GUJARAT TECHNOLOGICAL UNIVERSITY

M.E. Mechanical (Industrial Engineering)

Semester: I

Subject: ReliabilityEngineering and Maintenance Management (Interdisciplinary Elective – II)
Code: 1724608

Sr. No.	Topic	Hours
1	**Reliability Concept:**Reliability function - failure rate - Mean time between failures (MTBF) - Mean time to failure (MTTF) - a priori and a posteriori concept - mortality curve - useful life availability - maintainability - system effectiveness.	02
2	**Reliability Data Analysis:**Time to failure distributions - Exponential, normal, Gamma, Weibull, ranking of data - probability plotting techniques - Hazard plotting.	03
3	**Reliability Mathematics:**Introduction to probability distributions, Concept of Bathtub Hazard Rate curve, Reliability evaluation of two-state device networks-series, parallel, k-out-of-m systems; Standby redundant systems, Reliability evaluation of three-state device networks-series and parallel.	03
4	**Reliability Determination Methods:**Network reduction technique, Path tracing technique, Decomposition technique, Delta-Star method. **Advanced Reliability Evaluation Concepts:**Supplementary variables technique, Interference theory, Human reliability, Common cause failures, Fault trees, Failure mode and effect analysis.	04
5	**Reliability Prediction Models:** Series and parallel systems - RBD approach - Standby systems - m/n configuration - Application of Baye's theorem - cut and tie set method - Markov analysis - FTA - Limitations. **Reliability Management:** Reliability testing - Reliability growth monitoring - Non parametric methods - Reliability and life cycle costs - Reliability allocation - Replacement model.	04
6	**Maintenances systems and economics of reliability:** Maintainability and availability concepts, MTBF, MTTR, MTBM& MDT repair hazards rate, maintainability and availability functions and their mathematical expressions.	06
7	**Maintenance and spares management:** Preventive replacement- individual breakdown replacement policy - individual preventive replacement policy - preventive group replacement. **Condition based maintenance** - advantages and disadvantages - vibration monitoring - vibration parameters - vibration instruments.	07
8	**Total Productivity Maintenance (TPM):**Different Types of	10

	Maintenance,Distinctive Features of TPM, Pillars of TPM, Basic Philosophy of Zero Defects (ZD), ZD and TPM, Maximizing Equipment Effectiveness, Six Major Losses, TPM Development Activities, Steps of TPM Development, Autonomous Maintenance, Planned Maintenance, Measuring TPM Effectiveness.	
		39

Term Work:
The term work shall be based on the topics mentioned above.

Practical / Viva:
The candidate shall be examined on the basis of term-work.

Text Books:

1 Reliability Engineering, Srinath.L.S., Affiliated East West Press Pvt. Ltd., 2011
2 Reliability Engineering, Balagurusamy. E., Tata Mcgraw Hill Publishing Company, New Delhi,1984.

References:

1. Introduction to TPM, Nakajima Seiichi, Productivity Press India, Madras, 1997.
2. Reliability and Risk analysis, Modarres, Mara Dekker Inc., 1993.
3. The Reliability of Mechanical system, John Davidson, published by theInstitution of Mechanical Engineers, London, 1988.
4. Introduction to Reliability in Design, Smith C.O., McGraw Hill, London, 1976.
5. Reliability Anaysis and Prediction Engineering, K B Mishra, Elsevier Science Publishers,1992
6. Reliability Engineering in System Design and Operation, Balbir S. Dhillon. Von Nostrand Reinhold Company, New York, 1983.
7. Introduction to Reliability Engineering, Lewis, E. E. John Wiley & Sons, New York, 1987.
8. Practical Reliability Engineering, O'Connor Patric D.T.3/e revised, John Wiley & Sons, 1995.