							CWS	PRS	MTE	ETE	PRE
L	**T**	**P**	**Credit**	**Area**			**CWS**	**PRS**	**MTE**	**ETE**	**PRE**
3	0/1	2/0	4	DEC/GEC			15/25	25	20/25	40/50	-

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ME320 Reliability and Maintenance Engineering

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Objective: To enable the students to understand the fundamentals of reliability, factors influencing system effectiveness and methods of reliability improvements. To understand Fundamentals of steady state availability, Maintainability and Maintenance policies.

Syllabus		Contact Hours
Unit-1	**Introduction and Reliability Mathematics:** Relevance of reliability, availability and maintainability, definition of reliability, factors influencing system effectiveness, laws of probability, probability distributions: exponential, Weibull, normal, log normal; data collection, recovery of data, Statistical analysis of failure data.	**5**
Unit-2	**Fundamentals of Reliability:** Various reliability related functions; probability density function, cumulative distribution function, reliability function and hazard rate; reliability models; constant rate, Weibull, normal and lognormal model.	**6**
Unit-3	**System Reliability Assessment:** Types of systems- series, parallel, series parallel, parallel-series, stand by and complex; method of reliability evaluation; cut set and tie set methods, event trees and fault trees methods, Markov method, Reliability of repairable systems.	8
Unit-4	**Reliability Improvements -** Methods of reliability improvements, low level and high-level redundancy, active, stand by and K-out-of-N redundancy, effect of maintenance.	**7**
Unit-5	**Availability and Maintainability Assessments:** Point, mission and steady state availability. Availability assessment, Maintainability and its assessment. Maintenance policies.	**8**
Unit-6	**Design for Reliability -** Reliability allocation, Design for reliability and maintainability, optimization of reliability and maintainability and their trade-off, Practical applications of RAM Engineering to systems, products and processes; Monte Carlo simulation	**8**
	Total	**42**

Reference Book:	
1	Ebeling ChariesE. "An introduction to Reliability and Maintainability Engineering", Tata McGraw-Hill Publishing Co. Ltd., New Delhi, [ISBN 10 0070421382], 2000.
2	Srinath L.S." Reliability Engineering", Affiliated East –West Press Ltd., New Delhi, [ISBN 10 8176710482],2011
3	Dhillon, B.S. "Engineering Maintainbility", Prentice Hall of India, New Delhi,2000.
4	Blanchard, Benjamin,S., "Logistics Engineering and Management", Pearson,[ISBN 10 1292027134], 2013.

Course Outcomes

CO1	Explain quality, reliability, quality control and statistical quality control.

CO2	Analyze failure data, hazard models and system reliability and solve related numerical problems
CO3	Apply reliability improvement and allocation methods to engineering systems
CO4	Explain maintenance objectives and functions, factors influencing Plant Availability.
CO5	Determine the optimal overhaul/repair/replacement maintenance policy
CO6	Explain different maintenance systems and the steps involved in establishing a maintenance plan and designing a technically sound preventive maintenance and lubrication program.

CO-PO/PSO Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	2	1	0	1	0	0	3	3	2	2
CO2	2	3	3	2	1	1	0	1	2	0	2	2	2	2	2
CO3	2	2	2	3	1	1	0	0	0	0	0	3	3	1	1
CO4	3	3	3	3	2	2	1	0	1	0	0	3	3	2	2
CO5	2	3	3	2	1	1	0	1	2	0	2	2	2	2	2
CO6	2	2	2	3	1	1	0	0	0	0	0	3	3	1	1