RANDOM PROCESSES IN ENGINEERING

1	Course Title:	RANDOM PROCESSES IN ENGINEERING
2	Course Code:	BM5135
3	Type of Course:	Optional
4	Level of Course:	Second Cycle
5	Year of Study:	1
6	Semester:	1
7	ECTS Credits Allocated:	6.00
8	Theoretical (hour/week):	3.00
9	Practice (hour/week):	0.00
10	Laboratory (hour/week):	0
11	Prerequisites:	Undergraduate Level Probability and Statistics Knowledge
12	Language:	Turkish
13	Mode of Delivery:	Face to face
14	Course Coordinator:	Prof. Dr. KEMAL FİDANBOYLU
15	Course Lecturers:	-
16	Contact information of the Course Coordinator:	e-posta: kfidan@uludag.edu.tr Uludağ Üniversitesi, Bilgisayar Mühendisliği Bölümü Görükle Kampüsü, 16059 Nilüfer, Bursa
17	Website:	
18	Objective of the Course:	To provide the students with knowledge about basic applications of random processes in engineering, spectral representation, spectral estimation, mean square estimation and entropy.
19	Contribution of the Course to Professional Development:	Engineering Science: 85%; Engineering Design: 15%
20	Learning Outcomes:	

	1	Discuss random processes and their applications in engineering
	2	Describe random walk, Brownian motion, thermal and shot noise, Poisson points, modulation, cyclostationary and bandlimited processes, sampling theory, bispectra and system identification
	3	Explain spectral representation of random processes
	4	Examine ergodicity, spectral and mean square estimation, extrapolation and system identification
	5	Analyze Kalman filters
	6	Describe maximum entropy method, coding and channel capacity
	7	Explain Markov chains
	8	Define stationary distributions and limiting probabilities
	9	Illustrate Markov processes and queueing theory
	10	

21	Course Content:	

Course Content:		
Week	Theoretical	Practice
1	Random Processes; Definitions; Systems with Stochastic Inputs; The Power Spectrum; Discrete-Time Processes.	

2	Random Walks and Other Applications; Random Walks; Poisson Points and Shot Noise; Modulation; Cyclostationary Processes.
3	Bandlimited Processes and Sampling Theory; Deterministic Signals in Noise. Bispectra and System Identification.
4	Spectral Representation; Factorization and Innovations; Finite-Order Systems and State Variables.
5	Fourier Series and Karhunen–Lo`eve Expansions; Spectral Representation of Random Processes.
6	Spectrum Estimation; Ergodicity; Extrapolation and System Identification; The General Class of Extrapolating Spectra and Youla's Parametrization.
7	Mean Square Estimation and Filtering.
8	Kalman Filters and Their Applications.
9	Entropy; Basic Concepts; Random Variables and Stochastic Processes.
10	The Maximum Entropy Method; Coding; Channel Capacity.
11	Markov Chains; Higher Transition Probabilities and the Chapman–Kolmogorov Equation. Classification of States.
14	Networks of Queues.

Activites	Number	Duration (hour)	Total Work Load (hour)
Theoretical	14	3.00	42.00
Practicals/Labs	0	0.00	0.00
Self study and preperation	14	5.00	70.00
Homeworks	0	0.00	0.00
Projects Assesment	1	33.00	33.00
Field Studies	0	0.00	0.00
Midterm exams	1	15.00	15.00
Others	0	0.00	0.00
Final Exams	1	20.00	20.00
Total Work Load			180.00
Total work load/ 30 hr			6.00
ECTS Credit of the Course			6.00

Contribution of Term (Year) Learning Activities to Success Grade	40.00
Contribution of Final Exam to Success Grade	60.00
Total	100.00
Measurement and Evaluation Techniques Used in the Course	Classical problem-solving ability will be measured in midterm and final exams. The project will include research, simulation, report writing and presentation on a subject related to the course content.
24	**ECTS / WORK LOAD TABLE**

Textbooks, References and/or Other Materials: Athanasios Papoulis and S. Unnikrishna Pillai, "Probability, Random Variables, and Stochastic Processes, 4th Ed.

25	CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS															
	PQ1	PQ2	PQ3	PQ4	PQ5	PQ6	PQ7	PQ8	PQ9	PQ10	PQ11	PQ12	PQ13	PQ14	PQ15	PQ16
ÖK1	5	3	3	2	2	2	0	0	0	0	0	0	0	0	0	0
ÖK2	5	4	4	2	2	2	0	0	0	0	0	0	0	0	0	0
ÖK3	5	4	4	2	2	2	0	0	0	0	0	0	0	0	0	0
ÖK4	5	4	4	2	2	2	0	0	0	0	0	0	0	0	0	0
ÖK5	5	4	4	2	2	2	0	0	0	0	0	0	0	0	0	0
ÖK6	5	4	4	2	2	2	0	0	0	0	0	0	0	0	0	0
ÖK7	5	4	4	2	2	2	0	0	0	0	0	0	0	0	0	0
ÖK8	5	4	4	2	2	2	0	0	0	0	0	0	0	0	0	0
ÖK9	5	4	4	2	2	2	0	0	0	0	0	0	0	0	0	0
LO: Learning Objectives PQ: Program Qualifications																
Contribution Level:	1 very low		2 low			3 Medium			4 High				5 Very High			