Math 175 (Probability)

Course Outline

Course Information

Course Code: Math 175

Course Title: Probability

Pre-requisite: Math 153 (Calculus II), Math 151 (Fundamental Concepts of Mathematics)

Co-requisite: Math 154 (Calculus III)

Credit: 3.0 units

Semester Offered: Second Semester

Number of Contact Hours per Week: 3 hours

Course Description: This is an introductory course in probability covering axiomatic probability space, discrete and continuous random variables, special probability distributions; mathematical expectations, conditional probability and independence, multivariate distributions, Laws of Large Numbers, and the Central Limit Theorem

Course Outcomes

1. Compute probability of events;
2. Evaluate the distributional properties of discrete random variables;
3. Evaluate the distributional properties of continuous random variables;
4. Derive properties of multivariable distributions ;
5. Derive the distribution of functions of random variables; and
6. Derive sampling distributions and prove the Law of Large Numbers and the Central Limit Theorem.

Topical Outline

Module 1. Introduction to Probability

1. Properties of Probability
2. Counting Methods
3. Conditional Probability, Multiplication Rule of Probability, and Bayes Theorem
4. Independent Events

Module 2. Discrete Random Variables and Their Probability Distribution

1. Random Variables and Their Probability Distribution
2. Mathematical Expectation
3. Moment Generating Functions
4. The Binomial Distribution
5. The Geometric and Negative Binomial Distributions
6. The Hypergeometric Distribution
7. The Poisson Distribution

Module 3. Continuous Random Variables and Their Probability Distribution

1. Probability Density Function and Cumulative Distribution Function of Continuous Random Variables
2. Mathematical Expectation for Continuous Random Variables
3. The Uniform Distribution
4. The Normal Distribution
5. The Gamma Distribution
6. The Exponential Distribution
7. The Chi-Square Distribution
8. The Beta Distribution

Module 4. Multivariate Distributions

1. Joint Probability Distribution
2. Marginal Probability Distribution
3. Conditional Probability Distribution
4. Independent Random Variables

Module 5. Multivariate Probability Distributions

1. The method distribution functions
2. The method of transformations
3. The method of moment generating functions
4. Bivariate transformation

Module 6. Sampling Distribution, Law of Large Numbers and the Central Limit Theorem

1. Sampling distribution
2. Law of Large Numbers
3. Central Limit Theorem

Course Requirements and Grading System

1. Quizzes (15%)
2. Problem Sets (25%)
3. Long Examinations (60%)

Rating (%)	Grade Equivalent
98-100	1.00
95-97	1.25
90-94	1.50
85-89	1.75
80-84	2.00
75-79	2.25
70-74	2.50
65-69	2.75
60-64	3.00
53-59	3.25
46-52	3.50
39-45	3.75
32-38	4.00
25-31	4.25
18-24	4.50
11-17	4.75
0-10	5.00

Suggested References

1. Milla, N. E. (2024). Student Learning Guide in Math 175 (Probability).
2. Mendenhall, W., Scheaffer, R. L., and Wackerly, D. D. (2008). Mathematical Statistics with Applications, 7th ed. Brooks/Cole, Cenage Learning.
3. Hogg, R. V., Tanis, E. A., and Zimmerman, D. L. (2015). Probability and Statistical Inference, 9th ed. Pearson Education, Inc.
4. Hogg, R.V. and Craig, A. T. (2004). Introduction to Mathematical Statistics, Fifth Edition, Macmillan Publishing Co., Inc., N.Y.
5. Ramachandran, K. M. and Tsokos, C. P. (2009). Mathematical Statistics with Applications. Elsevier Inc.
6. Miller, I. and Miller, M. (1999). John E. Freund's Mathematical Statistics. 6th ed. Prentice-Hall Int'l., Inc. New Jersey.
7. Mood, Graybill, and Boes. 1974. Introduction to the Theory of Statistics. Third Edition. International Student Edition. McGraw-Hill Kogakusha, Ltd.
8. https://online.stat.psu.edu/stat414/