

**Foundations of Emerging Technologies**

<b>Instructor:</b>	<a href="#">Fang Song</a>
<b>Course Meeting Schedule:</b>	T/R 10 – 11:50 @ Hoff 109.
<b>Email:</b>	<a href="mailto:fsong@pdx.edu">fsong@pdx.edu</a> Stat email subject line with “f21-4510-fet”
<b>Course webpage:</b>	<a href="https://fangsong.info/teaching/f21_4510_fet/">https://fangsong.info/teaching/f21_4510_fet/</a>
<b>Office hours:</b>	TBD

**Course Description**

Emerging technologies, such as machine learning, quantum computing, modern cryptography, and big data analysis, have shown increasing significance of mathematical skills that go beyond a conventional discrete math course. Probability theory and linear algebra are evidently among the most essential. This course synthesizes fundamental theories and tools of probability and linear algebra with a slightly heavier weight on probability theory, and showcases applications in various topics in computer science. It aims to build a stronger foundation to facilitate future exploration in the emerging technologies.

**Course Objectives**

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

1. understand and analyze the combinatorial nature of problems.
2. describe and analyze typical discrete and continuous random variables.
3. understand and conduct computations involving vectors, matrices, eigenvalues, and eigenvectors.
4. apply basic techniques in probability theory and linear algebra to model computational problems and design effective solutions in emerging topics in computer science.
5. describe problems and write proofs with mathematical rigor.

**Course Prerequisites**

CS 350. This course is theoretical in nature and contains extensive practice on math and analytical problems as well as writing mathematical proofs.

**Readings**

No required text. We will primarily follow lecture notes. The references below are useful supplements.

- [AT] Alex Tsun. Probability & Statistics with Applications to Computing. [Link](#)
- [LLM] David Lay, Steven Lay, Judi McDonald. Linear Algebra and Its Applications, 5<sup>th</sup> Edition. Pearson. [Link](#)

**Grading Policies**

- Homework: 50%. Weekly assignments.
- Quizzes: 20%. Biweekly.
- Exam: 25%.
- Participation: 5%.

## Homework Policy

- You have a quota of 5 days in total for late submissions of homework or quizzes without penalty. You can use them at your will. Once the quota runs out, no late submissions will be accepted.
- Quizzes must be completed on your own. Collaboration on homework problems is highly encouraged, but you must write up solutions entirely on your own and clearly list who you discussed with for each problem. You must also clearly cite any other source you have referenced other than the text (a person, a book, a research paper, a webpage, etc.).
- All assignments must be submitted in PDF format. It is recommended to type-set your solutions using LaTeX, and you will get extra credit doing so.
- “I’ll take 15%” option on homework problems. Your solutions should be as clear and concise as possible. Partial credit will only be given for answers that make significant progress towards correct solutions. If you realize you cannot solve a problem, you may write “I’ll take 15%” instead of your answer, so you get 15% for this problem (or part of the problem). But if you do write an answer, you will get 0 if your solution is completely wrong. “I’ll take 15%” option does not apply to problems of bonus credits.
- For each assignment, a random subset of problems will be graded.

## Course Topics and Tentative Schedule

Check course webpage for details and updates

Week	Topic	Suggested Reading
1 - 2	Intro, combinatorics.	AT 0 – 1
3 – 7	Discrete probability, random variables, continuous random variables, concentration bounds.	AT 2 – 7
8 – 9	Vectors, vector space, matrices, linear transformations, eigenvectors, and eigenvalues.	LLM 2 – 5
10	Applications.	AT 9

## PSU Policies & Resources

### *Academic Integrity*

Academic integrity is a vital part of the educational experience at PSU. Please see the [PSU Student Code of Conduct](#) for the university’s policy on academic dishonesty. A confirmed violation of that Code in this course may result in failure of the course.

### Student Services

#### *Disability Access Statement*

If you have, or think you may have, a disability that may affect your work in this class and feel you need accommodations, contact the Disability Resource Center to schedule an appointment and initiate a conversation about reasonable accommodations. The DRC is located in 116 Smith Memorial Student Union, 503-725-4150, [drc@pdx.edu](mailto:drc@pdx.edu), <https://www.pdx.edu/disability-resource-center/>

### *Safe Campus Statement*

Portland State University desires to create a safe campus for our students. As part of that mission, PSU requires all students to take the learning module entitled Creating a Safe Campus: Preventing Gender Discrimination, Sexual Harassment, Sexual Misconduct and Sexual Assault. If you or someone you know has been harassed or assaulted, you can find the appropriate resources on PSU's Enrollment Management & Student Affairs: Sexual Prevention & Response website at <http://www.pdx.edu/sexual-assault>

### *Title IX Reporting*

As an instructor, one of my responsibilities is to help create a safe learning environment for my students and for the campus as a whole. Please be aware that as a faculty member, I have the responsibility to report any instances of sexual harassment, sexual violence and/or other forms of prohibited discrimination. If you would rather share information about sexual harassment, sexual violence or discrimination to a confidential employee who does not have this reporting responsibility, you can find a list of those individuals on PSU's Enrollment Management & Student Affairs: Sexual Prevention & Response website at <http://www.pdx.edu/sexual-assault>. For more information about Title IX please complete the required student module "Creating a Safe Campus: Preventing Gender Discrimination, Sexual Harassment, Sexual Misconduct and Sexual Assault" in the "My Courses" section of D2L.

### *Cultural Resource Centers*

The Cultural Resource Centers (CRCs) create a student-centered inclusive environment that enriches the university experience. We honor diversity, explore social justice issues, celebrate cultural traditions, and foster student identities, success, and leadership. Our centers include the Multicultural Student Center, La Casa Latina Student Center, Native American Student & Community Center, Pan African Commons, Pacific Islander, Asian, Asian American Student Center and the Middle Eastern, North African, South Asian program. We provide student leadership, employment, and volunteer opportunities; student resources such as computer labs, event, lounge and study spaces; and extensive programming. All are welcome!

### *Classroom Requirements for All Students and Faculty Due to Covid-19*

The University has established rules and policies to make the return to the classroom as safe as possible. It is required for everyone to follow all the Return to Campus rules and policies. To participate in this class, PSU requires students to comply with the following.

#### **Masks Required at all Times in Classroom**

- [Wear a mask or face covering indoors](#) at all times. Your mask or face covering must be properly worn (fully covering nose and mouth and tight fitting). Mesh masks, face shields, or face covering that incorporates a valve designed to facilitate easy exhalation are not acceptable. **Because a mask must be worn in the classroom, there should be no eating or drinking in the classroom.** If you have a medical condition or a disability that prevents you from wearing a mask or cloth face covering, you must obtain an accommodation from the [Disability Resource Center \(DRC\)](#) to be exempt from this requirement.
- CDC, State, and County guidance does not limit class size for in-person instruction or require physical distancing.

## **Vaccination**

- Be vaccinated against COVID-19 and complete the [COVID-19 vaccination attestation](#) form. Those students with medical or nonmedical exemptions or who will not be on campus at all must complete the process described on “COVID-19 Vaccine Exemption Request Form” to establish those exemptions.

## **Health Check, Illness, Exposure or Positive Test for COVID-19**

- Complete the [required self-check for COVID-19 symptoms before coming to campus each day](#).
- If you are feeling sick or have been exposed to COVID-19, do not come to campus. Call SHAC to discuss your symptoms and situation (503.725.2800). They will advise you on testing, quarantine, and when you can return to campus.
- If you test positive for COVID-19, [report your result to SHAC](#) and do not come to campus. SHAC will advise you on quarantine, notification of close contacts and when you can return to campus.
- Please notify me, (i.e. your instructor), should you need to miss a class period for any of these reasons so that we can discuss strategies to support your learning during this time.
- If I become ill or need to quarantine during the term, either I or the department chair will notify you via PSU email about my absence and how course instruction will continue.

## **Failure to Comply with Any of these Rules**

As the instructor of this course, the University has given me the authority to require your compliance with these policies. If you do not comply with these requirements, I may ask you to leave the classroom or I may need to cancel the class session entirely.

In addition, failure to comply with these requirements may result in a referral to the Office of the Dean of Student Life to consider charges under PSU's Code of Conduct. A student found to have violated a university rule (or rules) through the due process of student conduct might face disciplinary and educational sanctions (or consequences). For a complete list of sanctions, see Section 14 of the [Student Code of Conduct & Responsibility](#)

## **Guidance May Change**

Please note that the University rules, policies, and guidance may change at any time at the direction of the CDC, State, or County requirements. Please review the University's main [COVID-19 Response](#) webpage and look for emails from the University on these topics.