

COURSE INFORMATION					
Course Title	Code	Semester	C + P + L Hour	Credits	ECTS
Random Signal Processing	EE664		3 + 0 + 0	3	10

<b>Prerequisites</b>	-
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<b>Language of Instruction</b>	English
<b>Course Level</b>	Doctor of Philosophy
<b>Course Type</b>	Elective
<b>Course Coordinator</b>	Engin Maşazade
<b>Instructors</b>	Engin Maşazade
<b>Assistants</b>	
<b>Goals</b>	This course gives the necessary theoretical background for the students who want to conduct research especially related to areas of signal processing, controls, and communication.
<b>Content</b>	Probability, random variables, and random vectors for analysis and research in electrical engineering. Distribution functions and densities, expectation, characteristic functions, functions of random variables, random vectors and sequences, stochastic convergence.

Learning Outcomes	Program Outcomes	Teaching Methods	Assessment Methods
1) Ability to recall important definitions of probability theory such as notion of random variables and Bayes Rule	3	1,2	A,D
2) Ability to recall continuous and discrete random variables,	3	1,2	A,D
3) Ability to describe multivariate random variables such as the multivariate Normal distribution.	3	1,2	A,D
4) Ability to define Random Processes, ability to define stationary properties of Random Processes.	3,5,11	1,2	A,D
5) Ability of analyzing the random signals	3,4,5,11	1,2	A,D

<b>Teaching Methods:</b>	1: Lecture, 2: Problem Solving, 3: Simulation, 4: Seminar, 5: Laboratory, 6: Term Research Paper
<b>Assessment Methods:</b>	A: Exam, B: Quiz, C: Experiment, D: Homework, E: Project

COURSE CONTENT		
Week	Topics	Study Materials
1	Introduction	Textbook

2	Basic Concepts of Probability Theory.	Textbook
3	Conditional Probability and Independence, Sequential Experiments	Textbook
4	Random Variables, CDF, PDF	Textbook
5	Discrete Random Variables	Textbook
6	Continuous Random Variables	Textbook
7	Functions of Random Variables, Expected Value of a Random Variable	Textbook
8	MIDTERM I	Textbook
9	Multiple Random Variables	Textbook
10	Sums of Random Variables	Textbook
11	Sums of Random Variables and Central Limit Theorem	Textbook
12	Random Processes	Textbook
13	Random Processes	Textbook
14	Random Processes	Textbook

<b>RECOMMENDED SOURCES</b>	
<b>Textbook</b>	<ul style="list-style-type: none"> <li>Alberto Leon-Garcia, Probability, Statistics, and Random Processes For Electrical Engineering, Prentice Hall; 3 edition, 2008.</li> </ul>
<b>Additional Resources</b>	<ul style="list-style-type: none"> <li>Probability, Random Variables and Stochastic Processes, Athanasios Papoulis, McGraw Hill.</li> <li>Stark and Woods, Probability and Random Process, Pearson</li> <li>Introduction to Probability, 2nd edition, Dimitri Bertsekas and John N. Tsitsiklis, Athena Scientific, 2008.</li> <li>A First Course in Probability, Sheldon Ross, Prentice Hall</li> </ul>

<b>MATERIAL SHARING</b>	
<b>Documents</b>	
<b>Assignments</b>	Homework Solutions
<b>Exams</b>	Exam Solutions

<b>ASSESSMENT</b>		
<b>IN-TERM STUDIES</b>	<b>NUMBER</b>	<b>PERCENTAGE</b>
Midterm	1	66.7
Homework Assignment	5	33.3

<b>Total</b>	<b>100</b>
<b>CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE</b>	40
<b>CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE</b>	60
<b>Total</b>	<b>100</b>

<b>COURSE CATEGORY</b>	Field Course
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<b>COURSE'S CONTRIBUTION TO PROGRAM</b>						
No	Program Learning Outcomes	Contribution				
		1	2	3	4	5
1	Can reach information in breadth and depth, and can evaluate, interpret and apply this information to scientific research in the area of Electrical and Electronics Engineering.					
2	Can complete and apply information with scientific methods using limited or missing data; can integrate information from different disciplines.					
3	Sets up Electrical and Electronics Engineering problems, develops and implements innovative methods for their solutions.					X
4	Develops new and/or original ideas and methods; finds innovative solutions to the system, component, or process design.		X			
5	Has comprehensive knowledge about the state-of-the-art techniques and methods in Electrical and Electronics Engineering and their limitations.					X
6	Can design and conduct research of analytical, modeling or experimental orientation; can solve and interpret complex cases that come up during this process.					
7	Can communicate verbally and in writing in one foreign language (English) at the General Level B2 of the European Language Portfolio.					
8	Can assume leadership in multi-disciplinary teams; can develop solutions in complex situations, and take responsibility.					
9	Can systematically and openly communicate in national and international venues the proceedings and conclusions of the work he/she performs in Electrical and Electronics Engineering.					
10	Respects social, scientific and ethical values in all professional activities performed during the collection, interpretation and announcement phases of data.					
11	Is aware of new and emerging applications in Electrical and Electronics Engineering; investigates and learns them, whenever necessary.					X
12	Can identify the social and environmental aspects of Electrical and Electronics Engineering applications.					

<b>ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION</b>			
Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration (including 2 midterms: 14xtotal lecture hours)	14	3	42

Hours for off-the-classroom study (Pre-study, practice)	14	11	140
Midterm I	1	3	3
Homework assignment	5	10	50
Final examination	1	3	3
<b>Total Work Load</b>			238
<b>Total Work Load / 25 (h)</b>			9.52
<b>ECTS Credit of the Course</b>			10