

Kolhapur Institute of Technology's

COLLEGE OF ENGINEERING (AUTONOMOUS)

Gokul Shirgaon, Kolhapur



KOLHAPUR INSTITUTE
OF TECHNOLOGY'S
**COLLEGE OF
ENGINEERING**
(AUTONOMOUS),
KOLHAPUR

Curriculum Structure

For

**B. Tech. (Hons.) in Civil Engineering with
Specialization in Lean Construction
Technology**

Academic Year 2022-2023

Sr. No.	Course Code	Course
01	UCVH0302	Basics of construction project & management
02	UCVH0402	Lean Concept and Management approach
03	UCVH0502	Productivity measurement System
04	UCVH0602	Lean Tools, Practices and Construction Automation
05	UCVH0702	Mini Project

**Teaching and Evaluation scheme for B. Tech. (Hons.) in Civil Engineering with
 Specialization in Lean Construction Technology**

Sr. No	Curric ulum Comp onent	Course Code	Course	Teaching Scheme			Evaluation Scheme			
				L	T	P	Cre dit	Component	Marks	
									Max	Min for Passing
1	-	UCVH 0302	Basics of Construction Projects & Management	3	1	0	4	ESE	100	40
2	-	UCVH 0402	Lean Concept and management approach	3	1	0	4	ESE	100	40
3	-	UCVH 0502	Productivity Measurement System	3	1	0	4	ESE	100	40
4	-	UCVH 0602	Lean Tools, Practices and Construction Automation	3	1	0	4	ESE	100	40
5	-	UCVH 0702	Mini Project	0	0	4	2	ESE	100	40
			Total	12	4	4	18	Total Marks		500

Title of the Course:		Basics of Construction Projects and Management					L	T	P		Credit																																							
Course Code:		UCVH302					3	1	-		4																																							
	Course Pre-Requisite: Basic Civil Engineering																																																	
	Course Description: Students will be introduced with the elements of construction projects and Basics of Project Management																																																	
	Course Learning Objectives: This Course will assist students in understanding about construction projects lifecycle and basics project management .																																																	
	Course Outcomes: <table><tr><th rowspan="2">CO</th><th rowspan="2">After the completion of the course the student should be able to</th><th colspan="2">Bloom's Cognitive</th></tr><tr><th>Level</th><th>Descriptor</th></tr><tr><td>CO1</td><td>Describe the element of Construction Projects</td><td>2</td><td>Understand</td></tr><tr><td>CO2</td><td>Analyze project management characteristics for Construction projects</td><td>4</td><td>Analyze</td></tr></table>											CO	After the completion of the course the student should be able to	Bloom's Cognitive		Level	Descriptor	CO1	Describe the element of Construction Projects	2	Understand	CO2	Analyze project management characteristics for Construction projects	4	Analyze																									
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CO	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12																																						
CO1	-	1	1	-	-	-	1	-	-	-	2	2																																						
CO2	-	3	2	-	3	3	1	3	2	1	3	2																																						

CO-PSO Mapping:

CO	PS01	PS02	PS03
CO1	1	2	2
CO2	2	2	2

Assessments:

- Two components of In Semester Evaluation (ISE), One Mid Semester Examination(MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE1	10
MSE	30
ISE2	10
ESE	50

- ISE 1 and ISE 2 are based on Tutorial/Assignment/Declared test/Quiz/Seminar/Group Discussions etc.
- MSE: Assessment is based on 50% of course content (Normally first three Units)
- ESE: Assessment is based on 100%course content with 60-70% weightage for course content (Normally last two Units) covered after MSE.

Course Contents:

Unit1: Construction Project Life cycle Overview of Construction project, Stages of Construction Project: Concept, design, procurement, Construction, operation and Maintenance. Construction Project organizations	08 Hrs.
Unit2: Basics of Project management Management art or science, Project Objectives, Scientific Project Management, Classical management, functions of Management.	10 Hrs.

Unit3: Integrated Project Delivery Definition of Integrated project delivery (IPD), Introduction of Project Planning, works Breakdown Structure, Project stakeholders and their roles and responsibilities, Project Communication and control.	10 Hrs.
Unit4: Project Cost and Basics of Economics Types of Cost: Direct , Indirect Cost, Factors affecting Project cost, Impact of time on Cost of a project, Economic Comparison, Break Even Analysis, Payback Period	12 Hrs.

References Books: <ol style="list-style-type: none"> 1. Modern Construction Lean Project Delivery and integrated Practices (Industrial Innovation) by Lincoln H. Forbes & Syed M. Ahmed. 2. Modern Construction Management by Frank Harris , Ronald Mccaffer 3. Engineering Economics by Paneerselvam 4. Construction Project Management by Kumar Jha
Unit wise Measurable students Learning Outcomes: <ol style="list-style-type: none"> 1. At the end of this unit, students will understand need of Lean Technology for construction project 2. At the end of this unit, students will understand stages of Construction Projects 3. At the end of this unit, students will understand Integrated project delivery 4. At the end of this unit, student will analyze stage of project where lean technology is applicable.

FINAL

Title of the Course:				Lean Concept and Management approach					L	T	P		Credit
Course Code:				UCVH 402					3	1	-		4
	Course Pre-Requisite: Basic Construction Projects and Management												
	Course Description: Students will be learning about Lean concept and principles. Processes in lean as used by industry for productivity improvement with use Selected management philosophies.												
	Course Learning Objectives: This Course will assist students in understanding lean for efficient project management approaches												
	Course Outcomes:												
	CO		After the completion of the course the student should be able to							Bloom's Cognitive			
										Level	Descriptor		
	CO1		Describe the Lean Concept and principles used by Industry							2	Understand		
	CO2		Identify Management Practices for Implementing Lean principles in Construction projects							4	Analyze		
	CO-PO, CO-PSO Mapping:												
CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO1 2	
CO1	2	1	-	-	-	-	1	-	-	-	2	2	
CO2	-	3	2	-	1	3	1	3	-	1	3	2	

CO	PS01	PS02	PS03
CO1	1	2	2
CO2	1	2	2

Assessments:

- Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE1	10
MSE	30
ISE2	10
ESE	50

- ISE 1 and ISE 2 are based on Tutorial/Assignment/Declared test/Quiz/Seminar/Group Discussion etc.
- MSE: Assessment is based on 50% of course content (Normally first two Units)
- ESE: Assessment is based on 100% course content with 60-70% weightage for course content (Normally last three Units) covered after MSE.

Course Contents:

Unit1: Basics of lean Definition of Lean, History and Development of Lean , Mass Production Vs Lean Production, Toyota Way, History of Lean Construction	6 Hrs.
Unit2: Principle of Lean: value Value, Value stream , Identify customer values through a dialogue with specific customers , Introduce the Lean thinking Approach by Identification of Value-added and non-value added activities in their daily works, Value stream theory – Value stream mapping to identify wastes and waste-prone areas in processes	8Hrs.

Unit3: Principle of Lean: Flow Concept of Flow – Flow in systems – Flow & Predictability Production systems in Manufacturing vs Construction - Mass Vs Craft – Flow in Manufacturing Production systems – Flow in Construction Production systems – Benefits of flow based production systems and illustrations.	10Hrs .
Unit4: Principle of Lean: Pull, standardization, variability Flow in Push/Pull systems – How these concepts relate to Construction – Push/pull in construction at different levels (different phases-EPC, with in construction), Kaizen – PDCA and Continuous Improvement, Impact of perfection – Impact of variability and control of Variability – Process metrics – Production capacity, production rate, Buffer, Wasted Time(utilization)	10Hrs .
Unit 5: Principle of Lean: Culture, People and Process Building Lean culture in an organization – Human resources and Managing change in the organization – Team building and Training –Lean Maturity Model – pattern of behavior, Strategy Deployment Plan, Concept of people (Motivation, Group Dynamics), Developing process maps - Explanation of the process in terms of concepts and correlation with product	06 Hrs

References Books: 1. Modern Construction Lean Project Delivery and integrated Practices (Industrial Innovation) by Lincoln H. Forbes & Syed M. Ahmed. 2. Modern Construction Management by Frank Harris , Ronald Mccaffer 3. Lean in Construction Projects by Tomas Lindhom 4. Lean Construction Management (The Toyota Way) by Shang Gao · Sui Pheng Low 5. Industrial Management by O.P. Khanna
Unit wise Measurable students Learning Outcomes: 1. At the end of this unit, students will understand Historical development in Lean adaptation by industry. 2. At the end of this unit, students will understand 'value' as Principle of Lean Management 3. At the end of this unit, students will understand 'Flow' as Principle of lean management 4. At the end of this unit, student will analyze Impact of standardization in construction processes. 5. At the end of this unit , Students will understand Involvement of People , Process in Lean Culture.

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Title of the Course:				Productivity Measurement System				L	T	P		Credit														
Course Code:				UCVH 502				3	1	-		4														
Course Pre-Requisite: Basic Construction Projects and Management , Lean Concept and Management Approach																										
Course Description: Students will be learning about procedures for measuring productivity of resources employed on construction projects																										
Course Learning Objectives: This Course will assist students in understanding Productivity of Construction resources																										
Course Outcomes: <table><tr><th rowspan="2">CO</th><th rowspan="2">After the completion of the course the student should be able to</th><th colspan="2">Bloom's Cognitive</th></tr><tr><th>Level</th><th>Descriptor</th></tr><tr><td>CO1</td><td>Measure Productivity of Construction resources</td><td>5</td><td>Evaluating</td></tr><tr><td>CO2</td><td>Devising practices to improve the Productivity for a specific construction activity</td><td>6</td><td>Creating</td></tr></table>													CO	After the completion of the course the student should be able to	Bloom's Cognitive		Level	Descriptor	CO1	Measure Productivity of Construction resources	5	Evaluating	CO2	Devising practices to improve the Productivity for a specific construction activity	6	Creating
CO	After the completion of the course the student should be able to	Bloom's Cognitive																								
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CO1	Measure Productivity of Construction resources	5	Evaluating																							
CO2	Devising practices to improve the Productivity for a specific construction activity	6	Creating																							
CO-PO, CO-PSO Mapping:																										
CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12														
CO1	2	1	-	2	1	-	1	2	-	3	2	2														
CO2	2	3	3	2	1	-	1	2	-	3	2	2														

	CO	PS01	PS02	PS03	
	CO1	1	1	1	
	CO2	1	1	1	
Assessments: ESE: 100 marks Assessment is based on Theory End Semester Examination with equal weightage to each unit of the course. Question Paper may include Combination of Multi choice questions and Descriptive nature questions.					
Course Contents:					
Unit1: Production and Productivity Concept , Units of Measurement, Difference between Production and Productivity, factors Influencing Productivity with reference to construction activity , Cost and Time Impact					10 Hrs.
Unit 2:Productivity Levels Levels of Productivity in Projects: Corporate Level, Regional Level, Project Level, Work Package Level , Operational Level & their measurement					8 Hrs.
Unit3:Measurement of Productivity Productivity definition and its measurement for Construction activities, Input & Output measurement for construction items. Level of Efforts, Impact of Productivity measurement on Return on Capital Investment, visualizing activity productivity and production performance. Operational Productivity ,Profit, Operational view Vs. System view					12Hrs
Unit4:Productivity Improvement approach Planning and Monitoring Levels of Productivity measurement system, daily , weekly , cumulative performance evaluation, work hour forecast and analysis of trends					10Hrs

References Books:

1. Modern Construction Lean Project Delivery and integrated Practices (Industrial Innovation) by Lincoln H. Forbes & Syed M. Ahmed.
2. Modern Construction Management by Frank Harris , Ronald Mccaffer
3. Lean in Construction Projects by Tomas Lindhom
4. Lean Construction Management(The Toyota Way) by Shang Gao · Sui Pheng Low

Unit wise Measurable students Learning Outcomes:

1. At the end of this unit, students will understand difference between production and productivity in construction projects
2. At the end of this unit, students will understand levels of Productivity
3. At the end of this unit, students will measure the productivity
4. At the end of this unit, student will devise productivity improvement methods

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Title of the Course:				Lean tools, practices and Construction Automation						L	T	P		Credit
Course Code:				UCVH 602						3	1	-		4
	Course Pre-Requisite: Basic Construction Projects and Management , Lean Concept and Management Approach , Productivity measurement system													
	Course Description: Students will be learning Lean tools practiced worldwide and develop systems for construction automation													
	Course Learning Objectives: This Course will assist students in understanding Lean tools and practices													
	Course Outcomes:													
	CO		After the completion of the course the student should be able to							Bloom's Cognitive				
										Level	Descriptor			
	CO1		Understand lean tools and practices employed by construction industry							2	Understanding			
	CO2		Devise systems for performance improvement by construction automation							6	Creating			
	CO-PO, CO-PSO Mapping:													
CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2		
CO1	2	1	-	2	1	-	1	2	-	3	2	2		
CO2	2	3	3	2	1	-	1	2	-	3	2	2		

	CO	PS01	PS02	PS03	
	CO1	1	1	1	
	CO2	1	1	1	
Assessments: ESE: 100 marks Assessment is based on Theory End Semester Examination with equal weightage to each unit of the course. Question Paper may include Combination of Multi choice questions and Descriptive nature questions.					
Course Contents:					
Unit 1: Collaborative Planning System Project planning & monitoring, Project control through Big room approach, Communication , authentication , collaboration, Document Management & case studies					6 Hours
Unit 2: Last Planner system (LPS) Introduction to Last planner system & its components: Master Schedule, Phase schedules, Weekly schedule, Constraint analysis, Look ahead plan, case studies.					12
Unit 3:Lean & Building Information Modelling(BIM) Need for BIM, BIM Workflow, BIM Execution Plan, Introduction to Augmented reality & virtualization, Cloud and real time collaboration, Digital Twin and Facility management , Case studies					10 Hours
Unit 4: Construction automation Future Construction Site, Introduction to prefabrication and modular construction , 3D Printing and additive manufacturing, Mechanization & robotics application , Big Data analytics, Automation strategies & its Impact					12 Hours

References Books:

1. Modern Construction Lean Project Delivery and integrated Practices (Industrial Innovation) by Lincoln H. Forbes & Syed M. Ahmed.
2. Modern Construction Management by Frank Harris , Ronald Mccaffer
3. Lean in Construction Projects by Tomas Lindhom
4. Lean Construction Management by Shang Gao · Sui Pheng Low

Unit wise Measurable students Learning Outcomes:

1. At the end of this unit, students will understand project planning and coordination
2. At the end of this unit, students will understand Last planner system
3. At the end of this unit, students will understand application of BIM for Lean objectives
4. At the end of this unit, student will evaluate automation strategies for a construction phase

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