Gautam Buddha University, Greater Noida

School of Engineering (Mechanical Engineering)

Degree	Course Name	Course Code	Marks:100
M. Tech. in Design Engg.	Reliability in Engineering Design	MED 603	SM+MT+ET 25+25+50
Semester	**Credits**	**L-T-P**	**Exam.**
III	3	3-0-0	3 Hours

Unit - I

Introduction: Reliability definitions; Failure; Failure density; Failure rate; Hazard rate; Mean time to failure; MTBF; Maintainability; Availability; pdf; cdf; Safety and reliability; Quality; Cost and system effectiveness; Life characteristic phases; Modes of failure; Areas of reliability; Quality and reliability assurance rules; Product liability; Importance of Reliability.

(06 Hours)

Unit - II

Probability Theory: Set theory; Laws of probability; Total probability theorem; Probability distributions- Binomial; Normal; poisson ; Lognormal; Weibull ; Exponential; Standard deviation; Variance; Skewness coefficient ; Chebyshev inequality; Central limit theorem. **(06 Hours)**

Unit - III

System Reliability and Modeling: Series; Parallel; Mixed configuration; k- out of n structure; Complex systems- enumeration method; Conditional probability method; Cut set and tie set method; Redundancy; Element redundancy; Unit redundancy; Standby redundancy- types of stand by redundancy; Parallel components single redundancy; Multiple redundancy; Markov analysis. **(08 Hours)**

Unit - IV

System Reliability Analysis: Reliability allocation or apportionment; Reliability apportionment techniques – equal apportionment; AGREE; ARINC; Feasibility of objectives apportionment; Dynamic programming apportionment; Reliability block diagrams and models; Reliability predictions from predicted unreliability; Minimum effort method.**(08 Hours)**

Unit - V

Strength Based Reliability: Safety factor; Safety margin; Stress strength interaction. **(07 Hours)**

Unit - VI

Reliability Based Design of Mechanical Components: Shaft; Bearings; Joints; Gears. **(10 Hours)**

Recommended Books:

1. Concepts of Reliability Engg.; L.S. Srinath; Affiliated East-West Press (P) Ltd.; 1985.
2. Reliability Engineering; A.K. Govil; Tata McGraw-Hill Publishing Co. Ltd.; 1983.
3. Reliability Engineering; E. Balagurusmy; Tata McGraw-Hill Publishing Co. Ltd.; 1984.
4. Engineering Reliability; B.S. Dhillion and C. Singh; John Wiley & Sons; 1980.
5. Probabilistic; Reliability; M.L. Shooman; McGraw-Hill Book Co.; 1968.
6. Practical Reliability Engg.; P.D.T. Conor; John Wiley & Sons; 1985.
7. Reliability in Engineering Design; K.C. Kapur and L.R. Lamberson; John Wiley & Sons; 1977.
8. Reliability Engineering: Theory and Practice; A. Birolini; Third Edition; Springer; 1999.