Course Objectives

This course introduces probabilistic modeling and statistical inference, which are crucial to solving real-world engineering problems. By the end of the course the student should be able to:

- Derive basic properties of the Bernoulli, Binomial, Geometric, Uniform, Exponential, Poisson, Normal and other distributions and use them in different engineering applications [ABET (a)].

- Apply knowledge of basic statistical methods (e.g., interval estimation, hypothesis test) and simulation (e.g., random number generators, inverse transform method) for decision making [ABET (a, b)].

- Use R programming language to summarize a data set via box plot or a histogram, perform hypothesis testing, and apply linear regression [ABET (a, b, k)].

Textbook

The course is based on the Introduction to Probability, 2nd Edition textbook. We will also leverage the Video/Audio version of the book. Students will be assigned about 45 min of video lectures per week as well as a simple Canvas quiz. The Electronic Companion contains solutions to the end-of-the-chapter problems.

Grading

The typical University of Utah grading scale will be used (Table 1). However, I reserve the right to curve the scale dependent on overall class scores at the end of the semester. Any curve will
Table 1: Typical University of Utah grading scale

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>93-100</td>
</tr>
<tr>
<td>A-</td>
<td>90-92</td>
</tr>
<tr>
<td>B+</td>
<td>87-89</td>
</tr>
<tr>
<td>B-</td>
<td>80-82</td>
</tr>
<tr>
<td>C+</td>
<td>77-79</td>
</tr>
<tr>
<td>C</td>
<td>73-76</td>
</tr>
<tr>
<td>C-</td>
<td>70-72</td>
</tr>
<tr>
<td>D+</td>
<td>67-69</td>
</tr>
<tr>
<td>D</td>
<td>63-66</td>
</tr>
<tr>
<td>D-</td>
<td>60-62</td>
</tr>
<tr>
<td>E</td>
<td>0-59</td>
</tr>
</tbody>
</table>

only ever make it easier to obtain a certain letter grade. The course grades will be determined by three midterms (30%), final (15%), homework assignments (20%), quizzes (5%) and computer labs (30%). Students will be allowed to do extra Lab work to increase their final grade (e.g., from B+ to A-).

Course Policies

- Homework problems will be assigned weekly and collaboration among students is strongly encouraged.
- Make-up exams will be given only if written documentation of the extenuating circumstance regarding the absence is provided and the instructor is notified prior to the test.
- Please note and observe the Code of Student Rights and Responsibilities regarding conduct, plagiarism, and cheating.

Tentative Schedule (subject to change)

Week 01, 01/06 - 01/10:
   M: Introduction
   W: Lecture 1a: Probability Models and Axioms
   F: Lecture 1b: Probability Models and Axioms

Week 02, 01/13 - 01/17:
   M: Online Labs
   W: Online Labs
   F: Lecture 2a: Conditioning and Bayes’ Rule

Week 03, 01/20 - 01/24:
   M: No class (MLK Day)
   W: Lecture 2b: Conditioning and Bayes’ Rule
   F: Lecture 3a: Independence
Week 04, 01/27 - 01/31:

M: Lecture 3b: Independence  
W: Lecture 4a: Counting  
F: Online Labs  

Due: R programming A-Z (12 hr)

Week 05, 02/03 - 02/07:

M: Lecture 4b: Counting  
W: Midterm I  
F: Lecture 5a: Discrete Random Variables Part I

Week 06, 02/10 - 02/14:

M: Lecture 5b: Discrete Random Variables Part I  
W: Lecture 6a: Discrete Random Variables Part II  
F: Online Labs

Week 07, 02/17 - 02/21:

M: No class (President’s Day)  
W: Lecture 6b: Discrete Random Variables Part II  
F: Lecture 7a: Discrete Random Variables Part III  

Due: Statistics with R part I (10 hr)

Week 08, 02/24 - 02/28:

M: Lecture 7b: Discrete Random Variables Part III  
W: Midterm II  
F: Lecture 8a: Continuous Random Variables Part I

Week 09, 03/02 - 03/06:

M: Lecture 8b: Continuous Random Variables Part I  
W: Lecture 9a: Continuous Random Variables Part II  
F: Online Labs
Week 10, 03/09 - 03/13:
M: No class (Spring Break)
W: No class (Spring Break)
F: No class (Spring Break)

Week 11, 03/16 - 03/20:
M: Lecture 9b: Continuous Random Variables Part II
W: Lecture 10a: Continuous Random Variables Part III
F: Online Labs

Week 12, 03/23 - 03/27:
M: Lecture 10b: Continuous Random Variables Part III
W: Lecture 12a: Sum of Independent R.V.s. Covariance and Correlation
F: Midterm III
   Due: Statistics with R part II (12 hr)

Week 13, 03/30 - 04/03:
M: Lecture 18a: Inequalities, Convergence, and the Weak Law of Large Numbers
W: Lecture 18b: Inequalities, Convergence, and the Weak Law of Large Numbers
F: Online Labs

Week 14, 04/06 - 04/10:
M: Lecture 19a: The Central Limit Theorem (CLT)
W: Lecture 19b: The Central Limit Theorem (CLT)
F: Online Labs

Week 15, 04/13 - 04/17:
M: Lecture 20a: An Introduction to Classical Statistics
W: Lecture 20b: An Introduction to Classical Statistics
F: Online Labs
   Due: Statistics with R part III (7 hr)
Week 16, 04/20 - 04/24:

M: Simulation I

**Computer Labs**

The students will learn basics of R programming and apply it to (a) summarize a data set via pie charts/histograms/box plots, (b) statistical inference, (c) linear regression, and (d) simulation. Two online resources will be leveraged for sake of automated grading of R programming assignments:

- R Programming A-Z: R For Data Science With Real Exercises!
- Statistics with R Specialization
  - Free Textbook

Introducing students to online learning platforms will provide access to thousands of free courses and thereby facilitate life-long learning.
Appeals Procedures

See the Code of Student Rights and Responsibilities, located in the Class Schedule or on the UoU Web site for more details

Appeals of Grades and other Academic Actions

If a student believes that an academic action is arbitrary or capricious he/she should discuss the action with the involved faculty member and attempt to resolve. If unable to resolve, the student may appeal the action in accordance with the following procedure:

1. Appeal to Department Chair (in writing) within 40 business days; chair must notify student of a decision within 15 days. If faculty member or student disagrees with decision, then,
2. Appeal to Academic Appeals Committee (see https://www.coe.utah.edu/students/academic-affairs/academics/ for members of committee). See II Section D, Code of Student Rights and Responsibilities for details on Academic Appeals Committee hearings.

Withdrawal Procedures

See the Class Schedule or web for more details ** Please note the difference between the terms “drop” and “withdraw”.

Drop Period For Full Term Classes- No Penalty

Students may DROP any class without penalty or permission during the FIRST TEN academic days of the term (Friday, January 17, 2020).

Withdrawal from Full Term Length Classes

Students may WITHDRAW from classes without petition Friday, March 6, 2020. Beginning January 18th until March 6th, a “W” will appear on the transcript AND tuition will be charged. Refer to Class Schedule, Tuition and Fees for tuition information.

Drop/Withdrawal from Session I & Session II

See the web page for details: https://registrar.utah.edu/academic-calendars/spring2020.php

Withdrawals for term length classes after March 6th will only be granted due to compelling, nonacademic emergencies. A petition and supporting documentation must be submitted to the Dean's Office, 1704 Warnock Engineering Building. Petitions must be received before the last day of classes (April 21, 2020).

Repeating Courses

When a College of Engineering class is taken more than once, only the grade for the second attempt is counted. Grades of W, I, or V on the student's record count as having taken the class. Departments enforce these guidelines for other courses as well (e.g., math, physics biology, chemistry). Attempts of courses taken at transfer institutions count as one attempt. This means a student may take the course only one time at the University of Utah. Courses taken at the University of Utah may not be taken a second time at another institution. If a second attempt is needed, it must be at the University of Utah. Please work with your department advisor to determine the value of repeating courses. Students should note that anyone who takes a required class twice and does not have a satisfactory grade the second time may not be able to graduate. It is the responsibility of the student to work with the department of their major to determine how this policy applies in extenuating circumstances.

Americans with Disabilities Act (ADA)

The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you need accommodations in a class, reasonable prior notice needs to be given to the instructor and to the Center for Disability Services, 162 Olpin Union, 581-5020 (V/TDD) to make arrangements for accommodations. All written information in a course can be made available in alternative format with prior notification to the Center for Disability Services.

Adding Classes-Full Term

Please read carefully: All classes must be added within 10 academic days of the beginning of the semester (deadline: Friday, January 17, 2020). Late adds will be allowed January 20-24, requiring only the instructor’s signature. Any request to add a class after January 24, will require signatures from the instructor, department, and Dean, and need to be accompanied by a petition letter to the Dean's office.

A $50 FEE WILL BE ASSESSED BY THE REGISTRAR'S OFFICE FOR ADDING CLASSES AFTER January 24. ***

****Before you elect to take a class CR/NC you should check with your Advisor. Core classes used to compute your Engineering GPA need letter grades.
Important Safety Information

The University of Utah values the safety of all campus community members. To report suspicious activity or to request a courtesy escort, call campus police at 801-581-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit https://safeu.utah.edu