KUMARAGURU COLLEGE OF TECHNOLOGY,

An autonomous Institution affiliated to Anna University, Chennai

COIMBATORE – 641 049.

M.E CONSTRUCTION MANAGEMENT

REGULATION 2024

I to IV Semesters

Department of Civil Engineering

VISION

To develop industrial partnerships by integrated project management and inculcate unmatched knowledge and experience for students' global marketability.

MISSION

- Developing organizational and leadership capabilities with the potential to manage complex infrastructure projects and organizations globally.
- Developing industrial connect and promoting industrial collaborative projects with PMC
- Providing training on technological trends in construction management as an integral part of the program.
- Promotion of R & D activities to develop advanced technologies and Management approaches.
- Forging sound interdisciplinary techniques and collaborative partnership with national and international community

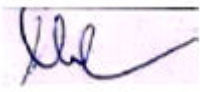
PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

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

PEO1: Provide students with a strong foundation in technical knowledge and critical thinking skills, enabling them to tackle complex challenges in the construction industry.

PEO2: Prepare students to adapt to the evolving demands of the industry, ensuring they can effectively contribute to and lead in various roles within construction management upon graduation.

PEO3: Develop essential communication skills in construction students for the effective practice of the construction profession.



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PROGRAM OUTCOMES (POs)

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

PO1: An ability to independently carry out research /investigation and work to solve practical problems**.**

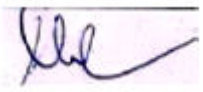
PO2: An ability to write and present a substantial technical report/document.

PO3: Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

PO4: Evaluate how the legal, economic, and social relationships between contracting, the building trades, and the regulatory environment inform construction management and decision-making

PO5: Analyze how issues related to cost, safety, and design impact project development, execution, and implementation, ensuring effective management of these factors to achieve successful project outcomes.

PO6: Apply global, ethical, and sustainability perspectives to construction management knowledge incorporating these aspects into decision-making to promote responsible and forward-thinking project management



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KUMARAGURU COLLEGE OF TECHNOLOGY

DEPARTMENT OF CIVIL ENGINEERING

REGULATION 2024

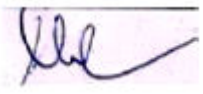
M.E. Construction Management - Curriculum

Semester I

S.No	Course code	Course Title	Course Mode	Course Type	L	T	P	J	C
1	24MAI501	Statistical methods for Engineers	Embedded	BS	3	0	2	0	4
2	24INT501	Research Methodology & IPR	Theory	ES	3	0	0	0	3
3	24CNI501	Quantitative Techniques for Management	Embedded	PC	3	0	2	0	4
4	24CNT502	Construction Equipment and Automation	Theory	PC	3	0	0	0	3
5	24CNT503	Construction Planning, Scheduling and Control	Theory	PC	3	0	0	0	3
6	24CNI504	Construction Economics and Finance	Embedded	PC	2	0	0	2	3
7	24CNP505	BIM Studio -1	Laboratory	ES	0	0	2	0	1
								Total Credits	**21**
								Total Contact Hours/week	**25**

Semester II

S.No	Course code	Course Title	Course Mode	Course Type	L	T	P	J	C
1	24CNI506	Project Formulation and Appraisal	Embedded	PC	2	0	0	2	3
2	24CNT507	Quality Health and Safety Management	Theory	PC	3	0	0	0	3
3	24CNI508	Contract Laws and Regulations	Embedded	PC	2	0	0	2	3
4	24CNE0YY	Professional Elective-I	Embedded	PE	2	0	0	2	3
5	24CNE0YY	Professional Elective-II	Theory	PE	3	0	0	0	3
6	24CNE0YY	Professional Elective-III	Theory	PE	3	0	0	0	3
7	24CNP509	BIM Studio -2	Laboratory	ES	0	0	4	0	2
								Total Credits	**20**
								Total Contact Hours/week	**25**



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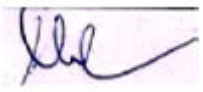
Semester III									
S.No	**Course code**	**Course Title**	**Course Mode**	**Course Type**	**L**	**T**	**P**	**J**	**C**
1	24CNE0YY	Professional Elective-IV	Embedded	PC	2	0	0	2	3
2	24CNE0YY	Professional Elective-V	Theory	PC	3	0	0	0	3
3	24CNE0YY	Professional Elective-VI	Theory	PC	2	0	0	2	3
4	24CNJ601	Industrial Training *	Project	PRJ	0	0	0	0	2
5	24CNJ602	Project Phase - I #	Project	PRJ	0	0	0	20	10
								Total Credits	**21**
								Total Contact Hours/week	**31**

*Mandatory for a minimum period of ONE month during II semester vacation

#Students can opt Project Phase-I as internship in Industry or Research laboratories

Semester IV									
S.No	**Course code**	**Course Title**	**Course Mode**	**Course Type**	**L**	**T**	**P**	**J**	**C**
1	24CNJ603	Project Phase – II	Project	PRJ	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	24CNE001	Organizational Behaviour	Theory	PE	3	0	0	0	3
2	24CNC002	Value Engineering and Valuation	Theory	PE	2	0	0	2	3
3	24CNC003	Resource Management and Control in Construction	Theory	PE	2	0	0	2	3
4	24CNE004	Construction Personnel Management	Theory	PE	3	0	0	0	3
5	24CNE005	Risk Management in Construction	Theory	PE	3	0	0	0	3
6	24CNC006	System Integration in Construction	Theory	PE	2	0	0	2	3



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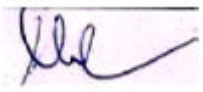
7	24CNC007	Real Estate Practices and Management	Theory	PE	2	0	0	2	3
8	24CNE008	Supply Chain Management and Logistics in Construction	Theory	PE	3	0	0	0	3
TRACK-2 TECHNOLOGY MANAGEMENT									
S.No	**Course code**	**Course Title**	**Course Mode**	**Course Type**	**L**	**T**	**P**	**J**	**C**
9	24CNE009	Sustainable Construction	Theory	PE	3	0	0	0	3
10	24CNE010	Health Monitoring of Structures	Theory	PE	3	0	0	0	3
11	24CNC011	Advanced Data Analysis	Theory	PE	2	0	0	2	3
12	24CNE012	Environmental Impact Assessment for Construction Engineering	Theory	PE	3	0	0	0	3
13	24CNC013	Design of Energy Efficient Buildings	Theory	PE	2	0	0	2	3
14	24CNE014	Prefabrication and Precast Construction Techniques	Theory	PE	3	0	0	0	3
15	24CNE015	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**
16	24CNC016	Construction Site Administration and Control	Theory	PE	2	0	0	2	3
17	24CNC017	Maintenance And Management Of Engineering Assets	Theory	PE	2	0	0	2	3
18	24CNC018	Digital Design Using Bim	Theory	PE	2	0	0	2	3
19	24CNC019	Smart Infrastructure System	Theory	PE	2	0	0	2	3
20	24CNC020	Lean Construction Concepts, Tools and Practices.	Theory	PE	2	0	0	2	3

Semester-wise Credits	
Semester - I	21
Semester - II	20
Semester - III	21



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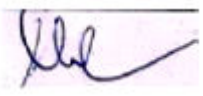
Semester - IV	20
Total Credits	**82**

Course types	**Credits**
Basic Science	4
Engineering Science	6
Professional Core	22
Professional Electives	18
Project/Internship	32
Seminar	NIL
Total Credits	**82**



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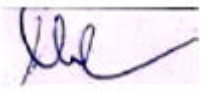
24MAI501	STATISTICAL METHODS FOR ENGINEERS (Common to CN, EN, MB)	L	T	P	J	C
		3	0	2	0	4
BS		SDG	9,10,13			

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			
3	3		2	3		3
4	3	3		3		3



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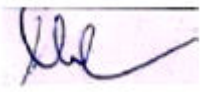
5	3	3				
6	2	2			3	

Course Content	
ESTIMATION THEORY Estimators: Unbiasedness, Consistency, Efficiency and Sufficiency – Maximum Likelihood Estimation – Method of moments. **Practical Component** Introduction to R programming Mean, Median and standard deviation	**9 Hours** **6 Hours**
TESTING OF HYPOTHESIS Testing of hypothesis for large samples (single mean, difference of means, single proportion, difference of proportion) – Small samples – t – test (single mean, difference of means, paired t- test) – F – test (variance ratio test) – Chi-square test – Tests for independence of attributes. **Practical Component** Application of Student t test Application of F test Application of Chi-square test	**9 Hours** **8 Hours**
CORRELATION AND REGRESSION Multiple and Partial Correlation - Method of Least Squares- Plane of Regression - Properties of Residuals - Coefficient of Multiple Correlation - Coefficient of Partial Correlation - Multiple Correlation with total and partial correlations- Regression and Partial correlations in terms of lower order coefficients. **Practical Component** Applications of Correlation coefficient Applications of partial correlation and Multiple Correlation	**9 Hours** **6 Hours**
DESIGN OF EXPERIMENTS Principles of experimental design – Completely randomized design– Randomized block design –Latin square design. **Practical Component** ANOVA – one-way classification ANOVA – two-way classification	**9 Hours** **6 Hours**
MULTIVARIATE ANALYSIS Random vectors and Matrices – Mean vectors and Covariance matrices – Multivariate Normal density and its properties – Principal components: Population principal components–Principal components from standardized variables.	**9 Hours** **4 Hours**



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Practical Component Perform PCA on multivariate data and interpret principal components.	

Theory Hours: 45	Tutorial Hours: 0	Practical Hours: 30	Project Hours: 0	Total Hours: 75

Learning Resources

Textbooks:

1. Devore, J.L., Probability and statistics for Engineering and the Sciences, Thomson and Duxbury, Singapore, 9th Edition,2015.
2. Freund J.E., Mathematical Statistics, Prentice Hall of India, 5th Edition,2001.
3. 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:

1. Johnson, R.A., and Wichern, D.W., Applied Multivariate Statistical Analysis, Pearson Education, Asia, 6th Edition, 2007.
2. Johnson. R. A., Miller & Freund's Probability and Statistics for Engineers, 7th Edition, Pearson Education, Delhi, 2005.
3. Spiegel, M.R. and Stephens, L.J. Schaum's outlines, Statistics, Tata McGraw-Hill, 3rd Edition, 2000.

Online Resources (Weblinks)

1. https://www.khanacademy.org/math/statistics-probability
2. https://archive.nptel.ac.in/courses/103/106/103106120/
3. https://onlinecourses.nptel.ac.in/noc21_ma74/preview

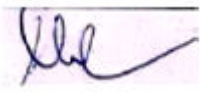
Assessment (Embedded course)

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



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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)	-

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		

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6	2	2		3	3	

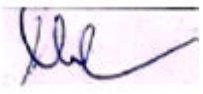
Course Content	
INTRODUCTION TO RESEARCH METHODS Definition and Objectives of Research, Scientific Method, Various Steps in Scientific Research, Research Planning, Selection of a Problem for Research, Formulation of Selected Problems, Purpose of the Research, Formulation of Research Objectives, Formulation 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.



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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)

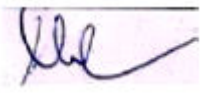
1. https://academic.oup.com/jiplp/article-abstract/19/5/460/7595847?redirectedFrom=fulltext&login=false
2. https://academic.oup.com/jiplp/issue/

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



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24CNI501	QUANTITATIVE TECHNIQUES FOR MANAGEMENT	L	T	P	J	C
		3	0	2	0	4
PC		SDG	9,11,12,13			

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

Course Objectives:

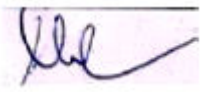
The purpose of taking this course is to:

1	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	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6



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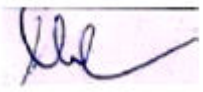
	Independent Research and Development	Technical Report and documentation	Mastery over domain specialization	Regulatory and Economic Analysis	Holistic Project Management	Sustainable and Ethical Practices
1	2			3		2
2		3	2		1	3
3		3		2	3	
4	3		3	2	2	
5		2		3		2
6	2		2		3	

Course Content	
LINEAR PROGRAMMING Meaning of Linear Programming – General Mathematical Formulation of LPP – Graphical Analysis – Simplex Method – Two-phase Method – Duality and Post Optimality Analysis – Advantage and Limitations of LPP	**9 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).	**9 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– Analytical Network Process (ANP) Modelling.	**9 Hours**
JOB SEQUENCING AND REPLACEMENT PROGRAMMING Johnsons Algorithm for n Jobs and Two machines – n Jobs and Three Machines – Two jobs and m Machines Problems –Replacement of assets that deteriorate with time – replacement of assets which fail suddenly	**9 Hours**
SIMULATIONS MODELLING Introduction - Methodology of Simulation – Basic Concepts –Simulation Procedure – Application of Simulation – Monte-Carlo Simulation – Limitations	**9 Hours**
LIST OF EXPERIMENTS • Solving Linear Programming Problems, • Solving Transportation Problem • Solving Assignment Models • Solving Network Flow Models • Solving Decision making Problems in Project Management • Solving AHP – Pairwise Comparison Matrix	**30 Hours**



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• Solving Simulation Problems	

Theory Hours:	45	Tutorial Hours:	0	Practical Hours:	30	Project Hours:	0	Total Hours:	75

Learning Resources

Textbooks:

1. S.L. Tang, Irtishad U. Ahmad, Syed M. Ahmed & Ming Lu, Quantitative Techniques for Decision Making in Construction, Hong Kong University Press
2. 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:

3. Barry Render, Ralph M. Stair, and Michael E. Hanna "Quantitative Analysis for Management", 12/e Global Edition, Pearson India
4. Wayne L. Winston, Practical Management Science: spreadsheet modeling and applications
5. Taha, Hamdy, Operations Research, 7th edition, (USA: Macmillan Publishing Company)

Online Resources (Weblinks)

1. Operations Research Models and Methods: https://www.me.utexas.edu/~jensen/ORMM/
2. Linear Programming https://ocw.mit.edu/courses/mathematics/18-06-linear-algebra-spring-2010/
3. Optimization Tutorials by NEOS Guide: https://neos-guide.org/
4. Monte Carlo Simulation Guide: https://www.palisade.com/risk/monte_carlo_simulation.asp
5. Analytical Hierarchy Process (AHP): https://bpmsg.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. Mr. HA.Nishaant AP/Civil

Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

Signature of the BOS Chairman

24CNT502	CONSTRUCTION EQUIPMENT AND AUTOMATION	L	T	P	J	C
		3	0	0	0	3
PC		SDG	9,12,13			

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

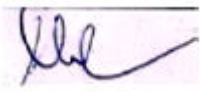
Course Objectives:

The purpose of taking this course is to:

1	Equip students with the knowledge 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



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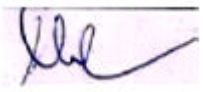
Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Independent Research and Development	Technical Report and documentation	Mastery over domain specialization	Regulatory and Economic Analysis	Holistic Project Management	Sustainable and Ethical Practices
1	3	2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



Signature of the BOS Chairman

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. Mr. HA.Nishaant AP/Civil

Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

Signature of the BOS Chairman

24CNT503	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)	-

Course Objectives:

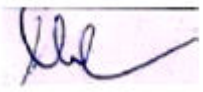
The purpose of taking this course is to:

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	



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3		2		2		
4	2	3	3	3	2	2
5	3		2	3	2	2

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

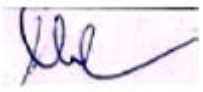
Learning Resources

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.



Signature of the BOS Chairman

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

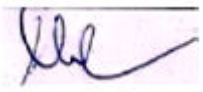
Assessment (Theory course)

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. 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. 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. Mr. HA. Nishaant AP/Civil

Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024



Signature of the BOS Chairman

24CNI504	CONSTRUCTION ECONOMICS AND FINANCE	L	T	P	J	C
		2	0	0	2	3
PC		SDG	9			

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

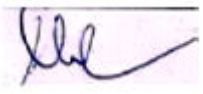
Course Objectives:

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



Signature of the BOS Chairman

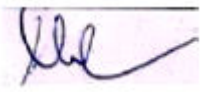
Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Independent Research and Development	Technical Report and documentation	Mastery over domain specialization	Regulatory and Economic Analysis	Holistic Project Management	Sustainable and Ethical Practices
1	2		2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

Learning Resources



Signature of the BOS Chairman

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 Evalu ation 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

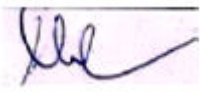
Assessment (Embedded course)

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. Mr. HA.Nishaant AP/Civil

Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024



Signature of the BOS Chairman

24CNP505	BIM STUDIO-1	L	T	P	J	C
		0	0	2	0	1
ES		SDG	9,11,12			

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

Course Objectives:

The purpose of taking this course is to:

1	To apply BIM methods for creating and integrating an Enterprise Project Structure (EPS) and Organizational Breakdown Structure (OBS) in a sample project.
2	To analyze project schedules using Earned Value Management (EVM) techniques to assess and interpret project performance metrics.
3	Evaluate project performance using Earned Value Management (EVM) techniques to track progress, identify deviations, and make data-driven decisions for project adjustments.

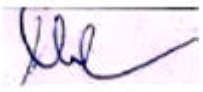
Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply BIM methods to create and integrate an Enterprise Project Structure (EPS) and Organizational Breakdown Structure (OBS) in a sample project.	Ap
CO 2	Analyze project schedules using Earned Value Management (EVM) techniques to assess project performance and identify potential issues.	An
CO 3	Generate project performance reports utilizing EVM metrics to track and predict project progress effectively.	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		3	2
2	2	3		2	2	2
3	2	3		3	2	2

Course Content

Schedule Preparation	



Signature of the BOS Chairman

EPS and OBS – Calendars – WBS- Projects – Activities, duration and assigning relationships – Scheduling – Baseline creation – Earned Value Management – Reports **LIST OF EXPERIMENTS** 1. Develop an Enterprise Project Structure (EPS) and Organizational Breakdown Structure (OBS) for a sample project. 2. Create and configure project calendars, including working days, non-working days, and holidays. 3. Construct a Work Breakdown Structure (WBS) for a sample project. 4. Identify and define project activities, estimate durations, and establish dependencies. 5. Create a project schedule using Gantt charts or other scheduling tools. 6. Establish baselines for scope, schedule, and cost in a project management tool. 7. Apply Earned Value Management (EVM) techniques and analyze metrics such as CPI and SPI. **8.** Generate and analyze project reports, including status and performance reports.	**30 Hours**

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

Learning Resources

Textbooks:

1. Kumar Neeraj Jha, Construction Project Management – Theory and Practice, Pearson Publications – Dorling Kindersley (India) Pvt. Ltd.
2. Chris Hendrickson and Tung Au, Project Management for Construction – Fundamental Concepts for Owners, Engineers, Architects and Builders, Prentice Hall, Pittsburgh.

References:

1. R. H. Maley, Project Management for Construction, Prentice Hall.
2. R. J. Hillson, Effective Risk Management in Construction Projects, Wiley-Blackwell.
3. T. Howell, Construction Project Management: A Practical Guide to Field Construction Management, McGraw-Hill Education.

Online Resources (Weblinks)

1. NAIOP. (n.d.). Building information modelling (BIM) basics. NAIOP. Retrieved from https://www.naiop.org/Research-and-Publications/Research/Topics/BIM
2. Autodesk. (n.d.). BIM for construction management. Autodesk. Retrieved from https://www.autodesk.com/solutions/bim
3. ProjectManagement.com. (n.d.). Earned value management (EVM) concepts and application. Project Management Institute. Retrieved from https://www.projectmanagement.com
4. Project Management Institute. (n.d.). Project management institute (PMI). Project Management Institute. Retrieved from https://www.pmi.org

Assessment (Practical course)

Lab Workbook, Experimental Cycle tests, viva-voce

Signature of the BOS Chairman

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
1. **Ms. Anita Deshmukh** Head of Project Management, Jindal Steel and Power Ltd. 2. **Mr. Vishal Mehra** CEO, BIM Consultancy India Pvt. Ltd.	1. **Dr. Kumar Neeraj Jha** Professor, Department of Civil Engineering, IIT Delhi 2. **Dr. R. S. J. R. Jha** Professor, Department of Civil Engineering, IIT Roorkee		1. Dr. P.A.Prabakaran AP/Civil 2. Ms.U.Sindhu Vaardini AP/Civil 3. Mr.P.Aswin Bharath AP/Civil 4. Mr. HA.Nishaant AP/Civil
Recommended by BoS on	13.08.2024		
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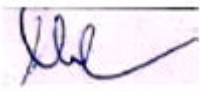
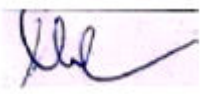


Signature of the BOS Chairman

SEMESTER -II



Signature of the BOS Chairman

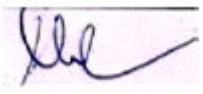
24CNI506	Project Formulation and Appraisal	L	T	P	J	C
		2	0	0	2	3
PC		SDG	9,10,13			

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



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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

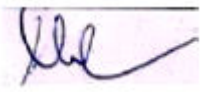
Learning Resources

Textbooks:

1. Prasanna Chandra, Projects – Planning, Analysis, Selection, Implementation Review, McGraw Hill Publishing Company Ltd., New Delhi. 2019.
2. Steven J. Peterson. “Construction Accounting and Financial Management”, Pearson Education International
3. Raina V.K, “Construction Management Practice – The inside Story”, Tata McGraw Hill Publishing Limited, 2019.

Reference books & Weblinks:

1. Barcus, S.W. and Wilkinson.J.W., Hand Book of Management Consulting Services, McGraw Hill, New York, 1995.
2. Joy P.K., Total Project Management - The Indian Context, New Delhi, Macmillan India Ltd., 2017.



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3. United Nations Industrial Development Organisation (UNIDO) Manual for the Preparation of Industrial Feasibility Studies, (IDBI Reproduction) Bombay, 2007
4. Kumar Neeraj Jha "Construction Project Management", Pearson Education International, New Delhi.

Online Resources:

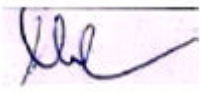
1. http://rckarnal.ignou.ac.in/Ignou-RC-Karnal/userfiles/file/MEDS-044%20(%20English)
2. https://www.ihmnotes.in/assets/Docs/Ignou/TS-03/Unit-21%20Project%20Formulation%20&%20Apprais
3. https://www.readyratios.com/reference/appraisal/project_appraisal.html

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. HA.Nishaant AP/Civil

Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024



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24CNT507	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	*Apply* the elements of an effective safety program *to organize* safety assessments and meetings on construction sites.	Ap
CO 2	*Analyze* the roles and responsibilities in safety management *to distinguish* between the duties of different personnel in ensuring site safety	An
CO 3	*Evaluate* the causes and impacts of construction accidents *to recommend* strategies for minimizing human and financial losses.	E
CO 4	*Assess* the factors influencing construction quality *to justify* the implementation of quality management guidelines	E
CO 5	*Design* a comprehensive QA/QC program *to develop* robust inspection procedures that ensure high construction quality.	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

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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 safely – 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 Hours: 45	Tutorial Hours: 0	Practical Hours: 0	Project Hours: 0	Total Hours: 45

Learning Resources

Textbooks:

1. D. L. Goetsch, *Construction Safety and the OSHA Standards*, 8th ed. Pearson, 2021. ISBN: 978-0134859651.
2. R. T. Liston, *Total Quality Management in Construction*, 1st ed. Taylor & Francis, 2008. ISBN: 978-0415390960.
3. G. M. Winch, *Managing Construction Projects*, 2nd ed. Wiley-Blackwell, 2010. ISBN: 978-1405192793.

Reference books & Weblinks:

4. P. J. B. Benenson, *Accident Prevention Manual for Business & Industry*, 15th ed. National Safety Council, 2016. ISBN: 978-0879123183.
5. A. T. G. K. W. H. Chua, *Safety Management in Construction: A Systems Approach*. London: Routledge, 2016. ISBN: 978-1138690540.
6. R. K. P. R. V. Gupta, *Quality Management for the Technology Sector*. 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)

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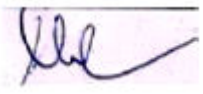
CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

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 4. Mr. HA.Nishaant AP/Civil	
Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024



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24CNI508	Contract Laws and Regulations	L	T	P	J	C
		2	0	0	2	3
PC		SDG	9,10			

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

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

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	3	2	2		
3		3	2			
4		2	3	2		
5		2			3	
6	1	2	2		3	2

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

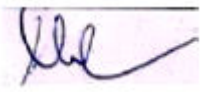
Learning Resources

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



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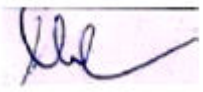
Online Resources:
1. https://archive.nptel.ac.in/courses/129/106/129106006/ 2. https://www.udemy.com/course/law-of-contract-as-under-indian-contract-act-1872/?couponCode=NVDIN35 3. https://courses.ledx.law/courses/contract-law/

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 4. Mr. HA.Nishaant AP/Civil	
Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024



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24CNP509	BIM Studio -2	L	T	P	J	C
		0	0	4	0	2
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	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
CO 4	Create integrated BIM solutions to address construction management challenges through innovative and collaborative approaches.	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	

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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	**60 Hours**

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

6. Kirby, L., Kim, M., & Krygiel, E. (2023). Mastering Autodesk Revit 2023 for architecture. Wiley.
7. McDonough, W. J. (2017). BIM for building owners and developers: Making a business case for using BIM on projects. Wiley.
8. Underwood, J., & Isikdag, U. (2011). Building information modelling: BIM in current and future practice. Wiley-Blackwell.
9. Dhanak, A. S. (2020). Construction management and BIM: A case study approach. CRC Press.
10. 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/

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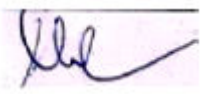
2. National Institute of Building Sciences (NIBS) – BIM : https://www.nibs.org/
3. BIM 360 – Autodesk https://www.autodesk.com/bim-360/

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@lntecc.com 2. Dr. G Muneeswaran, L&T, gmeswar@lntecc.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. Mr. HA.Nishaant AP/Civil	
Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024



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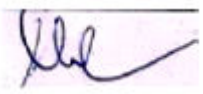
SEMESTER -III



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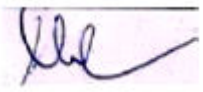
24CNJ601	INDUSTRIAL TRAINING	L	T	P	J	C
		0	0	0	0	2
Professional Core		SDG	4, 9			

Pre-requisite courses	Nil	Data Book / Code book (If any)	NA

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



Signature of the BOS Chairman

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 Hours:	**0**	**Tutorial Hours:**	**0**	**Practical Hours:**	**0**	**Project Hours:**	**0**	**Total Hours:**	0

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
Recommended by BoS on	05.05.2025		
Academic Council Approval	28	**Date**	

Signature of the BOS Chairman

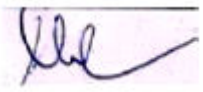
24CNJ602	PROJECT PHASE – I	L	T	P	J	C
		0	0	0	20	10
Professional Core		SDG	4, 9			

Pre-requisite courses	Nil	Data Book / Code book (If any)	Nil

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



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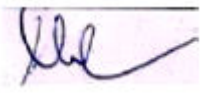
Course Content	
The student individually works on a specific topic approved by the head of the division under the guidance of a faculty member who is familiar in this area of interest. The student can select any topic which is relevant to the area of construction management. The topic may be experimental / 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.	**300 Hours**

Theory Hours:	**0**	**Tutorial Hours:**	**0**	**Practical Hours:**	**0**	**Project Hours:**	**300**	**Total Hours:**	300

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@lntecc.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	05.05.2025		
Academic Council Approval	28	**Date**	



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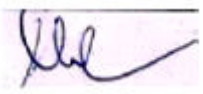
SEMESTER IV



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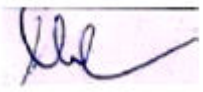
24CNJ603	PROJECT PHASE – II	L	T	P	J	C
		0	0	0	40	20
Professional Core		SDG	4, 9			

Pre-requisite courses	Nil	Data Book / Code book (If any)	NIL

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	2	1	2	3	2
2	1	2	1	2	3	2
3	1	2	1	3	3	2



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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 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.	**600 Hours**

Theory Hours:	**0**	**Tutorial Hours:**	**0**	**Practical Hours:**	**0**	**Project Hours:**	**600**	**Total Hours:**	**600**

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	05.05.2025		
Academic Council Approval	28	**Date**	

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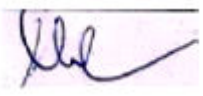
PROFESSIONAL ELECTIVES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24CNE001	Organizational Behaviour	L	T	P	J	C
		3	0	0	0	3
PE		SDG	4,8,16			

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

Course Objectives:	
The purpose of taking this course is to:	
1	Understand key management concepts and functions while exploring individual and group behavior in organizations.
2	Apply motivation theories and performance management strategies to enhance employee engagement.
3	Learn advanced organizational structures and design principles to navigate modern workplace challenges.
4	Develop practical skills in negotiation and empowerment to improve decision-making and leadership effectiveness.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply management theories and decision-making processes in practical scenarios.	Ap
CO 2	Apply concepts of individual and interpersonal behaviour within organizational settings.	Ap
CO 3	Implement motivation theories and performance management strategies in real-world situations.	Ap
CO 4	Apply organizational structures and design principles to manage modern workplace challenges.	Ap
CO 5	Develop and apply negotiation strategies and empowerment techniques in organizational contexts.	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	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	2
3		3	3	2		
4	2		3	3	2	3
5	1	3	2	2		3

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Course Content

FOUNDATIONS OF MANAGEMENT AND DECISION MAKING Management Concepts - Functions & Processes - Planning, Organizing, Controlling - Managerial Roles & Skills - Evolution of Management Theories - Classical, Scientific, Administrative, Behavioural - Contemporary Theories - Agile Management - Organizational Planning: Vision, Mission, Goals - Types & Steps in Planning - Dynamic Environment Planning - Decision Making Processes - Types & Styles - Behavioural Influences - Group Decision Making - Decision-Making Models	**9 Hours**
INDIVIDUAL AND INTERPERSONAL BEHAVIOUR Organizational Behaviour Importance - Culture & Diversity - Personality Structure - Personality & Behaviour - Measuring Personality - Employee Attitudes - Nature & Effects - Group Dynamics - Formation & Properties - Cohesiveness - Conflict Management - Interpersonal & Inter-group Conflicts - Conflict Resolution Techniques - Leadership Traits - Styles & Theories - Power Dynamics - Politics in Organizations	**9 Hours**
MOTIVATION AND PERFORMANCE MANAGEMENT Motivation Theories - Hierarchy of Needs - Two-Factor Theory - Self-Determination Theory - Psychological Contract - Goal Setting Theory - Employee Engagement - Performance Management Systems - Modern Performance Metrics - Feedback Mechanisms - Rewards & Recognition - Motivation Strategies - Employee Well-being - Work-Life Balance - Recent Trends in Motivation	**9 Hours**
ADVANCED ORGANIZATIONAL STRUCTURES AND DESIGN Organizational Structure Principles - Authority, Power & Influence - Mechanistic vs. Organic Structures - Contemporary Organizational Designs - Matrix & Flat Structures - Challenges in Modern Structures - Managing International Workforces - Cross-Cultural Communication - Remote & Hybrid Work Models - Organizational Agility - Change Management Approaches - Cultural Contingencies - Alternative Change Strategies	**9 Hours**
NEGOTIATION AND EMPOWERMENT Negotiation Fundamentals - Negotiation Tactics - Increasing Effectiveness - Power Dynamics in Negotiations - Empowerment Strategies - Employee Participation - Effective Management Techniques - Conflict Resolution in Negotiations - Cross-Cultural Negotiations - Building Consensus - Leadership in Negotiation - Case Studies - Practical Negotiation Exercises	**9 Hours**

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

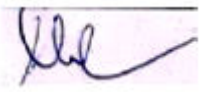
Learning Resources

Textbooks:

1. Robbins, S. P., & Judge, T. A. Principles of Management. Pearson Education, New Jersey. 2019.
2. Robbins, S. P., & Judge, T. A. Organizational Behavior. Pearson Education, New Jersey. 2019.
3. Kerzner, H. Project Management: A Systems Approach to Planning, Scheduling, and Control. Wiley, Hoboken, New Jersey. 2020.

Reference books & Weblinks:

4. Daft, R. L. Management: A Global, Innovative, and Entrepreneurial Perspective. Cengage Learning, Boston. 2018.



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5. Lewicki, R. J., Barry, B., & Saunders, D. M. Negotiation. McGraw-Hill Education, New York. 2021.
6. Heathfield, S. M. Motivating Employees. The Balance Careers. 2020.

Online Resources:

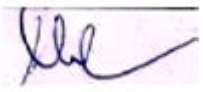
1. Organizational Behavior | Harvard Business Publishing Education
2. https://www.udemy.com/course/organisational-behaviour/
3. https://open.umn.edu/opentextbooks/textbooks/761

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. Ravi Verma** Senior Vice President, Construction and Infrastructure Finance, JCB India 2. **Mr. Anil Mehta** Director of Financial Planning and Analysis ,Shapoorji Pallonji	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

Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024



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24CNC002	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	

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

Learning Resources

Textbooks:

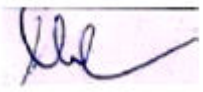
1. Prasanna Chandra, Projects – Planning, Analysis, Selection, Implementation Review, McGraw Hill Publishing Company Ltd., New Delhi, 2019.
2. Benjamin S. Blanchard and Wolter J. Fabrycky, Systems Engineering and Analysis, Pearson, 5th Edition, 2011.
3. Robert J. Chapman, Project Risk Analysis and Management, 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



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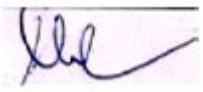
2. Value Engineering: A Practical Guide - Construction Industry Research and Information Association (CIRIA)
3. Value Engineering Techniques - Project Management Institute (PMI)

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. Mr. HA.Nishaant AP/Civil	
Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024



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24CNC003	Resource Management and Control in Construction	L	T	P	J	C
		2	0	0	2	3
PE		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
CO 6	Develop a comprehensive project plan that incorporates resource allocation, scheduling, and budgeting to ensure successful project 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	3		3
2	3				3	
3	2	2		3		2
4	3	2		2		
5	2		2		2	3
6		3	2		3	3

Signature of the BOS Chairman

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.	**6 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	**6 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**.**	**6 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.	**6 Hours**
RESOURCE ALLOCATION AND LEVELLING Problems in Time-cost trade-off – Project Crashing – Resource allocation, Resource loading, Resource levelling & Smoothening Problems- Representation in Gantt Chart - Cumulative Cost Graph - S Curve – Earned Value Problems.	**6 Hours**
PROJECT COMPONENT Development of a comprehensive project plan that incorporates resource allocation, scheduling, and budgeting for a construction project. Application of concepts learned in the course, including manpower estimation, material and equipment selection, and creation of a Work Breakdown Structure (WBS) to monitor project performance effectively. Focus on enhancing practical skills in resource management and project execution.	**30 hours**

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

Learning Resources

Textbooks:

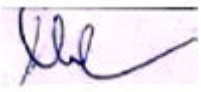
1. Sharma , S C., Construction equipment management , Khanna publishers, Delhi, 2016.
2. Kumar Neeraj Jha Construction project management , Pearson publishers, 2015.
3. Andrew,D., Szilagg, Hand Book of Engineering Management, 1982.
4. Prasanna Chandra**.** *Projects – Planning, Analysis, Selection, Implementation Review.* 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/



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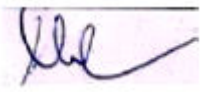
2. https://onlinecourses.nptel.ac.in/noc23_mg124/preview
3. https://www.projectmanager.com/blog/quick-guide-resource-management

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. Mr. HA.Nishaant AP/Civil	
Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024



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24CNE004	Construction Personnel Management	L	T	P	J	C
		3	0	0	0	3
PE		SDG	3,5,8			

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

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

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:

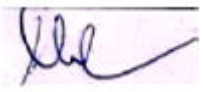
1. http://www.hrmguide.co.uk
2. https://www.shrm.org
3. http://www.careerbuilder.com

Assessment (Theory course)

Signature of the BOS Chairman

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. 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. Mr. HA.Nishaant AP/Civil	
Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024



Signature of the BOS Chairman

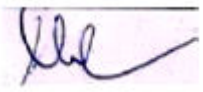
24CNE005	RISK MANAGEMENT IN CONSTRUCTION	L	T	P	J	C
		3	0	0	0	3
PC		SDG	9,11,12,13			

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



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

Learning Resources

Textbooks:

1. Chapman, C., & Ward, S. (2011). *Project risk management: Processes, techniques, and insights* (2nd ed.). Wiley.
2. Hillson, D., & Simon, P. (2020). *Risk management in projects* (3rd ed.). Routledge.
3. Smith, N. J., Merna, T., & Jobling, P. (2014). *Managing risk in construction projects* (3rd ed.). Wiley-Blackwell.

Reference books & Weblinks:

1. Hopkin, P. (2018). *Fundamentals of risk management: Understanding, evaluating, and implementing effective risk management* (5th ed.). Kogan Page.
2. Vose, D. (2008). *Risk analysis: A quantitative guide* (3rd ed.). Wiley.

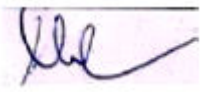
Online Resources:

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/

Signature of the BOS Chairman

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. Mr. HA.Nishaant AP/Civil	
Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024



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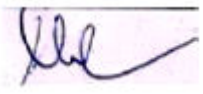
24CNC006	SYSTEM INTEGRATION IN CONSTRUCTION	L	T	P	J	C
		2	0	0	2	3
PE		SDG	9,11,12,13			

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

Course Objectives:	
The purpose of taking this course is to:	
1	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	*Apply* the principles of structural integration *to organize* material selection and specification for building enclosures.	Ap
CO 2	*Analyse* 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.	E
CO 5	*Design* safety systems for fire prevention and hazard control *to develop* comprehensive plans for pollution-free and hazard-free construction execution.	C
CO 6	*Optimize collaboration, streamline workflows, and enhance overall project efficiency.*	C



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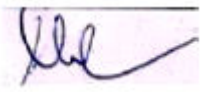
Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Mastering Sustainable Practices	Applying advanced techniques and innovative technology	Evaluate solution considering public health and environmental factors	adopting advanced design tools for project management & 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.	**6 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.	**6 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.	**6 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.	**6 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.	**6 Hours**
PROJECT COMPONENT	**30 Hours**



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Aesthetics in architecture – Environmental quality factors and services – Role of Construction Management in infrastructure projects – Maintenance planning for longevity and low upkeep – Safety systems for fire protection and hazard-free execution.	

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

Learning Resources

Textbooks:

1. Ching, F. D. K., & Binggeli, C. (2018). *Architecture: form, space, and order* (4th ed.). Wiley.
2. Dorsey, J. M. (2019). *Building envelopes: Design and performance* (2nd ed.). Wiley.
3. McQuiston, F. C., Parker, J. D., & Spitler, J. D. (2016). *Heating, ventilating, and air conditioning: Analysis and design*(7th ed.). Wiley.

Reference books & Weblinks:

1. Moser, D. (2020). *Facilities maintenance: Repair, renovation, and reconstruction* (3rd ed.). Cengage Learning.
2. Searle, R. (2017). *Building safety: Principles and practice* (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. Er. P. Jahanathan, UCON PT Structural System, Pvt. Ltd., jegan@utraconindia.com 2. Dr. G Muneeswaran, L&T, gmeswar@lntecc.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. Mr. HA.Nishaant AP/Civil

Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

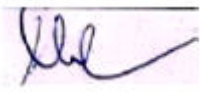
Signature of the BOS Chairman

24CNC007	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)	-

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



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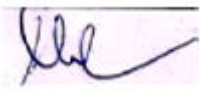
Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Mastering Sustainable Practices	Applying advanced techniques and innovative technology	Evaluate solution considering public health and environmental factors	adopting advanced design tools for project management & 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). *Real estate principles: A value approach* (3rd ed.). McGraw-Hill.
2. Glascock, J. H., & Zumpano, L. V. (2019). *Real estate law* (4th ed.). Cengage Learning.
3. Glickman, N. J., & Tashjian, E. (2010). *An introduction to real estate finance* (3rd ed.). Blackwell Publishing.

Reference books & Weblinks:

1. McCarthy, L. J., & Schmitz, S. (2017). *Real estate development: Principles and process* (5th ed.). Urban Land Institute.
2. Roulac, S. E. (2018). *Real estate transaction: Principles and practices* (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. Er. P. Jahanathan, UCON PT Structural System, Pvt. Ltd., jegan@utraconindia.com 2. Dr. G Muneeswaran, L&T, gmeswar@lntecc.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. Mr. HA.Nishaant AP/Civil

Recommended by BoS on	13.08.2024		
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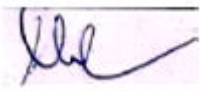

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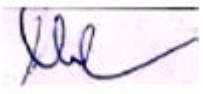
24CNE008	SUPPLY CHAIN MANAGEMENT AND LOGISTICS IN CONSTRUCTION	L	T	P	J	C
		3	0	0	0	3
PE		SDG	9,11,12,13			

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



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

Learning Resources

Textbooks:

1. Chopra, S., & Meindl, P. (2019). *Supply chain management: Strategy, planning, and operation* (7th ed.). Pearson.
2. Jacobs, F. R., & Chase, R. B. (2018). *Operations and supply chain management* (15th ed.). Cengage Learning.
3. Lambert, D. M., & Cooper, M. C. (2000). *Issues in supply chain management*. Industrial Marketing Management, 29(1), 65–83. https://doi.org/10.1016/S0019-8501(99)00113-8

Reference books & Weblinks:

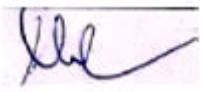
1. Simchi-Levi, D., Kaminsky, P., & Simchi-Levi, E. (2018). *Designing and managing the supply chain: Concepts, strategies, and case studies* (4th ed.). McGraw-Hill.
2. Coyle, J. J., Langley, C. J., Novack, R. A., & Gibson, B. (2016). *Supply chain management: A logistics perspective* (10th ed.). Cengage 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)



Signature of the BOS Chairman

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
1. Dr. G Muneeswaran, L&T, gmeswar@lntecc.com 2. Er. P. Jahanathan, UCON PT Structural System, Pvt. Ltd., jegan@utraconindia.com	1. Dr. K.S. Anandh, SRMIST 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 4. Mr. HA.Nishaant AP/Civil
Recommended by BoS on	13.08.2024		
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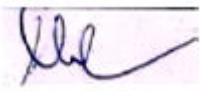


Signature of the BOS Chairman

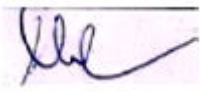
24CNE009	Sustainable Construction	L	T	P	J	C
		3	0	0	0	3
PE		SDG	9,11,12,13			

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

Course Objectives:	
The purpose of taking this course is to:	
1	Understand the 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	



Signature of the BOS Chairman

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

Learning Resources

Textbooks:

1. Charles J Kibert, Sustainable Construction: Green Building Design & Delivery, 4th 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:

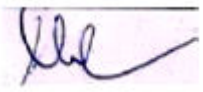
1. https://www.coursera.org/learn/sustainable-construction-management
2. https://onlinecourses.nptel.ac.in/noc19_ce40/preview
3. https://www.ciobacademy.org/product/sustainable-construction-and-development/

Assessment (Theory course)

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

Signature of the BOS Chairman

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. Mr. HA.Nishaant AP/Civil
Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024



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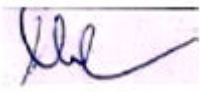
24CNE010	Health Monitoring of Structures	L	T	P	J	C
		3	0	0	0	3
PE		SDG	9,11,12			

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



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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 MAGNTEOSTRICTIVE 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 Hours: 45	Tutorial Hours: 0	Practical Hours: 0	Project Hours: 0	Total 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 Giurglutiu, Structural Health Monitoring with Wafer Active Sensors, Academic Press Inc, 2007.

Online Resources:

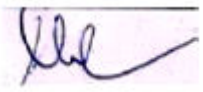
1. https://journals.sagepub.com/home/SHM
2. https://archive.nptel.ac.in/noc/courses/noc18/SEM2/noc18-oe05/
3. http://ndl.iitkgp.ac.in/he_document/nptel/nptel/courses_114_106_114106046_video_lec27

Assessment (Theory course)

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

Signature of the BOS Chairman

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, Trichy, kamalselva21@gmail.com		1. Ms.U.Sindhu Vaardini AP/Civil 2. Mr.P.Aswin Bharath AP/Civil 3. Mr. HA.Nishaant AP/Civil
Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024



Signature of the BOS Chairman

24CNC011	Advanced Data Analysis	L	T	P	J	C
		2	0	0	2	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 proficiency in statistical analysis to inform decision-making in various contexts.
2	Enhance skills in interpreting and applying factor analysis for data insights.
3	Cultivate the ability to use regression techniques for trend forecasting and problem-solving.
4	Promote the creation and interpretation of advanced models for complex data analysis.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Analyze statistical data to apply probability distributions and hypothesis testing in practical scenarios	An
CO 2	Evaluate factor analysis techniques and interpret results to understand factor scores and their implications.	E
CO 3	Compare regression methods to forecast trends and solve problems using linear models and index numbers.	Ap
CO 4	Analyze discriminant and cluster analysis to validate models and classify data effectively.	An
CO 5	Create advanced models using conjoint analysis and multi-dimensional scaling to interpret complex data	An
CO 6	Develop and execute a data analysis project that applies advanced statistical methods to solve real-world problems and derive actionable insights.	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	1		
2		3	2	2		
3		3	2	1		
4		2	3	2		
5			2	2	3	1
6		3		3		2

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Course Content	
STATISTICAL DATA ANALYSIS Data and Statistics- Review of Basic Statistical Measures-Probability Distributions-Testing of Hypotheses-Non-Parametric Tests–Basic concepts–Univariate, Bi-variate and Multivariate techniques.	**6 Hours**
FACTOR ANALYSIS Factor Analysis: Definition – Objectives – Approaches to factor analysis – methods of estimation – Factor rotation – Factor scores - Sum of variance explained – interpretation of results. Canonical Correlation Analysis - Objectives – Canonical variates and canonical correlation – Interpretation.	**6 Hours**
REGRESSION Correlation Analysis: Types & Methods - Regression Analysis: Linear Models - Index Numbers: Unweighted, Weighted - Forecasting Methods - Case Studies.	**6 Hours**
ISCRIMINANT AND CLUSTER ANALYSIS Discriminant Analysis - Basic concepts – Separation and classification of two populations - Evaluating classification functions – Validation of the model. Cluster Analysis – Definitions – Objectives – Similarity of measures – Interpretation and validation of the model.	**6 Hours**
ADVANCED TECHNIQUES Conjoint Analysis – Definitions – Basic concepts – Attributes – Preferences – Ranking of Preferences – Output of Conjoint measurements – Utility - Interpretation. Multi-Dimensional Scaling – Definitions – Objectives – Basic concepts – Scaling techniques – Structural Equation modelling.	**6 Hours**
PROJECT COMPONENT Data Collection: Methods and sources - Data Preparation: Cleaning and organizing data - Application of statistical techniques - Data Analysis: Implementation and interpretation of results - Reporting: Presentation of findings and recommendations.	**30 Hours**

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

Learning Resources

Textbooks:

1. Joseph F Hair, Rolph E Anderson, Ronald L. Tatham& William C. Black, Multivariate Data Analysis, Pearson Education, New Delhi, 2021.
2. Barbara G. Tabachnick, Linda S.Fidell, Using Multivariate Statistics, 6th Edition, Pearson, 2018.
3. Richard A Johnson and Dean W.Wichern, Applied Multivariate Statistical Analysis, Prentice Hall, New Delhi, 2017.

Reference books & Weblinks:

1. David R Anderson, Dennis J Sweeney and Thomas A Williams, Statistics for Business and Economics, Thompson, Singapore, 2017.
2. Howard E.A. Tinsley & Steven D. Brown, Handbook of Applied Multivariate Statistics & Mathematical modeling, Academic Press, 2022.

Online Resources:

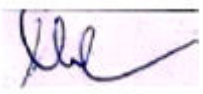
1. https://iimamritsar.ac.in/p/advanced-data-analytics.html
2. https://www.coursera.org/specializations/advanced-statistics-data-science

Assessment (Theory course)

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

Signature of the BOS Chairman

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. Kamal, BITS Trichy, kamalselva21@gmail.com 2. Dr. N.Pannirselvam, SRMIST		1. Dr. P.A.Prabakaran AP/Civil 2. Ms.U.Sindhu Vaardini AP/Civil 3. Mr.P.Aswin Bharath AP/Civil 4. Mr. HA.Nishaant AP/Civil
Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024



Signature of the BOS Chairman

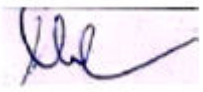
24CNE012	Environmental Impact Assessment for Construction Engineering	L	T	P	J	C
		3	0	0	3	3
PE		SDG	9,10,11,12			

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

Course Objectives:	
The purpose of taking this course is to:	
1	Understand the application of scientific and engineering principles to address sustainable development challenges.
2	Develop skills to assess the impacts of projects on biodiversity and ecosystems.
3	Gain knowledge of legal frameworks governing environmental impact assessments.
4	Enhance the ability to conduct comprehensive analyses of environmental, social, and health impacts.

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 of science and engineering fundamentals in sustainable development challenges	Ap
CO 2	Explain the identification, prediction and evaluation of impacts that will be caused by projects or industries on biodiversity	Ap
CO 3	Identify the legal requirements of environmental impact assessment for projects.	An
CO 4	Develop the ability to perform integrated analysis by considering environmental, social and health impacts.	An
CO 5	Select appropriate methods for environmental impact assessment for Infrastructure and environmental service	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	1		
2	3	2	3	2		
3		2	1	2	3	
4	3	2	3	2	1	
5			3	1		2



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Course Content	
INTRODUCTION Sustainable Development challenges and need - Key approaches for Impact Assessment – EIA approach: historical development - Legal and Regulatory aspects in India - Types and Objectives, Components, Process of EIA.	**9 Hours**
PREDICTION AND ASSESSMENT Prediction and Assessment: tools - impact on air, water, soil & Noise - Role of Biodiversity impact Assessment - Identification, Prediction and Evaluation of Impacts on Biodiversity - Techniques of Biodiversity impact assessment - EIA Report Preparation - Environmental Management Plan: Preparation and implementation - Mitigation and Rehabilitation plans.	**9 Hours**
HEALTH AND SOCIO-ECONOMICIMPACT ASSESSMENT Health Assessment: Impact of Environment on Health - Developing framework for Health impact analysis, tools and techniques - Socio-Economic Impact Assessment: Overview and Scope of Social Impact Assessment - SIA model and the planning process - Land acquisition: Legal aspects, Resettlement & Rehabilitation and Development.	**9 Hours**
INTEGRATED ANALYSIS Integrated Analysis of Environmental, Social and Health Impacts - Challenges for Integrated Approach - Scope for Integrated approach in economic analysis - CBA, Social CBA, and Cost effectiveness Analysis - Analytic Hierarchy process based Approach.	**9 Hours**
IMPACT OF INFRASTRUCTURE & ENVIRONMENTAL SERVICES EIA for Mining, extraction of natural resources and power generation – Case studies - Primary Processing and Material production - Material Processing, Manufacturing/Fabrication - Service Sectors - Physical Infrastructure including Environmental Services - Building and Construction Projects - Area Development Projects and Townships - Strategic Environmental Assessment, Technological Assessment.	**9 Hours**

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

Learning Resources

Textbooks:

1. Canter, L.W., "Environmental Impact Assessment", McGraw Hill, New York, 1996.
2. Anjaneyulu, Yerramilli, and ValliManickam, "Environmental impact assessment methodologies", Hyderabad: BS Publications, 2022.

Reference books & Weblinks:

1. Lawrence, D.P., "Environmental Impact Assessment – Practical Solutions to recurrent problems", Wiley-Interscience, New Jersey, 2003.
2. Petts, J., "Handbook of Environmental Impact Assessment', Vol., I and II, Blackwell science, London, 1999.
3. World Bank – Source Book on Environmental Impact Assessment, 2010.

Online Resources:

1. https://www.udemy.com/course/environmental-impact-assessment-eia-p/?couponCode=NVDIN35
2. https://onlinecourses.nptel.ac.in/noc22_ar07/preview
3. https://www.iisd.org/learning/eia/

Assessment (Theory course)

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

Signature of the BOS Chairman

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@lntecc.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. Mr. HA.Nishaant AP/Civil	
Recommended by BoS on	13.08.2024		
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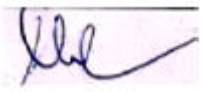


Signature of the BOS Chairman

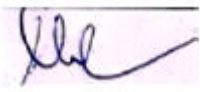
24CNC013	DESIGN OF ENERGY EFFICIENT BUILDINGS	L	T	P	J	C
		2	0	0	2	3
PE		SDG	7,11			

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



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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 Hours:	30	Tutorial Hours:	0	Practical Hours:	0	Project Hours:	30	Total 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.

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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:

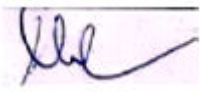
1. https://www.energy.gov/eere/buildings
2. https://www.architecture2030.org
3. https://www.greenbuildingadvisor.com

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. 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. Dr. P.A.Prabakaran AP/Civil 2. Ms.U.Sindhu Vaardini AP/Civil 3. Mr.P.Aswin Bharath AP/Civil 4. Mr. HA.Nishaant AP/Civil

Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024



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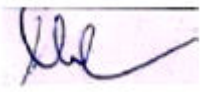
24CNE014	PREFABRICATION AND PRECAST CONSTRUCTION TECHNIQUES	L	T	P	J	C
		3	0	0	0	3
PE		SDG	9,11			

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

Course Objectives:	
The purpose of taking this course is to:	
1	Equip students with knowledge of prefabrication systems and their structural behaviour.
2	Develop skills in applying design techniques for precast elements in construction projects.
3	Critically evaluate advanced prefabricated designs and detailing methods.
4	Provide students with techniques for ensuring structural integrity and efficiency in prefabricated systems.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Analyse prefabrication systems and their structural behaviour.	An
CO 2	Apply design techniques for precast elements in construction.	Ap
CO 3	Evaluate advanced prefabricated designs and detailing methods.	An
CO 4	Analyse structural connections and ensure integrity in prefabricated systems.	An
CO 5	Create efficient production and construction techniques for prefabricated buildings.	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		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



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Course Content	
INTRODUCTION TO PREFABRICATION AND PRECAST SYSTEMS Types of Prefabrication - Prefabrication Systems - Structural Behaviour - Planning & Layout of Prefabrication Plants - Automation & Digital Twin Technology - IS Code & International Standards - Sustainable Practices - Case Studies	**9 Hours**
DESIGN AND APPLICATION OF PRECAST ELEMENTS Handling & Erection Stresses - Prestressing of Roof Members & Floor Systems - Two-Way Load Bearing Slabs - Precast Beams & Columns - Precast Shear Walls - Wall Panels & Modular Units - BIM for Design - Case Studies	**9 Hours**
ADVANCED PREFABRICATED DESIGN AND DETAILING Designing Prefabricated Units - Industrial Structures & Multi-storey Buildings - Water Tanks & Silos - High-Performance Concrete - Seismic Design - Modular Construction - Digital Fabrication - Case Studies	**9 Hours**
JOINTS, CONNECTIONS, AND STRUCTURAL INTEGRITY Structural Connections - Dimensioning & Detailing - Compression, Shear, Tension Joints - Modular & Seismic Resilient Connections - Fire Safety - Testing & Certification - Smart Materials - Case Studies	**9 Hours**
PRODUCTION, MACHINERY, AND CONSTRUCTION OF PREFABRICATED BUILDINGS Production & Transportation - Erection Techniques - Shuttering & Mould Design - Dimensional Tolerances - Total Prefabricated Building Assembly - Automated Construction Techniques - Quality Control - Case Studies	**9 Hours**

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

Learning Resources

Textbooks:

1. Kim, S. Elliot. (2017). Precast Concrete Structures. CRC Press.
2. Bachmann, H., & Steinle, A. (2011). Precast Concrete Structures. Wiley VCH.
3. Smith, R. E. (2010). Prefab Architecture: A Guide to Modular Design and Construction. John Wiley & Sons.

Reference books & Weblinks:

1. Handbook of Precast Concrete Buildings. (2016). ICI Publications.
2. Mokk, L. (2006). Prefabricated Systems: Principles of Construction. Springer.
3. Hui, S. K. (2011). Modular Construction Design and Delivery. Taylor & Francis.

Online Resources:

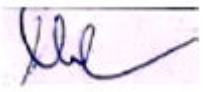
1. https://www.precast.org
2. https://www.engineeringcivil.com
3. https://www.constructiondive.com

Assessment (Theory course)

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

Signature of the BOS Chairman

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. Dr. P.A.Prabakaran AP/Civil 2. Ms.U.Sindhu Vaardini AP/Civil 3. Mr.P.Aswin Bharath AP/Civil 4. Mr. HA.Nishaant AP/Civil
Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024



Signature of the BOS Chairman

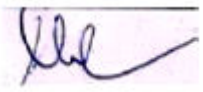
24CNE015	SHORING, SCAFFOLDING AND FORMWORK	L	T	P	J	C
		3	0	0	0	3
PE		SDG	9,11			

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	



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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

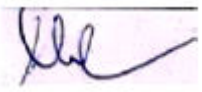
Learning Resources

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.



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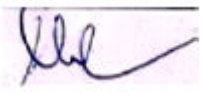
Online Resources:
1. https://www.concrete.org 2. https://www.scaffold.org 3. https://www.engineeringcivil.com

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. 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. Dr. P.A.Prabakaran AP/Civil 2. Ms.U.Sindhu Vaardini AP/Civil 3. Mr.P.Aswin Bharath AP/Civil 4. Mr. HA.Nishaant AP/Civil	
Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024



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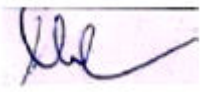
24CNC016	CONSTRUCTION SITE ADMINISTRATION AND CONTROL	L	T	P	J	C
		2	0	0	2	3
PE		SDG	9,11			

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



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

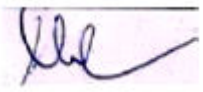
1. https://www.leanconstruction.org
2. https://www.autodesk.com/solutions/construction-site-management
3. https://www.procore.com

Assessment (Theory course)

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

Signature of the BOS Chairman

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. Mr. HA.Nishaant AP/Civil	
Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024



Signature of the BOS Chairman

24CNC017	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)	-

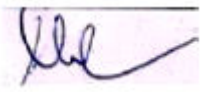
Course Objectives:	
The purpose of taking this course is to:	
1	Enable students to identify and manage stakeholders' expectations concerning asset management.
2	Familiarize students with internationally recognized asset management methodologies and good practices.
3	Provide structured approaches for 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

Signature of the BOS Chairman

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 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.	**30 Hours**



Signature of the BOS Chairman

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

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)
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. Mr. HA.Nishaant AP/Civil

Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

Signature of the BOS Chairman

24CNC018	Digital Design Using BIM	L	T	P	J	C
		2	0	0	2	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	Understand and apply fundamental BIM tools and techniques to create and manage 3D models.
2	Analyze and integrate BIM methodologies in various project delivery processes to improve collaboration and coordination.
3	Explore global BIM implementation challenges and emerging technologies for enhanced project efficiency.
4	Utilize BIM tools for scheduling, cost estimation, and clash detection to address interoperability and project management issues.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply BIM fundamentals and tools to create a basic 3D model using BIM authoring software.	Ap
CO 2	Analyze the BIM-based design process and integrate various project delivery methods in a coordinated environment.	An
CO 3	Examine challenges in BIM implementation by evaluating global practices and the use of emerging technologies.	Ap
CO 4	Create a 4D program and estimate project costs using nD BIM modeling tools for scheduling and budgeting.	An
CO 5	Analyze interoperability issues by testing export formats and utilizing clash detection tools in a BIM model.	An
CO 6	Implement a BIM project by collaborating in a multidisciplinary team to apply BIM workflows and evaluate the project's lifecycle performance for sustainability and efficiency."	C

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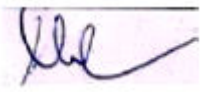
Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Mastering Sustainable Practices	Applying advanced techniques and	Evaluate solution considering public health and	Adopting advanced design tools for project	Technological advancement for complex	Community involvement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

Course Content

INTRODUCTION TO BIM FOR CONSTRUCTION Fundamentals of BIM - terminology, CAD & BIM - IFCs - schemas -interoperability- parametric modelling - Introduction of modelling environment and tools - modelling approaches to producing Plans - 3D models - views and sections of buildings - creating an initial sample of 3D BIM model using a BIM authoring software.	**6 Hours**
DEVELOPMENT OF DESIGN PROCESS Introduction to BIM process and integrated project delivery, nD modelling, BIM software systems and guidelines to choosing different BIM software systems - BIM-based design process and analysis - design coordination. BIM-based construction process - 4D, 5D.	**6 Hours**
CHALLENGES IN BIM IMPLEMENTATION BIM-based operation issues - facility management - Drivers and barriers in BIM adoption, BIM global practices -Automation in design and construction -virtual experiments - augmented reality, virtual reality -use of sensors in construction.	**6 Hours**
BIM MODELLING Introduction to aspects of nD modelling, scheduling and quantity take-offs using BIM enabled systems and export to spreadsheets - Production of a 4D program in 4D BIM software -cost estimation - producing cost estimates in a 5D BIM software.	**6 Hours**
INTEROPERABILITY IN BIM Basics about interoperability - Export formats and applications - exchange of information through IFC - COBie -BIM 360 Glue - Mobile BIM - Clash detection - Overview of clash detection tools- use of software to detect/resolve clashes in a BIM model.	**6 Hours**
PROJECT COMPONENT Introduction to modeling environments and tools - development of BIM-based design processes and integrated project delivery - automation, virtual/augmented reality, and facility management - collaborative BIM project execution - model coordination, clash detection, and lifecycle performance evaluation - project documentation and presentation.	**30 Hours**



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

Learning Resources

Textbooks:

1. Eastman, C M, Chuck Eastman, Paul Teicholz, and Rafael Sacks (2011) BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers and Contractors, John Wiley & Sons.
2. Hardin, Brad and Dave McCool (2015) BIM and Construction Management: Proven Tools,Methods, and Workflows, John Wiley & Sons.
3. Kymmell, Willem (2007) Building Information Modeling: Planning and Managing Construction Projects with 4D CAD and Simulations (McGraw-Hill Construction Series):Planning and Managing Construction Projects with 4D CAD and Simulations, McGraw Hill Professional.

Reference books & Weblinks:

1. Daniotti, Bruno, Gianinetto, Marco, Della Torre, Stefano (Eds.), Digital Transformation ofthe Design, Construction and Management Processes of the Built Environment, Research for Development, Springer Open,2020.
2. Dominik Holzer, The BIM Manager's Handbook: Guidance for Professionals in Architecture, Engineering, and Construction, Wiley, 2016.
3. Erica Epstein, Implementing Successful Building Information Modeling, Artech House, 2012.
4. Javad Majrouhi Sardroud, Automation in Construction Management, Scholars' Press, 2014.
5. Thomas R. Kurfess, Robotics and Automation Handbook, CRC Press, 2018.

Online Resources:

1. https://digitalskills.pravartak.org.in/course_details.php?courseID=48&cart=
2. https://digitalskills.pravartak.org.in/course_details.php?courseID=48&cart=
3. https://www.coursera.org/learn/bim-fundamentals
4. https://www.udemy.com/topic/bim/

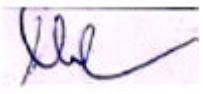
Assessment (Theory course)

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. 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. Mr. HA.Nishaant AP/Civil

Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024



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24CNC019	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

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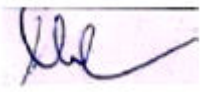
Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Mastering Sustainable Practices	Applying advanced techniques and innovative technology	Evaluate solution considering public health and environmental factors	Adopting advanced design tools for project management & 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**



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

Learning Resources

Textbooks:

1. Bibri, S. E. (2018). *Smart sustainable cities of the future: The untapped potential of big data analytics and context-aware computing for advancing sustainability*. Springer. https://doi.org/10.1007/978-3-319-73981-6.
2. Jahankhani, H., Carlile, A., & Emrouznejad, A. (Eds.). (2019). *Cyber defence in the age of AI, smart societies, and augmented humanity*. Springer. https://doi.org/10.1007/978-3-030-35746-7
3. Sathiaseelan, A., Sriram, V., & Babulal, S. (Eds.). (2020). *Telecommunications and networking: Emerging technologies and applications*. Springer. https://doi.org/10.1007/978-3-030-42108-3

Reference books & Weblinks:

1. Momoh, J. A. (2012). *Smart grid: Fundamentals of design and analysis*. Wiley-IEEE Press. https://doi.org/10.1002/9781118156117
2. Gellings, C. W. (2009). *The smart grid: Enabling energy efficiency and demand response*. 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)
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. Mr. HA.Nishaant AP/Civil

Recommended by BoS on	13.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

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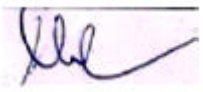
24CNC020	Lean Construction Concepts, Tools and Practices	L	T	P	J	C
		2	0	0	2	3
PE		SDG	8,9,11			

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		



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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

Learning Resources

Textbooks:

Introduction to Lean Construction

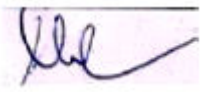
1. Gould, F. E., & Joyce, N. E. (2009). *Construction project management* (3rd ed.). Pearson.
2. Halpin, D. W., & Senior, B. A. (2011). *Construction management* (4th ed.). Wiley.
3. Hendrickson, C. (2000). *Project management for construction: Fundamental concepts for owners, engineers, architects, and builders*. Prentice Hall.

Lean Management Fundamentals

4. Liker, J. K., & Convis, G. L. (2011). *The Toyota way to lean leadership: Achieving and sustaining excellence through leadership development*. McGraw-Hill.
5. Womack, J. P., & Jones, D. T. (2003). *Lean thinking: Banish waste and create wealth in your corporation* (2nd ed.). Free Press.
6. Ohno, T. (1988). *Toyota production system: Beyond large-scale production*. Productivity Press.

Core Concepts of Lean Construction

7. Ballard, G., & Tommelein, I. (2020). *Lean construction: A systemic view of project delivery*. Routledge.



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8. Koskela, L. (2000). *An exploration towards a production theory and its application to construction*. 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:

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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/

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)**
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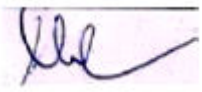

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