

CEN 402 – Introduction to Random Processes.

Course Description (catalog)

Introduction to random variables, parameter estimation, stochastic processes, random signal processing and applications to systems.

Objectives

The goal of this course is to teach students about the different statistical models that can help them in their future studies and research in networking and signal processing.

Textbook(s) and/or Other Required Materials:

Primary:

Probability and Stochastic Processes: A Friendly Introduction for Electrical and Computer Engineers, Yates, R. D. and Goodman, D. J., John Wiley and Sons, 3rd Ed., 2014.

Supplementary:

Random Variables and Random Signal Processing, Peebles, P., McGraw Hill.
Statistic Informed Decisions Using Data, Sullivan III, M., Pearson.

Course Outcomes

This course requires the student to demonstrate the ability to:

1. Memorize the concepts of probability, random variable and their representations and operations.
2. Define statistics, sampling, confidence intervals, and hypothesis testing.
3. Recognize random processes and their classifications.
4. Explain joint probability, conditional probability, independence, and Baye's rule.
5. Analyze data statistics, relative frequency, percentiles and outliers.
6. Calculate the mean, variance, and joint moment of two random variables such as the correlation and covariance.
7. Estimate parameters using maximum likelihood.

Topics covered and schedule in weeks

Experiments, Models, and Probabilities	2
Discrete and Continuous Random Variables	2
Pairs of Random Variables	2
Random Vectors	1
Parameter Estimation using the Sample Mean	2
Stochastic Processes	4
Random Signal Processing	2

Assessment Plan for the course

Student's performance in homework, quizzes, exams, and projects.

Category	Percent
Homework	20
Quizzes	10
Exam	30 (2x15)
Final	40

Contribution of course to Meeting Curriculum Disciplines

Curriculum Discipline	Percentage
Mathematics and Basic Science	50
Engineering Science	30
Engineering Design	15
General Education	5

Relationship of Course to Program Outcomes

Outcome	Program Outcome Description	Contribution
(a)	an ability to apply knowledge of mathematics, science, and engineering	
(b)	an ability to design and conduct experiments, as well as to analyze and interpret data	
(c)	an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	√
(d)	an ability to function on multidisciplinary teams	√
(e)	an ability to identify, formulate, and solve engineering problems	√
(f)	an understanding of professional and ethical responsibility	
(g)	an ability to communicate effectively	
(h)	the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	√
(i)	a recognition of the need for, and an ability to engage in life-long learning	
(j)	a knowledge of contemporary issues	√
(k)	an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	√

Prepared by and date:

Prof. Nasser-Eddine Rikli, Sunday, August 27, 2023.