

SRM University
Faculty of Engineering & Technology
Kattankulathur – 603203
Department of Mechanical Engineering
Course plan

Course code : **ME0068**
Course title : **TQM and Reliability Engineering**
Semester : **VIII**
Academic year / semester: **2014 – 2015 / Even (Jan – April 2015)**

Section details:

Section	Room No.	Details of Faculty member				Student contact time
		Name	Faculty Room No.	I/c No.	e-mail id	
A		P. Karthikeyan	MEC 110	1824	karthikeyan.pa@ktr.srmuniv.ac.in	MON 12:30 to 13:00
B		A. Rajasekaran	MEB 405	1807	rajasekaran.a@ktr.srmuniv.ac.in	TUE 12:30 to 13:00
C		E. Vijayaragavan	MEB 302	1844	vijayaragavan.e@ktr.srmuniv.ac.in	WED 12:30 to 13:00
D		D. Selwyn Jebadurai	MEB 302	—	selwynjebadurai.d@ktr.srmuniv.ac.in	THU 12:30 to 13:00
E		V. Ragavendra Rao	MEB 305	1803	raghavendra.v@ktr.srmuniv.ac.in	FRI 12:30 to 13:00
F		N. C. Sasidharan Periane	MEB 305	1803	sasidharan.nc@ktr.srmuniv.ac.in	MON 12:30 to 13:00
G		R. G. Padmanabhan	MEH 109	1870	padmanabhan.g@ktr.srmuniv.ac.in	WED 12:30 to 13:00
H		N. Arun	MEB 305	1803	arun.n@ktr.srmuniv.ac.in	FRI 12:30 to 13:00

Direct assessment details:

Name of assessment	Marks	Topics	Tentative date	Duration
Cycle test - I	10	Basic Concepts and TQM Principles	09 / 02 / 2015	100 min
Surprise test	05	TQM & QC tools	02 / 03 / 2015	10 – 15 min
Cycle test - II	10	TQM, QC tools, Reliability	09 / 03 / 2015	100 min
Model examination	20	All topics	15 / 04 / 2015	3 hours
End semester examination	50	All topics	06 / 05 / 2015	3 hours
Attendance	05			

Syllabus of the course:

ME0068 TQM and Reliability Engineering 3 0 0 3

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 feedback - 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

1. Joel E. Ross, *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

- 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.

Mapping between instructional objectives and student outcomes

S. No.	Instructional Objectives	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 all ply knowledge of mathematics, science, and engineering	Using SQC techniques and tools, the students will be able to analyze 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 all ply 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 analyze 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 all ply 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											
	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 modern engineering 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			
												X
4	Course Coordinator	Mr. A. Rajasekaran										

SESSION PLAN

Session No.	TITLE / DETAILS OF CHAPTER	REFERENCES
BASIC CONCEPTS		
1	Evolution of Total Quality Management	TI Chapter 1
2	Definition of quality	TI Chapter 1
3	Comparison between traditional approach and TQM	TI Chapter 1
4	Deming - Crosby - Juran - Taguchi, Ishikawa theories - Quality costs	TI Chapter 1 R5 Chapter 2
5	Product quality Vs Service quality	TI Chapter 1
6	Strategic planning	TI Chapter 4
7	Goal setting	TI Chapter 4
8	Steps involved in strategic planning	TI Chapter 4
9	TQM implementation	R4 Chapter 4
TQM PRINCIPLES & BASIC TOOL		
10	Customer Satisfaction - Types of customers, customer supplier chain	TI Chapter 7
11	Customer perception of quality customer feed back	TI Chapter 7
12	Customer complaints - Customer retention - Service quality	TI Chapter 7
13	Employee involvement - Employee motivation - Maslow's hierarchy of needs	R4 Chapter 6
14	Herzberg theory - Empowerment and team work	R4 Chapter 6
15	Introduction to seven basic tools	TI Chapter 6
16	Check sheets, histograms - Control charts	TI Chapter 6
17	Pareto diagram - Cause and effect diagram	TI Chapter 6
18	Stratification - Scatter diagrams	TI Chapter 6
NEW SEVEN MANAGEMENT TOOLS & ADVANCED TOOLS		
19	Affinity diagram - Relations diagram	R4 Chapter 14
20	Tree diagram - Matrix diagram - Matrix data analysis diagram	R4 Chapter 14
21	Process decision program chart	R4 Chapter 14
22	Arrow diagram	R4 Chapter 14
23	Advanced QC tools like QFD	TI Chapter 6
24	Root cause analysis	TI Chapter 9
25	Taguchi method - Mistake proofing (poka-yoke)	R5 Chapter 9
26	Failure mode and effects analysis (FMEAs), failure mode and effects criticality analysis (FMECAs) and Fault tree analysis (FTAs) etc.	R4 Chapter 19
27	Quality Management Systems	TI Chapter 12
RELIABILITY		
28	Definition - Probabilistic nature of failures	R1 Chapter 1
29	Mean failure rate - Meantime between failures	T2 Chapter 3
30	Hazard rate - Hazard models	R1 Chapter 4
31	Weibull model	T2 Chapter 4
32	System reliability improvement	R1 Chapter 5
33	Redundancy	R1 Chapter 6
34	Series - Parallel and Mixed configurations	R1 Chapter 5
35	Problems in Series - Parallel and Mixed configurations	R1 Chapter 5 & 6
36	Problems in Series - Parallel and Mixed configurations	R1 Chapter 5 & 6

Session No.	TITLE / DETAILS OF CHAPTER	REFERENCES
MAINTAINABILITY		
37	Introduction	R4 Chapter 18
38	Choice of maintenance strategy	R4 Chapter 18
39	Mean time- to repair (MTTR)	R4 Chapter 18
40	Factors contributing to Mean Down Time (MDT)	R1 Chapter 7
41	Fault diagnosis, and routine testing for unrevealed faults	R1 Chapter 7
42	Factors contributing to Mean Maintenance Time - (MMT) on condition maintenance	R1 Chapter 7
43	Periodic condition monitoring	T2 Chapter 9
44	Continuous condition monitoring	T2 Chapter 9
45	Economics of maintenance	T2 Chapter 9

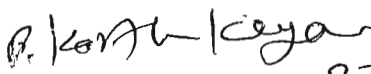
TEXT BOOKS


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

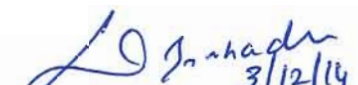
REFERENCE BOOKS

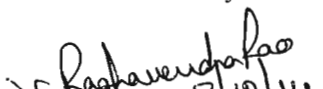
1. Balagurusamy, E., *Reliability Engineering* Tata McGraw Hill publishing Co., New Delhi, 1984.
2. Greg Bound, et.al, *Beyond Total Quality Management towards the emerging paradigm*, McGraw Hill Inc., 1994.
3. Zeiri, *Total Quality Management for Engineers*, Wood Head Publishers, 1991.
4. Subburaj Ramasamy, *Total Quality Management*, Tata McGraw Hill publishing Co., New Delhi, 2012.
5. Poornima M charantimath, *Total Quality Management*, Second Edition, Pearson Education, 2011.
6. Bjorn Andersen, Tom Fagerhaug, *Root Cause Analysis: Simplified Tools and Techniques*, Second Edition, American Society for Quality, 2006.

Signature of the Faculty:


2-12-14
Mr. P. Karthikeyan


01/12/2014.
Mr. E. Vijayaragavan

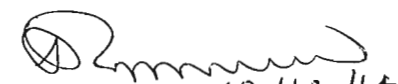

3/12/14
Mr. D. Selwyn Jebadurai



3/12/14
Mr. V. Ragavendra Rao


17/12/14
Mr. N. C. Sasidharan Periane


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Mr. R. G. Padmanabhan


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Course Coordinator
Mr. A. Rajasekaran


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Head of the Department
Dr. S. Prabhu