COURSE INFORMATON					
Course Title	*Code*	*Semester*	*L+P Hour*	*Credits*	*ECTS*
Fuzzy Set Theory and Applications	**ESYE 550**	**1-2**	**3**	**3**	**10**

Prerequisites	None

Language of Instruction	English
Course Level	M. Sc.
Course Type	Elective
Course Coordinator	
Instructors	Prof. Dr. Melek BASAK
Assistants	
Goals	This course is designed to introduce Fuzzy Logic as an alternative to Probability Theory. Fuzzy Logic has a wide range of application capability whenever probability assumptions are unsatisfied or existing uncertainty is non random. In order to be able to apply fuzzy set theory to in various decision problems as well as other application problems, students are introduced differences and similarities between probability theory and fuzzy set theory.
Content	The course covers basics related to uncertainty modelling and fuzzy set theory including fuzzy operators, fuzzy relations, membership functions, fuzzy control and fuzzy decisions. Students are required to submit a project on fuzzy decision making.

Course Learning Outcomes	**Program Learning Outcomes**	**Teaching Methods**	**Assessment Methods**
1. Defines and argues about fuzzy set theory and uncertainty concepts.	1,5	1,2,4	D
2. Identifies the similarities and differences between probability theory and fuzzy set theory and their application conditions.	1,3,5	1,2,4	D
3. Applies fuzzy set theory in modeling and analyzing uncertainty in a decision problem.	2	1,2,4	D
4. Applies fuzzy control by examining simple control problem examples.	12	1,2,4	D
5. Applies fuzzy set theory to solve and finalize a complex decision problem.	5	1,2,4	D

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	**Week**	**Week**
1	Classical and Fuzzy Sets	Text book
2	Classical and Fuzzy Relations	Text book
3	Membership Functions	Text book
4	Fuzzy Arithmetic and Operators	Text book
5	Fuzzy Decision Making	Text book
6	Int. To Fuzzy Control	Text book
7	Fuzzy Measures	Text book
8	Project: Fuzzy Set Teory Application	Papers
9	Project: Fuzzy Set Teory Application	Papers
10	Project: Fuzzy Set Teory Application	Papers
11	Presentation 1	
12	Project: Fuzzy Set Teory Application	Papers
13	Project: Fuzzy Set Teory Application	Papers
14	Presentation 2	

RECOMMENDED SOURCES	
Textbook	Fuzzy Logic with Engineering Applications Timothy J. Ross, McGraw-Hill – **2010** | ISBN-10: **047074376X** | ISBN-13: **978-0470743768** | Edition: **3**
Additional Resourses	Academic research papers on various decision topics

MATERIAL SHARING	
Documents	Academic research papers on various decision topics
Assignments	
Exams	

ASSESSMENT		
IN-TERM STUDIES	**NUMBER**	**PERCENTAGE**
Attendence (at least 11 weeks) and contribution	13	20
Presentation	2	80
Total		**100**

COURSE CATEGORY	Expertise/Field Courses

COURSE'S CONTRIBUTION TO PROGRAM							
No	Program Learning Outcomes	Contribution					
		1	2	3	4	5	1
1	Ability to reach knowledge in breadth and depth through scientific research in Systems Engineering field; to have extensive knowledge about current techniques and procedures together with their constraints.					**X**	
2	Ability to complement and apply knowledge by scientific methods utilizing limited or missing data; to use knowledge in different disciplines effectively by blending them.					**X**	
3	Ability to formulate Systems Engineering problems; to develop novel and original ideas and procedures for their solutions and to use innovative procedures in solutions.				**X**		
4	Awareness of new and developing applications in Systems Engineering; ability to investigate and learn these applications when required.						
5	Ability to design and apply analytical, and modeling and experimental based research; to solve and interpret complex situations encountered in this process.				**X**		
6	Ability to lead multi-disciplinary teams; to develop solution approaches in complicated situations and to take responsibility.						
7	Ability to develop novel and/or original ideas and methods; to develop innovative solutions for the design of systems, parts or the processes.						
8	Ability to communicate orally or in writing the process and the results of Systems Engineering studies systematically and openly in national or international platforms.						
9	Ability to master a foreign language (English) at the European Language Portfolio B2 General Level to communicate orally or in writing.						
10	Ability to recognize social, scientific and ethical values in the process of collection, interpretation and publishing of data, and in all professional activities.						
11	Ability to visualize social and environmental dimensions of Systems Engineering applications and to observe these dimensions in professional practice.						
12	Ability to develop appropriate methodology and procedures for the modeling, improvement, control and design of complex systems for a specified target.			**X**			

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION			
Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration (Excluding the exam weeks: 13x Total course hours)	13	3	39
Hours for off-the-classroom study (Pre-study, practice)	21	10	210
Midterm examination	0	0	0
Project	1	2	2
Final examination			
Presentation			
Total Work Load			251
Total Work Load / 25 (h)			10.04
ECTS Credit of the Course			10