STAT 3933 PRINCIPLES OF QUANTITATIVE STATISTICS(3 credit hours)

Elmira College

SPRING 2025

Required Text:

1. James L. Johnson(1997). ***Probability and Statistics for Computer Science***(1st ed.).Wiley-Blackwell.
2. Marina Meila(2022). ***Probability and Statistics for Computer Science***. Washington.edu.

Supplemental readings might be included to illustrate or expand on textbook readings.

Pre-requisites: STAT 1200 Introductory Probability and Statistics

Course Description

This course provides a comprehensive introduction to quantitative statistical methods, focusing on probability theory, statistical modeling, and data analysis. Students will learn key concepts such as descriptive statistics, probability distributions, hypothesis testing, regression analysis, and time series forecasting. While the course emphasizes computational techniques, business-related examples and case studies will be used to illustrate practical applications.

Course Objectives and Goals

- Analyze and interpret descriptive and inferential data, including tabular, graphical, and numerical representations, to draw meaningful insights;
- Apply fundamental concepts of probability and probability distributions to evaluate real-world problems and quantify uncertainty;
- Implement statistical modeling techniques, such as maximum likelihood estimation and Bayesian estimation, to estimate model parameters and assess their suitability for various data sets;
- Use hypothesis testing and inferential methods, such as chi-square and analysis of variance, to evaluate business hypotheses and make data-driven conclusions;
- Employ regression techniques, including simple, multiple, and logistic regression, to model relationships and solve complex business problems;
- Build time series models and develop forecasting strategies to analyze trends and predict future outcomes in various fields;
- Leverage statistical software tools to tackle quantitative challenges and apply statistical techniques across business contexts and other areas.

Evaluation of Performance

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

6 Quizzes	30%
2 Homework	20%
Midterm Exam	20%

Final Exam	30%
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
Probability and statistics in computer science	Chapter 1	
Combinatorics and probability	Chapter 2	
Probability spaces and random variables	Chapter 3	Quiz 1
Conditional probability	Chapter 4	
Discrete distributions	Chapter 5	Quiz 2
Statistics and their properties	Chapter 6	Homework 1
The multivariate normal distribution	Chapter 7	
Discrete decision theory	Chapter 8	Quiz 3
Maximum likelihood estimation for the discrete distribution	Chapter 9	
Confidence intervals	Chapter 10	Midterm Exam
Continuous sample spaces	Chapter 11	
Continuous distributions	Chapter 12	
Parametric density estimation	Chapter 13	Quiz 4
Non-parametric density estimation	Chapter 14	
Cross-validation	Chapter 15	Quiz 5
Bayesian estimation	Chapter 16	

Linear regression	Chapter 17	
Likelihood ratio classification	Chapter 18	Homework 2
Statistical estimators as random variables	Chapter 19	Quiz 6
Mixtures: A statistical view of clustering	Chapter 20	
Hypothesis testing	Chapter 21	Final Exam