ABDULLAH GÜL UNIVERSITY
GRADUATE SCHOOL OF ENGINNERING & SCIENCE
INDUSTRIAL ENGINEERING DEPARTMENT
COURSE DESCRIPTION AND APPLICATION INFORMATION

Course Name	Code	Semester	T+P (Hour)	Credit	ECTS
Risk Modeling, Assessment, and Management	IE 534	Fall - Spring	3 + 0	3	10

Prerequisites	IE 511 Modeling and Optimization or equivalent, IE 501 Probability Theory or equivalent

Course Type	Compulsory
Course Language	English
Course Coordinator	Assoc. Prof. İbrahim Akgün
Course Instructor	Assoc. Prof. İbrahim Akgün
Course Assistant	
Course Objective	Risk-based decision making and risk analysis has a number of important applications in the field, such as engineering, science, manufacturing, health, homeland security, business, governance and public policy. The aim of the course, (1) To introduce the most recent developments in risk analysis, (2) To teach how to calculate risk mathematically in real life decision making problems and how to construct the risk probabilities, (3) To discuss institutional, organizational and political aspects of risk analysis and management with real life case studies, (4) To implement of risk management in a real problem of an organization. In the course, risk assessment and management process, single- and multi-objective decision making, fault trees, terrorism and extreme event risk modeling will be covered.
Course Learning Outcomes	A student who successfully completes this course, 1. Understand the importance of modeling in risk analysis and system engineering. 2. Implements appropriate risk analysis and management process to problems. 3. Creates probability distributions based on historical data or expert opinions. 4. Performs and implements risk analyzes using single- and multi-objective decision trees. 5. Implements appropriate multi-objective decision making techniques to problems. 6. Implements risk modeling and assesment to extreme events. 7. Applies fault tree, event tree, failure mode effect and analysis techniques. 8. Makes risk modeling and analysis of systems of dynamic systems and complex systems.
Course Content	• Systems Engineering and Mathematical Models • (Single and Multi-Objective) Decision Tree Analysis • Multi-Objective Decision Making, Multi-Objective Risk Impact Analysis • Hierarchical Holographic Modeling and Risk Filtering, Ranking and Management • Analysis of fault trees, event trees and failure mode effect and analysis

WEEKLY SUBJECTS AND RELATED PRELIMINARY PREPARATION PAGES

Week	Subjects	Preliminary
1	System Engineering and Role of Modeling in Risk Analysis	
2	Basic Components of Mathematical Models	
3	Basic Decision Analysis, Decision Trees and Probability Distribution Functions	
4	Multi-Objective Decision Making	
5	Multi-Objective Decision Making	
6	Risk Assessment of Extreme Events: Divided Multi-Objective Risk Method	
7	Hierarchical Holographic Modeling and Risk Filtering, Ranking and Management	
8	Multiobjective Statistical Method – Midterm Exam	
9	Risk, Uncertainty and Uncertainty Taxonomy	
10	Multi-Objective Decision Tree Analysis	
11	Extreme Events Statistic	
12	Multi-Stage, Multi-Objective Impact Analysis Method: Modeling of Dynamic Systems	

13	Combination of Multi-Objective Risk Method and Multi-Stage multiobjective Impact Analysis Method	
14	Fault Tree Analysis, Event Tree Analysis, System Reliability	
15	Modeling of Complex Systems	
16	Final Exam	

KAYNAKLAR	
Lecture Notes	Lecture notes and slides of the course will be shared with students during the semester via CANVAS system.
Other Sources	**Textbook:** Haimes, Yacov Y., Risk Modeling, Assessment, and Management, Wiley & Sons, Inc., N.Y., Third Edition, 2009. **Supplementary Textbooks:** 1. Chelst K, Canbolat YB. Value-Added Decision Making for Managers, CRC Press Taylor and Francis Group, 2012. 2. Cohon JL. Multiobjective Programming and Planning, Academic Press, 1978. 3. Chankong V, Haimes, YY. Multiobjective Decision Making: Theory and Methodology, North-Holland, 1983.

MATERIAL SHARING	
Documents	will be shared with students during the semester via CANVAS system.
Homework	will be shared with students during the semester via CANVAS system.
Exams	5 (five) quizzes and 1 (one) final exam.

EVALUATION SYSTEM		
ACTIVITIES	**QUANTITY**	**WEIGHT**
Homework	5	%15
Final Exam	1	%30
Academic Paper Presentation and Quiz	4	%15
Project	1	%40
TOTAL		%100
Term Activities Percentage		%70
Final Exam Percentage		%30
TOTAL		%100

Course Category	
Natural Sciences and Mathematics	%40
Engineering Sciences	%50
Social Sciences	%10

LEARNING OUTCOMES AND PROGRAM QUALIFICATIONS RELATIONSHIP

No	Program Qualification	Contribution Level				
		1	2	3	4	5
1	PQ1.					X
2	PQ2.				X	
3	PQ3.		X			
4	PQ4.			X		
5	PQ5.					X
6	PQ6.				X	

*Increasing from 1 to 5.

ECTS / WORK LOAD TABLE			
Activities	Activity	Duration (Hour)	Total Work Load
Course Duration (including exam week: 16x total course hours)		3	48

Out-of-class Study Time (Pre-study, practice)		4	64
Reading		1	16
Internet browsing, library work		1	10
Project		5	50
Report Preparation		15	30
Presentation Preparation		5	5
Presentation		2	4
Homework		5	25
Quiz		0,2	1
Midterm		20	20
Final Exam		30	30
Total Work Load			303
Total Work Load / 30			10.1
Course ECTS CREDIT			10