Faculty of Engineering & Technology, SRM University, Kattankulathur – 603203
School of Mechanical Engineering

Department of Mechanical Engineering
Course plan

Course code : ME0068
Course title : TQM & Reliability Engineering
Semester : 6&8
Academic year / semester : 2012-'13 / EVEN :(Jan 2013- May 2013)

Date : 04 JAN 2013

Section details:

Section	Details of Faculty member				
	Name	Room No.	Inter com No.	e-mail id	Student contact time
IV MECH 'B'	Mr. J. Daniel Glad Stephen	MEM32/ B	1839	stephen.j@ktr.srmuniv.ac.in	12.45 – 1.15 PM
IV MECH 'A'	Mr. A. Rajasekaran	MEB405	1807	rajasekaran.a@ktr.srmuniv.ac.in	12.45 – 1.15 PM
IV MECH 'C'	Mr. P. Prasanna	MEM32/ B	1839	prasanna.p@ktr.srmuniv.ac.in	12.45 – 1.15 PM
IV MECH 'D'	Mr. R. G. Padmanabhan	MEH109	-	padmanabhan.g@ktr.srmuniv.ac.in	12.45 – 1.15 PM
III AS 'B'	Mr. T. Maridurai	MEB302 A	1829	mariduri.t@ktr.srmuniv.ac.in	12.45 – 1.15 PM
III AS 'A'	Mr. N. Arun	MEH109	-	arun.n@ktr.srmuniv.ac.in	12.45 – 1.15 PM
IV AUTO	Mr. J. Thavamani	MEC111	1822	thavamani.j@ktr.srmuniv.ac.in	12.45 – 1.15 PM

Direct assessment details:

Name of assessment	Marks	Topics(Tentiative)	Tentative date	Duration
Cycle test - I	10	Till customer retention - Service quality	04.02.2013	100 minutes
Surprise test	05	Advanced Tools	20.02.2013	10 – 15 min
Cycle test - II	10	Till quality Management Systems	04.03.2013	100 minutes
Model examination	20	Entire Syllabus	15.04.2013	3 hours
End semester examination	50	Entire Syllabus	-	3 hours
Attendance	05	N/A		

Mapping between instructional objectives and student outcomes

S.No	Instructional objective	Student outcome	Justification
1	Meaning of TQM and Theories about TQM	d) An ability to function on multidisciplinary teams	Goal setting – Students act as Multidisciplinary team members in role play (representing various departments of a company) to review the current quality level and set goals.
		h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context	By studying Deming, Crosby, Juran, Taguchi and Ishikawa theories, students will get the broad exposure.
2	Planning and manufacturing for quality, its tools and techniques	a)An ability to apply knowledge of mathematics, science, and engineering	Using SQC techniques and tools, the students will be able to analyse current quality level.
		d) An ability to function on multidisciplinary teams	As a team, students will be able to use advanced management tools like Affinity diagram, Relationship diagram, Arrow diagram, Root cause analysis diagram, and Quality Function Deployment.
3	Human involvement to improve quality and the development and transformation due to such involvement	h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context	By studying the importance of employee involvement, motivation, empowerment, team work, customer retention, and service quality, students will get the relevant broad exposure.
4	To know about failure models, component reliability & system reliability	a) An ability to apply knowledge of mathematics, science, and engineering	By studying probability nature of failures and techniques like Failure Mode and Effect Analysis (FMEA), Failure Mode and Effects Criticality Analysis (FMECA), and Fault Tree Analysis (FTA), students will be able to use these tools in case studies to analyse the system reliability.
		h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context	By studying Quality Management Systems like ISO 9000 and ISO 14000, students will be able to understand and apply the global standards.
5	To know about mean down time, maintainability of systems & condition monitoring	a) An ability to apply knowledge of mathematics, science, and engineering	By studying Mean time to failure, Mean down time, Mean time to repair, and Fault diagnosis, the students will be able to monitor and improve the condition of system.

Expected Learning Outcomes of the Course

		L	T	P	C
ME0068	TQM AND RELIABILITY ENGINEERING	3	0	0	3
	Prerequisite				
	Nil				

Student outcomes	Program Educational Objectives			
	The main objective of the B.Tech in Mechanical Engineering Program is to provide a periodically-updated curriculum so that, following the completion of the program and with a few years of experience, our alumni will have the expertise to:			
	1. Practice mechanical engineering in different disciplines towards system design, realization, and manufacturing.	2. Enhance professional practice to meet the global standards with ethical and social responsibility.	3. Solve industrial, social, and environmental problems with appropriate techniques and tools.	4. Work in large cross-functional teams and pursue life-long learning.
(a) an ability to apply knowledge of mathematics, science, and engineering	X		X	
(d) an ability to function on multidisciplinary teams		X	X	X
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context		X		X

Course designed by		Department of Mechanical Engineering									
1	Student outcome	a	b	c	d	e	f	g	h	i	j	k
		X			X				X			

2	Category	GENERAL (G)	BASIC SCIENCES (B)	ENGINEERING SCIENCES AND TECHNICAL ART (E)	PROFESSIONAL SUBJECTS (P)
					X

3	Broad area (for professional courses only, i.e 'under P' category)	Manufacturing	Design	Thermal	General		

4	Course Coordinator	Mr. J.DANIEL GLAD STEPHEN

Syllabus: ME0068 - TQM AND RELIABILITY ENGINERING

PURPOSE To provide knowledge about Total Quality Management (TQM), TQM tools and techniques applied to Manufacturing and also about reliability and maintainability of different systems.

INSTRUCTIONAL OBJECTIVES

At the end of the course students will be able to know

- Meaning of TQM and Theories about TQM
- Planning and manufacturing for quality its tools and techniques
- Human involvement to improve quality and the development and transformation due to such involvement
- About failure models, component reliability & system reliability
- About mean down time, maintainability of systems & condition monitoring

BASIC CONCEPTS

Evolution of total quality Management - Definition of quality - Comparison between traditional approach and TQM, Deming - Crosby - Juran - Taguchi, Ishikawa theories - Quality costs - Product quality Vs Service quality Strategic planning - Goal setting - Steps involved in strategic planning - TQM implementation.

TQM PRINCIPLES & BASIC TOOL

Customer Satisfaction - Types of customers, customer supplier chain, Customer perception of quality customer feed back - Customer complaints - Customer retention - Service quality.

Employee involvement - Employee motivation - Maslow's hierarchy of needs - Herzberg theory - Empowerment and team work. Basic Tools: Introduction to seven basic tools - Check sheets, histograms - Control charts, Pareto diagram - Cause and effect diagram - Stratification - Scatter diagrams.

NEW SEVEN MANAGEMENT TOOLS & ADVANCED TOOLS

Affinity diagram - Relations diagram - Tree diagram - Matrix diagram - Matrix data analysis diagram - Process decision program chart - Arrow diagram.

Advanced QC tools: Advanced QC tools like QFD - Root cause analysis - Taguchi method - Mistake proofing (poka-yoke) - Failure mode and effects analysis (FMEAs), failure mode and effects criticality analysis (FMECAs) and Fault tree analysis (FTAs) etc. - Quality Management Systems.

RELIABILITY

Definition - Probabilistic nature of failures - Mean failure rate - Meantime between failures - Hazard rate - Hazard models, Weibull model - System reliability improvement - Redundancy - Series - Parallel and Mixed configurations.

MAINTAINABILITY

Introduction - Choice of maintenance strategy - Mean time- to repair (MTTR) - Factors contributing to Mean Down Time (MDT) - Fault diagnosis, and routine testing for unrevealed faults - Factors contributing to Mean Maintenance Time - (MMT) on condition maintenance - Periodic condition monitoring - Continuous condition monitoring - Economics of maintenance.

TEXT BOOKS

- Joel E. Rose, Total Quality Management, 2nd Edition, Kogan Page Ltd., USA 1993
- Srinath, L. S., Reliability Engineering, Affiliated East West Press, New Delhi 1995

REFERENCE BOOKS

- Balagurusamy, E., Reliability Engineering Tata McGraw Hill publishing Co., New Delhi, 1984
- Greg Bound, et.al, Beyond Total Quality Management towards the emerging paradigm, McGraw Hill Inc., 1994
- Zeiri, Total Quality Management for Engineers, Wood Head Publishers, 1991

Lesson Plan:

S.No	No. of Hours	TOPICS	References (code of the Text / Reference books)
		BASIC CONCEPTS	
1	1	Evolution of total quality Management	T1 , chapter 1
2	1	Comparison between traditional approach and TQM	T1 , chapter 2
3	1	Deming – Crosby theories	T1 , chapter 1
4	2	Juran , Taguchi, Ishikawa theories	T1 , chapter 1
5	1	Quality costs	T1 , chapter 11
6	1	Product quality Vs Service quality	T1 , chapter 1
7	1	Strategic planning	T1 , chapter 4
8	1	TQM implementation.	T1 , chapter 2
		TQM PRINCIPLES & BASIC TOOL	
9	1	Types of customers, customer supplier chain, Customer perception of quality	T1 , chapter 7
10	1	customer feed back - Customer complaints	T1 , chapter 7
11	1	Customer retention - Service quality	T1, chapter 7
12	1	Employee involvement	T1 , chapter 2
13	1	Employee motivation	T1 , chapter 2
14	1	Maslow's hierarchy of needs - Herzberg theory - Empowerment and team work.	T1 , chapter 2
15	1	Check sheets, histograms - Control charts, Pareto diagram - Cause and effect diagram -	T1 , chapter 6
16	1	Stratification - Scatter diagrams	T1 , chapter 6
		NEW SEVEN MANAGEMENT TOOLS & ADVANCED TOOLS	
17	1	Affinity diagram - Relations diagram	R4 , chapter 14
18	1	Tree diagram - Matrix diagram - Matrix data analysis diagram -	R4 , chapter 14
19	1	Process decision program chart - Arrow diagram.	R4 , chapter 14
20	2	QFD	T1, chapter 6
21	1	Root cause analysis - Taguchi method	

22	1	Mistake proofing (poka-yoke	
23	2	Failure mode and effects analysis (FMEAs),	R4, chapter 19
24	1	failure mode and effects criticality analysis (FMECAs)	R4, chapter 19
25	1	Fault tree analysis (FTAs)	T2, chapter 8
26	1	Quality Management Systems	T1, chapter 12
		RELIABILITY	
27	1	Probabilistic nature of failures	T2, chapter 1
28	1	Mean failure rate	T2, chapter 3
29	1	Meantime between failures,	T2, chapter 3
30	1	Hazard rate - Hazard models	T2, chapter 4
31	1	Weibull model	T2, chapter 4
32	1	System reliability improvement	T2, chapter 6
33	2	Redundancy - Series - Parallel and Mixed configurations.	T2, chapter 7
		MAINTAINABILITY	
34	1	Choice of maintenance strategy	T2, chapter 9
35	2	Mean time- to repair (MTTR) -	T2, chapter 10
36	1	Factors contributing to Mean Down Time (MDT)	T2, chapter 10
37	1	Fault diagnosis, Routine testing for unrevealed faults	T2, chapter 10
38	1	Factors contributing to Mean Maintenance Time - (MMT) on condition maintenance	T2, chapter 10
39	1	Periodic condition monitoring	T2, chapter 10
40	1	Continuous condition monitoring - Economics of maintenance.	R1, chapter 11
		Total hour 45	

Text books:

1) Joel E. Rose, *Total Quality Management*, 2nd Edition, Kogan Page Ltd., USA 1993
2) Srinath, L. S., *Reliability Engineering*, Affiliated East West Press, New Delhi 1995

Reference Books:

1) Balagurusamy, E., *Reliability Engineering* Tata McGraw Hill publishing Co., New Delhi, 1984
2) Greg Bound, et.al, *Beyond Total Quality Management towards the emerging paradigm*, McGraw Hill Inc., 1994

22	1	Mistake proofing (poka-yoke	
23	1	Failure mode and effects analysis (FMEAs),	R4, chapter 19
24	1	failure mode and effects criticality analysis (FMECAs)	R4, chapter 19
25	1	Fault tree analysis (FTAs)	T2, chapter 8
26	1	Quality Management Systems	T1, chapter 12
		RELIABILITY	
27	1	Probabilistic nature of failures	T2, chapter 1
28	1	Mean failure rate	T2, chapter 3
29	1	Meantime between failures,	T2, chapter 3
30	1	Hazard rate - Hazard models	T2, chapter 4
31	1	Weibull model	T2, chapter 4
32	1	System reliability improvement	T2, chapter 6
33	1	Redundancy - Series - Parallel and Mixed configurations.	T2, chapter 7
		MAINTAINABILITY	
34	1	Choice of maintenance strategy	T2, chapter 9
35	1	Mean time- to repair (MTTR) -	T2, chapter 10
36	1	Factors contributing to Mean Down Time (MDT)	T2, chapter 10
37	1	Fault diagnosis, Routine testing for unrevealed faults	T2, chapter 10
38	1	Factors contributing to Mean Maintenance Time - (MMT) on condition maintenance	T2, chapter 10
39	1	Periodic condition monitoring	T2, chapter 10
40	1	Continuous condition monitoring - Economics of maintenance.	R1, chapter 11
		Total hour 40	

Text books:

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2) Greg Bound, et.al, *Beyond Total Quality Management towards the emerging paradigm*, McGraw Hill Inc., 1994

3) Zeiri, *Total Quality Management for Engineers*, Wood Head Publishers, 1991
4) Subburaj Ramasamy, Total Quality Management, Tata McGraw Hill publishing Co.,

Name of the faculty :

Section	Name	Signature
IV MECH 'B'	Mr. J. Daniel Glad Stephen	
IV MECH 'A'	Mr. A. Rajasekaran	
IV MECH 'C'	Mr. P. Prasanna	
IV MECH 'D'	Mr. R. G. Padmanabhan	
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HOD/Mechanical