GENERIC ELECTIVE COURSE–8C: INTRODUCTION TO RELIABILITY THEORY

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Introduction to Reliability Theory	4	3	0	1	Class XII Pass with Mathematics	Knowledge of Probability Distribution and Statistical Inference

Learning Objectives
The learning objectives include:

- To describe the theoretical aspects of reliability along with their application area.
- To determine the growth in the mean life and/or the reliability of units during their research, engineering and development phase.

Learning Outcomes:
After completing this course, students should be able to:
- Understand the Concept of Reliability, Maintainability and Availability.
- Understand the various estimation procedures of reliability function(s).
- Calculate Reliability of series and parallel systems.

SYLLABUS OF GE-8c

Theory

UNIT I (10 hours)
Reliability measures
Definition of Components, systems and coherent systems. Reliability functions, hazard rate function, reverse hazard rate function, residual lifetime, inactivity time, mean residual lifetime function, mean inactivity time, reliability bounds, cut and path sets.

UNIT II (08 hours)
Common life time distributions
Common lifetime distributions and their properties (Exponential, Weibull and Gamma), scale model, proportional hazard rate model, proportional reverse hazard rate model, MTTF, Bathtub failure rate, reliability importance of components.

UNIT III (12 hours)
Estimation of reliability functions
Various methods of reliability estimation (Classical); of some common lifetime distributions, Reliability estimation under complete and various censored samples. Stress-Strength reliability: concepts and its estimation for exponential and Weibull, k-out-of-n (exponential) and its application.

UNIT IV   (15hours)
Reliability systems and ageing
Reliability of series/parallel systems: introduction, series systems with identical components. Different types of redundancy. Notions of Ageing: Different ageing classes, ageing properties of common lifetime distributions, closure properties of different ageing classes under formation of coherent structures.

PRACTICAL/LABWORK–(30hours)

List of Practical:
1. Calculation of reliability function and its estimates
2. Calculation of hazard rate for various models.
3. Calculation of stress-strength reliability.
4. Various reliability and hazard rate plots.
5. Behavior of reliability estimates corresponding to sample size.
6. Practical on ageing.
7. Other relevant problems.

Practical work to be conducted using electronic spreadsheet / EXCEL/ Statistical Software Package/ SPSS/ calculators.

ESSENTIAL READINGS:
* Sinha, S.K. (1986): Reliability and Life testing; Wiley Eastern.

SUGGESTIVE READINGS:
* Barlow, R.E. and Proschan F. (1981): Statistical Theory of Reliability and Life Testing; Holt, Rinehart and Winston.
* Lawless, J.F. (2011): Statistical Models and Methods for Life Time Data, 2nd edition; John Wiley.
* Bain L.J. and Max Engelhardt (1991): Statistical Analysis of Reliability and Life Testing Models; Marcel Dekker.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch University of Delhi, from time to time.

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