COURSE INFORMATON					
Course Title	*Code*	*Semester*	*L+P Hour*	*Credits*	*ECTS*
SYSTEMS ENGINEERING METHODOLOGY	**ESYE505**	**1**	**3+0**	**3**	**10**

Prerequisites	

Language of Instruction	English
Course Level	M. Sc.
Course Type	Compulsory
Course Coordinator	
Instructors	Assist.Prof. Zeynep Ocak
Assistants	
Goals	This course aims to teach systems engineering methodology and its applications in the design and development of complex systems.
Content	Course Introduction; What is Systems Engineering?, INCOSE Model of SE; RCI Model of SE, RCI Systems Engineering Process, Lean Thinking; Set-Based Design, Axiomatic Design; Decision-Based Design; Summary of Frameworks Phase, Quality Function Deployment, Robust Design, System Modeling And Analysis, Systems Engineering In Professional Practice, Extreme Programming, Structure, analysis, design, and models, Architecture Modeling Languages, Applications of SysML to Modeling and Simulation, and Research Paper Presentations.

Course Learning Outcomes	**Program Learning Outcomes**	**Teaching Methods**	**Assessment Methods**
1. Ability to derive a systems engineering plan for a real world project	4	2	A, C, D
2. Ability to decide on appropriateness of a proposed process, strategy or method for systems engineering using main concepts in probability, economics and cognitive sciences	2	2	A, C, D
3. Ability to implement most important tools of systems engineering (QFD, robust design, etc.)	7	2	A, C, D
4. Ability to foresee the value added to systems engineering processes by modeling and simulation	9	2	A, C, D
5. Ability to construct an effective plan of gathering and using information for systems engineering	3	2	A, C, D
6. Ability to determine the effect of manufacturing, maintenance and wastes on systems' cost and value	5	2	A, C, D

Teaching Methods:	1: Lecture, 2: Paper Discussion, 3: Lab, 4: Case-Study
Assessment Methods:	A: Testing, B: Paper Summary, C: Homework, D: Project

COURSE CONTENT		
Week	**Topics**	**Study Materials**
1	Course Introduction; What is Systems Engineering?	Textbook, Research Articles
2	INCOSE Model of SE; RCI Model of SE RCI Systems Engineering Process	INCOSE Manual, Research Articles
3	Lean Thinking; Set-Based Design	Research Articles
4	Axiomatic Design; Decision-Based Design; Summary of Frameworks Phase	Research Articles
5	Quality Function Deployment	Research Articles
6	Robust Design	Research Articles
7	Midterm Exam	Research Articles
8	System Modeling And Analysis	Research Articles
9	Systems Engineering In Professional Practice	Research Articles
10	Extreme Programming	Research Articles
11	Structure, analysis, design, and models	Textbook
12	Architecture Modeling Languages	Textbook
13	Applications of SysML to Modeling and Simulation	Textbook
14	Research Paper Presentations	

RECOMMENDED SOURCES	
Textbook	Decision Making in Systems Engineering and Management by G. S. Parnell, P. J. Driscoll, D. L. Henderson (2008) Architecture and Principles of Systems Engineering by C. E. Dickerson, D. N. Mavris (2008)
Additional Resources	Supplementary reading materials will be available during the term

MATERIAL SHARING	
Documents	Papers on relevant subjects provided

Assignments	3 Homeworks
Exams	1 Midterm, 1 Final Exam

ASSESSMENT		
IN-TERM STUDIES	**NUMBER**	**PERCENTAGE**
Mid-term	1	31
Assignment	1	23
Class Participation	1	15
Term Project	1	31
Total		**100**
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE		35
CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE		65
Total		**100**

COURSE CATEGORY	Expertise/Field Courses

COURSE'S CONTRIBUTION TO PROGRAM							
No	Program Learning Outcomes	Contribution					
		1	2	3	4	5
1	Ability to understand and apply natural sciences, mathematics and engineering sciences in advanced level.					
2	Ability to possess wide and deep knowledge in the field of Industrial and Systems Engineering including the most recent advances.					**X**
3	Ability to possess advanced level of required skill, techniques and methods to conduct research by using and evaluating up-to-date information.					**X**
4	Ability to model, design and develop solutions, under realistic constraints, a system, a process or a product by generating innovative and original ideas.					**X**
5	Ability to transfer advancements in scientific, technical and cultural developments to the society with the ethical responsibility and scientific					**X**

	objectivity.					
6	Ability to perceive, design and apply an original research process independently: manages this process successfully.					
7	Ability to execute a comprehensive study that brings innovation to the science and technology or develops technological product/process or adapts an already known method to a new field.					**X**
8	Ability to contribute to the development of science and technology literature by publishing research results in respectable scientific platforms.					
9	Ability to analyze, synthesize and evaluate critically the ideas and developments in the field of specialization.					**X**
10	Ability to communicate effectively in writing, orally and visually with peers and wide scientific and social communities by using a foreign language at a level of European Language Portfolio C1 General Level.					

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION			
Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration (14x3)	14	3	42
Reading the course materials	14	7	98
Midterm examination	1	2	2
Homework	3	5	15
Project (Preparation plus presentation)	1	35	35
Hours of studying for the exams (Midterm and Final)	1	55	55
Final examination	1	3	3
Total Work Load			250
Total Work Load / 25 (h)			10.0
ECTS Credit of the Course			10