniques for Construction Management”, City University of Hong Kong Press	
References:	
- Barry Render, Ralph M. Stair, and Michael E. Hanna “Quantitative Analysis for Management”, 12/e Global Edition, Pearson India - Wayne L. Winston, Practical Management Science: spreadsheet modeling and applications - Taha, Hamdy, Operations Research, 7th edition, (USA: Macmillan Publishing Company)	
Online Resources (Weblinks)	
- Operations Research Models and Methods: https://www.me.utexas.edu/~jensen/ORMM/ - Linear Programming https://ocw.mit.edu/courses/mathematics/18-06-linear-algebra-spring-2010/ - Optimization Tutorials by NEOS Guide: https://neos-guide.org/ - Monte Carlo Simulation Guide: https://www.palisade.com/risk/monte_carlo_simulation.asp - Analytical Hierarchy Process (AHP): https://bpmmsg.com/academic/ahp/	

Assessment (Embedded course)
SA, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)
Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by			
Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)	
1. Mr. Suresh Kumar Senior Project Manager, L&T Construction 2. Mr. Amit Sharma Vice President, Project Management, TATA Projects Ltd.	1. Dr. P.K. Viswanathan Professor, Department of Civil Engineering, IIT Madras 2. Dr. M. Arivazhagan Dean, School of Management Studies ,NIT Trichy	1. Dr. P.A.Prabakaran AP/Civil 2. Ms.U.Sindhu Vaardini AP/Civil 3. Mr.P.Aswin Bharath AP/Civil 4. Ms.S.Chitra AP/Civil	
Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	Date	24.08.2024

24CPE005	Organizational Behaviour	L	T	P	J	C
		3	0	0	0	3
PE		SDG		3,5,8		

Pre-requisite courses	-	Data Book / Code book (If any)	-
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Course Objectives:	
The purpose of taking this course is to:	
1	Equip students with knowledge of manpower planning and organizational structures in construction.
2	Critically assess the impact of individual and group behaviour on team performance.
3	Examine various management methods and strategies to resolve human resource challenges within the construction industry.
4	Assess the effectiveness of welfare measures in enhancing employee safety, compensation, and overall well-being.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply the principles of manpower planning to develop effective staffing plans in construction projects.	Ap
CO 2	Analyze the structure and operations of construction organizations to enhance human resource development.	Ap
CO 3	Evaluate the impact of individual and group behavior on team performance and decision-making in construction projects.	An
CO 4	Examine various management and development methods to address special human resource problems in construction	An
CO 5	Analyze welfare measures to determine their effectiveness in improving employee compensation, safety, and well-being.	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Mastering Sustainable Practices	Applying advanced techniques and innovative technology	Evaluate solution considering public health and environmental factors	adopting advanced design tools for project management & research	technological advancement for complex engineering solutions	Community involvement through appropriate design standards
1	3		3	3		
2		3	2		3	
3		2		3		3
4	2				3	3

5	2		2		3	3
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Course Content	
MANPOWER PLANNING Manpower Planning – Organizing – Staffing – Staffing Plan – directing and controlling – Managerial Staffing – Recruitment – Selection – Personnel Principles	9 Hours
ORGANIZATION Organization – Span of Control – Organization Charts – Development and Operation of human resources — Placement, Training and Development.	9 Hours
HUMAN BEHAVIOUR Introduction to the field of people management - basic individual psychology; motivation - Job design and performance management - Managing groups at work - self-managing work teams - Intergroup behaviour and conflict in organizations – Leadership – Behavioural aspects of decision-making and communication for people management	9 Hours
MANAGEMENT AND DEVELOPMENT METHODS Performance appraisal – Employee handbook and personnel manual – Job descriptions and organization structure and human relations – Special Human resource problems – Identification of training needs- training calendar – evaluation of training – Productivity of Human resources – Discipline and discharge.	9 Hours
WELFARE MEASURES Compensation – Wages and Salary, Employee Benefits, employee appraisal and assessment - Employee services – Safety and health – GPF – EPF – Group Insurance – Housing - Pension – Laws related to welfare measures.	9 Hours

Theory Hours: 45	Tutorial Hours: 0	Practical Hours: 0	Project Hours: 0	Total Hours: 45
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Learning Resources
Textbooks:
1. Dessler, G. (2019). Human Resource Management. Pearson Education. 2. Noe, R. A. (2017). Fundamentals of Human Resource Management. McGraw-Hill Education. 3. Mathis, R. L., & Jackson, J. H. (2016). Human Resource Management. Cengage Learning.
Reference books & Weblinks:
1. Kazi, A. S. (2020). Construction Project Management: A Practical Guide to Field Construction Management. CRC Press. 2. Kerzner, H. (2017). Project Management: A Systems Approach to Planning, Scheduling, and Controlling. Wiley. 3. Jha, K. N. (2014). Construction Project Management. Pearson Education India.
Online Resources:
1. http://www.hrmguide.co.uk 2. https://www.shrm.org 3. http://www.careerbuilder.com

Assessment (Theory course)
CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Course Curated by			
Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)	
1. Er. P. Jahanathan, UCON PT Structural System, Pvt. Ltd., jegan@utraconindia.com 2. Dr. G Muneeswaran, L&T, gmeswar@lntec.com	1. Dr. S. Kamal, BITS Trichy, kamalselva21@gmail.com 2. Dr. K.S. Anandh, SRMIST	1. Dr. P.A.Prabakaran AP/Civil 2. Ms.U.Sindhu Vaardini AP/Civil 3. Mr.P.Aswin Bharath AP/Civil 4. Ms.S.Chitra AP/Civil	
Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	Date	24.08.2024

24CPE006	RISK MANAGEMENT IN CONSTRUCTION			L	T	P	J	C
				3	0	0	0	3
PC				SDG		9,11,12,13		
Pre-requisite courses		-	Data Book / Code book (If any)			-		

Course Objectives:	
The purpose of taking this course is to:	
1	Introduce the basics of risk, its causes, and its role in corporate, financial, and infrastructure projects.
2	Teach Risk identification and analysis using tools like RAMP, SWOT, and Delphi methods.
3	Develop skills for creating risk management plans, mitigation strategies, and stakeholder frameworks.
4	Enable effective handling of residual risks through insurance policies, premiums, and communication strategies.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply key concepts, definitions, and frameworks of risk management to assess risks in corporate, financial, and infrastructure projects.	Ap
CO 2	Analyse project risks through qualitative and quantitative techniques, including SWOT, Delphi, and historical data reviews, to prioritize risk factors effectively.	An
CO 3	Evaluate risk management plans, policies, and stakeholder roles to ensure successful risk response and mitigation.	E
CO 4	Create comprehensive strategies for risk mitigation, allocation, and residual risk handling using frameworks like RAMP and insurance policies.	C
CO 5	Develop risk communication strategies to engage stakeholders and the public, addressing concerns and promoting transparency.	C

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Mastering Sustainable Practices	Applying advanced techniques and innovative technology	Evaluate solution considering public health and environmental factors	adopting advanced design tools for project management & research	technological advancement for complex engineering solutions	Community involvement through appropriate design standards
1	2	2		2	2	
2		3	2	3	3	2
3	2	2	3	3	2	3
4	2	3	2		3	2
5	3	2	3		2	3

Course Content	
INTRODUCTION Definitions of risk – Elements of risk management – causes of risk – Corporate Governance – Finance & Market Risk – Risks associated with infrastructure and other complex projects – Importance of Risk – quantifiable and un-quantified risks.	9 Hours
IDENTIFICATION OF RISK Risk analysis and Management for projects (RAMP) Identifying risk events – preparing for risk identification – risk categories – referring to historical information. Identifying the project risk – reviewing project documents – brainstorming – The Delphi technique - analysing SWOT – diagrammatic techniques - Analysing project risk through qualitative and quantitative measures	9 Hours
RISK RESPONSE AND COMMUNICATION Planning for risk management: Project charter – risk management policies – roles and responsibilities – stakeholder tolerance – risk management plan template – revisiting the work breakdown structure – Risk management plan – creating the risk management plan – risk analysis – tracking – Preparing for risk response – creating risk response – result of risk response planning. Risk monitoring and control. Risk communication – informing public about risk and responding to expresses concerns – education.	9 Hours
RISK ALLOCATION Use of risk prompts – use of Risk Assessment tables – details of RAMP process, –utility of Grading of construction entities for reliable risk assessment – Risk Mitigation – by elimination, reducing, transferring, a voiding, absorbing or pooling.	9 Hours
RESIDUAL RISK HANDLING Residual risk – mitigation of un-quantified risk – Coverage of risk through CIDC’s MOU with the Actuarial Society of India through risk premium such as (BIP) – Bidding Indemnity Policy (DIMO) – Delay in meeting obligation by client policy, (SOC) – Settlement of claims policy (LOP)- Loss of profit policy (TI) –Transit Insurance policy (LOPCE) – Loss of performance of construction equipment policy.	9 Hours

Theory	Tutorial	Practical	Project	Total
Hours: 45	Hours: 0	Hours: 0	Hours: 0	Hours: 45

Learning Resources
Textbooks:
1. Chapman, C., & Ward, S. (2011). <i>Project risk management: Processes, techniques, and insights</i> (2nd ed.). Wiley. 2. Hillson, D., & Simon, P. (2020). <i>Risk management in projects</i> (3rd ed.). Routledge. 3. Smith, N. J., Merna, T., & Jobling, P. (2014). <i>Managing risk in construction projects</i> (3rd ed.). Wiley-Blackwell.
Reference books & Weblinks:
1. Hopkin, P. (2018). <i>Fundamentals of risk management: Understanding, evaluating, and implementing effective risk management</i> (5th ed.). Kogan Page. 2. Vose, D. (2008). <i>Risk analysis: A quantitative guide</i> (3rd ed.). Wiley.
Online Resources:
1. https://onlinecourses.nptel.ac.in/noc22_mg55/preview 2. https://www.coursera.org/learn/project-risk-management

3. <https://archive.nptel.ac.in/courses/105/102/105102206/>

Assessment (Theory course)

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
1. Er. T. Gurusamy, GHAA Associates guru.epmc@gmail.com 2. Er. P. Jahanathan, UCON PT Structural System, Pvt. Ltd., jegan@utraconindia.com	1. Dr. V. R. Prasath Kumar, SRMIST 2. Dr. C.Shankar, Assistant Professor, Coimbatore Institute of Technology,	1. Dr. P.A.Prabakaran AP/Civil 2. Ms.U.Sindhu Vaardini AP/Civil 3. Mr.P.Aswin Bharath AP/Civil 4. Ms.S.Chitra AP/Civil
Recommended by BoS on	13.08.2024	
Academic Council Approval	No: 27	Date 24.08.2024

24CPE007	SUPPLY CHAIN MANAGEMENT AND LOGISTICS IN CONSTRUCTION	L	T	P	J	C
		3	0	0	0	3
PE		SDG	9,11,12,13			
Pre-requisite courses	-	Data Book / Code book (If any)			-	

Course Objectives:	
The purpose of taking this course is to:	
1	Understand the fundamental concepts and importance of supply chain management, including its objectives and dynamics
2	Analyze the design and planning of supply chain networks, focusing on logistics, distribution channels, and demand management processes.
3	Evaluate the strategies for supply chain planning and implementation, including inventory management, sourcing, and the role of information technology.
4	Explore transportation strategies and location planning within supply chains, emphasizing carrier selection and intermodal transportation.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Analyse SCM models and their dynamics.	An
CO 2	Apply network design techniques to logistics planning	Ap
CO 3	Evaluate SCM planning and IT integration strategies	E
CO 4	Analyse supply chain strategies and their integration	An
CO 5	Create transportation strategies and location planning methods	C

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Mastering Sustainable Practices	Applying advanced techniques and innovative technology	Evaluate solution considering public health and environmental factors	adopting advanced design tools for project management & research	technological advancement for complex engineering solutions	Community involvement through appropriate design standards
1		3	2			2
2			3		2	
3	2		2	3		
4		2	2		2	3
5	2					2

Course Content	
INTRODUCTION TO SUPPLY CHAIN MANAGEMENT (SCM) SCM Overview - Importance & Objectives - Process Tools - Supply Chain Dynamics - SCM Models - Change Drivers - Types of Cargoes - Agile & Green SCM - Maritime SCM - Case Studies	9 Hours
SUPPLY CHAIN NETWORK DESIGN AND DEMAND MANAGEMENT Network Design & Planning - Logistics/SCM Network Importance - Factors & Framework - Distribution Channels - Economic of Distribution - Customer Service - Demand Management Process - Forecasting & CPFR - Case Studies	9 Hours
SUPPLY CHAIN PLANNING, IMPLEMENTATION, AND IT INTEGRATION Aggregate Planning Strategies - Inventory Management - Sourcing & Transportation - Order Management Systems - Logistics Information Systems - EDI & TMS - Impact of BIM and new data management capabilities on supply chain management in construction - Case Studies	9 Hours
SUPPLY CHAIN STRATEGIES AND INTEGRATION Supply Chain Strategies - Strategy Classification - Corporate & Logistics Strategies - Strategic Fit - Customer Relationship Management - Push & Pull Systems - Distribution Strategies - Centralized vs. Decentralized Control - Case Studies	9 Hours
LOCATION AND TRANSPORTATION STRATEGIES IN SUPPLY CHAIN Location Planning - Evaluating Alternatives - Transportation Role & Strategy - Carrier Selection - Intermodal Transportation - Costing & Pricing - Rate Profiles - Transportation Documents - Case Studies.	9 Hours

Theory	Tutorial	Practical	Project	Total
Hours: 45	Hours: 0	Hours: 0	Hours: 0	Hours: 45

Learning Resources
Textbooks:
1. Chopra, S., & Meindl, P. (2019). <i>Supply chain management: Strategy, planning, and operation</i> (7th ed.). Pearson. 2. Jacobs, F. R., & Chase, R. B. (2018). <i>Operations and supply chain management</i> (15th ed.). Cengage Learning. 3. Lambert, D. M., & Cooper, M. C. (2000). <i>Issues in supply chain management</i>. Industrial Marketing Management, 29(1), 65–83. https://doi.org/10.1016/S0019-8501(99)00113-8
Reference books & Weblinks:
1. Simchi-Levi, D., Kaminsky, P., & Simchi-Levi, E. (2018). <i>Designing and managing the supply chain: Concepts, strategies, and case studies</i> (4th ed.). McGraw-Hill. 2. Coyle, J. J., Langley, C. J., Novack, R. A., & Gibson, B. (2016). <i>Supply chain management: A logistics perspective</i> (10th ed.). Cengage Learning.
Online Resources:
1. https://onlinecourses.nptel.ac.in/noc24_hs128/preview 2. https://www.coursera.org/learn/supply-chain-logistics

Assessment (Theory course)
CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Course Curated by			
Expert(s) from Industry		Expert(s) from Higher Education Institution	Internal Expert(s)
1. Dr. K. M. Nanthan, L&T, R KMNNN@lntecc.com 2. Dr.C. Velan, Ascendas, Taramani, velan62@yahoo.com		1. Dr. N.Pannirselvam, SRMIST 2. Dr. J. Saravanan, Annamalai University, ausjs5070@gmail.com	1. Dr. P.A.Prabakaran AP/Civil 2. Ms.U.Sindhu Vaardini AP/Civil 3. Mr.P.Aswin Bharath AP/Civil 4. Ms.S.Chitra AP/Civil
Recommended by BoS on		13.08.2024	
Academic Council Approval		No: 27	Date 24.08.2024

24CPE008	Building Services and Facility Management		L	T	P	J	C
3			0	0	0	3	
PC			SDG		9,10,13		
Pre-requisite courses	-	Data Book / Code book (If any)	Nil				

Course Objectives:	
The purpose of taking this course is to:	
1	understand basic concepts and principles of building services
2	study the rudiments of electrical installations in a building
3	describe mechanical operation and design principles for HVAC
4	state fire safety requirements and regulations
5	introduce the concepts of intelligent and smart buildings

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	understand the basics of water distribution, piping and sewerage system in buildings	U
CO 2	Interpret the design and placement of mechanical and electrical services within building structures.	Ap
CO 3	Analyze the components and working principles of HVAC systems in different building types.	An
CO 4	Illustrate the layout and components of fire safety systems in accordance with standard codes and guidelines	Ap
CO 5	Analyze smart building systems and evaluate their effectiveness in improving building performance and sustainability	An

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Mastering Sustainable Practices	Applying advanced techniques and innovative technology	Evaluate solution considering public health and environmental factors	adopting advanced design tools for project management & research	technological advancement for complex engineering solutions	Community involvement through appropriate design standards
1	3			3	2	2
2				3		3
3	3	2	3		3	3
4	2	3	1	3		2
5	3			3	2	2

Course Content	
WATER SUPPLY AND SANITARY SYSTEM Water Supply - Water purification process - Layout of water distribution network - Component of cold and hot water supply system – Types of tanks - types of pipes - plumbing system for building-internal supply in buildings - Rainwater Harvesting - storm water drainage from buildings - Arrangement of sewerage systems in housing - Pipe systems - septic and sewage treatment plant	9 Hours
ELECTRICAL SYSTEM AND DESIGN Types of electrical system – Distribution in buildings - Single/three phase supply - Protective devices in electrical installation - Earthing and its types - Electrical installations in buildings - Types of wires – Wiring systems - Main and distribution boards – Transformers and switch gears - Principles of illumination	9 Hours
HEATING, VENTILATING AND AIR CONDITIONING (HVAC) Heat emitters - Low temperature and High temperature hot water heating systems - Underfloor and panel heating - Thermal insulating material - Thermal insulation of roofs and exposed walls Ventilation requirements – Natural and Mechanical ventilation – Factors affecting indoor airflow – Air velocity and diffusion - Principles and systems of air conditioning – Thermodynamics - Transfer of heat - Refrigeration cycle components -Types of air conditioning systems for buildings - Different systems of ducting	9 Hours
FIRE SAFETY DESIGN Fire hazard of materials and building - Fire detection and alarm system – Water based fire extinguishers – Gas based fire extinguishers – Special and portable fire extinguishing system – Wet and Dry risers – Means of fire escape – Smoke detectors, control and vents – Staircase pressurization – Emergency power supply - General Requirements as per IS: 1642:1989 and NBC 2005	9 Hours
SMART AND INTELLIGENT BUILDINGS Elevators and Escalators – Building automation hardware - Smart building fixtures and components – Smart insulation – Smart windows – Home assistance – Green buildings - Zero energy Buildings – IoT and AI based building system	9 Hours

Theory	Tutorial	Practical	Project	Total
Hours: 45	Hours: 0	Hours: 0	Hours: 0	Hours: 45

Learning Resources
Textbooks:
3. Fred Hall and Roger Greeno, “Building Services Handbook”, Elsevier, Oxford, 2007 4. Fair G.M., Geyer J.C. and Okun .D, “Water and waste Engineering“, Vol. II, John Wiley & sons, Inc., New York. 2008.
Reference books & Weblinks:
4. William H.Severns and Julian R.Fellows, “Air conditioning and refrigeration”, John Wily and sons, London, 2008 5. Shengwei Wang, Intelligent buildings and building automation, Spon Press, 2010. 6. Marco Casini, “Smart Buildings - Advanced Materials and Nanotechnology to Improve Energy-Efficiency and Environmental Performance”, Elsevier, 2018.
Online Resources:
1. https://www.24houranswers.com/online-class/plumbing-and-sanitary-systems-in-architecture

2.	https://opentextbc.ca/plumbing3b/chapter/describe-the-building-water-supply-system/
3.	https://www.ashrae.org/professional-development/self-directed-learning-group-learning-texts/fundamentals-of-hvac-systems
4.	https://www.aecdaily.com/course/924606
5.	https://www.nexuslabs.online/smart-building-strategist

Assessment (Theory course)
CAT, Activity and Learning Task(s)* , Mini project, MCQ, End Semester Examination (ESE)

Course Curated by			
Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)	
3. Dr. K. M. Nanthan, L&T, R KMNNN@intecc.com 4. Dr.C.Velan,Ascendas, Taramani, velan62@yahoo.com	5. Dr. Senthilkumar. V, IIT Palakkad, senthil@iitpkd.ac.in 6. Dr. Ramesh Kannan. M, Anna University (CEG), rameshkannan@annauniv.edu	5. Dr. P.A.Prabakaran AP/Civil 6. Ms.U.Sindhu Vaardini AP/Civil 7. Mr.A.Aswin Bharath AP/Civil	
Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	Date	24.08.2024

24CPC009	Planning and Design of Energy Efficient Buildings		L	T	P	J	C
2			0	0	2	3	
PE			SDG		7,11		
Pre-requisite courses	-	Data Book / Code book (If any)			-		

Course Objectives:	
The purpose of taking this course is to:	
1	Equip students with the knowledge to design buildings that optimize energy efficiency.
2	Introduce passive solar heating and cooling techniques.
3	Explore materials and techniques for daylighting and electrical lighting systems.
4	Assess the role of heat control, ventilation, and their impact on energy efficiency.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply the principles of heat transfer and thermal comfort	Ap
CO 2	Analyze passive solar heating and cooling techniques	An
CO 3	Evaluate the effectiveness of daylighting and electrical lighting methods	An
CO 4	Examine the impact of heat control and ventilation systems	An
CO 5	Design energy-efficient buildings.	An
CO6	Develop and implement a project that applies energy-efficient design principles to a specific building type.	C

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Mastering Sustainable Practices	Applying advanced techniques and innovative technology	Evaluate solution considering public health and environmental factors	adopting advanced design tools for project management & research	technological advancement for complex engineering solutions	Community involvement through appropriate design standards
1	2	3	2	2		2
2	2	3	2	3	2	2
3	3	3	2	2	2	2
4	3	2	2	3	2	2
5	3	3	3	3	2	3
6	3	3	3	3	3	3

Course Content

INTRODUCTION Climate adapted and climate rejecting buildings – Heat Transfer – Measuring Conduction – Thermal Storage – Measurement of Radiation – The Greenhouse Effect – Convection – Measuring latent and sensible heat – Psychrometry Chart – Thermal Comfort – Microclimate, Site Planning and Development – Temperature – Humidity – Wind – Optimum Site Locations – Sun Path Diagrams – Sun Protection – Types of Shading Devices – Design responses to energy conservation strategies	6 Hours
PASSIVE SOLAR HEATING AND COOLING General Principles of passive Solar Heating – Key Design Elements – Sunspace – Direct gain – Trombe Walls, Water Walls – Convective Air loops – Concepts – Case Studies – General Principles of Pass Passive Cooling – Ventilation – Principles – Case studies – Courtyards – Roof Ponds – Cool Pools- Predicting ventilation in buildings – Window Ventilation Calculations – Room Organization Strategies for Cross and Stack Ventilation – Radiation – Evaporation and dehumidification – Wind Catchers – Mass Effect – Zoning – Load Control – Air Filtration and odour removal.	6 Hours
DAYLIGHTING AND ELECTRICAL LIGHTING Materials, components and details – Insulation – Optical materials – Radiant Barriers – Glazing materials – Glazing Spectral Response – Day lighting – Sources and concepts –Building Design Strategies – Case Studies – Daylight apertures – Light Shelves – Codal requirements – Day lighting design – Electric Lighting – Light Distribution – Electric Lighting control for day lighted buildings, Switching controls – Coefficient of utilization – Electric Task Lighting – Electric Light Zones – Power Adjustment Factors.	6 Hours
HEAT CONTROL AND VENTILATION Hourly Solar radiation – Heat insulation – Terminology – Requirements – Heat transmission through building sections – Thermal performance of Building sections – Orientation of buildings – Building characteristics for various climates – Thermal Design of buildings – Influence of Design Parameters– Mechanical controls – Examples. Ventilation – Requirements – Minimum standards for ventilation-Ventilation Design – Energy Conservation in Ventilating systems – Design for Natural Ventilation-Calculation of probable indoor wind speed.	6 Hours
DESIGN FOR CLIMATIC ZONES Energy efficiency – An Overview of Design Concepts and Architectural Interventions – Embodied Energy – Low Embodied Energy Materials – Passive Downdraft Evaporative Cooling – Design of Energy Efficient Buildings for Various Zones – Cold and cloudy – Cold and sunny – Composite – Hot and dry – Moderate – Warm and humid – Case studies of residences, office buildings and other buildings in each zones – Commonly used software packages in energy efficient building analysis and design - Energy Audit – Certification	6 Hours
PROJECT COMPONENT Design an energy-efficient model for a chosen building type (residential, commercial, or institutional). Integrate principles of passive solar heating, daylighting, heat control, and ventilation. The project will involve using simulation software to assess energy savings, environmental impact, and potential improvements	30 Hours

Theory	Tutorial	Practical	Project	Total
Hours: 30	Hours: 0	Hours: 0	Hours: 30	Hours: 60

Learning Resources
Textbooks:
1. Brown, G. Z., & DeKay, M. (2001). Sun, Wind, and Light: Architectural Design Strategies. John Wiley & Sons.. 2. Majumdar, M. (Ed.). (2002). Energy-Efficient Buildings in India. Tata Energy Research Institute. 3. Stein, B., Reynolds, J. S., Grondzik, W., & Kwok, A. G. (2006). Mechanical and Electrical Equipment for Buildings. John Wiley & Sons.

Reference books & Weblinks:	
1.	Energy Conservation Building Code (2007). Bureau of Energy Efficiency, New Delhi.
2.	Chiras, D. (2012). The Solar House: Passive Heating and Cooling. Chelsea Green Publishing.
3.	Stine, W. B., & Geyer, M. A. (2001). Power from the Sun. Wiley.
Online Resources:	
1.	https://www.energy.gov/eere/buildings
2.	https://www.architecture2030.org
3.	https://www.greenbuildingadvisor.com

Assessment (Theory course)
CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Course Curated by			
Expert(s) from Industry		Expert(s) from Higher Education Institution	Internal Expert(s)
1. Dr.C. Velan, Ascendas, Taramani, velan62@yahoo.com 2. Er. Jayasankar k, Ultra Tech cement Limited, jayasankar2411@gmail.com		1. Dr. S. Prakashchandar, SRMIST 2. Dr. S. Kamal, University college of Engineering, Ramnad, kamalselva21@gmail.com	1. Dr. P.A.Prabakaran AP/Civil 2. Ms.U.Sindhu Vaardini AP/Civil 3. Mr.P.Aswin Bharath AP/Civil 4. Ms.S.Chitra AP/Civil
Recommended by BoS on		13.08.2024	
Academic Council Approval		No: 27	Date 24.08.2024

24CPC010	REAL ESTATE PRACTICES AND MANAGEMENT	L	T	P	J	C
		2	0	0	2	3
PE		SDG		9,11,12,13		

Pre-requisite courses	-	Data Book / Code book (If any)	-
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Course Objectives:	
The purpose of taking this course is to:	
1	Understand the scope and classification of real estate activities and the factors that affect the real estate market.
2	Explain the statutory provisions, including laws and regulations that govern land use and property development in real estate.
3	Identify the roles and responsibilities of real estate participants and stakeholders, including consultants and ethical practices in the industry.
4	Evaluate the processes involved in real estate development, including project formulation, feasibility studies, and documentation of real estate transactions.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Analyze the factors affecting the real estate market to evaluate the role of government in market regulation.	An
CO 2	Examine statutory provisions and land use controls to assess their impact on property development and environmental issues.	An
CO 3	Evaluate the roles and responsibilities of real estate participants and stakeholders to recommend best practices and ethical standards.	E
CO 4	Analyze real estate development processes to manage planning, scheduling, and risk in real estate projects.	An
CO 5	Evaluate real estate documentation and appraisal techniques to ensure accurate transfer of titles and effective transaction closure.	E
CO 6	Analyze the project components of real estate development to assess their impact on project feasibility, financial viability, and stakeholder engagement.	C

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Mastering Sustainable Practices	Applying advanced techniques and innovative technology	Evaluate solution considering public health and environmental factors	adopting advanced design tools for project management & research	technological advancement for complex engineering solutions	Community involvement through appropriate design standards
1	2		3	2		2
2	2	2	3			2
3	2		3	2		2
4	2	2	2	3	2	
5		2	2	2	3	
6	2	2		3	1	

Course Content	
REAL ESTATE MARKET Real Estate Scope – classification of real estate activities and peculiarities – Factors affecting real estate market – Role of Government in real estate market	6 Hours
STATUTORY PROVISIONS Laws – rules and regulation – land use controls in property development – registration And licensing requirements – Knowledge base for assessment and forecasting the Real Estate market – environmental issues related to Real Estate Transactions.	6 Hours
PARTICIPANTS AND STAKE HOLDERS Role – Scope – working characteristics and principal functions of real estate participants and stakeholders – real estate consultants and their activities – Code of ethics for Real Estate participants – Good practices and managerial responsibilities.	6 Hours
REAL ESTATE DEVELOPMENT Functions of real development like project formulation – feasibility studies – developing – costing and financing – managing including planning – Scheduling and monitoring of real estate projects – risk management – Facilities management – marketing/advertising.	6 Hours
DOCUMENTATION Interests in real estate – Documentation in real estate processes –Transfer of titles and records – Real estate appraisal and valuation – Types of agreement between the consultants and principal – closing the real estate transactions.	6 Hours
PROJECT COMPONENT Interests in project feasibility – Financial modeling and budgeting – Stakeholder engagement strategies – Risk assessment and management – Impact of site selection and market analysis – Best practices in project execution.	30 Hours

Theory Hours:	30	Tutorial Hours:	0	Practical Hours:	0	Project Hours:	30	Total Hours:	60
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Learning Resources	
Textbooks:	
1.	Miller, N. G., & Geltner, D. (2011). <i>Real estate principles: A value approach</i> (3rd ed.). McGraw-Hill.
2.	Glascock, J. H., & Zumpano, L. V. (2019). <i>Real estate law</i> (4th ed.). Cengage Learning.
3.	Glickman, N. J., & Tashjian, E. (2010). <i>An introduction to real estate finance</i> (3rd ed.). Blackwell Publishing.
Reference books & Weblinks:	
1.	McCarthy, L. J., & Schmitz, S. (2017). <i>Real estate development: Principles and process</i> (5th ed.). Urban Land Institute.
2.	Roulac, S. E. (2018). <i>Real estate transaction: Principles and practices</i> (2nd ed.). Realty Publications.
Online Resources:	
1.	https://www.coursera.org/learn/real-estate-property-management
2.	https://onlinecourses.nptel.ac.in/noc20_ar14/preview

Assessment (Theory course)
CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Course Curated by			
Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)	
1. Mr. M. Suman Dhas, L&T, Chennai 2. Dr. A. Kallarpiran, SEED for Safety	1. Dr. Ramesh Kannan. M, Anna University (CEG), rameshkannan@annauniv.edu 2. Dr. K.S. Anandh, SRMIST	1. Dr. P.A.Prabakaran AP/Civil 2. Ms.U.Sindhu Vaardini AP/Civil 3. Mr.P.Aswin Bharath AP/Civil 4. Ms.S.Chitra AP/Civil	
Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	Date	24.08.2024

24CPE011	Sustainable Construction Management		L	T	P	J	C
3			0	0	0	3	
PE			SDG	9,11,12,13			
Pre-requisite courses	-	Data Book / Code book (If any)			-		

Course Objectives:	
The purpose of taking this course is to:	
1	Understand the importance of sustainability in the construction industry.
2	Gain proficiency in evaluating energy efficiency and performance in buildings.
3	Develop the ability to assess and compare green building certification systems.
4	Foster skills in selecting materials and practices that minimize environmental impact.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Describe the various sustainable materials used in construction	Un
CO 2	Explain the method of estimating the amount of energy required for building	Ap
CO 3	Describe the features of LEED, TERI and GRIHA ratings of buildings.	Un
CO 4	Explore the concept and performance of zero energy buildings.	An
CO 5	Select less carbon emission materials for construction.	E

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Mastering Sustainable Practices	Applying advanced techniques and innovative technology	Evaluate solution considering public health and environmental factors	adopting advanced design tools for project management & research	technological advancement for complex engineering solutions	Community involvement through appropriate design standards
1	3		2			
2	2	3	2			
3		2	2	3		
4	3	2	2	1		
5	3	2	1		2	

Course Content	
INTRODUCTION Introduction and definition of Sustainability - Carbon cycle - role of construction material: concrete and steel, etc. - CO2 contribution from cement and other construction materials.	9 Hours
MATERIALS USED IN SUSTAINABLE CONSTRUCTION Construction materials and indoor air quality - No/Low cement concrete - Recycled and manufactured aggregate - Role of QC and durability - Life cycle and sustainability.	9 Hours
ENERGY CALCULATIONS Components of embodied energy - calculation of embodied energy for construction materials - Energy concept and primary energy - Embodied energy via-a-vis operational energy in conditioned building - Life Cycle energy use.	9 Hours
GREEN BUILDINGS Control of energy use in building - ECBC code, codes in neighboring tropical countries - OTTV concepts and calculations – Features of LEED and TERI – Griha ratings - Role of insulation and thermal properties of construction materials - influence of moisture content and modeling Performance ratings of green buildings – Zero energy building.	9 Hours
ENVIRONMENTAL EFFECTS Non-renewable sources of energy and Environmental aspects – energy norm, coal, oil, natural gas - nuclear energy - Global temperature, Green house effects, global warming - Acid rain: Causes, effects and control methods - Regional impacts of temperature change.	9 Hours

Theory	Tutorial	Practical	Project	Total
Hours: 45	Hours: 0	Hours: 0	Hours: 0	Hours: 45
Learning Resources				
Textbooks:				
1. Charles J Kibert, Sustainable Construction: Green Building Design & Delivery, 4 th Edition, Wiley Publishers 2016. 2. Steve Goodhew, Sustainable Construction Process, Wiley Blackwell, UK, 2016. 3. Craig A. Langston & Grace K.C. Ding, Sustainable Practices in the Built Environment, Butterworth Heinemann Publishers, 2011.				
Reference books & Weblinks:				
1. William P Spence, Construction Materials, Methods & Techniques (3e), Yesdee Publication Pvt. Ltd, 2012 2. New Building Materials and Construction World magazine				
Online Resources:				
1. https://www.coursera.org/learn/sustainable-construction-management 2. https://onlinecourses.nptel.ac.in/noc19_ce40/preview 3. https://www.ciobacademy.org/product/sustainable-construction-and-development/				

Assessment (Theory course)
CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Course Curated by			
Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)	
1. Dr. A. Kallarpiran, SEED for Safety 2. Dr. K. M. Nanthan, L&T, R KMNNN@Intecc.com	1. Dr.R.Baskar, Annamalai University, Chidambaram, rajaram_baskar@rediffmail.com 2. Dr. N.Pannirselvam, SRM IST	1. Dr. P.A.Prabakaran AP/Civil 2. Ms.U.Sindhu Vaardini AP/Civil 3. Mr.P.Aswin Bharath AP/Civil 4. Ms.S.Chitra AP/Civil	
Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	Date	24.08.2024

24CPE012	Health Monitoring of Structures		L	T	P	J	C
3			0	0	0	3	
PE			SDG		9,11,12		
Pre-requisite courses	-	Data Book / Code book (If any)	-				

Course Objectives:

The purpose of taking this course is to:

1	Develop a comprehensive understanding of sustainable construction practices.
2	Foster critical thinking skills to assess environmental impacts on building design.
3	Enhance the ability to integrate various building systems for optimal performance.
4	Promote effective safety and maintenance strategies for long-term building resilience.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply the principles of structural integration to organize material selection and specification for building enclosures.	Ap
CO 2	Analyze the environmental factors affecting interior quality to distinguish effective systems for weather resistance, thermal control, and air quality.	An
CO 3	Evaluate the integration of mechanical, electrical, and plumbing systems to recommend optimized solutions for infrastructure development projects.	E
CO 4	Assess maintenance strategies to justify the use of low-maintenance materials and construction methods for long-term durability.	Ap
CO 5	Design safety systems for fire prevention and hazard control to develop comprehensive plans for pollution-free and hazard-free construction execution.	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Mastering Sustainable Practices	Applying advanced techniques and innovative technology	Evaluate solution considering public health and environmental factors	adopting advanced design tools for project management & research	technological advancement for complex engineering solutions	Community involvement through appropriate design standards
1	3	2	1			
2	2	3	3	2		
3			2	2	1	
4	3	2	2			
5	3			2	2	1

Course Content	
INTRODUCTION TO SHM An Overview of Structural Health Monitoring and Smart Materials.	9 Hours
VIBRATION CONTROL FOR SHM Introduction to FE formulation – Constitutive Relationship – Element Stiffness Matrix for High Precision Finite Element – Element Mass Matrix for High Precision. Finite Element – Developing Actuator and Sensor Influence Matrix – Estimating Sensor Voltage – Active Control of Damping – A Case study of Performance Estimation for Different Patches – SHM of Ribbon Reinforced Composite Laminate.	9 Hours
SHM USING PIEZO AND MAGNETOSTRICTIVE LAYERS Delamination Sensing using Piezo Sensory Layer – Voltage Response from Piezo patch – Electrical Impedance Method basic theory – A Case Study: Results and Discussions – SHM using Magneto strictive Sensory Layer – Basics of Magnetization.	9 Hours
HYSTERESIS Planning systems for least maintenance materials and construction – Access for maintenance – Delamination Sensing using Magneto strictive Sensory Layer – Constitutive relationship with composite relationship – MS Layer in symmetric Laminate – MS Layer Away from the Mid plane in Asymmetric Laminate – Case Studies related to MS Layer based SHM.	9 Hours
SHM USING LDV Experimental Modal Analysis using LDV – Introduction, what is LDV? – Velocity and Displacement Measurement using LDV – Case Study for Symmetric Laminate – Case Study for Crossply.	9 Hours

Theory	Tutorial	Practical	Project	Total
Hours: 45	Hours: 0	Hours: 0	Hours: 0	Hours: 45
Learning Resources				
Textbooks:				
1. Daniel Balageas, Claus-Peter Fritzen, Alfredo Güemes, Structural Health Monitoring, John Wiley and Sons, 2006. 2. Douglas E Adams, Health Monitoring of Structural Materials and Components- Methods with Applications, John Wiley and Sons, 2007.				
Reference books & Weblinks:				
1. J.P. Ou, H.Li and Z.D. Duan, Structural Health Monitoring and Intelligent Infrastructure, Vol-1, Taylor and Francis Group, London, U.K, 2006 2. Victor Giurgutiu, Structural Health Monitoring with Wafer Active Sensors, Academic Press Inc, 2007.				
Online Resources:				
1. https://journals.sagepub.com/home/SHM 2. https://archive.nptel.ac.in/noc/courses/noc18/SEM2/noc18-oe05/ 3. http://ndl.iitkgp.ac.in/he_document/nptel/nptel/courses_114_106_114106046_video lec27				

Assessment (Theory course)
CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Course Curated by			
Expert(s) from Industry		Expert(s) from Higher Education Institution	Internal Expert(s)
1. Dr. K. M. Nanthan, L&T, R KMNNN@lntecc.com 2. Dr.C. Velan, Ascendas, Taramani, velan62@yahoo.com		1. Dr. S.Kandasamy, Vel Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Technology, Chennai, drskandasamy@veltech.edu.in 2. Dr. N.Pannirselvam, SRM IST	1. Ms.U.Sindhu Vaardini AP/Civil 2. Mr.P.Aswin Bharath AP/Civil
Recommended by BoS on		13.08.2024	
Academic Council Approval		No: 27	Date 24.08.2024

24CPE013	Shoring, Scaffolding and Formwork		L	T	P	J	C
			3	0	0	0	3
PE			SDG	9,11			
Pre-requisite courses	-	Data Book / Code book (If any)	-				

Course Objectives:	
The purpose of taking this course is to:	
1	Provide detailed knowledge on the planning of formwork plant and site equipment.
2	Equip students with the skills to select appropriate materials and accessories for formwork, and analyze the forces acting on it.
3	Teach students to design forms and shores for various structural elements.
4	Train students to apply knowledge of form erection for beams, slabs, columns, walls, and domes.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Explain detail planning of formwork, plant and site equipment.	An
CO 2	Select material accessories for formwork connection and analyze pressures on formworks.	Ap
CO 3	Design the forms and shores	Ap
CO 4	Apply the knowledge of erecting forms for beams, slabs, columns, walls and causes of failures.	Ap
CO 5	Apply the knowledge of forms and its erection for domes and tunnels, types of slip forms and scaffolds.	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Mastering Sustainable Practices	Applying advanced techniques and innovative technology	Evaluate solution considering public health and environmental factors	adopting advanced design tools for project management & research	technological advancement for complex engineering solutions	Community involvement through appropriate design standards
1		2		3		2
2		2		3		2
3		2		3	3	
4		2		3	3	
5		2		3	3	

Course Content	
PLANNING, SITE EQUIPMENT&PLANT FOR FORM WORK Introduction - Forms for foundations, columns, beams walls etc., General objectives of formwork building - Planning for safety - Development of a Basic System - Key Areas of cost reduction - Planning examples. Standard units - Corner units - Pass units - Calculation of labour constants - Formwork hours - Labour Requirement - Overall programme - Costing - Planning crane arrangements - Site layout plan - Transporting plant - Formwork beams - Scaffold frames - Framed panel formwork - Formwork accessories	9 Hours
MATERIALS ACCESSORIES PROPRIETARY PRODUCTS & PRESSURE Lumber - Types - Finish - Sheathing boards working stresses - Repetitive member stress - Plywood - Types and grades - Jointing Boarding - Textured surfaces and strength - Reconstituted wood - Steel - Aluminum - Hardware and fasteners - Nails in Plywood - Allowable withdrawal load and lateral load. Pressures on formwork - Examples - Vertical loads for design of slab forms - Uplift on shores - Laterals loads on slabs and walls.	9 Hours
DESIGN OF FORMS AND SHORES Basic simplification - Beam formulae - Allowable stresses - Deflection, Bending - Lateral stability - Shear, Bearing - Design of Wall forms - Slab forms - Beam forms - Column forms - Examples in each. Simple wood stresses - Slenderness ratio - Allowable load vs length behaviour of wood shores - Form lining Design Tables for Wall formwork - Slab Formwork - Column Formwork - Slab props - Stacking Towers - Free standing and restrained - Rosett Shoring - Shoring Tower - Heavy Duty props.	9 Hours
BUILDING AND ERECTING THE FORM WORK Carpentry Shop and job mill - Forms for Footings - Wall footings - Column footings - Sloped footing forms - Strap footing - Stepped footing - Slab form systems - Sky deck and Multiflex - Customized slab table - Standard Table module forms - Swivel head and uniportal head - Assembly sequence - Cycling with lifting fork - Moving with table trolley and table prop. Various causes of failures - ACI - Design deficiencies - Permitted and gradual irregularities.	9 Hours
FORMS FOR DOMES AND TUNNELS, SLIP FORMS AND SCAFFOLDS Hemispherical, Parabolic, Translational shells - Typical barrel vaults Folded plate roof details - Forms for Thin Shell roof slabs design considerations - Building the forms - Placing concrete - Form removed -Strength requirements -Tunnel forming components - Curb forms invert forms - Arch forms - Concrete placement methods - Cut and cover construction - Bulk head method - Pressures on tunnels - Continuous Advancing Slope method - Form construction - Shafts. Slip Forms - Principles -Types - advantages - Functions of various components - Planning -Desirable characteristics of concrete - Common problems faced - Safety in slip forms special structures built with slip form Technique - Types of scaffolds .	9 Hours

Theory Hours:	45	Tutorial Hours:	0	Practical Hours:	0	Project Hours:	0	Total Hours:	45
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Learning Resources
Textbooks:
1. Kumar, N. Jha. (2017). Formwork for Concrete Structures. Tata McGraw-Hill Education. 2. Austin, C. K. (1996). Formwork for Concrete. Cleaver-Hume Press Ltd. 3. Peurifoy, R. L., & Oberlender, G. D. (2006). Formwork for Concrete Structures. McGraw-Hill.
Reference books & Weblinks:
1. Hurd, M. K. (1996). Formwork for Concrete, Special Publication No. 4. American Concrete Institute. 2. Hurst, M. P. (2003). Construction Press: Formwork for Concrete. London and New York. 3. Wiener, J. (2005). Shoring and Scaffolding. Springer.
Online Resources:

1. <https://www.concrete.org>
2. <https://www.scaffold.org>
3. <https://www.engineeringcivil.com>

Assessment (Theory course)

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
1. Mr. Jayasankar k, Ultra tech cement Limited, jayasankar2411@gmail.com 2. Mr. K. M. Nanthan, L&T, RKMNNN@Intecc.com	1. Dr. A .R. Krishnaraja, Kongu Engineering college, krajacivil@kongu.ac.in 2. Dr. M. Balasubramanian, SRMIST	1. Dr. P.A.Prabakaran AP/Civil 2. Ms.U.Sindhu Vaardini AP/Civil 3. Mr.P.Aswin Bharath AP/Civil 4. Ms.S.Chitra AP/Civil
Recommended by BoS on	13.08.2024	
Academic Council Approval	No: 27	Date 24.08.2024

24CPC014	Construction Site Planning and Control	L	T	P	J	C
		2	0	0	2	3
PE		SDG	9,11			
Pre-requisite courses	-	Data Book / Code book (If any)			-	

Course Objectives:

The purpose of taking this course is to:

1	Equip students with the skills to analyze project delays and develop effective mitigation strategies.
2	Enable students to evaluate the effectiveness of different project delivery systems.
3	Provide students with site management techniques focused on safety and layout planning.
4	Develop an understanding of the Field Procedure Manual for labour and waste management.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Analyse project delays and suggest mitigation strategies.	An
CO 2	Evaluate project delivery systems' effectiveness.	An
CO 3	Apply site management techniques for layout and safety.	Ap
CO 4	Analyse the Field Procedure Manual for labour and waste management.	An
CO 5	Create a communication plan using digital tools and ERP.	An
CO 6	Design and execute a project plan focusing on site management and control using modern digital tools.	C

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Mastering Sustainable Practices	Applying advanced techniques and innovative technology	Evaluate solution considering public health and environmental factors	adopting advanced design tools for project management & research	technological advancement for complex engineering solutions	Community involvement through appropriate design standards
1	3		2	3	2	3
2	3		2	3	2	3
3	3		2	3	2	3
4	3		2	3	2	3
5	3		2	3	2	3
6	3	3	3	3	3	3

Course Content	
INDIAN CONSTRUCTION INDUSTRY AND PROJECT ECONOMICS Overview - Sectors - Project Delays: Causes & Mitigation - GDP Contribution - Construction as a Business - Risk Management - Economic Indicators - Sustainable Practices - Technology Integration - Industry Case Studies	6 Hours
PROJECT LIFE CYCLE AND DELIVERY SYSTEMS Life Cycle Phases: Concept to Completion - Stakeholder Roles - Delivery Systems: Design-Bid-Build, Design-Build, EPC, PPP - Merits & Demerits - Integrated Project Delivery (IPD) - Technology in Delivery - Agile Management - Stakeholder Communication - Case Studies	6 Hours
CONSTRUCTION SITE MANAGEMENT Site Layout Planning - Site Facilities Setup - Safety Management - Accident Prevention - Digital Documentation - Contract Administration - Lean Construction - AI in Site Management - Case Studies	6 Hours
FIELD PROCEDURE MANUAL AND RESOURCE MANAGEMENT Field Procedure Manual (FPM) - Labor & Subcontractor Management - Site Waste Management - Measurement & Billing - Project Control Estimate - Escalation Management - ERP Systems - Case Studies	6 Hours
PROJECT COMMUNICATION AND CASE STUDIES Project Communication Tools - Meetings & Reviews - Organizational Relationships - ERP in Construction - Digital Collaboration - Real-World Case Studies - Lessons Learned - Future Trends.	6 Hours
PROJECT COMPONENT Develop a detailed project plan that includes site layout, safety management, digital documentation practices, and communication strategies using ERP tools. Present their plans and showcase their implementation of modern site management techniques.	30 Hours

Theory	Tutorial	Practical	Project	Total
Hours: 30	Hours: 0	Hours: 0	Hours: 30	Hours: 60

Learning Resources
Textbooks:
1. Mincks, W., & Johnston, H. (2011). Construction Jobsite Management. Delmar Cengage Learning, New York. 2. Ritz, G. (1994). Total Construction Project Management. McGraw-Hill, Singapore. 3. Jha, N. (2015). Construction Project Management: Theory and Practice. Pearson Education, 2nd Edition, India.
Reference books & Weblinks:
1. Joy, P. (2007). Handbook of Construction Management. Macmillan India Limited, New Delhi. 2. Moore, D. (2001). Project Management – Designing Effective Organizational Structures in Construction. Blackwell Publishing, London. 3. Gould, F. E., & Joyce, N. E. (2011). Construction Project Management. Pearson, USA.
Online Resources:
1. https://www.leanconstruction.org 2. https://www.autodesk.com/solutions/construction-site-management 3. https://www.procore.com

Assessment (Theory course)
CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Course Curated by			
Expert(s) from Industry		Expert(s) from Higher Education Institution	Internal Expert(s)
1. Er.P.Tamilamuthan IPMCS, Chennai 2. Mr. K. M. Nanthan, L&T, RKMNNN@lntecc.com		1. Dr.Sathish Raj , NIT Goa 2. Dr. J. Saravanan, Annamalai University, ausjs5070@gmail.com	1. Dr. P.A.Prabakaran AP/Civil 2. Ms.U.Sindhu Vaardini AP/Civil 3. Mr.P.Aswin Bharath AP/Civil 4. Ms.S.Chitra AP/Civil
Recommended by BoS on		13.08.2024	
Academic Council Approval		No: 27	Date 24.08.2024

24CPC015	Maintenance and Management of Engineering Assets	L	T	P	J	C
		2	0	0	2	3
PE		SDG		9,11		

Pre-requisite courses	-	Data Book / Code book (If any)	-
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Course Objectives:	
The purpose of taking this course is to:	
1	Enable students to identify and manage stakeholders' expectations concerning asset management.
2	Familiarize students with internationally recognized asset management methodologies and good practices.
3	Provide structured approaches for improving value realization from assets.
4	Emphasize the value of an integrated, life cycle, and risk-based approach to managing assets.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Recognize and be able to apply asset management terminology, definitions and principles.	Ap
CO 2	Identify and manage the expectations of stakeholders with respect to asset management.	Ap
CO 3	Become familiar with internationally recognized asset management methodologies and good practices.	Ap
CO 4	Appreciation of the structured approaches available for the improvement of value realization from assets.	Ap
CO 5	Recognition of the value obtainable from the integrated approach to the life cycle and risk- based management of assets.	Ap
CO6	Design a comprehensive asset management plan focusing on lifecycle management and value realization.	C

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Mastering Sustainable Practices	Applying advanced techniques and innovative technology	Evaluate solution considering public health and environmental factors	adopting advanced design tools for project management & research	technological advancement for complex engineering solutions	Community involvement through appropriate design standards
1	3		2	3	2	3
2	3		2	3	2	3
3	3		2	3	2	3
4	3		2	3	2	3
5	3		2	3	2	3
6	3	3	3	3	3	3

Course Content	
PRINCIPLES OF ASSET MANAGEMENT Central banks -- main investor classes -- government policy-- trust law -- corporate governance - - role of the listings authority -- environmental and ethical issues -- competition and fair-trading controls -- monopolies regulators -- investment restrictions in investment agreements	6 Hours
MANAGING ASSET LIFE CYCLE DECISIONS AND ACTIVITIES Financial instruments available for short-term lending and borrowing -- corporate debt and credit derivatives -- swaps and swaptions -- private debt -- asset-backed securities, securitisation -- venture capital -- hedge funds -- currency -- infrastructure -- commodities -- insurance-linked securities -- structured products -- new ways of investing in old asset classes	6 Hours
ASSESSING AND MANAGING ASST MANAGEMENT RISKS Factors affecting equity prices -- credit analysis of bonds -- role of credit rating agencies -- fixed income analytics and valuation (including interest rate swaps and futures) -- arbitrage pricing and the concept of hedging - empirical characteristics of asset prices	6 Hours
MANAGING CHANGE IN ASSET MANAGEMENT SYSTEMS AND CAPABILITIES Asset/liability mismatching risk -- market risk -- credit risk (including counterparty risk) -- operational risk - liquidity risk -- relative performance risk -- opportunity set -- efficient frontier -- indifference curves -- the optimum portfolio.	6 Hours
METHODS FOR REALISING WHOLE LIFE VALUE FROM ASSETS Discuss the application of the key findings in behavioural finance -- Outline the main steps involved in financial planning-- asset pricing models -- asset / liability modelling. -- asset / liability mismatch reserving. -- liability hedging -- dynamic liability benchmarks.	6 Hours
PROJECT COMPONENT	30 Hours

Create a detailed asset management plan, focusing on lifecycle and risk management. Analyze real-world data to propose improvements for value realization and maintenance of engineering assets. The plan should include financial analysis, risk mitigation strategies, and sustainability measures.	
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Theory Hours: 30	Tutorial Hours: 0	Practical Hours: 0	Project Hours: 30	Total Hours: 60
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Learning Resources	
Textbooks:	
1. Geltner, D. M. M. (2007). Commercial Real Estate Analysis and Investments. South-Western Educational & Professional. 2. Ratcliffe, J. (2004). Urban Planning and Real Estate. Taylor & Francis. 3. Miles, M. E., Berens, G., & Eppli, M. (2007). Real Estate Development: Principles and Process. Urban Land Institute.	
Reference books & Weblinks:	
4. Peca, S. P. (2009). Real Estate Development and Investment: A Comprehensive Approach. Wiley. 5. Smith, N. J., Merna, T., & Jobling, P. (2009). Managing Risk in Construction Projects. Wiley. 6. Amadi-Echendu, J. E., & Brown, K. A. (2006). Physical Asset Management: With an Introduction to ISO 55000. Springer.	
Online Resources:	
1. https://www.iso.org/iso-55000-asset-management.html 2. https://www.theiam.org 3. https://www.maintenance.org	

Assessment (Theory course)
CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Course Curated by					
Expert(s) from Industry		Expert(s) from Higher Education Institution		Internal Expert(s)	
3.	Er.P.Tamilamuthan IPMCS, Chennai	3.	Dr.Sathish Raj , NIT Goa	1.	Dr. P.A.Prabakaran AP/Civil
4.	Mr. K. M. Nanthan, L&T, RKMNNN@Intecc.com	4.	Dr. J. Saravanan, Annamalai University, ausjs5070@gmail.com	2.	Ms.U.Sindhu Vaardini AP/Civil
				3.	Mr.P.Aswin Bharath AP/Civil
				4.	Ms.S.Chitra AP/Civil
Recommended by BoS on		13.08.2024			
Academic Council Approval		No: 27		Date	24.08.2024

24CPC016	Smart Infrastructure System		L	T	P	J	C
			2	0	0	2	3
PE			SDG		9,11		
Pre-requisite courses	-	Data Book / Code book (If any)	-				

Course Objectives:	
The purpose of taking this course is to:	
1	Understand the layers of modern cities and the need for sustainable smart solutions to reduce carbon emissions.
2	Learn about smart security infrastructure, including surveillance and emergency response systems for crisis management.
3	Explore modern telecommunications infrastructure, including wired, wireless, and satellite communication for smart city networks.
4	Analyze smart transport systems, including real-time traffic management, water supply, and waste management solutions.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Analyze the characteristics of modern cities to develop sustainable smart solutions for reducing carbon emissions	An
CO 2	Evaluate smart security infrastructure to recommend effective crisis management solutions.	E
CO 3	Examine smart telecommunications infrastructure to assess the role of modern communication technologies.	Ap
CO 4	Analyze smart transport infrastructure to optimize real-time information systems and traffic management.	An
CO 5	Create energy solutions using smart grid systems to reduce carbon emissions while maintaining user convenience.	An
CO 6	Design and implement a comprehensive smart city project that integrates sustainable solutions across infrastructure sectors, focusing on reducing carbon emissions and enhancing urban liveability.	C

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Mastering Sustainable Practices	Applying advanced techniques and innovative technology	Evaluate solution considering public health and environmental factors	Adopting advanced design tools for project management & research	Technological advancement for complex engineering solutions	Community involvement through appropriate design standards
1	3	3	2			
2		2	3	2	1	
3			2	3	2	
4			2		2	
5	3			1		
6	2	1	3		2	2

Course Content	
MODERN CITIES-CHARACTERISTICS Three layers concept of modern cities (Urban infrastructure, facility & service layers), Understanding the need to reduce carbon emissions and developing sustainable smart solutions. Four facets of smart solutions; Framework of public information system in smart cities.	6 Hours
SMART SECURITY INFRASTRUCTURE City surveillance systems, Intelligent Traffic Management Systems, Emergency Response systems & smart solutions to handle crisis management.	6 Hours
SMART TELE COMMUNICATIONS INFRASTRUCTURE Wired & wireless network systems, Role of satellite communication, Wi-Fi and RF systems in smart communication, Optical Fiber Cable and DWDM (Dense Wave Division Multiplexing), IPMPCS (Multi-Protocol Cable Switching) solutions.	6 Hours
SMART TRANSPORT INFRASTRUCTURE Smart transportation, Logistics, Real time Information systems, traffic information management, smart solutions for water supply and waste water engineering; remote sensing & GIS technology.	6 Hours
ENERGY SOLUTIONS Renewable energy, Smart grid systems, Reducing carbon emissions without compromising on convenience of users, Community Energy Management systems, Energy on wheels, H2H & V2H (Home to Home & Vehicle to Home) Energy solutions, smart meters, case studies-Japan and Europe countries.	6 Hours
PROJECT COMPONENT Smart City Project Implementation involves defining project objectives and forming teams to assess local urban infrastructure challenges and opportunities. Teams will develop a project plan integrating smart solutions across transport, energy, security, and telecommunications to reduce carbon emissions and enhance liveability. The project will culminate in final documentation and presentations, allowing teams to showcase their work and gather feedback for future improvements.	30 Hours

Theory Hours:	30	Tutorial Hours:	0	Practical Hours:	0	Project Hours:	30	Total Hours:	60
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Learning Resources	
Textbooks:	
1.	Bibri, S. E. (2018). <i>Smart sustainable cities of the future: The untapped potential of big data analytics and context-aware computing for advancing sustainability</i> . Springer. https://doi.org/10.1007/978-3-319-73981-6 .
2.	Jahankhani, H., Carlile, A., & Emrouznejad, A. (Eds.). (2019). <i>Cyber defence in the age of AI, smart societies, and augmented humanity</i> . Springer. https://doi.org/10.1007/978-3-030-35746-7
3.	Sathiaseelan, A., Sriram, V., & Babulal, S. (Eds.). (2020). <i>Telecommunications and networking: Emerging technologies and applications</i> . Springer. https://doi.org/10.1007/978-3-030-42108-3
Reference books & Weblinks:	
1.	Momoh, J. A. (2012). <i>Smart grid: Fundamentals of design and analysis</i> . Wiley-IEEE Press. https://doi.org/10.1002/9781118156117
2.	Gellings, C. W. (2009). <i>The smart grid: Enabling energy efficiency and demand response</i> . CRC Press. https://doi.org/10.1201/9781420083175
Online Resources:	
1.	https://nptel.ac.in/courses/124105016
2.	https://www.coursera.org/learn/smart-cities
3.	https://www.coursera.org/courses?query=infrastructure
4.	https://www.udemy.com/course/smart-cities/

Assessment (Theory course)			
CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)			
Course Curated by			
Expert(s) from Industry		Expert(s) from Higher Education Institution	Internal Expert(s)
5. Er.P.Tamilamuthan IPMCS, Chennai 6. Mr. K. M. Nanthan, L&T, RKMNNN@Intecc.com		5. Dr.Sathish Raj , NIT Goa 6. Dr. J. Saravanan, Annamalai University, ausjs5070@gmail.com	1. Dr. P.A.Prabakaran AP/Civil 2. Ms.U.Sindhu Vaardini AP/Civil 3. Mr.P.Aswin Bharath AP/Civil 4. Ms.S.Chitra AP/Civil
Recommended by BoS on		13.08.2024	
Academic Council Approval		No: 27	Date 24.08.2024

24CPC017	Lean Construction Concepts, Tools and Practices			L	T	P	J	C
				2	0	0	2	3
PE				SDG		8,9,11		
Pre-requisite courses		-	Data Book / Code book (If any)			-		

Course Objectives:	
The purpose of taking this course is to:	
1	Understand the fundamentals of construction project management and productivity measurement in the context of contemporary techniques and challenges.
2	Learn the principles of Lean Management, including the Toyota Production System, waste elimination, and Lean project delivery methods.
3	Analyze core concepts of Lean Construction, such as workflow reliability, production control, and the differences between traditional and Lean approaches.
4	Explore the tools and techniques of Lean Construction, including Value Stream Mapping, Last Planner System, and continuous improvement practices.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Analyse productivity measurement systems and current management practices.	An
CO 2	Evaluate lean management principles and waste elimination techniques.	E
CO 3	Apply lean concepts to enhance workflow and production control.	Ap
CO 4	Analyse tools and techniques for effective lean construction planning	An
CO 5	Create a lean implementation strategy incorporating advanced tools and sustainability.	An
CO 6	Implement a lean construction project that incorporates productivity measurement systems and waste elimination techniques to improve efficiency and sustainability.	C

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Mastering Sustainable Practices	Applying advanced techniques and innovative technology	Evaluate solution considering public health and environmental factors	Adopting advanced design tools for project management & research	Technological advancement for complex engineering solutions	Community involvement through appropriate design standards
1		3	1	2		
2		2	3	1	2	
3			2		2	
4			2	3	2	
5	1			2		
6	2	2	1	3		

Course Content	
INTRODUCTION TO LEAN CONSTRUCTION Overview of Construction Project Management - Productivity Measurement Systems - Current Management Practices - Construction Project Phases - Contemporary Techniques & Challenges - Production Planning in Construction - Industry State Analysis - Case Studies	6 Hours
LEAN MANAGEMENT FUNDAMENTALS Lean Management Overview - Toyota Production System - Evolution of Lean in Construction - Production Theories - Lean Construction Value & Target Value Design - Lean Project Delivery System - Identifying and Eliminating Waste - Case Studies	6 Hours
CORE CONCEPTS OF LEAN CONSTRUCTION Lean Thinking Principles - Variability Impact - Traditional vs. Lean Construction - Workflow Reliability - Work Structuring - Production Control - Lean Project Delivery vs. Traditional Methods - Case Studies	6 Hours
LEAN CONSTRUCTION TOOLS AND TECHNIQUES Value Stream Mapping - Work Sampling - Last Planner System - Flow & Pull-Based Production - Look-Ahead Scheduling - Constraint Analysis - Weekly Planning Meetings - Daily Huddles - Root Cause Analysis - Continuous Improvement - Just-In-Time - Case Studies	6 Hours
LEAN CONSTRUCTION IMPLEMENTATION Implementing Lean Construction - IT Support for Lean - Lean in Design - Design Structure Matrix - Location-Based Management System - BIM (Building Information Modelling) - Integrated Project Delivery (IPD) - Sustainability through Lean - Future Trends - Case Studies.	6 Hours
PROJECT COMPONENT The project work for the course, involves an overview of key principles and methodologies, along with a literature review on existing applications. Students will plan their projects by defining scope and goals, gather and analyze data for cost-saving opportunities, and apply value engineering principles throughout various phases. The project concludes with a final report and presentation, emphasizing practical applications in construction management.	30 Hours

Theory Hours:	30	Tutorial Hours:	0	Practical Hours:	0	Project Hours:	30	Total Hours:	60
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Learning Resources	
Textbooks:	
Introduction to Lean Construction - Gould, F. E., & Joyce, N. E. (2009). <i>Construction project management</i> (3rd ed.). Pearson. - Halpin, D. W., & Senior, B. A. (2011). <i>Construction management</i> (4th ed.). Wiley. - Hendrickson, C. (2000). <i>Project management for construction: Fundamental concepts for owners, engineers, architects, and builders</i>. Prentice Hall. Lean Management Fundamentals - Liker, J. K., & Convis, G. L. (2011). <i>The Toyota way to lean leadership: Achieving and sustaining excellence through leadership development</i>. McGraw-Hill. - Womack, J. P., & Jones, D. T. (2003). <i>Lean thinking: Banish waste and create wealth in your corporation</i> (2nd ed.). Free Press. - Ohno, T. (1988). <i>Toyota production system: Beyond large-scale production</i>. Productivity Press. Core Concepts of Lean Construction - Ballard, G., & Tommelein, I. (2020). <i>Lean construction: A systemic view of project delivery</i>. Routledge. - Koskela, L. (2000). <i>An exploration towards a production theory and its application to construction</i>. VTT Technical Research Centre of Finland.	

9. Howell, G., & Ballard, G. (1998). *Implementing lean construction: Understanding and action*. Lean Construction Institute.
- Lean Construction Tools and Techniques**
10. Rother, M., & Shook, J. (2003). *Learning to see: Value stream mapping to create value and eliminate muda*. Lean Enterprise Institute.
11. Ballard, G. (2000). *The last planner system of production control*. University of Birmingham.
12. Koskela, L., & Howell, G. (2002). *The underlying theory of project management is obsolete*. Lean Construction Institute.
- Lean Construction Implementation**
13. Sacks, R., & Pikas, E. (2017). *Building lean, building BIM: Improving construction the tidy way*. Routledge.
14. Eastman, C., Teicholz, P., Sacks, R., & Liston, K. (2011). *BIM handbook: A guide to building information modeling for owners, managers, designers, engineers and contractors* (2nd ed.). Wiley.
15. Azhar, S. (2011). *Building information modeling (BIM): Trends, benefits, risks, and challenges for the AEC industry*. *Leadership and Management in Engineering*, 11(3), 241-252.

Reference books & Weblinks:

Introduction to Lean Construction

1. Ballard, G., & Howell, G. (2003). *Lean project management*. Lean Construction Institute.
2. Koskela, L. (2000). *An exploration towards a production theory and its application to construction*. VTT Technical Research Centre of Finland.
3. Forbes, L. H., & Ahmed, S. M. (2011). *Modern construction: Lean project delivery and integrated practices*. CRC Press.

Lean Management Fundamentals

4. Liker, J. K. (2004). *The Toyota way: 14 management principles from the world's greatest manufacturer*. McGraw-Hill.
5. Womack, J. P., Jones, D. T., & Roos, D. (1990). *The machine that changed the world: The story of lean production*. Free Press.
6. Emmitt, S., & Ruikar, K. (2013). *Collaborative design management*. Routledge.

Core Concepts of Lean Construction

7. Koskela, L., & Ballard, G. (2006). *Should project management be based on theories of economics or production?*. Lean Construction Institute.
8. Mossman, A. (2009). *Why isn't the UK construction industry going lean with gusto?*. *Lean Construction Journal*, 5(1), 24-36.
9. Howell, G., & Ballard, G. (1998). *Implementing lean construction: Understanding and action*. Lean Construction Institute.

Lean Construction Tools and Techniques

10. Ballard, G. (2000). *The last planner system of production control*. University of Birmingham.
11. Rother, M., & Shook, J. (2003). *Learning to see: Value stream mapping to add value and eliminate muda*. Lean Enterprise Institute.
12. Howell, G., & Ballard, G. (2002). *Managing variability in project production systems*. Lean Construction Institute.

Lean Construction Implementation

13. Sacks, R., Eastman, C. M., Lee, G., & Teicholz, P. (2018). *BIM handbook: A guide to building information modeling for owners, designers, engineers, contractors, and facility managers* (3rd ed.). Wiley.
14. Macomber, H., & Howell, G. (2004). *Two great wastes in organizations: A typology for addressing the concerns for lean construction*. Lean Construction Institute.
15. Tzortzopoulos, P., & Formoso, C. T. (2017). *Lean construction: Core concepts and new frontiers*. Routledge.

Online Resources:

1. <https://archive.nptel.ac.in/courses/105/106/105106213/>
2. https://onlinecourses.nptel.ac.in/noc22_ce49/preview
3. <https://www.coursera.org/learn/lean-management-fundamental>

4. https://www.udemy.com/topic/lean/
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Assessment (Theory course)
CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Course Curated by			
Expert(s) from Industry		Expert(s) from Higher Education Institution	Internal Expert(s)
1. Dr. Marimuthu, ILCE, technical.secretary1@ilce.in 2. Er.P.Tamilamuthan IPMCS, Chennai		1. Dr. Ramesh Kannan. M, Anna University (CEG), rameshkannan@annauniv.edu 2. Dr. K.S. Anandh, SRMIST	1. Dr. P.A.Prabakaran AP/Civil 2. Ms.U.Sindhu Vaardini AP/Civil 3. Mr.P.Aswin Bharath AP/Civil 4. Ms.S.Chitra AP/Civil
Recommended by BoS on		13.08.2024	
Academic Council Approval		No: 27	Date 24.08.2024