

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Mechanical Engineering, VII-Semester

Open Elective ME-703(D) Reliability Engineering

Course Objectives:

1. To introduce the basic concepts of reliability, various models of reliability.
2. To analyze reliability of various systems.
3. To introduce techniques of frequency and duration for reliability evaluation of repairable systems.

Unit 1. Reliability :

Definition, Importance, History, Reliability Vs. Quality, Failure pattern of complex product, Factor of safety and reliability, Reliability analysis procedure, Reliability management, Some examples of system failures., Reliability function-MTTF, Hazard rate function, Bath tub curve

Unit 2. Basic probability theory:

Set theory, Laws of probability, Probability theorem Random variables and probability distributions, Bay's Theorem, Central limit theorem,

Unit 3. Functions of random variables:

Single, two and several random variables, Probability distribution functions, density functions for different types of discrete and continuous variables, mean, mode and median, Numerical solutions, Extremal distributions, derivation of the reliability function-constant failure rate model – time dependent failure models. Weibull distribution – normal distribution – the lognormal distribution.

Unit 4. Modeling of geometry, strength and loads:

Fatigue strength, Time dependent reliability of components, Failure rate versus time, reliability and hazard functions and different distributions, Estimation of failure rate, Expected residual life, Series, parallel and mixed systems, complex systems, Reliability enhancement,

Unit 5. Reliability based design:

Optimization problems, Failure modes and effect analysis, Event tree and fault tree analysis, Reliability testing, Reliability data and analysis, measurement of reliability, Monte Carlo Simulation, Computation of reliability, Optimization techniques for system reliability with redundancy – heuristic methods applied to optimal system reliability- redundancy allocation by dynamic programming – reliability optimization by non linear programming.

References:

1. Singiresu S. Rao, Reliability Engineering, Pearson
2. Grant E. L. & Leavell Worth, Statistical Q. C., T.M.H.
3. Balagurusamy, Reliability Engg., T.M.H.
4. Mahajan, Statistical Q.C.
5. Juran and Grayan, Quality Planning Analysis, T.M.H
6. Charles E. Ebling, "An introduction to Reliability and Maintainability Engg", Tata McGraw-Hill, 2000
7. Atrick D T o'connor, "Practical Reliability Engineering", John-Wiley and Sons inc, 2002
8. David J Smith, "Reliability, Maintainability and Risk: Practical Methods for Engineers", Butterworth, 2002.