MATH 2423 Probability(3 credit hours)

Elmira College

SPRING 2025

Required Text:

1. ***Introduction to Probability and Statistics for Engineers and Scientists*** (5th Edition) by Sheldon M. Ross;
2. ***First Course in Probability*** (10th edition) by Sheldon Ross, 2019, Pearson.

Pre-requisites: MATH 2020 Calculus II

Course Description

This course offers an overview of probability theory and its applications in various scientific fields. The course covers the mathematical treatment of random events occurring in natural, physical, and social sciences. Topics include mathematical probability axioms, combinatorial analysis, binomial distribution, Conditional probability and independence, Poisson distribution, normal distribution, random variables, probability distributions,moments, sampling distributions, expectations, and limit theorems.

Course Objectives and Goals

- Understand convergence concepts and apply them in various contexts.
- Identify and analyze different types of random variables and their distributions.
- Understand and apply the weak law of large numbers and central limit theorem.
- Calculate conditional probabilities and determine independence.
- Use moment generating functions to calculate moments and describe distributions.

Evaluation of Performance

Your grade will be based upon your performance on exams, assignments, and participation.

Assignments	20%
Problem Sets	10%
Mini Quizzes	30%
Midterm Exam	20%
Final Exam	20%
Total	100%

Grades will be assigned as follows:

A	93% and above	B-	80 - 82%	D+	67 - 69%
A-	90 - 92%	C+	77 - 79%	D	63 - 66%
B+	87 - 89%	C	73 - 76%	D-	60 - 62%
B	83 - 86%	C-	70 - 72%	F	59% or below

Withdrawal Policy: Please see Elmira College Bulletin for information on this policy.

Academic Honesty: Please read the section on Academic Honesty in the **Code of Conduct**. Briefly, academic dishonesty includes: cheating, fabrication, facilitating academic dishonesty, and plagiarism. Ask if you have any questions on whether something constitutes as academic dishonesty. All work must be original and new. Past assignments from current or other courses will not be accepted. Academic dishonesty will not be tolerated. It will result in zero on the assignment, and a report will be filed with the school. Continued practice will result in failure of the class. Institutional penalties may also apply with repeated acts of academic honesty.

Student Responsibility:

- It is your responsibility to keep track of assignments and due dates.
- You should ask questions concerning assignments and lectures, if you need any clarifications.
- If you are struggling in class, have concerns, and/or unsure about expectations, please stop by during office hours or make an appointment for another time.

Tentative Schedule of Topics

Topic	Materials	Tasks & Evaluations
Foundation of Probability Theory	Chapter 1	
Basic Concepts of Probability	Chapter 2	
Axioms of Probability	Chapter 3	Assignment #1
Combinatorial Analysis	Chapter 4	
Probability as a Continuous Set Function	Chapter 5	
Probability as a Measure of Belief	Chapter 6	Assignment #2
Probability Distributions	Chapter 7	
Discrete Probability Distributions	Chapter 8	Problem Set #1
Continuous Probability Distributions	Chapter 9	
The Normal Distribution	Chapter 10	
Random Variables	Chapter 11	Mini Quiz #1
Expected Value and Variance	Chapter 12	
The Bernoulli and Binomial Random Variables	Chapter 13	Midterm Exam
Normal Random Variables and Exponential Random Variables	Chapter 14	
Joint Probability Distributions	Chapter 15	
Conditional Probability and Independence	Chapter 16	Assignment #3
Bayes' Theorem	Chapter 17	
Independent Events	Chapter 18	
P(·|F) Is a Probability	Chapter 19	Assignment #4
The Central Limit Theorem	Chapter 20	
Confidence Intervals	Chapter 21	Problem Set #2
Hypothesis Testing	Chapter 22	
Type I and Type II Errors p-Values	Chapter 23	
Regression Analysis	Chapter 24	Mini Quiz #2

Simple Linear Regression	Chapter 25	
Multiple Linear Regression	Chapter 26	
Model Selection	Chapter 27	Final Exam