University of Sri Jayewardenepura

Department of Statistics

STA 318 2.0 Advanced Probability and Distribution Theory

Type : : Optional for General Degree students
Compulsory for Statistics Special Degree Students

Duration: 30 lecture hours

Pre-requisites: STA 112 3.0 Probability and Distribution Theory I
STA 121 3.0 Statistical Inference

Objectives:

- To introduce advanced concepts in distribution theory which is required to follow advanced statistical courses.

Course contents:

1. Bivariate Distributions

   Random Vector, Joint Probability Mass Function, Joint Probability Density Function, Cumulative Distribution Function, Marginal Distribution, Conditional Probability Distribution, Expectation, Variance, Covariance and Correlation

2. Generating Functions

   Moment Generating Function, Characteristic Function, Probability Generating Function

3. Distribution of a Function of Random Variables

   Moment Generating Function Technique, Cumulative Distribution Function Techniques, Transformation Technique

4. Normal Distribution

   Bivariate Normal Distribution, Multivariate Normal Distribution

5. Important Inequalities

   Markov's Inequality, Chebyshev's Inequality

Learning Outcomes: At the end of the course, you will be able to:

- Calculate probabilities related to bivariate distributions.
- Find marginal distributions and conditional distributions.
- Calculate Expectation, Variance, Covariance and Correlation related to random variables.
- Derive moment generating function, characteristic function and probability generating functions of different distributions.
- Calculate moments using moment generating functions.
- Identify distributions of functions of random variables.
- Calculate marginal probabilities, conditional probabilities and joint probabilities related to bivariate normal distribution.
- Identify distributions of functions of multivariate normal random variables.
- Apply Markov's Inequality and Chebyshev's Inequality.

Method of Assessment:

1. Mid Semester Examination - 20%
2. End of Semester Examination - 80%

Note: At least 80% attendance for lectures is required to sit for end semester examination

Reference Text books:

Mood, A. M., Graybill, F. A., and Boes, D., *Introduction to the theory of Statistics.*

Gupta, S. C. and Kapoor, V. K., *Fundamentals of Mathematical Statistics*.

Lecturer in charge: Ms. Thiyanga Talagala