Department of Statistics and Computer Science

STA 112 3.0 Probability and Distribution Theory I

Type: Core

Duration: Forty five (45) hours

Credit value: 3.0

Pre-requisites: None

Course contents:

1 ELEMENTS OF PROBABILITY

1.1 Introduction
1.2 Events
    1.2.1 Events as subsets of sample spaces
    1.2.2 Random variables
    1.2.3 Events in terms of random variables
1.3 Event operations
    1.3.1 Complement
    1.3.2 Intersection
    1.3.3 Union
1.4 Axioms of probability
1.5 Interpretations of probability
    1.5.1 Relative frequency interpretation
    1.5.2 Subjective interpretation
1.6 Methods for determining probability
    1.6.1 Classical method
    1.6.2 Relative frequency method
    1.6.3 Subjective method
    1.6.4 Using probability models
1.7 Conditional probability
1.8 Rules of probability
    1.8.1 Complement
    1.8.2 Addition rule
    1.8.3 Multiplication rule
    1.8.4 The law of total probability
    1.8.5 Bayes' theorem

2 DISTRIBUTION FUNCTION

2.1 Probability mass function
    2.1.1 Properties of a pmf
2.2 Probability density function
    2.2.1 Properties of pdf
    2.2.2 Existence of pdf
    2.2.3 Calculation of probability using pdf
2.3 Cumulative distribution function
    2.3.1 Relationship between cdf and pdf
2.4 Descriptive properties of distributions
    2.4.1 Mean of a random variable
    2.4.2 Variance of a random variable

Method of Assessment:
1.5 – hour test 1: 20%
1.5 – hour test 2: 20%
The best mark out of the above two tests will be considered for 20%
Three-hour end-semester examination: 80%

Course Objectives:
The objective of this course unit is to provide the basic knowledge required to calculate probabilities of events.

Learning Outcomes:
By the end of the course unit students should be able to,

- explain the meaning of technical terms.
- state and prove probability rules and theorems.
- write down events as subsets of sample spaces.
- property define events related to problem.
- write down complex events in terms of basic events.
- calculate probability of events using probability rules.
- interpret the probability
- identify random variables of interest in problems
- express events of interest in terms of random variables
- select suitable probability models for random variables
- correctly use the notations introduced in class.
- calculate probabilities, moments and quantiles related to distributions.
- use relationships between distributions in solving problems.
- state and use central limit theorem in solving problems.
- state sampling distributions taught in class.
- Solve the problems provided in class, answer the past papers available in the website of the department, and solve any other problem of similar nature that invoves the course content.

Recommended text book:

- Introduction to the Theory of Statistics
  Authors: Mood, A.M., Graybill, F. A., and Boes, D. Publisher: McGraw Hill

Lecturer in charge: Ms. Thiyanga Talagala