



CE310 Probability and Statistics in Civil Engineering

C E Room: 201, M W F 11:00 - 11:50 AM

Description of Course

(3 units) Statistical decision theory and its application in civil engineering, identification and modeling of non-deterministic problems in civil engineering and the treatment thereof relative to engineering design and decision making, statistical reliability concepts.

Course Prerequisites or Co-requisites

MATH 129; Advanced standing.

Instructor and Contact Information

Instructor: Achintya Haldar

Office: 220E, CE Bldg.

Phone: 621-2142

Email: haldar@u.arizona.edu

Office Hours/"Open Door Policy"

Instructor home page – haldar.faculty.arizona.edu

Course Format and Teaching Methods

Lecture only, in-class discussions with handouts.

Course Objectives and Expected Learning Outcomes

Course Objectives: To develop a basic concepts on probability and different types of distribution functions and their applications in civil engineering; determination of distributions and parameters from observation data; randomness in response variables including regression analysis; reliability evaluation procedures and simulation techniques.

ABET outcomes:

An ABET Course Classification Form is attached. For further information see

http://assessment.arizona.edu/academic_degree_programs)

Week No.	Topic	Reading
1	Basic Concept of Reliability	1.1-1.7
2	Mathematics of Probability – Introduction, Introduction to Set Theory, Axioms of Probability, Multiplication Rule	2.1, 2.2,2.3, 2.4
3	Theorem of Total Probability, Baye’s Rule	2.5,2.6
4	Modeling Uncertainty – Introduction, Steps in Quantifying Randomness, Analytical Models to Quantify Randomness	3.1,3.2,3.3
	Test 1 – First three chapters (Date to be announced)	
5, 6, 7	Commonly used Probability Distributions – Introduction, Continuous Random Variables, Discrete Random Variables	4.1,4.2,4.3
8	Determination of Distributions and Parameters from Observed Data – Introduction, Determination of Probability Distribution: Probability papers, construction of a Probability Paper	5.1,5.2.1,5.2.2
9	Statistical Tests, Estimation of Parameters of a Distribution, Interval Estimation of Mean and Variance	5.2.3,5.3,5.4
	Test 2 – Chapters 4 and 5 (Date to be announced)	
10	<i>Spring Break</i>	
11, 12	Randomness in Response Variables – Introduction, Known Functional Relationship Between the Response and a Single Basic Random Variable, Response as a Known Function of Multiple Random Variables	6.1,6.2,6.3
13	Partial and Approximate Solutions, Regression Analysis	6.4,6.6
14	Fundamentals of Reliability Analysis - Introduction, Deterministic and Probabilistic Approaches, Risk and Safety Factor Concept	7.1,7.2,7.3,7.4
15	Monte Carlo Simulation Technique	9.1, 9.2

Absence and Class Participation Policy

The UA’s policy concerning Class Attendance, Participation, and Administrative Drops is available at: <http://catalog.arizona.edu/policy/class-attendance-participation-and-administrative-drop>

The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable, <http://policy.arizona.edu/human-resources/religious-accommodation-policy>.

Absences pre-approved by the UA Dean of Students (or Dean Designee) will be honored. See: <https://deanofstudents.arizona.edu/absences>

Participating in the course and attending lectures and other course events are vital to the learning process. As such, attendance is required at all lectures and discussion section meetings. Students who miss class due to illness or emergency are required to bring documentation from their health-care provider or other relevant, professional third parties. Failure to submit third-party documentation will result in unexcused absences.

Course Communications

Students will be communicated by emails in most cases.

Required Texts or Readings

Probability, Reliability, and Statistical Methods in Engineering Design, by Achintya Haldar and Sankaran Mahadevan, John Wiley and Sons, Inc., November 1999, ©2000, ISBN 978-0-471-33119-3

Required or Special Materials

Must bring the textbook every day in the first phase of the class.

Required Extracurricular Activities (if any)

None.

Assignments and Examinations: Schedule/Due Dates

Weekly homework	10%
2- One Hour Exams	45%
1- Final Exam	40%
Attendance	5%
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	100%

Final Examination or Project

The date and time of the final exam or project, along with links to the Final Exam Regulations, <https://www.registrar.arizona.edu/courses/final-examination-regulations-and-information>, and Final Exam Schedule, <http://www.registrar.arizona.edu/schedules/finals.htm>

May 9, 2017 (Monday)

Grading Scale and Policies

University policy regarding grades and grading systems is available at <http://catalog.arizona.edu/policy/grades-and-grading-system>

Late HWs without proper justification will not be accepted.

Composite grades will be calculated using the weight factors mentioned earlier. Students will then be grouped in to several sub-groups for the overall grading purpose.

Requests for incomplete (I) or withdrawal (W) must be made in accordance with University policies, which are available at <http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete> and <http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal> respectively.

Dispute of Grade Policy: Contact me immediately if you have any question or comment on the grade you receive following an exam.

Scheduled Topics/Activities

HWs will be due in one week period. Two Hour Exam dates will be announced at least 2 weeks in advanced.

Classroom Behavior Policy

To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., texting, chatting, reading a newspaper, making phone calls, web surfing, etc.).

Students are asked to refrain from disruptive conversations with people sitting around them during lecture. Students observed engaging in disruptive activity will be asked to cease this behavior. Those who continue to disrupt the class will be asked to leave lecture or discussion and may be reported to the Dean of Students.

Some learning styles are best served by using personal electronics, such as laptops and iPads. These devices can be distracting to other learners. Therefore, students who prefer to use electronic devices for note-taking during lecture should use one side of the classroom.

Threatening Behavior Policy

The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See <http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students>.

Accessibility and Accommodations

Our goal in this classroom is that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, please let me know immediately so that we can discuss options. You are also welcome to contact the Disability Resource Center (520-621-3268) to establish reasonable accommodations. For additional information on the Disability Resource Center and reasonable accommodations, please visit <http://drc.arizona.edu>.

If you have reasonable accommodations, please plan to meet with me by appointment or during office hours to discuss accommodations and how my course requirements and activities may impact your ability to fully participate.

Please be aware that the accessible table and chairs in this room should remain available for students who find that standard classroom seating is not usable.

Code of Academic Integrity

Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See:

<http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity>.

The University Libraries have some excellent tips for avoiding plagiarism, available at <http://www.library.arizona.edu/help/tutorials/plagiarism/index.html>.

Selling class notes and/or other course materials to other students or to a third party for resale is not permitted without the instructor's express written consent. Violations to this and other course rules are subject to the Code of Academic Integrity and may result in course sanctions.

Additionally, students who use D2L or UA e-mail to sell or buy these copyrighted materials are subject to Code of Conduct Violations for misuse of student e-mail addresses. This conduct may also constitute copyright infringement.

UA Nondiscrimination and Anti-harassment Policy

The University is committed to creating and maintaining an environment free of discrimination; see <http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy>

Our classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others.

Additional Resources for Students

UA Academic policies and procedures are available at <http://catalog.arizona.edu/policies>

Student Assistance and Advocacy information is available at

<http://deanofstudents.arizona.edu/student-assistance/students/student-assistance>

Confidentiality of Student Records

<http://www.registrar.arizona.edu/personal-information/family-educational-rights-and-privacy->

Subject to Change Statement

Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor.

Attachment

ABET 2010 Criteria Course Classification Form

Course Number CE 310 Course Name Probability and Statistics in Civil Engineering
 Required? Circle: **YES** / NO Semester/Instructor Spring 2013 – Achintya Haldar
 Homework Frequency weekly Exam Frequency Two (2) midterms & one (1) final
 Course Project? Circle: YES / **NO** Labs or Case Studies? Circle: YES / **NO**

For each of the following ABET outcome criteria, please list the level (**H**igh, **M**edium, **L**ow, or blank if not applicable) contained in this course. The criteria descriptions that will be used by the College in the ABET evaluation are attached. Please describe the relevant course activities that you can use to justify why you think your course meets the criteria. **No course is expected to address all of these criteria and it would be rare to have more than 2 or 3 criteria at a high level (except a capstone course)** Be conservative in your judgment. For the ABET evaluation, we will assess student performance for criteria that are judged High. If you judge your course as High in a criteria, then the course should include a large percentage of effort (class time, homework, projects) devoted to the criteria. Note that 2 extra table entries are available for departments to specify their own criteria.

Outcome criteria	Level H M L	Relevant Activities
A. Apply mathematics, science and engineering principles	H	Application of principles of mathematics and engineering to quantify uncertainty
B. Ability to design and conduct experiments and interpret data	H	Mathematical modeling of experimental data
C. Ability to design a system, component, or process to meet desired needs	L	Developing and understanding relationship between safety factor and risk in design problems
D. Ability to function on multidisciplinary teams		
E. Ability to identify, formulate, and solve engineering problems	H	Simple design problems satisfying pre-selected risk
F. Understanding of professional and ethical responsibility		
G. Ability to communicate effectively		
H. The broad education necessary to understand the impact of engineering solutions in a global context	L	Different design practices and uncertainty in them in different countries
I. Recognition of the need for and an ability to engage in life-long learning		
J. Knowledge of contemporary issues		
K. Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice	M	Develop an appreciation of recent risk-based design codes
L. Pass the FE exam as the first step towards professional registration	L	Be familiar with reliability and statistics-related issues
M. Be proficient in the major areas of civil engineering	M	Be familiar with risk-based design codes