

Probability and Statistics (3-2-0)

Evaluation:

| | Theory | Practical | Total |
|-----------|--------|-----------|-------|
| Sessional | 50 | - | 50 |
| Final | 50 | - | 50 |
| Total | 100 | - | 100 |

Course Objective:

This course is designed to familiarize the students with basic knowledge about probability and statistics. After successful completion of this course students would be able to understand and apply the concept of presentation and summarization of data, probability and probability distributions, sampling and estimation, hypothesis testing, simple regression and correlation.

Course Contents:

1. Introduction of Statistics and Presentation of Data

(4hrs)

- 1.1 Introduction of statistics
- 1.2 Application of statistics in engineering
- 1.3 Variables, types of variable: numerical and categorical variable
- 1.4 Sources of data: primary and secondary source
- 1.5 Presentation and classification of data: stem- and-leaf displays
- 1.6 Frequency distribution
- 1.7 Diagrammatic and graphical presentation of data: Pareto diagram
- 1.8 Pie-diagram, histogram, frequency curve and frequency polygon
- 1.9 Cumulative frequency curve or ogive curve

2. Summarizing and Describing the Numerical Data

(4hrs)

- 21 Measure of central tendency (mean, median, mode). partition values
- 22 Measure of variation: range, inter-quartile range, standard deviation
- 2.3 Coefficient of variation
- 2.4 Box and whisker plot

3. Probability

(5 hrs)

- 31 Random experiment, sample space. event and types of events, counting rule
- 32 Various approaches to probability
- 33 Laws of probability-additive, multiplicative
- 3.4 Conditional-probability and independence
- 3.5 Baye's theorem

4. Random Variable and Probability Distribution

(12 hrs)

- 4.1 Random variable: discrete and continuous random variable
- 4.2 Probability mass function
- 4.3 Expectation. laws of expectation (addition and product law)
- 4.4 Discrete probability distribution: Binomial distribution, Poisson distribution, Hyper Geometric distribution and Negative binomial distribution

- 4.5 Probability density function, cumulative distribution functions, expected values of continuous random variables
- 4.6 Continuous probability distribution: rectangular distribution, exponential distribution, Gamma distribution, Beta distribution, Normal distribution, Log-Normal distribution

5. Bi-variate Random Variables and Joint Probability Distribution (3 hrs)

- 5.1 Joint probability mass function joint probability density function joint probability distribution function
- 5.2 Marginal probability mass function, marginal probability density function, conditional probability mass function
- 5.3 Sums and average of random variables

6. Sampling and Estimation (5 hrs)

- 6.1 Population and samples
- 6.2 Sampling distribution of mean
- 6.3 Types of sampling: probability and non-probability sampling
- 6.4 Determination of sample size
- 6.5 Central limit theorem and its application
- 6.6 Estimation: concept of point and interval estimation, criteria of good estimator, interval estimation, maximum likelihood estimation
- 6.7 Confidence interval for population mean and population proportion

7. Testing of Hypothesis (7hrs)

- 7.1 Null and alternative hypothesis, level of significance, type I and type II error, critical value, P-value, one and two tailed test, steps involved in hypothesis testing
- 7.2 One Sample test for mean and proportion
- 7.3 Two sample test for mean (independent and dependent) and proportion

8. Simple Linear Regression and Correlation (5 hrs)

- 8.1 Simple correlation and its properties
- 8.2 Concept of simple regression analysis. estimation of regression coefficient by using least square estimation method
- 8.3 Standard error, coefficient of determination.

Text Book:

Johnson, Richard A *Probability and Statistics for Engineers* (8th edition). New Delhi: PHI learning private limited. 2011.

Reference Books:

1. Devore, Jay L. *Probability and Statistics. for Engineering and the Sciences* (8th edition). New Delhi: Cengage learning.
2. Sheldon, M. Ross. *Probability and Statistics for Engineers and Scientist* (4th edition). New Delhi: Cengage Learning.
3. Shrestha, Hridya B. *Statistics and Probability* (2nd edition), Kathmandu: Ekata Books Distributer Pvt. Ltd.