Course Code	Course Name	Credits
ILO 7012	Reliability Engineering	03

Objectives:

- 1. To familiarize the students with various aspects of probability theory
- 2. To acquaint the students with reliability and its concepts
- 3. To introduce the students to methods of estimating the system reliability of simple and complex systems
- 4. To understand the various aspects of Maintainability, Availability and FMEA procedure

Outcomes: Learner will be able to...

- 1. Understand and apply the concept of Probability to engineering problems
- 2. Apply various reliability concepts to calculate different reliability parameters
- 3. Estimate the system reliability of simple and complex systems
- 4. Carry out a Failure Mode Effect and Criticality Analysis

Sr. No	Detailed Contents	Hrs
01	Probability theory: Probability: Standard definitions and concepts; Conditional Probability, Baye's Theorem. Probability Distributions: Central tendency and Dispersion; Binomial, Normal, Poisson, Weibull, Exponential, relations between them and their significance. Measures of Dispersion: Mean, Median, Mode, Range, Mean Deviation, Standard Deviation, Variance, Skewness and Kurtosis.	08
02	Reliability Concepts: Reliability definitions, Importance of Reliability, Quality Assurance and Reliability, Bath Tub Curve. Failure Data Analysis: Hazard rate, failure density, Failure Rate, Mean Time To Failure (MTTF), MTBF, Reliability Functions. Reliability Hazard Models: Constant Failure Rate, Linearly increasing, Time Dependent Failure Rate, Weibull Model. Distribution functions and reliability analysis.	08
03	System Reliability: System Configurations: Series, parallel, mixed configuration, k out of n structure, Complex systems.	05
04	Reliability Improvement: Redundancy Techniques: Element redundancy, Unit redundancy, Standby redundancies. Markov analysis. System Reliability Analysis – Enumeration method, Cut-set method, Success Path method, Decomposition method.	08
05	Maintainability and Availability: System downtime, Design for Maintainability: Maintenance requirements, Design methods: Fault Isolation and self-diagnostics, Parts standardization and Interchangeability, Modularization and Accessibility, Repair Vs Replacement. Availability – qualitative aspects.	05
06	Failure Mode, Effects and Criticality Analysis: Failure mode effects analysis, severity/criticality analysis, FMECA examples. Fault tree construction, basic symbols, development of functional reliability block diagram, Fau1t tree analysis and Event tree Analysis	05

Assessment:

Internal Assessment for 20 marks:

Consisting Two Compulsory Class Tests

First test based on approximately 40% of contents and second test based on remaining contents (approximately 40% but excluding contents covered in Test I)

End Semester Examination:

Weightage of each module in end semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

- 1. Question paper will comprise of total six questions, each carrying 20 marks
- 2. Question 1 will be compulsory and should cover maximum contents of the curriculum
- **3.** Remaining questions will be mixed in nature (for example if Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
- 4. Only Four questions need to be solved.

REFERENCES:

- 1. L.S. Srinath, "Reliability Engineering", Affiliated East-Wast Press (P) Ltd., 1985.
- 2. Charles E. Ebeling, "Reliability and Maintainability Engineering", Tata McGraw Hill.
- 3. B.S. Dhillion, C. Singh, "Engineering Reliability", John Wiley & Sons, 1980.
- 4. P.D.T. Conor, "Practical Reliability Engg.", John Wiley & Sons, 1985.
- 5. K.C. Kapur, L.R. Lamberson, "Reliability in Engineering Design", John Wiley & Sons.
- 6. Murray R. Spiegel, "Probability and Statistics", Tata McGraw-Hill Publishing Co. Ltd.