

San José State University
College of Science/Department of Computer Science
CS 262, Randomized Algorithms and Applications, Section 1, Fall, 2017

Course and Contact Information

Instructor:	Dr. Teng Moh
Office Location:	MQH 411
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Office Hours:	MW 20:45 to 21:45
Class Days/Time:	MW 19:30 to 20:45
Classroom:	MQH 422
Prerequisites:	CS 154 or CS 155

Course Description

Design and analysis of algorithms which incorporate randomness in their design. Applications will be given in several of the following areas: data structures, pattern matching, cryptography, parallel computing, distributed computing, and interactive proof systems.

Course Learning Outcomes (CLO)

Upon successful completion of this course, students will be able to:

1. CLO 1 *Create probabilistic recurrence relations from randomized recursive programs.*
2. CLO 2 *Solve simple probabilistic recurrence relations.*
3. CLO 3 *Understand how randomization can effect an algorithm's runtime, correctness, or both, and have algorithm examples for each.*
4. CLO 4 *Distinguish between performance based on random input assumptions compared to those based on randomized algorithms in which the algorithm controls all randomization.*
5. CLO 5 *Understand the use and derivation of the basic tools of probability analysis such as Markov and Chernoff inequalities.*
6. CLO 6 *Apply more advanced probability analysis tools such as Chernoff bounds and Hoeffding bounds.*
7. CLO 7 *Explain how randomization is used in several applications, and describe what benefits it has within those applications.*

Required Texts/Readings

Textbook

§ Michael Mitzenmacher and Eli Upfal, **Probability and Computing: Randomization and Probabilistic Techniques in Algorithms and Data Analysis**, Cambridge University Press, 2nd ed, 2017, ISBN: 978-1107154889

Other Readings [Optional]

§ Sheldon M. Ross, **A First Course in Probability**, Pearson, 9th ed, 2012, ISBN: 978-0321794772

§ Sheldon M. Ross, **Probability Models for Computer Science**, Academic Press, 1st ed, 2001, ISBN: 978-0125980517

Other equipment / material requirements (include if applicable)

Include if applicable.

Course Requirements and Assignments

SJSU classes are designed such that in order to be successful, it is expected that students will spend a minimum of forty-five hours for each unit of credit (normally three hours per unit per week), including preparing for class, participating in course activities, completing assignments, and so on. More details about student workload can be found in [University Policy S12-3](http://www.sjsu.edu/senate/docs/S12-3.pdf) at <http://www.sjsu.edu/senate/docs/S12-3.pdf>.

Homework is due typewritten (include source code, but not executable files) by class starting time on the due date. Each assigned problem requires a solution and an explanation (or work) detailing how you arrived at your solution. Cite any outside sources used to solve a problem. When grading an assignment, I may ask for additional information. A subset of the assigned problems will typically be graded.

Refer the course website for latest information of homework assignments.

NOTE that [University policy F69-24](http://www.sjsu.edu/senate/docs/F69-24.pdf) at <http://www.sjsu.edu/senate/docs/F69-24.pdf> states that “Students should attend all meetings of their classes, not only because they are responsible for material discussed therein, but because active participation is frequently essential to insure maximum benefit for all members of the class. Attendance per se shall not be used as a criterion for grading.”

Examinations

One mid-term exam scheduled approximately at the end of 8th week, and a final exam scheduled on Wednesday, Dec. 13, 19:45-22:00.

Grading Policy

Grading information:

- *I will determine letter grades for the course, including +/- grades based on*

<i>Percentage</i>	<i>Grade</i>
<i>92 and above</i>	<i>A</i>
<i>90 - 91</i>	<i>A-</i>
<i>88 - 89</i>	<i>B+</i>
<i>82 - 87</i>	<i>B</i>
<i>80 - 81</i>	<i>B-</i>
<i>78 - 79</i>	<i>C+</i>
<i>72 - 77</i>	<i>C</i>
<i>70 - 71</i>	<i>C-</i>
<i>60 - 69</i>	<i>D</i>
<i>59 and below</i>	<i>F</i>

- *List of the percentage weight [or point value] assigned to various class assignments*
 - *Homework: 20%*
 - *Midterm: 20%*
 - *Project: 30%*
 - *Final: 30%*
- *No make-up exams will be given and no late homework will be accepted.*

Classroom Protocol

§ *Always start your email subject with “CS262” to get my attention.*

§ *Wireless laptop is required. Your laptop must remain closed (preferably in your backpack and, in any case, not on your desk) until I inform you that it is needed for a particular activity.*

§ *Cheating will not be tolerated, but working together is encouraged*

§ *Student must be respectful of the instructor and other students. For example, but not limited*

- *Turn off cell phones*

§ *To encourage participation from students, **no** recording is allowed.*

University Policies

Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. will be available on Office of Graduate and Undergraduate Programs' [Syllabus Information web page](http://www.sjsu.edu/gup/syllabusinfo/) at <http://www.sjsu.edu/gup/syllabusinfo/>

CS 262, Fall 2016, Course Schedule

The schedule is subject to change with fair notice and the notice will be made available in class.

Course Schedule

Week	Topics
1	Verifying Polynomial Identities and Axioms of Probability
2	Naïve Bayesian Classifier and Randomized Min-Cut Algorithms
3	Random Variables and The Bernoulli
4	Conditional Expectation and Coupon Collector's Problem
5	Expected Run-Time of Quick Sort and Markov's Inequality
6	Variance and Moments and Chebyshev's Inequality
7	Randomized Algorithms for Computing the Median
8	Review and Midterm Exam, Wednesday, Oct. 18
9	Moment Generating Functions and Chernoff Bounds
10	Set Balancing and Hoeffding Bounds
11	Poisson Approximation and Random Graphs
12	The Probability Method
13	Applications of Randomized Algorithms
14	Applications of Randomized Algorithms
15	Applications of Randomized Algorithms
16	Review
Final Exam	Wednesday, Dec. 13, 19:45-22:00