

INTRODUCTION TO PROBABILITY AND STATISTICS I

MATH 4740/8746

1.0 Course Description

- 1.1 Overview of Content and Purpose:** (3 hours) A mathematical introduction to probability theory including the properties of probability; probability distributions; expected values and moments, specific discrete and continuous distributions; and transformations of random variables.
- 1.2 For whom Intended:** The student should gain a solid foundation in elementary probability theory and should be ready to apply it to a statistical inference in MATH 4750/8756.
- 1.3 Prerequisite:** MATH 2030 or MATH 2230, MATH 1970.

2.0 Content and Organization

- 2.1 Topics:**
1. Probability Theorem
 - a) Properties of probability
 - b) Conditional probability
 - c) Independence
 - d) Bayes theorem
 2. Discrete Distributions
 - a) Probability distribution functions and cumulative distribution functions
 - b) Mean and variance; moment-generating functions
 - c) Marginal and conditional probability distributions
 - d) Some specific discrete distributions
 3. Continuous Distributions
 - a) Probability density functions and cumulative distribution functions
 - b) Mean and variance; moment generating functions
 - c) Marginal and conditional probability distributions
 - d) Some specific continuous distributions
 4. Functions of Random Variables
 - a) Distribution function technique
 - b) Transformation technique
 - c) Moment-generating function technique

3.0 Teaching Methodology

- 3.1 Methods to be Used:** The class will be presented by lecture; class discussion and questions; and problem assignments, possibly including the use of statistical software packages.

4.0 Evaluation

- 4.1 Basis for Evaluating Student Performance:** Students will be evaluated by examinations and performance on assigned homework problems and computer software use (if appropriate). Graduate students will be given assignments involving work not expected of undergraduate students.

5.0 Resource Material

5.1 **Textbook(s) or Other Required Readings:** Freund, *Mathematical Statistics with Applications*, 7th Ed., Pearson Prentice-Hall, 2004.

6.1 **Current Bibliography of Resources:**

1. Freund, W.J., *Mathematical Statistics*, 5th Ed., Prentice-Hall, Inc., Englewood Cliffs, N.J., 1994.
2. Hoel, P.G., *Mathematical Statistics*, 5th Ed., John Wiley & Sons, Inc., New York, 1984.
3. Hogg, R.V., & Craig, A.T., *Introduction to Mathematical Statistics*, 5th Ed., Prentice-Hall, Inc., Englewood Cliffs, N.J., 1995.
4. Mood, A.M., Graybill, F.A., Boes, D.C., *Introduction to the Theory of Statistics*, 3rd Ed. McGraw Hill, Inc., New York, 1974.