University of Sri Jayewardenepura

Faculty of Applied Sciences

Department of Statistics

STA 123 2.0 Probability and Distribution Theory II

Type: Core

Duration: 30 lecture hours

Pre-requisites: STA 114 2.0 Probability and Distribution Theory I
STA 113 2.0 Descriptive Statistics

Course Objective:

The objective of this course unit is to introduce concepts, theory and applications of basic knowledge required to calculate probabilities using methods outlined in "course contents".

Course contents:

1. Probability Density Function(pdf)
   1.1 Properties of pdf
   1.2 Existence of pdf
   1.3 Calculation of probabilities using pdf

2. Cumulative Distribution Function
   2.1 cdf of a discrete random variable
   2.2 cdf of a continuous random variable
   2.3 Relationship between cdf and pdf

3. Descriptive properties of distributions
   3.1 Mean of a random variable
   3.2 Variance of a random variable

4. Models for Continuous Distributions
   4.1 Uniform Distribution
       4.1.1 Calculation of probabilities
       4.1.2 Mean and variance of Uniform Distribution
   4.2 Normal Distribution
       4.2.1 Mean and variance of t distribution
       4.2.2 Calculation of Normal probabilities
       4.2.3 Empirical rules

4.2.4   Calculation of normal quantiles

4.2.5   Poisson approximation to Binomial

4.2.6   Normal approximation to Binomial

4.3 Student's t distribution

4.3.1   Mean and variance of t distribution

4.3.2   Calculation of probabilities

4.3.3   Normal approximation to t distribution

4.4 Gamma distribution

4.4.1   Mean and variance of the gamma distribution

4.4.2   Calculation of gamma probabilities

4.4.3   Normal approximation to gamma distribution

4.5 χ^2 distribution

4.5.1   Mean and variance of the χ^2 distribution

4.5.2   Calculation of probabilities of χ^2 distribution

4.5.3   Quantiles of χ^2 distribution

4.6 Exponential Distribution

4.6.1   Mean and variance of Exponential Distribution

4.6.2   Calculation of probabilities of Exponential distribution

4.7 F Distribution

5. Distribution of Functions of Random Variable

5.1 Distribution of transformations of random variables

5.2 Distribution of sum of independent random variables

5.3 Sampling distributions

6. Moment Generating Function Technique

Learning Outcomes:

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

- Explain the meaning of technical terms

- Determine probabilities from probability density function
- Determine cumulative distribution functions from probability density function
- Determine probabilities from cumulative distribution functions
- Calculate mean and variance for some common probability distributions
- Derive moment generating function of different distributions.

- Select appropriate continuous probability distributions to calculate probabilities in specific applications
- Calculate moments and quantiles related to distributions
- Use relationships between distributions in solving problems
- Correctly use the notations introduced in the class

Reference Text books:

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

2. Probability and Statistics for Engineering and Sciences
   Author: Jay L Devore
   Publisher: BROOKS/ COLE CENGAGE Learning

Method of Assessment:

1. **<u>Unannounced</u>** Quizzes – 25%

   (Two unannounced quizzes will be held and the test with the best mark out of the above two tests will be considered for 25%. You can bring one (1) letter/A4 sized sheet of paper with *hand-written* notes on both sides. There are no restrictions for the contents of that sheet.)

2. Two – hour end semester examination – 75%

Lecturer in charge: Ms. Thiyanga Talagala
Second Semester, 2014 – Starting on 4th August, 2014