

B.E Semester: 6 Mechanical Engineering
Subject Name: Lean Manufacturing (ME605-N-D)
[Dept. Elect.-2]

A. Course Objective:

It is desired that at the end of the course, the student will be equipped with the basic knowledge of lean manufacturing, tools, techniques and implementation outcomes.

B. Teaching / Examination Scheme:

Teaching Scheme				Total Credit	Evaluation Scheme					
L	T	P	Total		Theory		Mid Sem Exam	CIA	Pract.	Total
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	Marks
3	0	2	5	4	3	70	30	20	30	150

C. Detailed Syllabus:

Unit No.	Details
1	Introduction Lean Manufacturing: Introduction, Definitions of Lean manufacturing, explaining basic concepts. Overview of historical development. Management theory.
2	Primary Tools of Lean manufacturing: 5-S, Workplace organization, Total Productive Maintenance, Process mapping/ Value stream mapping, Work cell.
3	Secondary Tools of Lean manufacturing: Objective and benefits of Secondary lean tool, Cause and Effect diagram, Pareto chart, Spider chart, Poka yoke, Kanban, Automation, Single minute exchange of die (SMED), Design for manufacturing and assembly, Just in time (JIT), Visual workplace, OEE
4	TQM Tools And Techniques: The seven traditional tools of quality, New management tools, and Six sigma: Concepts, methodology, applications to manufacturing, service sector including IT, Bench marking, Reason to bench mark, Bench marking process, FMEA, Stages, and Types. Quality circles ,Quality Function Deployment (QFD), Taguchi quality loss function, TPM ,Concepts, improvement needs, Cost of Quality , Performance measures
5	Total Productive Maintenance: Objectives and functions, Tero technology, Reliability Centered Maintenance (RCM), maintainability prediction, availability and system effectiveness, maintenance costs, maintenance organization. Minimal repair, maintenance types, balancing PM and breakdown maintenance, Primary and secondary tool for TPM, Case studies related to TPM.
6	Design of Experiments: Introduction , Methods, Taguchi approach, Achieving robust design, Steps in experimental design Designing for Quality: Introduction to Concurrent Engineering, Quality Function Deployment (QFD) and Failure Mode

	and Effect Analysis (FMEA), Concept, Methodology and Application (with case studies). Quality in Service Sectors: Characteristics of Service Sectors, Quality Dimensions in Service Sectors, Measuring Quality in Different Service Sectors.
7	Six Sigma: Meaning of six sigma, Why six sigma, Six sigma improvement model, DMAIC and DMADV principle, , building six sigma organization and culture, Six sigma application, case studies
8	Quality Circle: Quality Circle structure, Its operation, Characteristics of Quality Circle, developing quality circle in organization, Basic problem solving techniques.

Total hours (Theory):48
Total hours (Practical):32
Total hours:80

D. Lesson Planning:

Sr. No.	Date/Week	Unit	Weight age	Topic No
1	1 st ,2 nd ,3 rd	Unit 1	20%	1
2	4 th .5 th ,6 th	Unit 2	20%	2
3	7 th , 8 th ,9 th	Unit 3	20%	3,4
4	10 th .11 th . 12 th	Unit 4	20%	5,6
5	13 th , 14 th ,15 th ,16 th	Unit 5	20%	7,8

E. Instructional Method & Pedagogy

1	At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2	Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal Weight age should be given to all topics while teaching and conduction of all examinations.
3	Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
4	One/Two internal exams may be conducted and total/average/best of the same may be converted toequivalent of 30 marks as a part of internal theory evaluation.
5	Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
6	Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overallinternal evaluation.

F. List of Practical:

1	Application development on TQM.- Excel.
2	Practical on work place management- case study.
3	Practice of preventive maintenance in W/S machine.- case study.
4	Prepare spider chart for machine utility.
5	Implement kanban system to mechanical workshop utility.
6	Apply taguchi for practical assessment.
7	Produce quality circle diagram for utility inspection.

8	Material utility case study.
9	Machine utility case study.
10	Resource utility case study.

G. Students Learning Outcomes:

1	The student can identify different areas of Lean Manufacturing.
2	Can find the applications of all the areas in day to day life.

H. Text Books & Reference Books:

1	Mitra A., "Fundamentals of Quality Control and Improvement", PHI, 2nd Ed., 1998.
2	J Evans and W Linsay, The Management and Control of Quality, 6'th Edition, Thomson, 2005
3	Besterfield, D H et al., "Total Quality Management", 3rd Edition, Pearson Education, 2008.
4	D. C. Montgomery, Design and Analysis of Experiments, John Wiley & Sons, 6th Edition, 2004
5	Dale H. Besterfield, "Total Quality Management", Pearson Education Asia.
6	Poornima Charantimath, "Total Quality Management", Pearson Education Asia 3. Tapan Bose "Total Quality Management", Pearson Education
7	K C Jain and A K Chitale, "Quality Assurance and Total Quality Management (ISO 9000, QS 9000 ISO 14000)" by, Khanna Publishers
8	B. L. Hanson & P. M. Ghare, "Quality Control & Application", Prentice Hall of India