CEE 260/MIE 273
Probability and Statistics in Engineering
Fall 2025 Course Syllabus

Contents

1 Personnel and Logistics

1.1 Venue and Class Time

All classes will be held Engineering Lab II Room 119. They will also be recorded and available for download via Canvas (using Echo360). You are expected to attend all lectures, except by prior notification. I will also upload slides in advance of each lecture. Periodically, I will also make typeset notes available to you, particularly for exam review sessions. I encourage you to use the Canvas Forum for discussions on homework, problem sets and other academic/course matters.

Day & Time: Tuesdays 1:00PM – 2:15PM
Physical Location: ELab II Room 119
Gradescope Entry Code: J6W65J
Project Presentations: December 11 (10:30AM – 12:30PM)

1.2 Instructor

Name: Dr. Jimi Oke[1]
Email: jimi@umass.edu
Office: Marston 214D
Office Hours: Wednesdays and Thursdays (2:20 – 3:20PM)

1.3 Teaching Assistant

The Teaching Assistant will be responsible for coordinating the course and holding additional office hours for homework help.

Name: Mohammed Abdalazeem
Email: mamohammed@umass.edu
Tutorials: Fridays (10:00AM – 11:00AM; Location: TBD)

1.4 Graders

Two graders will be responsible for evaluating and assigning grades to problem sets:
- Colin O'Brien
- Rillary Madruga Ferreira

2 Course Information

2.1 Description

The Probability and Statistics in Engineering course is designed to introduce students to the field of probability and statistics, and demonstrate its importance and utility in the solution of problems specifically of interest to civil, environmental, mechanical and industrial engineering. Core areas covered by this course are
- basic probability concepts
- the role of uncertainty in engineering design
- sampling and inference (hypothesis testing, confidence intervals, ANOVA)
- probability distribution model fitting and testing
- regression and correlation analyses

[1] Pronounced "aw-KEH"; Pronouns: He/Him/His

2.2 Objectives

CEE 260/MIE 273 aims to introduce you to statistical methods in engineering and develop your ability to analytically apply these methods in your practice of engineering.

2.3 Outcomes

In this course, you will:

- Understand the fundamental concepts of probability, such as independence, expectation, error propagation, and density functions.
- Identify, apply and evaluate the proper probability model for different systems.
- Use statistical methods to describe processes and make inferences about systems from data.
- Perform regression analyses, test hypotheses, and calculate confidence intervals for solving engineering problems.
- Develop and apply computational and numerical approaches to quantify uncertainty.
- Gain proficiency with Python for statistical analysis.

2.4 Textbook

Required Text: Diez, David, Cetinkaya-Rundel, Mine, and Barr, Christopher. OpenIntro Statistics (4th Ed.) 2019. https://leanpub.com/openintro-statistics

Supplementary Reading: William Navidi. Statistics for Engineers and Scientists. Fifth Edition, McGraw-Hill Education 2020.

Other resource: Kunin et al. Seeing Theory (https://seeing-theory.brown.edu/index.html)

2.5 Prerequisite

MATH 132 (or equivalent).

3 Policies

My goal is to introduce you to the rudiments of probability and statistics within an engineering context. I will use slides in the classroom, and annotate them electronically when possible. These slides will be available to you prior to the lecture. I will endeavor to foster an equitable and inclusive learning environment that will spark your curiosity and challenge you learn actively. I strongly urge you to come to class prepared, having done the reading, ready to reflect on your homework or problem set and engage with new material. I will ask frequent questions of you, and will also expect you to ask as many questions as possible. Further specifics on class policies and values are as follows.

3.1 Overview of Assessments

You will be evaluated based on your in-class activities, problem sets, a midterm and a project. See Table 1 for a breakdown of the grades.Students are assessed individually, and there is no predetermined grade spread in any subject. Consistent with this, after drop date, students who remain in this class are not in jeopardy of seeing their grades change due to the change in class composition. There will be no grading on a curve. Individual grades will be based on the scale shown in Table 2.

Table 1 Course components and grade breakdown

Assessment	Number	Unit %	Total %	Explanation
In-Class Activities	24	1	20	4 absences excused
Problem Sets [PS]	9	4	36	
Labs	8	2	14	lowest one dropped
Midterm Exam	1	12	10	
Regression Project	1	20	20	
TOTAL			**100**	

Table 2 Grading scale

Grade	Range (%)
A	93–100%
A−	90–92
B+	87–89
B	83–86
B−	80–82
C+	77–79
C	73–76
C−	70-72
D	60-69
F	≤ 60

3.2 In-class activities

During each lecture (there are 24 this semester), there will be an activity to be completed either individually or in a group. Activities will include surveys, short readings, interactive quizzes/polls and/or worksheets. In order to participate fully, **please bring your laptop to all lectures**.

3.3 Problem sets and LABs

Problem sets (PS) will be assigned weekly and due on Tuesdays at 12:59pm submitted via Canvas. Solutions will be posted after the due date. In addition you will typically be assigned a LAB which includes a guided Python problem (provided as a Google Colab Notebook) with clearly stated objectives. In each case, the steps will be laid out as clearly as possible. You should be able to complete these without further external guidance. These assignments will enable you master some key probabilistic and statistical functions in Python, along with practice in visualization. You will also practice applying a concept you learned in class while completing these assignments. In each LAB, you will be required to submit a `.ipynb` (Google Colab Notebook) with your responses. Instructions will be clearly laid out on each assignment, so please follow them to a T. This will ensure that your work can be efficiently and fairly evaluated.

NOTE: **Late problem sets will not be graded**, excepting emergencies or illness (of which adequate proof must be provided) or **prior permission** for exigencies (with requests made *no later than the Sunday before the due date*).

3.4 Exam

The mid-term will be conducted as a take-home open-book exam. You will typically have 2 hours to complete it. It will be submitted as a PDF document.

3.5 Project

The project will be a structured assignment focused on linear regression. You will execute this in a group of 5 students. More detailed instructions will be provided after the mid-term. Deliverables will include a proposal, a report and a presentation.

4 Schedule

The table below summarizes the schedule of topics, reading and assignments for this course. Please study carefully. Let me or the TA know promptly if you have any questions.

Date	Module	Topic	Reading	Assignments
M1 Introduction				
Tu, Sep 2	1A	Data and Sampling	1	
Th, Sep 4	1B	Summarizing Data	2	
Tu, Sep 9	1C	Case Studies and Experiments	2	PS 1 due
M2 Probability				
Th, Sep 11	2A	Events & Set Operations	3.1	
Tu, Sep 16	2B	Theory of Probability	3.2	PS 2 & LAB 2 due
Th, Sep 18	2C	Conditional Probability & Bayes' Theorem	3.3-4	
M3 Probability Distributions				
Tu, Sep 23	3A	Introduction	3.5	PS 3 & LAB 3 due
Th, Sep 25	3B	Normal Distribution	4.1	
Tu, Sep 30	3C	Lognormal and Exponential Distributions	TBD	PS 4 & LAB 4 due
Th, Oct 2	3D	Binomial Distribution	4.3	
Tu, Oct 7	3E	Poisson Distribution	4.5	PS 5 & LAB 5 due
Th, Oct 9	3F	Review/Applications		
Tu, Oct 14		MIDTERM EXAM (Take Home: 2hrs)		
M4 Inference Foundations				
Th, Oct 16	4A-i	Point Estimates and Sampling Variability	5.1	
Tu, Oct 21	4A-ii	Point Estimates and Sampling Variability	5.1	
Th, Oct 23	4B	Confidence Intervals for a Proportion	5.2	
Tu, Oct 28	4C	Hypothesis Testing for a Proportion	5.3	PS 6 & LAB 6 due
M5 Inference for Categorical Data				
Th, Oct 30	5A	Inference for Single Proportion	6.1	
Tu, Nov 4		NO CLASS (Election Day)		
Th, Nov 4	5B	Difference of Two Proportions	6.2	
Tu, Nov 11		NO CLASS (Veteran's Day)		
Th, Nov 13	5C	Goodness of Fit Testing (Chi-square)	6.3-4	
M6 Inference for Numerical Data				
Tu, Nov 18	6A	One-sample means	7.1	PS 7 & LAB 7 due
Th, Nov 20	6B	Inference with Two Samples	7.2-3	
Tu, Nov 25	6C	Power and ANOVA	7.4-5	PS 8 & LAB 8 due
Th, Nov 27		THANKSGIVING RECESS		
M7 Linear Regression				
Tu, Dec 2	7A	Correlation and Least Squares	8.1-2	
Th, Dec 4	7B	Inference for Regression	8.4, 9.1-4	
Tu, Dec 9		NO CLASS		PS 9 & LAB 9 due
Th, Dec 11		PROJECT PRESENTATIONS		

5 Values

5.1 Academic Honesty Policy Statement

Since the integrity of the academic enterprise of any institution of higher education requires honesty in scholarship and research, academic honesty is required of all students at the University of Massachusetts Amherst. Academic dishonesty including but not limited to cheating, fabrication, plagiarism, and facilitating dishonesty, is prohibited in all programs of the University. Appropriate sanctions may be imposed on any student who has committed an act of academic dishonesty. Instructors should take reasonable steps to address academic misconduct. Any person who has reason to believe that a student has committed academic dishonesty should bring such information to the attention of the appropriate course instructor as soon as possible. Instances of academic dishonesty not related to a specific course should be brought to the attention of the appropriate department Head or Chair. The procedures outlined below are intended to provide an efficient and orderly process by which action may be taken if it appears that academic dishonesty has occurred and by which students may appeal such actions. Since student are expected to be familiar with this policy and the commonly accepted standards of academic integrity, ignorance of such standards is not normally sufficient evidence of lack of intent. For more information about what constitutes academic dishonesty, please see the Dean of Students' website: http://umass.edu/dean_students/honesty/

5.2 Disability Statement

The University of Massachusetts Amherst is committed to making reasonable, effective and appropriate accommodations to meet the needs of students with disabilities and help create a barrier-free campus. If you are in need of accommodation for a documented disability, register with Disability Services to have an accommodation letter sent to your faculty. It is your responsibility to initiate these services and to communicate with faculty ahead of time to manage accommodations in a timely manner. For more information, consult the Disability Services website at http://www.umass.edu/disability/.

5.3 Title IX

In accordance with Title IX of the Education Amendments of 1972 that prohibits gender-based discrimination in educational settings that receive federal funds, the University of Massachusetts Amherst is committed to providing a safe learning environment for all students, free from all forms of discrimination, including sexual assault, sexual harassment, domestic violence, dating violence, stalking, and retaliation. This includes interactions in person or online through digital platforms and social media. Title IX also protects against discrimination on the basis of pregnancy, childbirth, false pregnancy, miscarriage, abortion, or related conditions, including recovery. There are resources here on campus to support you. A summary of the available Title IX resources (confidential and non-confidential) can be found at the following link: https://www.umass.edu/titleix/resources. You do not need to make a formal report to access them. If you need immediate support, you are not alone. Free and confidential support is available 24 hours a day/7 days a week/365 days a year at the SASA Hotline 413-545-0800.

5.4 Policy Against Discrimination, Harassment, and Related Interpersonal Violence

In synergy with the aspirations of our department and the college, I strive to ensure that my classroom is a place where all students can not only succeed, but also thrive. Federal and state laws as well as University policies provide several protections to support these efforts.

The University of Massachusetts Amherst, through this Policy Against Discrimination, Harassment, and Related Interpersonal Violence prohibits unlawful discrimination, harassment, and retaliation on the basis of race, color, religion, caste, creed, sex, sex stereotypes, sex characteristics, sexual orientation, gender identity and expression, pregnancy and pregnancy-related condition(s), age, marital status, national origin, mental or physical disability, political belief or affiliation, veteran status , genetic information, natural and protective hairstyle, and any other legally protected class of individuals protected from discrimination under state or federal law in any aspect of the access to, admission, employment, or treatment in the University's educational program and activity. The University affirms its commitment to provide a welcoming and respectful work and educational environment, in which all individuals within the University community may benefit from each other's experiences and foster mutual respect and appreciation of divergent views. Any member of the campus community, guest, or other person who acts to deny or limit the access to educational, employment, residential, and/or social programs or activities, benefits, and/or opportunities of any (other) member of the campus community, guest, or visitor on the basis of their actual or perceived membership in classes protected by this Policy will be in violation of this Policy.

6 Wellness and Success

You are not alone at UMass—many people care about your well-being and many resources are available to help you thrive and succeed. During this time, you may be experiencing pressures related to as health, money, family, and academic concerns or stress and trauma from societal inequities and violence. Coursework is challenging and classes are not the only demand in your life. You have resilience and are already using effective strategies to help you achieve your educational goals. Take stock of these and consider what new steps or resources could be helpful. Getting enough sleep, exercising, eating well, and connecting with others are all antidotes to stress. If you are struggling academically, reach out to your instructors and advisors prior to deadlines and before the demands of exams, papers, and projects reach their peak. Students experiencing challenges including stress, anxiety, difficulty concentrating, loneliness, and trauma, or who feel down or alienated, can find it helpful to connect with one or more of the many supportive resources on campus that stand ready to assist you. You matter at UMass.

6.1 Academic Advice and Support

- Academic Dean: https://www.umass.edu/registrar/students/list-academic-deans
- Academic Advisor: https://www.umass.edu/gateway/academics/academic-advising
- Writing Center: https://www.umass.edu/writingcenter/
- Learning Resource Center: https://www.umass.edu/lrc/

6.2 Single-Stop Resources

- Referrals for personal, financial, or life challenges that interfere with college success and well-being: http://www.umass.edu/studentlife/single-stop

6.3 Communities of Support

- Residential Life Support for on campus students; help addressing roommate disputes and residence hall quality of life: https://www.umass.edu/living/
- Off Campus Student Life (OCSL): https://www.umass.edu/offcampuslife/; (413) 577-1005
  Community connections and programs for students living off-campus
- International Programs Office (IPO): https://www.umass.edu/ipo/; (413) 545-2710
  Networking and assistance for international students and scholars at UMass and UMass students studying abroad
- Center for Multicultural Advancement and Student Success (CMASS): https://www.umass.edu/cmass/; (413) 545-2517
  Mentoring, workshops, advocacy, scholarship and internship opportunities, graduate school preparation and career development
- Stonewall Center: https://www.umass.edu/stonewall/; (413) 545-4824
  Programming, advocacy, and support for LGBTQIA+ students and allies
- Student Parent Programs: https://www.umass.edu/ofr/; (413) 545-0865
  Support for students with children
- Student Veteran Resource Center:
  https://www.umass.edu/veterans/student-veteran-resource-center-svrc; (413) 545-0939
  A welcoming place for veterans, active military members, and their families to study, network, learn, seek support, and get help with benefits
- Center for Women and Community: https://www.umass.edu/cwc; (413) 545-0883
  Information and referrals, community education, general counseling, and empowerment-based support groups for survivors of all genders
- Men and Masculinities Center: https://www.umass.edu/masculinities/; (413) 577-4636
  Supports male student success and the development of healthy masculinities
- Office of Religious and Spiritual Life: https://www.umass.edu/orsl/; (413) 545-9642
  Educational programs, advocacy, dialogue, interfaith programs and service
- Center for Health Promotion: https://www.umass.edu/studentlife/health-safety/chp; (413) 577-5181
  Peer wellness coaching, alcohol screening and brief intervention, support for students in recovery

6.4 Offices that Can Help

- Center for Counseling and Psychological Health: https://www.umass.edu/counseling/ (413) 545-2337. After hours: (877) 831-7421
  24/7 emergency crisis intervention, support groups and workshops, online therapy and resources, brief psychotherapy and referrals
- Dean of Students Office: https://www.umass.edu/dean_students/ (413) 545-2684
  Advice and support for managing challenging or crisis related matters
- UMass Police Department: https://www.umass.edu/umpd/ (413) 545-2121. Emergency: (413) 545-3111 or 911
  Immediate emergency response, anonymous tip reporting, theft prevention, community safety, and self-defense programs and training
- University Health Services: https://www.umass.edu/uhs/ (413) 577-5000
  24/7 medical advice and triage, walk-in clinic, nutritional counseling, sports medicine, and more
- Disability Services: https://www.umass.edu/disability/ (413) 545-0892
  Help registering and accommodating students with all types of disabilities
- Student Legal Services Office: https://www.umass.edu/slso/ (413) 545-1995
  Confidential legal counseling and advice for all fee-paying students with any legal matter
- Psychological Services Center: https://www.umass.edu/psc/ (413) 545-0041
  Individual, couples and group therapy and assessment services
- Ombuds Office: https://www.umass.edu/ombuds/ (413) 545-0867
  Facilitation and informal mediation; resolution of grade disputes
- Equal Opportunity Office: https://www.umass.edu/equalopportunity/ (413) 545-3464
  Upholds university's commitment to access and opportunity for all