COURSE INFORMATON					
Course Title	*Code*	*Semester*	*L+P Hour*	*Credits*	*ECTS*
STOCHASTIC PROCESSES	**ESYE 540**	**1**	**3 + 0**	**3**	**10**

Prerequisites	

Language of Instruction	English
Course Level	Master's Degree
Course Type	Elective
Course Coordinator	
Instructors	
Assistants	
Goals	This course aims to help students acquire both the mathematical principles and the intuition necessary to create, analyze, and understand insightful models for a broad range of various stochastic processes.
Content	A short review of the concepts of probability which is followed by the basic theory of the Laws of Large numbers and Bernoulli Processes. The course then includes Poisson process, Renewal processes, Markov chains in discrete and continuous time, as well as Brownian motion and Random walks. Applications of these stochastic processes are emphasized by examples.

Course Learning Outcomes	**Program Learning Outcomes**	**Teaching Methods**	**Assessment Methods**
1) Proficient in fundamantel probability concepts	1,2,4	1,2,4	A, C
2) Experienced in basic theory of probability	1,2,4	1,2,4	A, C
3) Achieves probabilistic intuition and insight in thinking about problems	1,2,4	1,2,4	A, C
4) Attains a moderate and practical knowledge in both Discrete and Continuous Markov Chains	1,2,4	1,2,4	A, C
5) Uses theoretically studied methods on queuing systems and uses models to determine whether systems are reliable.	1,2,4	1,2,4	A, C

6) Becomes familier with the application of stochastic processes in fields such as engineering, management sciences and operational research.	1,2,4	1,2,4	A, C

Teaching Methods:	1: Lecture, 2: Question-Answer, 3: Lab, 4: Case-study
Assessment Methods:	A: Testing, B: Experiment, C: Homework, D: Project

COURSE CONTENT

Week	Topics	Study Materials
1	INTRODUCTİON AND REVIEW OF PROBABILITY	Textbook, Course Notes
2	BERNOULLI PROCESSES	Textbook, Course Notes
3	LAWS OF LARGE NUMBERS, CONVERGENCE	Textbook, Course Notes
4	POISSON PROCESSES	Textbook, Course Notes
5	RENEWAL THEORY	Textbook, Course Notes, Case study
6	RENEWAL REWARD PROCESSES	Textbook, Course Notes, Case study
7	MARKOV CHAINS	Textbook, Course Notes, Case study
8	MIDTERM EXAM	Textbook, Course Notes
9	CONTINUOUS TIME MARKOV CHAINS	Textbook, Course Notes
10	BIRTH AND DEATH PROCESSES	Textbook, Course Notes
11	QUEUEING THEORY	Textbook, Course Notes, Case study
12	RELIABILITY THEORY	Textbook, Course Notes, Case study
13	RANDOM WALKS	Textbook, Course Notes
14	BROWNIAN MOTION AND STATIONARY PROCESSES	Textbook, Course Notes, Case study

RECOMMENDED SOURCES	
Textbook	INTRODUCTION TO PROBABILITY MODELS 10TH EDITION, SHELDON M. ROSS, ELSEVIER, 2010
Additional Resources	STOCHASTIC PROCESSES 2ND EDITION, SHELDON M. ROSS, WILEY 1996

MATERIAL SHARING	
Documents	Modeling case study, lecture notes
Assignments	Homeworks 1-6
Exams	Midterm 1, Final Exam

ASSESSMENT		
IN-TERM STUDIES	**NUMBER**	**PERCENTAGE**
Midterm 1	1	45
Homeworks	6	55
Total		**100**
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE		30
CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE		70
Total		**100**

COURSE CATEGORY	Expertise/Field Courses

COURSE'S CONTRIBUTION TO PROGRAM							
No	Program Learning Outcomes	Contribution					
		1	2	3	4	5
1	Adequate background in Mathematics, Natural Sciences and the Industrial and Systems Engineering discipline.					**X**
2	Ability to identify, model and solve complex problems in the area of Industrial and Systems Engineering.					**X**
3	Ability to design a complex system, process, device or product under realistic constraints and conditions, in such a way as to meet the desired requirements.			**X**		
4	Ability to employ information technologies effectively in Industrial and Systems Engineering applications and develop and/or use modern techniques and tools for these applications.			**X**		

5	Ability to design and conduct experiments and interpret results to analyze problems in the area of Industrial and Systems Engineering.			**X**		
6	Ability to take responsibility both individually and as a team member to solve unforeseen problems that arise in intra-disciplinary and inter-disciplinary projects.					
7	Ability to access information in the area of Industrial and Systems Engineering and to report and communicate this information to others using a foreign language (English) at the European Language Portfolio C1 General Level.					
8	Ability to follow current issues and recent developments in science and technology by accessing databases and other sources of information and to continue to educate oneself.					
9	Awareness of scientific and ethical responsibility in professional matters.					
10	Ability to initiate innovative projects in the area of Industrial and Systems Engineering and to manage these projects considering all aspects.					
11	Ability to identify the impact of Industrial and Systems Engineering applications on health, environment and safety; awareness of the legal consequences of Industrial and Systems Engineering solutions.					

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION			
Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration (Excluding the exam weeks: 12x Total course hours)	12	3	36
Hours for off-the-classroom study (Pre-study, practice)	14	10	140
Midterm examination	1	3	3
Homework	6	10	60
Final examination	1	3	3
Total Work Load			242
Total Work Load / 25 (h)			9.68
ECTS Credit of the Course			10