

Probabilistic Methods in Engineering

ENG231

Prof. Dr. Serhan Yarkan

Fall '22

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Office Hours:

Tuesday 17:00 - 18:30

Wednesday 17:00 - 18:00

Office: Küçükyalı, B-303

Class Hours: Tuesday 14:00 - 17:00

Class Room: Küçükyalı, C-104

Course Description

The first step of being an engineer/scientist is learning to understand and model processes underlying physical reality. However, we need to overcome a challenging issue: inherent random/stochastic behavior of physical reality. Hence, One of the most important courses in the EE curriculum is Probability Theory. Engineers/scientists need to understand how probability and statistics work to solve real-world problems that they will face throughout their life.

Prerequisites

Mathematical Analysis, Linear Algebra, Differential Equations

Textbooks

- Athanasios Papoulis, S. Unnikrishna Pillai - Probability, Random Variables and Stochastic Processes, McGraw-Hill Europe, 4th Edition
- Dimitri P. Bertsekas, John N. Tsitsiklis - Introduction To Probability, Athena Scientific, 2nd Edition
- Sheldon M. Ross, A First Course in Probability, Pearson, 9th Edition

Course Logistics

Lectures will be held at Küçükyalı, C-104. In case an update/change takes place, official announcements will be posted on the website.

Voluntary Teaching Assistants

Halil Said Cankurtaran, Abdurrahman Ötkür | Office: Küçükyalı, B-303 (within office hours).

Midterm and Final Exams

- The midterm exam will be all-comprehensive to the point when the exam is held.
- The final exam will be all-comprehensive.

Grading Policy

- In-semester Evaluation
 - Midterm Exam: 40% <, 50% >
 - When applicable: Pop-up quizzes (not more than 10%, included into In-semester evaluations)
- Final Exam: 50%

Course Policies

During Class

Taking pictures, and recording video or audio is not allowed. Put your phone on silent mode or turn it off. In case students are late or students need to leave pay strict attention not to disturb the class session.

Attendance Policy

Attendance is obligatory. According to rules and regulations, students have to meet at least 70% attendance requirement ($\# \text{NumberOfWeeksLectureDelivered} \times 0.7$ will be rounded down) of the course.

Schedule and weekly learning goals [Tentative]

The schedule is tentative and subject to change. The learning goals below should be viewed as the key concepts you should grasp after each week, and also as a study guide before each exam, and at the end of the semester.

- **Week 1:** Introduction to probability theory and set theory
- **Week 2:** Probability space: sample space, event space, measure
- **Week 3:** Independence, Kolmogorov's probability axioms
- **Week 4:** Conditional probability
- **Week 5-7:** Random Variables
 - Definition of random variables
 - Probability mass function
 - Probability density function
 - Cumulative distribution function
- **Week 8: Midterm exam**

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- **Week 9:** Transformation of RV's
 - **Week 10-11:** Fourier Transform, Moment generating function, characteristic function
 - **Week 12:** Joint Behavior of RV's
 - **Week 13:** Statistics
 - **Week 14:** Maximum Likelihood Estimation
 - **Week 15:** Final exam