

Syllabus – ECE 353: Introduction to Probability and Random Signals – Winter 2022

Welcome to ECE 353 – Introduction to Probability and Random Signals:

In this course we will cover notions of probability, elementary statistical data analysis, random variables, densities, expectation, correlation, and random processes, to name a few. In a nutshell, **our course objective is to learn how to reason under uncertainty**. This objective is approached by introducing the basics of applied probability, random variables and random processes, and learning how to use analytical tools to come to grips with randomness and uncertainty in science and engineering.

Please reach out to me if you need help for any reason!

I am here to support your success in life and in this course. Please reach out to me directly if you are concerned about your ability to engage in course activities for any reason. You can do so by sending me an email. You need not disclose private medical information or provide documentation of your illness.

This is a difficult time to be in university. We have more opportunities for success when we are flexible and compassionate in our interactions. This is achieved through open communication in both directions.

If you need help, accommodation, or additional resources, please contact me as soon as possible. You do not need to justify your needs to me. I will help as best I can within my limitations. We have due dates for assignments and exams in this class to maintain progress towards the goal of understanding and mastery, but it is not my intention to punish learning that happens out of sync with that schedule.

Email is the primary form of communication with me. Email will be checked daily on weekdays. I will do my best to respond to questions within 24 hours or, if sent on the weekend, the following Monday.

Instructor:

Dr. Tim Marrinan (He/Him/His)

Office: 3130 Kelley Engineering Center

Email: marrinat@oregonstate.edu

Instructor's office hours: Wednesday, 5:00-6:00 PM KEC 1005, Friday 10:00-11:00 AM on gather.town (<https://gather.town/app/g8uGVkpKZea6C9Eu/ECE%20353%20Office%20Hours>)

Problem solving session: Wednesday, 6:00-7:00 PM KEC 1005

Teaching Assistant:

Subash Timilsina (He/Him/His)

Email: timilsis@oregonstate.edu

T.A.'s office hours: Tuesday 12:30 – 1:30 PM in Kelley Atrium, Wednesday 12:30 – 1:30 PM on [Zoom](#)

Course Web page: Canvas

Lecture Section: KEAR 212: Tuesday, Thursday 08:30 AM – 09:50 AM (80 minutes)

Prerequisites: MTH 254 or MTH 254H (Calculus), ECE 351 (Signals and Systems I).

Textbook:

Roy D. Yates, and David Goodman,

Probability and Stochastic Processes:

A Friendly Introduction for Electrical and Computer Engineers,

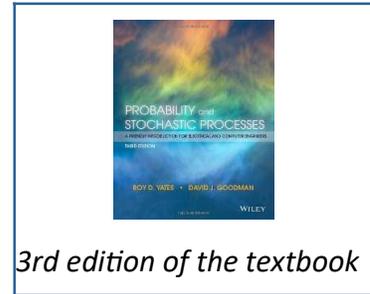
Third edition, Wiley, 2014.

ISBN-13: 978-1118324561 or ISBN-10: 1118324560

or

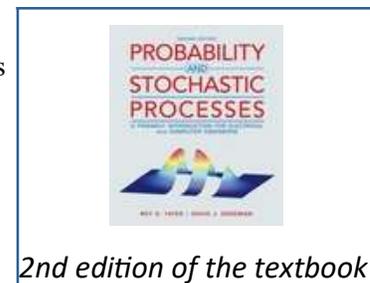
Second edition

ISBN-13: 978-0471272144 or ISBN-10: 0471272140



Note: In the third edition, some of the more advanced material has been taken out (and made available through a companion website), and more problems and examples have been included. The second edition includes the more advanced material in the book itself. **You can use the second edition** if you wish.

Most course materials are in the slides for this course and will be posted on Canvas. Use the book and the slides simultaneously. The slides outline the things that we cover, and the book provides many more examples and exercises.



Course outcomes:

- 1) An understanding of the laws of probability, conditional probability, and the Bayes principle.
- 2) An understanding of discrete and continuous random variables, to compute expected values and variances, as well as an understanding of the meaning of these concepts.
- 3) An understanding of basic univariate probability models such as the uniform, Gaussian, binomial, and Poisson models.
- 4) An ability to use correlation properties to design linear least squares estimators.
- 5) An understanding of the bivariate and multivariate (vector) probability models.
- 6) An understanding of the central limit theorem and its implications
- 7) An understanding of basic concepts of random processes, including Gaussian processes and the Poisson process, autocorrelation and power spectral density functions, as well as an ability to estimate these from observations of random data.

Final grade evaluation rubric: 400 points total

- 25% In-class midterm Exam I, closed book (100 points)
- 25% In-class midterm Exam II, closed book (100 points)
- 30% Final Exam, closed book (120 points)
- 20% Homework (8 assignments x 10 points each = 80 points)

Group collaboration and homework grading policy:

All assignments will be submitted via Canvas with an official due date and time. You are encouraged to submit assignments on time so that you maintain your progress in the class. It is allowed to discuss homework with fellow students, but the solutions that you turn in should reflect your own work. **More importantly, doing your homework will make a big difference in your ability to do well in the exams.**

Course outline (tentative):

Chapter # in blue refers to the 3rd edition and [Chapter #] in black refers to the 2nd edition:

- Introduction: experiments, outcomes, events, laws of probability, frequency interpretation, conditional probability, Bayes rule
 - Chapters 1&2 [Chapter 1]: Experiments, Models, and Probabilities
- A single random variable
 - Chapter 3 [Chapter 2]: Discrete Random Variables
 - Chapter 4 [Chapter 3]: Continuous Random Variables
- Multiple random variables, sums of random variables, limit theorems
 - Chapters 5, 6, 7 [Chapter 4]: Pairs of Random Variables
 - Chapter 8 [Chapter 5]: Random Vectors
 - Chapter 9 [Chapter 6]: Sums of Random Variables (selected parts)
- Estimation
 - Chapters 10, 12, supplement [Chapter 9]: Estimation of a Random Variable (selected parts)
- Random processes
 - Chapter 13 [Chapter 10]: Stochastic Processes
 - Supplement [Chapter 11]: Random Signal Processing (selected parts)

Important dates:

In-class Mid-term Exam I: Tue, Feb. 01, 2022
In-class Mid-term Exam II: Tue, Feb. 22, 2022
Final Exam: TBD (Week of Mar 14 – Mar 18)

Homework Release Dates:

Homework 1:	Jan. 07, 2022	Deadline:	Jan. 14, 2022 (11:59 PM)
Homework 2:	Jan. 14, 2022	Deadline:	Jan. 21, 2022 (11:59 PM)
Homework 3:	Jan. 21, 2022	Deadline:	Jan. 28, 2022 (11:59 PM)

Mid-term I: Feb. 1, 2022 (In-class mid-term)

Homework 4:	Jan. 28, 2022	Deadline:	Feb. 04, 2022 (11:59 PM)
Homework 5:	Feb. 04, 2022	Deadline:	Feb. 11, 2022 (11:59 PM)
Homework 6:	Feb. 11, 2022	Deadline:	Feb. 18, 2022 (11:59 PM)

Mid-term II: Feb, 22, 2022 (In-class mid-term)

Homework 7:	Feb. 18, 2022	Deadline:	Feb. 25, 2022 (11:59 PM)
Homework 8:	Feb. 25, 2022	Deadline:	Mar. 04, 2022 (11:59 PM)

Final Exam: TBD (Week of Mar 14 – Mar 18)

Quarantine, isolation, or missed class time:

This class is scheduled to be offered in-person on campus. OSU has vaccination and mask mandates in place and we meet in a space that follows the best practice guidelines of the CDC and the state of Oregon. Masks are required to be in class. If you are not wearing a mask, and no mask is available for you, I will have to ask you to leave unless you have a disability related accommodation.

There may be unexpected changes. If health and safety concerns prevent us meeting in person, the class will be adjusted to provide the best learning experience that we can safely cultivate.

If you experience symptoms of COVID-19 please consult [OSU Quarantine and Isolation](#) guidelines to determine your next steps. **If you are unable to attend a class session please contact me via email so I can share a recording of the covered materials with you. After viewing the recorded session please email me with any contributions or questions.**

If you are ill (or caring for someone who is):

I am here to support your success in life and in this course. Please reach out to me directly if you are concerned about your ability to engage in course activities due to illness or any other reason. You can do so by sending me an email. You need not disclose private medical information or provide documentation of your illness. The Office of the Dean of Students can also assist you if you are navigating a range of extenuating life circumstances including but not limited to prolonged illness, hospitalization, financial concerns, etc. They can be reached via Zoom chat or audio Monday through Friday from 9 a.m. to 5 p.m. at beav.es/4qQ or by email at support.odos@oregonstate.edu.

Classroom Behavior:

COVID-19: During this public health emergency we all have a shared responsibility to each other to take steps to reduce spread and transmission of COVID-19. This includes getting fully vaccinated as soon as you are eligible, following all OSU and public health authority guidance and regulations, wearing face coverings in shared spaces, and staying home if you are sick or have been in close contact with a known or suspected COVID-19 case. If you need to stay home due to illness or potential exposure, please contact your instructor who will work with you to facilitate your continued engagement with the course material and make up assignments with no penalty for lateness. For the updates from OSU on COVID-19 safety and mitigation measures, visit: <https://covid.oregonstate.edu/safety-and-success-planning>

Policy Violations:

Each member of the OSU community is responsible for holding themselves accountable to OSU policies and standards. Faculty are responsible for classroom management and may refer students to the Office of Student Conduct and Community Standards for further discipline if warranted.

Communication and interaction:

You will have ongoing access to your peers and me throughout the course. Email is the primary form of communication with me. Email will be checked daily on weekdays. I will do my best to respond to questions within 24 hours or, if sent on the weekend, the following Monday.

Through the Canvas emails, course calendar, and announcements I will maintain ongoing communication with you. These are also tools you may use to contact me, share your ideas, comments and questions through private and public means.

Honor code/academic integrity:

Integrity is a character-driven commitment to honesty, doing what is right, and guiding others to do what is right. Oregon State University students and faculty have a responsibility to act with integrity in all of our educational work, and that integrity enables this community of learners to interact in the spirit of trust, honesty, and fairness.

Academic misconduct, or violations of academic integrity, can fall into seven broad areas, including but not limited to: cheating; plagiarism; falsification; assisting; tampering; multiple submissions of work; and unauthorized recording and use.

It is important that you understand what student actions are defined as academic misconduct at Oregon State University. The OSU Libraries offer a tutorial on academic misconduct, and you can also refer to the [OSU Student Code of Conduct](#) and the [Office of Student Conduct and Community Standard's website](#) for more information. More importantly, if you are unsure if something will violate our academic integrity policy, ask your professors, GTAs, academic advisors, or academic integrity officers.

If you are found responsible for academic misconduct, the College Hearing Officer (or other hearing body) will make a determination of sanctions that are appropriate to the violation and the surrounding context). College Hearing Officers are authorized to assign Academic Sanctions as described in the [Code](#).

Students with disabilities:

The Oregon State University is committed to providing equitable access to learning opportunities for all students. Disability Access Services (DAS) provides accommodations, education, consultation and advocacy for qualified students with disabilities at Oregon State University. DAS works with students at OSU, OSU-Cascades, across Oregon and around the world through the OSU E-campus program.

Accommodations for students with disabilities are determined and approved by Disability Access Services (DAS). If you, as a student, believe you are eligible for accommodations but have not obtained approval please contact DAS immediately at 541-737-4098 or at <http://ds.oregonstate.edu>. DAS notifies students and faculty members of approved academic accommodations and coordinates implementation of those accommodations. While not required, students and faculty members are encouraged to discuss details of the implementation of individual accommodations.

Mental Health:

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating, and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce your ability to participate in daily activities. Oregon State University services are available to assist you with addressing these and other concerns you may be experiencing. You can learn more about the broad range of confidential mental health services available on campus via <http://counseling.oregonstate.edu/>

Make-up exams and incomplete work:

All assignments will be submitted via Canvas with an official due date and time. You are encouraged to submit assignments on time so that you maintain your progress in the class. There is no need to notify me if you plan to submit regular course assignments up to 4 days after the due date and time. No late points will be deducted. If you anticipate a longer delay in submitting assignments, please contact me via email to request a formal extension. You do not need to explain to me the reason for the extension. Simply state the assignment to be completed and when you are able to submit it.

I will make every attempt to provide reasonable accommodations if you miss an exam because of an illness or family emergency. Please contact me within 72 hours of the exam. Incomplete work should be completed within 1 month after the final exam date. A student is not permitted to submit extra work in an attempt to raise their grade.