



DEPARTMENT OF MATHEMATICS AND COMPUTER & INFORMATION SCIENCE

INTRODUCTION TO PROBABILITY AND STATISTICS MA3210

Departmental Syllabus

**TEXTBOOK:** **Probability and Statistics for Engineers and Scientists, 9/E**, by Walpole, Myers, Myers, Ye, Pearson 2012, ISBN-13: 9780321629111.

**Prerequisite:** A grade of **C** or higher in MA2310 Calculus I or MA2300 Calculus for Business

**COURSE DESCRIPTION:** Foundation material in probability and statistical inference. Topics include sample spaces, conditional probability and Bayes' rule, random variables, discrete and continuous probability distributions, expectation, estimation, and hypothesis testing.

**COURSE OBJECTIVES:** To provide a foundation in probability theory and statistical inference in order to solve applied problems and to prepare for more advanced courses in probability and statistics.

**COURSE EVALUATION & GRADING:** Course grade will be based on midterm exams, quizzes, homework, and Final Exam. The Final exam is **cumulative** and it counts at least **30%** of the course grade. The grading scale is as follows:

A = [94, 100] A <sup>-</sup> = [90, 93]	B <sup>+</sup> = [87, 89]	C <sup>+</sup> = [77, 79]	D <sup>+</sup> = [67, 69]	F = [0, 59]
	B = [84, 86]	C = [74, 76]	D = [64, 66]	
	B <sup>-</sup> = [80, 83]	C <sup>-</sup> = [70, 73]	D <sup>-</sup> = [60, 63]	

**TUTORIAL:** Drop-in tutorial is available in the Mathematics Learning Center.

**ACCOMMODATIONS FOR STUDENTS WITH SPECIAL NEEDS:** If you have or suspect you may have a physical, psychological, medical or learning disability that may impact your course work, please contact Stacey DeFelice, Director, The Office of Services for Students with Disabilities (OSSD), NAB, 2065, Phone: 516-628-5666, Fax (516) 876-3005, TTD: (516) 876-3083. E-mail: defelices@oldwestbury.edu. The office will help you determine if you qualify for accommodations and assist you with the process of accessing them. All support services are free and all contacts with the OSSD are strictly confidential.

## TOPICS TO BE COVERED

*Textbook* **Probability and Statistics for Engineers and Scientists, 9/E**, by Walpole, Myers, Myers, Ye, Pearson 2012, ISBN-13: 9780321629111.

### **2. Probability**

- 2.1 Sample Space
- 2.2 Events
- 2.3 Counting Sample Points
- 2.4 Probability of an Event
- 2.5 Additive Rules
- 2.6 Conditional Probability, Independence and Product Rules
- 2.7 Bayes' Rule

### **3. Random Variables and Probability Distributions**

- 3.1 Concept of a Random Variable
- 3.2 Discrete Probability Distributions
- 3.3 Continuous Probability Distributions
- 3.4 Joint Probability Distributions

### **4. Mathematical Expectation**

- 4.1 Mean of a Random Variable
- 4.2 Variance and Covariance of Random Variables
- 4.3 Means and Variances of Linear Combinations of Random Variables 127
- 4.4 Chebyshev's Theorem

### **5. Some Discrete Probability Distributions**

- 5.1 Introduction and Motivation
- 5.2 Binomial and Multinomial Distributions
- 5.3 Hypergeometric Distribution
- 5.4 Negative Binomial and Geometric Distributions
- 5.5 Poisson Distribution and the Poisson Process

### **6. Some Continuous Probability Distributions**

- 6.1 Continuous Uniform Distribution
- 6.2 Normal Distribution

- 6.3 Areas under the Normal Curve
- 6.4 Applications of the Normal Distribution
- 6.5 Normal Approximation to the Binomial
- 6.6 Gamma and Exponential Distributions
- 6.7 Chi-Squared Distribution

## **8. Sampling Distributions and More Graphical Tools**

- 8.1 Random Sampling and Sampling Distributions
- 8.2 Some Important Statistics
- 8.3 Sampling Distributions
- 8.4 Sampling Distribution of Means and the Central Limit Theorem
- 8.5 Sampling Distribution of  $S^2$
- 8.6 t-Distribution
- 8.7 F-Distribution

## **9. One- and Two-Sample Estimation Problems**

- 9.1 Introduction
- 9.2 Statistical Inference
- 9.3 Classical Methods of Estimation
- 9.4 Single Sample: Estimating the Mean
- 9.5 Standard Error of a Point Estimate
- 9.6 Prediction Intervals
- 9.7 Tolerance Limits
- 9.12 Single Sample: Estimating the Variance

## **10. One- and Two-Sample Tests of Hypotheses**

- 10.1 Statistical Hypotheses: General Concepts
- 10.2 Testing a Statistical Hypothesis
- 10.3 The Use of P-Values for Decision Making in Testing Hypotheses
- 10.4 Single Sample: Tests Concerning a Single Mean