



# GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Branch: Construction Engineering & Management

Course / Subject Code: ME01014061

Course / Subject Name : Lean Construction

w. e. f. Academic Year:	2024-25
Semester:	1 <sup>st</sup> Semester
Category of the Course:	PEC

<b>Prerequisite:</b>	Basic construction practices
<b>Rationale:</b>	Lean construction aims to maximize value and minimize waste by streamlining processes and improving efficiency. It focuses on optimizing workflows, reducing delays, and enhancing collaboration among stakeholders. By continuously improving and addressing inefficiencies, lean construction enhances project delivery and reduces costs. Ultimately, it seeks to deliver higher quality projects in a more predictable and sustainable manner.

No	Program Outcomes
01	Engage in critical thinking and research to develop solutions to multifold real-world problems.
02	Communicate effectively with the engineering community at large level on complex design tasks & prepare best workouts and deliverables.
03	Demonstrate a high level of professionalism in handling multidisciplinary and complex Construction engineering and management problems.
04	Plan, Schedule, Manage and Control the complex construction and infrastructure projects in a sustainable local and global context.
05	Address technical, societal issues pertaining to Construction engineering & management by offering state of art and robust, sustainable and practical solutions while upholding high standards of ethics and professionalism.

### Course Outcome:

After Completion of the Course, Student will be able to:

No	Course Outcomes	RBT Level
1	Understand unnecessary cost associated with every design & project.	U, R
2	Target unnecessary cost associated with every design & project.	A,N
3	Remove unnecessary cost associated with every design & project.	A,N

\*Revised Bloom's Taxonomy (RBT)



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### Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Tutorial / Practical		
				ESE (E)	PA/ CA (M)	PA/CA (I)	ESE (V)	
3	0	2	4	70	30	20	30	150

### Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	<p><b>Lean Concept and Principles</b>            Concept of Lean and Philosophy, role of value engineering and management, effect of cost on design parameters, purpose and application of lean concept to construction industry, application to design, market value.            Lean construction exercises - Value Stream Mappings (Sort, Set in order, Shine, Standardize, Sustain), Last Planner System, Just-In-Time Delivery,  Kaizen (Continuous Improvement), Pull Planning, Standard Work, Cross-Functional Collaboration, Root Cause Analysis, Visual Management.</p>	11	20
2.	<p><b>Value Management (VM) Job Plan &amp; Functional Analysis</b>            Role and purpose of VM job plan, steps of VM job plan, general phase, project selection phase, information phase, functional phase, judicial phase, evaluation phase, recommendation phase and implementation phase.            Functions, relationship, function analysis systems technique (FAST), application in value management, improvement in systems</p>	12	30
3.	<p><b>Costing &amp; Cost Modelling</b>            Life cycle cost elements; LCC logic, application to facilities, analysis of the total cost of ownership, escalation &amp; its impact, cost analysis concepts, cost matrix in LCC analysis            Cost estimation system, use of cost models, establishing cost targets, objectives of costing, cost target team and organization, classification of costs based on complexity, datum creation; matrix and functional cost model, quality cost model, equipment cost model, billing cost model.</p>	12	30

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4	<b>Valuation Methods</b> Rental method: essential ingredients, forms of rent, year purchase, capitalized value, Shares and debentures, bonds of gilt-edged securities, life of structures, case studies in rental method of evaluation. Land & building method: cost of construction, estimate on area basis, estimate on cubic basis, estimate by cost index, residual or demolition value of old building and case studies, profit method of valuation with case studies.	10	20
	<b>Total</b>	<b>45</b>	<b>100</b>

## Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
10	30	30	30	--	--

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

## References/Suggested Learning Resources

### Books:

1. Anil Kumar, M (2003) Value Engineering: Concept, Technique and Application, SAGE Publishers.
2. Dell'isola, J. Alphonse (1988) Value Engineering in the Construction Industry, 3rd Edition.
3. James J. O' Brien (1976) Value analysis in design and construction, 1st Edition McGraw Hill Book Company.
4. Khan Sharique,(2024) The Lean Construction: A leader's guide for achieving efficiency, developing lean culture and collaborative teams using lean tools. ,Adhyaan Books
5. Namavati, H R (1998) Theory and Practice of Valuation, Lakhani Book Depot.

### Web Reference :

1. [https://onlinecourses.nptel.ac.in/noc22\\_ce49/preview](https://onlinecourses.nptel.ac.in/noc22_ce49/preview)
2. <https://core.ac.uk/download/pdf/9632366.pdf>
3. <https://leanconstruction.org/lean-topics/lean-construction/>
4. <https://iglcstorage.blob.core.windows.net/papers/attachment-8a46af13-917c-4ce1-91a2-df6e7eab7721.pdf>



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## **Suggested Course Assignment /Tutorial List:**

### **Practical Work Assignments Based on :**

1. Application lean construction techniques
2. Carry out value stream mapping exercise
3. Carry out Last planner system exercise
4. Carry out pull planer system exercise
5. Exercise based on Rental value method and Land value method
6. Exercise on cos modelling

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