Jimma University

College of Natural Sciences

Department of Statistics

Course title: Introduction to Probability

Course code: **Stat1012**

Credit: 5 EtCTS

Credit hours: 3 (3Lecture hrs+2 hrs tutorial)

Instructor's Name: Reta H. (MSc.)

Email: habtamuretab@yahoo.com

Length of time to complete the course: 16 Weeks

Course description

Elementary probability; Random variables; Probability distributions, Cumulative distribution function; Common discrete probability distributions: Binomial, Poisson and Geometric; Common continuous distributions: Uniform, Normal and exponential; Functions of random variables and their distributions, Expectation, Covariance and Correlation.

Objectives

- to introduce students to the fundamental concepts in probability theory;
- to introduce the basic principles and methods of quantification of uncertainty;
- to introduce the basics of random variables, common probability distributions and expectation;
- to introduce two dimensional random variables their probability distributions including marginal and conditional distributions and independence;
- to introduce one and two dimensional functions and computing their probability distribution, expectation, variance and correlation;
- to demonstrate the importance and usefulness of probability in real applications;
- to build up interest in probability and hence encourage students to study more advanced courses.

Learning outcomes

At the end of the course students are expected to:

- equip themselves with basic concepts of probability and a good appreciation of the laws of probability;

- know what is meant by a random variable, probability distribution, cumulative distribution function, probability density function, expectation, variance and correlation;
- use standard statistical tables for the normal, t, chi-square and F distributions;
- understand conditional probability and independence;
- define joint, marginal and conditional distribution and independent random variables;
- be familiar with functions of random variables and derive their probability distributions
- compute expectation, variance and correlation of random variables;
- be familiar with standard discrete and continuous probability distributions and their applications.

Course Outline

1. Introduction (6 lecture hours)

1.1 Deterministic and non-deterministic models

1.2 Random experiments, sample space and events

1.3 Review of set theory: sets, union, intersection, complementation, De Morgan's rules

1.4 Finite sample spaces

1.5 Equally likely outcomes

1.6 Counting techniques

1.7 Definitions of probability

1.8 Axioms of probability

1.9 Derived theorems of probability

2. Conditional Probability and Independence (5 lecture hours)

2.1. Conditional Probability

2.2 Multiplication rule

2.3 Partition Theorem, Bayes' Theorem and Applications

2.4 Independent Events

3. One-dimensional Random Variables (5 lecture hours)

3.1 Random variable: definition and distribution function

3.2 Discrete random variables

3.3 Continuous random variables

3.4 Cumulative distribution function and its properties

4. Functions of Random Variables (4 lecture hours)

4.1. Equivalent events

4.2. Functions of discrete random variables and their distributions

4.3. Functions of continuous random variables and their distributions

5. Two-Dimensional Random Variables (6 lecture hours)

5.1 Two-dimensional random variables

5.2 Joint distributions for discrete and continuous random variables

5.3 Marginal and conditional probability distributions

5.4 Independent random variables

5.5 Distributions of functions of two random variables

6. Expectation (6 lecture hours)

6.1 Expectation of a random variable

6.2 Expectation of a function of a random variable

6.3 Properties of expectation

6.4 Variance of a random variable and its Properties

6.5 Moments and moment generating function

6.6 Chebyshev's Inequality

6.7 Covariance and Correlation Coefficient

6.8 Conditional Expectation

7. Common Discrete Distributions and their Properties (8 lecture hours)

7.1 Binomial distribution

7.2 Poisson distribution

7.3 Geometric distribution

8. Common Continuous Distributions and their Properties (8 lecture hours)

8.1 Uniform distribution

8.2 Normal distribution

8.3 Exponential distribution

Textbooks

Meyer L. P. Introductory Probability and Statistical Applications (2nd Edition), Amerind Pub. Co.

References

1. Cheaffer, R.L. and McClave, J.T (1994). Probability and Statistics for Engineers (4nd Edition). Duxbury Press.
2. Lipschutz, S. and Schiller, J. (1998). Introduction to Probability and Statistics. Schaum's Outline Series, Mc Graw-Hill.
3. Mendenhall, W., Beaver, R.J. and Bearer, B.M. (2008). Introduction to Probability and Statistics (13th Edition). Duxbury Press.
4. Mendenhall, W., Beaver, R.J. and Bearer, B.M. (2005). Student Solutions Manual for Introduction to Probability and Statistics (12th Edition). Duxbury Press.
5. Walpole, R. E., Myers, S.L. and Ye, K. (2006). Probability and Statistics for Engineers and Scientists (6th Edition). Prentice Hall.
6. Roussas, G. G. (2006). Introduction to Probability. Academic Press.
7. Bertsekas, D. P. and Tsitsiklis, J. N. (2008). Introduction to Probability (2nd Edition). Athena Scientific.
8. Suhov, Y. and Kelbert, M. (2005). Probability and Statistics by Examples. Cambridge University Press.
9. Ross S. (2006). A First Course in Probability (7th Edition). Prentice-Hall, Upper Saddle River, New Jersey.

Teaching and learning methods

Lectures, tutorials and assignments.

Mode of Assessment

Continuous Assessment 50%

Final Exam 50%

Method	Assignment	Test	Quiz	Final
Percent	20	20	10	50
Frequency	At least 4	2	At least 2	1