



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. Unannounced 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