



DEPARTMENT OF MECHANICAL ENGINEERING		LP: OE22002
B.E/B.Tech/M.E/M.Tech : <u>B.E</u> Regulation: R2022		Rev. No: 01
PG Specialisation : NA		Date:05.07.24
Sub. Code / Sub. Name : OE22002 / Lean Six Sigma		
Unit : 1		

Unit Syllabus: INTRODUCTION TO LEAN MANUFACTURING

9

Conventional Manufacturing versus Lean manufacturing - Principles of Lean Manufacturing
 - Basic elements of lean manufacturing - Introduction to Lean manufacturing tools

Objective: A comprehensive understanding of the core principles of Lean, including identifying and eliminating waste, creating value for customers, and optimizing processes for efficiency and effectiveness.

Session No *	Topics to be covered	Ref	Teaching Aids
1	Introduction to lean and bird's eye view of subject	R1, pg 2-3	BB //PPT
2	Evolution of lean	R1, pg 5-10	BB/PPT
3	Traditional versus lean manufacturing	R1, pg 15-24	BB/PPT
4	Customer Need; lean tools- Process mapping value stream management3 M; 7 types of Muda; 7 major losses reduction	R1, pg 26-32	BB/PPT
5	Principles of Lean Manufacturing	R1, pg 33-42	BB/PPT
6	Basic elements of lean manufacturing	R1, pg 45-58	BB/PPT
7	Push vs Pull system; waste reduction for Push & Pull	R1, pg 62-66	BB/PPT
8	Autonomous maintenance, JIT, Autonomation Presentation by students about various lean tools and its application in daily life- Participative learning	R1, pg 92-95	BB/PPT
9	Introduction to Lean manufacturing tools	R1, pg 115-117	BB/PPT
Content beyond syllabus covered (if any):			

* Session duration: 50 minutes



Sub. Code / Sub. Name: OE22002 / Lean Six Sigma

Unit : II

Unit Syllabus: SET UP TIME REDUCTION, TQM, 5S, VSM 9

Set up time reduction -definition, philosophies and reduction approaches. TQM - Principle and implementation. 5S - Principle and implementation - Value Stream Mapping - Procedure and principle

Objective: A comprehensive understanding of the core principles of Lean, including identifying and eliminating waste, creating value for customers, and optimizing processes for efficiency and effectiveness.

Session No *	Topics to be covered	Ref	Teaching Aids
10	Set up time reduction	R1, pg 112-113	BB /PPT
11	SMED -definition, philosophies and reduction approaches	R1, pg 118-122	BB/PPT
12	TQM - Principle	R1, pg 124-131	BB/PPT
13	TQM tools and techniques- Overview	R1, pg 132-135	BB/PPT
14	Concept of 5S	R1, pg 152-157	BB/PPT
15	5S principle and implementation Demonstration with YouTube videos about 5S implementation in industries	R1, pg 162-173	BB/PPT
16	Value and Non value added activities	R1, pg 174-177	BB/PPT
17	Value Stream Mapping and its benefits	R1, pg 182-188	BB/PPT
18	Case study in VSM Brainstorming session with industrial case of how VSM is done for industrial problem – Experiential learning	-	BB/PPT
Content beyond syllabus covered (if any): VSM case study discussion with a journal paper			

* Session duration: 50 mins



Sub. Code / Sub. Name: OE22002 / Lean Six Sigma

Unit : III

Unit Syllabus : INTRODUCTION TO SIX-SIGMA

9

Six Sigma measures - Yield - DPMO - Quality Level - Reliability function using Six-Sigma - MTTF using Six Sigma - Maintenance free operating period - Availability using Six Sigma – Examples

Objective: Thorough understanding of the core principles, concepts, and methodologies of Six Sigma, including the DMAIC (Define, Measure, Analyze, Improve, Control) framework.

Session No *	Topics to be covered	Ref	Teaching Aids
19	What is six sigma	R2, pg 52 - 66	BB /PPT
20	Phases of Six sigma	R2, pg 173-186	BB/PPT
21	Six Sigma measures- Yield	R2, pg 10-20	BB/PPT
22	Defects & Defectives- DPMO	R2, pg 201-203	BB/PPT
23	Quality check & sampling for DPMO	R2, pg 201-203	BB/PPT
24	Reliability function using Six-Sigma	R2, pg 201-203	BB/PPT
25	MTTF using Six Sigma	R2, pg 201-203	BB/PPT
26	Maintenance free operating period	R2, pg 201-203	BB/PPT
27	DMAIC Case study discussion with example of DMAIC phase for industrial application- Participative learning	R2, pg 201-203	BB/PPT
Content beyond syllabus covered (if any): Mumbai Dabbawalas- Case study discussion for six sigma implementation			

* Session duration: 50 mins



Sub. Code / Sub. Name: OE22002 / Lean Six Sigma

Unit : IV

Unit Syllabus: ELEMENTS OF SIX SIGMA

9

Quality Measurement techniques - SQC, Six Sigma Cp and Cpk - Statistical quality control (SQC) methods. Control charts and Six Sigma - Process capability index - Examples

Objective: Thorough understanding of the core principles, concepts, and methodologies of Six Sigma, including the DMAIC (Define, Measure, Analyze, Improve, Control) framework

Session No *	Topics to be covered	Ref	Teaching Aids
28	Statistical Quality Control- SQC	R3, pg 91 – 94	BB /PPT
30	Six Sigma Cp and Cpk	R3, pg 95 – 109	BB/PPT
31	Statistical quality control (SQC) methods	R3, pg 110 – 114	BB/PPT
32	Analyze – process analysis – hypothesis testing – statistical tests and tables	R3, pg 115 – 121	BB/PPT
33	Control chart for variables	R3, pg 121 – 129	BB/PPT
34	Control chart for attributes	R3, pg 136 – 138	BB/PPT
35	Industrial problems in control charts – Participative learning	--	BB/PPT
36	Process capability index - Examples	R3, pg 146-155	BB/PPT
Content beyond syllabus covered (if any):			

* Session duration: 50 mins



Sub. Code / Sub. Name: OE22002 / Lean Six Sigma

Unit : V

Unit Syllabus: TOOLS AND TECHNIQUES

9

SIPCO, QFD, Voice of the customer, Kano models, Cost of Poor Quality (COPQ) and DMAIC - Define, Measure, Analyze, Improve and Control - Case Studies for Six Sigma

Objective: Learn and apply the use of statistical tools and techniques.

Session No *	Topics to be covered	Ref	Teaching Aids
37	SIPCO	R3, pg 22-27	BB /PPT
38	SIPCO – Analysis for manufacturing and service sectors	R3, pg 367-379	BB/PPT
39	Quality Function Deployment (QFD)	R3, pg 380-391	BB/PPT
40	QFD analysis for Pizza Participative learning by brainstorming with students	R3, pg 392-395	BB/PPT
41	Kano models	R3, pg 341-350	BB/PPT
42	Cost of Poor Quality (COPQ)	R3, pg 310-313	BB/PPT
43	COPQ analysis Experiential learning- students will go to shop floor and analyze for COPQ	R3, pg 54-65	BB/PPT
44	DMADV & DFSS	R3, pg 67-73	BB/PPT
45	Success stories of six sigma	R3, pg 465-480	BB/PPT

Content beyond syllabus covered (if any):Motorola and Godrej – Six sigma case studies

* Session duration: 50 mins

**TEXT BOOKS:**

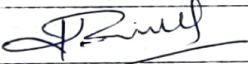
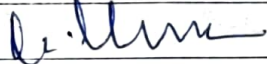
1. Gopalakrishnan N, Simplified Lean Manufacture: Elements, rules, tools and implementation, Prentice Hall of India, NewDelhi 2013.
2. James P. Womack , Daniel T. Jones ,Lean Thinking, Free press business,2013.

REFERENCE BOOKS

1. Kai Yang and Basemel-Haik, "Design for Six-Sigma: A Roadmap for Product Development", McGraw Hill, 2009.
2. Michael L. George, David Rowlands, Bill Kastle ,What is Lean Six Sigma, Tata McGrawHill,2003.
3. James P. Womack , Daniel T. Jones ,Lean Thinking, Free press business,2013.

WEB RESOURCES:

1. <https://nptel.ac.in/courses/110/105/110105123/>

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Date	4/7/24	4/7/24
Remarks *:		
Remarks *:		

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD