Course Syllabus

ISYE 6739-I

A Gentle Introduction to Probability

Professor: Dr. David Goldsman

Course Description

This course provides an introduction to basic probability concepts. Our emphasis is on applications in science and engineering, with the goal of enhancing modeling and analysis skills for a variety of real-world problems.

Prerequisites

You will be expected to come in knowing a bit of set theory and basic calculus. But don't worry too much – we'll provide bootcamps on that material in order to make the class pretty much self-contained. In addition, this course will involve a bit of computer programming, so it would be nice to have at least a little experience in something like Excel, just to bring back the programming memories.

Course Goals

A Gentle Introduction to Probability

- Get up to speed with bootcamps in set theory and calculus.
- Understand and use underlying probability axioms.
- Learn about and apply elementary probability concepts and counting rules, including permutations and combinations.
- Study the concepts of independence, and conditional probability.
- Learn how to update probabilities via Bayes Rule.

Grading Policy

- There will be one exam for this course. Test questions are multiple choice or T/F.
- There will be three homework assignments for this course. The HWs often have bonus questions, which you can do to earn a few extra points. Let r = the number of required questions, R = the # of required questions you answer correctly, and B = the number of bonus questions you answer correctly. Then your HW grade will be 100*(R+B)/r.
- You must achieve an overall weighted average of 60% to pass the course.
- Work hard and you will be rewarded – Grading is usually pretty generous.
- But let's be winners, not whiners. We are happy to discuss grades, but please make reasonable requests. 😊
- Grading Breakdown: For this course, the HW counts as 20% and the exam as 80%.

Exam Policy

- The exam covers all the material in the course.

Plagiarism Policy

Plagiarism is considered a serious offense. You are not allowed to copy and paste or submit materials created or published by others, as if you created the materials. All materials submitted and posted must be your own.

Course Materials

- All content and course materials can be accessed online.
- Suggested textbook: D. Goldsman and P. Goldsman, *A First Course in Probability and Statistics* – available for **free** PDF download. $ave $ave $ave!

For an inexpensive hard copy, click the book icon →

Technology/Software Recommendations

- Internet connection (DSL, LAN, or cable connection desirable)
- Adobe Acrobat PDF reader (free download; see https://get.adobe.com/reader/)
- Excel (or equivalent)
- R statistical software (free download; see cran.r-project.org) (or similar statistics packages such as Minitab, JMP, SAS, etc.)
- Bonus software: Any "real", high-level language such as Matlab, Python, etc.

Course Topics and Sample Pacing Schedule

- The table below contains a course topic outline and a SUGGESTED course progression timetable.
- The **SUGGESTED** (but not mandatory) time units are in weeks, so there's one HW/week.
- Note that some topics below are marked as **OPTIONAL**. We have included this material in case you need additional review or would like to delve into a topic further. You will be given extra credit homework on those topics, but you will not be tested on those topics.

	Course Topics
Week 1	**Course I: Introduction to Probability** **Module 0: Course Introduction + Bootcamps** • Lesson 1: Syllabus • Lesson 2: Introduction to Probability and Statistics (§1.1 of text) • Lesson 3 **[OPTIONAL]:** The Joy of Sets Bootcamp (§1.2.1) • Lesson 4 **[OPTIONAL]:** Calculus Bootcamp: Introduction + Derivatives (§1.2.2) • Lesson 5 **[OPTIONAL]:** Calculus Bootcamp: Integration and Beyond (§1.2.2)

	Homework • Homework 1
Week 2	**Module 1: Getting Started with Probability** • Lesson 1: Experiments, Sample Spaces, and Events (§§1.3.1–1.3.2) • Lesson 2: What is Probability? (§1.3.3) • Lesson 3: Basic Probability Results (§1.3.3) • Lesson 4: Finite Sample Spaces (§1.4) • Lesson 5: Counting Techniques: Baby Examples (§1.5.1) • Lesson 6: Counting Techniques: Permutations (§1.5.2) • Lesson 7: Counting Techniques: Combinations (§1.5.3) **Homework** • Homework 2
Week 3	**Module 1 (cont'd): Getting Started with Probability** • Lesson 8: Hypergeometric, Binomial, and Multinomial Problems (§§1.6.1–1.6.3) • Lesson 9: Permutations vs. Combinations (§1.6.4) • Lesson 10: The Birthday Problem (§1.6.5) • Lesson 11: The Envelope Problem (§1.6.6) • Lesson 12: Poker Problems (§1.6.7) • Lesson 13: Conditional Probability (§1.7.1) • Lesson 14: Independence Day (§1.7.2) • Lesson 15: Partitions and the Law of Total Probability (§1.8) • Lesson 16: Bayes Theorem (§1.8) **Homework** • Homework 3 **Assessments** • **Course I Exam – Study Really Hard!**