

## A Reliability Course Outline

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### I-Part I (Basic Concepts)

1. Introduction and Basic Reliability Concepts
  - Context, objectives, advantages, costs, alternatives, etc. of Reliability
  - Reliability, Hazard, bath-tub curve, TTF, Numb. Failures, etc.
2. Main Distributions used in Reliability
  - Discrete and continuous, with related characteristics
  - MLE, Information, asymptotic properties, etc.
3. Distribution Identification and Assessment
  - Via Goodness of Fit tests and Empirical methods
4. Reliability for the Exponential Life
5. Reliability for the Weibull Life
6. Review and Three-part test

### II- Part II (Life testing Assessment & Demonstration)

1. Confidence, sample size bounds, censoring, zero failures
2. Acceptance sampling and Sequential Testing in reliability
3. Reliability growth modeling and analysis
4. Bayesian reliability models
5. Review and Three-part test

### III-Part III: Systems Reliability and Extensions

1. Models of total systems reliability
2. Systems Availability and Logistics
3. Reliability modeling problems and solutions

### IV-Final Project: delivery and presentation.

#### Pre-requisites:

- A Sequence of probability and statistics courses (6 credits)
- Computer ability and use of statistics SW (e.g. Minitab)

ECS 526 Reader: 2004 version contents:

Part I: Introduction and Descriptive Statistics:

1. Data Quality and Pedigree
2. Statistical Analysis of Reliability Data, Part 1: Random variables, Distributions, Parameters, & Data
  1. Empirical Assessment of Normal & Lognormal Distribution Assumptions
  2. Statistical Assumptions of an Exponential Distribution
  3. Empirical Assessment of Weibull Distribution
  4. Graphical Comparisons of Two Populations

Part II: Statistical Data Analysis:

5. Statistical Analysis of Reliability Data, Part 2: testing and Conf. Intervals
6. The Chi-Square: A Large-Sample Goodness of Fit Test
7. Anderson-Darling: A goodness of Fit Test for Small Samples Assumptions
8. Kolmogorov-Simirnov: A Goodness of Fit Test for Small Samples
9. Statistical Confidence
10. Reliability Estimations for the Exponential Life
11. Statistical Quality Control (SPC) Charts
12. Operating Characteristic (OC) Functions and Acceptance Sampling Plans
13. Understanding Binomial/Exponential Sequential Tests

Part III: Reliability Modeling:

14. Statistical Analysis of Reliability Data, Part 3: Regression/ANOVA
15. Measuring Cost Avoidance in the Face of Messy Data
16. Combining Data
17. Censored Data
18. Design and Evaluation of Aquatic Ecosystems

Part IV: Advanced Topics:

19. Understanding Series/Parallel Systems
20. Understanding Systems Availability
21. Determining the Experimental Sample Size
22. Use of Bayesian Techniques for Reliability
23. Operations Research/Statistics Techniques
24. Reliability Modeling: Problems and Solutions

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