

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

Prerequisites	
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Language of Instruction	English
Course Level	M. Sc.
Course Type	Compulsory
Course Coordinator	
Instructors	Assist.Prof. Halis Sak
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	12	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	4	2	A, C, D
3. Ability to implement most important tools of systems engineering (QFD, robust design, etc.)	5	2	A, C, D
4. Ability to foresee the value added to systems engineering processes by modeling and simulation	1	2	A, C, D
5. Ability to construct an effective plan of gathering and using information for systems engineering	2	2	A, C, D
6. Ability to determine the effect of manufacturing, maintenance and wastes on systems' cost and value	11	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
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COURSE'S CONTRIBUTION TO PROGRAM						
No	Program Learning Outcomes	Contribution				
		1	2	3	4	5
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.					

4	Awareness of new and developing applications in Systems Engineering; ability to investigate and learn these applications when required.									X
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.									X
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 (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