Course code	Course Name	L-T-P - Credits	Year of Introduction
MR361	Reliability Engineering	3-0-0--3	2016

Prerequisite : NIL

Course Objectives

- To understand the basic principle of reliability engineering and its applications to various systems in engineering

Syllabus

Probability - Probability distributions –-central tendency and dispersion- point estimation and interval estimation- goodness of fit tests-Reliability -Failure data analysis- reliability functions- hazard functions- Availability and Maintainability -Reliability hazard models - distribution functions and reliability analysis System Reliability - Different configurations – Redundancy – m/n system – Complex systems- Standby system. Interference theory and reliability computations – Maintainability prediction – Measures of maintainability – System Availability – Replacement theory

Expected outcome .

On completion of this subject students will be able to

- Understand the various concepts of reliability and quality in the field of engineering

Text Books:

1. Naikan A.,Reliability Engineering and Life Testing, PHI, New Delhi, 2010
2. O'Connor PDT, Practical Reliability Engineering, John Wiley & Sons Ltd, Singapore, 2004

Data Book (Approved for use in the examination): Statistical Table

References:

1. Lewis, E.E., Introduction to Reliability Engineering, John Wiley & Sons, 1995.
2. Modarres, Reliability and Risk analysis, Mara Dekker Inc., 1993.
3. Kapur K.C. and Lamberson L.R., Reliability in Engineering Design, John Wiley & Sons, 1977

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	**Probability** Probability: Conditional probability- Baye's theorem- Probability distributions – Normal- Lognormal-Poisson- Exponential and Weibull distributions – relationship between them and their significance -central tendency and dispersion- point estimation and interval estimation- goodness of fit tests.	7	15%
II	**Reliability** Reliability: Definitions- Importance- Quality and reliability- bath tub curve -Failure data analysis- Hazard rate- failure rate- MTTF- MTBF- reliability functions- hazard functions- Availability and Maintainability	7	15%
	FIRST INTERNAL EXAMINATION		
III	**Failure data analysis** Reliability hazard models- Parts stress model- Constant- linearly increasing and time dependent failure rates- Weibull	7	15%

	model- distribution functions and reliability analysis System Reliability: System configurations- series- parallel- mixed configurations- k out of m system- standby systems		
IV	**Reliability assessment** Different configurations – Redundancy – m/n system – Complex systems: RBD – Baye's method – Cut and tie sets – Fault Tree Analysis – Standby system.	7	15%
SECOND INTERNAL EXAMINATION			
V	**Reliability monitoring** Interference theory and reliability computations – Normal-exponential and Weibull stress – strength Distributions Life Testing – Objectives- Types - Censoring- replacement- accelerated life testing – data quantification – Temperature stress and failure rates – stress combinations	7	20%
VI	**Reliability improvement** Analysis of downtime – Repair time distribution – System MTTR – Maintainability prediction – Measures of maintainability – System Availability – Replacement theory	7	20%
END SEMESTER EXAM			

QUESTION PAPER PATTERN

Maximum Marks : 100 Exam Duration:3 hours

PART A: FIVE MARK QUESTIONS

8 compulsory questions –1 question each from first four modules and 2 questions each from last two modules (8 x 5= 40 marks)

PART B: 10 MARK QUESTIONS

5 questions uniformly covering the first four modules. Each question can have maximum of three sub questions, if needed. Student has to answer any 3 questions

(3 x10 = 30 marks)

PART C: 15 MARK QUESTIONS

4 questions uniformly covering the last two modules. Each question can have maximum of four sub questions, if needed. Student has to answer any two questions

(2 x15 = 30 marks)