

## Course Syllabus

Spring 2023

CS-SE-STAT 3341.001

Probability and Statistics in Computer Science and Software Engineering

Time and Location: 11:30 AM to 12:45 PM Monday and Wednesday ECSS 2.410

Instructor:	Shengjie Jiang
Email:	<a href="mailto:Shengjie.jiang@utdallas.edu">Shengjie.jiang@utdallas.edu</a> (Please include the course # and section # in your email)
Office:	FN 2.208
Office Hours:	12:45 PM – 1:45 PM Monday and Wednesday or by appointment
TA:	TBD
Email:	TBD

### Course Pre-requisites

(MATH 1326 or MATH 2414 or MATH 2419), and (CE 2305 or CS 2305 or TE 2305 with a grade of C or better).

### Course Description

Axiomatic probability theory, independence, conditional probability. Discrete and continuous random variables, special distributions of importance to CS/SE, and expectation. Simulation of random variables and Monte Carlo methods. Central limit theorem. Basic statistical inference, parameter estimation, hypothesis testing, and linear regression. Introduction to stochastic processes. Illustrative examples and simulation exercises from queuing, reliability, and other CS/SE applications.

### Textbook

• Probability and Statistics for Computer Scientists, 2ed, Michael Baron. ISBN: 978-1-4398-7590- 2. Free e-book is available: UT Dallas library webpage > Databases > click letter “O” > click O’Reilly Online Learning > login > searching the textbook.

### Required Supplies

- TI 83/84 is required for homework, quizzes, and exams. The instructor will provide instructions and demonstrate the use of the tool. Use other tools to do your homework is okay, such as Excel and MatLab. However, students are responsible for learning the tools of their choice.
- SCANTRONS, form F-1712-PAR-L (one for each exam; you will also need a no.2 pencil and a good eraser)



## Learning Objectives

- Learn the basic probability rules and concepts, how to apply them, and when they don't apply
- Understand probability distributions and use them to answer probability questions
- Relate calculus to probability and use calculus to solve some probability problems
- Learn the basics of Markov chains and how to use matrices for finite-state chains
- Have an introduction to classical statistical inference (confidence intervals, hypothesis tests) and to how calculus may be used (parameter estimation)

## Grading Policies

### Distribution:

30% Homework

20% Quizzes

25% Exam #1

25% Exam #2

### Criteria:

A+: [97,  $\infty$ ) A: [93, 97) A-: [90, 93)

B+: [87, 90) B: [83, 87) B-: [80, 83)

C+: [77, 80) C: [73, 77) C-: [70, 73)

D+: [67, 70) D: [63, 67) D-: [60, 63)

F: [0, 60)

**Homework:** There will be twelve Homework sets on eLearning, and two will be counted as extra credits. If you do not complete them, consider these two assignments as dropped. Students must scan their work into a single PDF file and submit it through the link within eLearning. **Homework submitted through email to me will not be accepted.** Solutions will be available on eLearning after the deadline. Adobe Scan is a free and good phone/tablet App to scan your homework.

**Quizzes:** There will be ten quizzes online after/during class. The two lowest quiz scores will be dropped, so there are **no make-up quizzes**.

**Exams:** There will be two closed-book and closed-note 75-minute exams. Each exam consists of 34 multiple-choice questions. One page of the cheating sheet is allowed, and you can write or print anything you want on the cheating sheet. Exams will be scantron and please remember to bring your calculator and pencils. No devices with Wifi are allowed during the exam.

## Tentative Course Outline (**Tentative**)

Week	Date	Topic	Due
1	Jan 18	Syllabus overview & Chapter 2 Probability basics	
2	Jan 23	Chapter 2. Set operations	
2	Jan 25	Chapter 2. Rules of probability	HW1 (Ch.2)
3	Jan 30	Chapter 2. Conditional probability and independence	
3	Feb 1	Chapter 2. Bayes' Rule and Law of Total Probability	HW2 (Ch.2)
4	Feb 6	Chapter 2. Combinatorics	
4	Feb 8	Chapter 3. Discrete random variables	HW3 (Ch.3)
5	Feb 13	Chapter 3. Bernoulli and Binomial distribution	
5	Feb 15	Chapter 3. Geometric and Poisson distribution	HW4 (Ch.3)
6	Feb 20	Chapter 4. Continuous random variables and Uniform distribution	
6	Feb 22	Chapter 4. Exponential and Gamma distribution	HW5 (Ch.4)
7	Feb 27	Chapter 4. Normal distribution	
7	Mar 1	Chapter 4. Central Limit Theorem	HW6 (Ch.4)
8	<b>Mar 6</b>	<b>Exam Review</b>	
8	<b>Mar 8</b>	<b>Exam #1</b>	
9	Mar 13	Spring Break	
9	Mar 15	Spring Break	
10	Mar 20	Chapter 6. Stochastic Processes	
10	Mar 22	Chapter 6. Markov Chains	
11	Mar 27	Chapter 8. Intro to Descriptive Statistics	
11	Mar 29	Chapter 8. Intro to Graphical Statistics	HW7 (Ch.6)
12	Apr 3	Chapter 9. Parameter estimation	
12	Apr 5	Chapter 9. Parameter estimation	HW8 (Ch.8)
13	Apr 10	Chapter 9. Confidence interval	
13	Apr 12	Chapter 9. Confidence interval	HW9 (Ch.9)
14	Apr 17	Chapter 9. Intro to Hypothesis Testing	
14	Apr 19	Chapter 9. Significance Tests	HW10 (Ch.9)
15	Apr 24	Chapter 9. Significance Tests	
15	Apr 26	Chapter 11. Linear Regression	HW11 (Ch.9)
16	May 1	Chapter 11. Linear Regression	
16	<b>May 3</b>	<b>Exam Review</b>	HW12 (Ch.11)
17	<b>TBD</b>	<b>Exam #2</b>	

## Course Policies

**eLearning:** Lecture Notes, Assignments, Quizzes, course announcements, etc., will be posted on eLearning. You are encouraged to check eLearning and UTD email daily to keep up-to-date.

**Make-up Exams:** If the absence is known in advance, please communicate with me at least one week before the exam. You must contact me immediately if the absence is not known in advance (illness). If the absence is not excused, the further missed exam receives a grade of zero. To treat all students fairly, please do not request special projects, extra credit, rounded scores, or any other special treatment.

**Late Homework: Not accepted.** Solutions will be posted on eLearning after the due date of HW.

**Make-up Quizzes:** No make-up quizzes. Since quizzes are on eLearning, late submission is not an option; thus, the missing quizzes will receive a grade of zero.

**Class Attendance:** Please attend each class because the course will move quickly. Those who do not attend class regularly are inviting scholastic difficulty.

**Comet Creed:** This creed was voted on by the UT Dallas student body in 2014. It is a standard that Comets choose to live by and encourage others to do the same: “As a Comet, I pledge honesty, integrity, and service in all that I do.”

**UT Dallas syllabus policies and procedures:** The information contained in the following link constitutes the University’s policies and procedures segment of the course syllabus. Please go to <http://go.utdallas.edu/syllabus-policies> for these policies.