

COURSE INFORMATION					
Course Title	Code	Semester	L+P Hour	Credits	ECTS
QUANTITATIVE METHODS FOR SYSTEMS ENGINEERING II	ESYE604	2	3+0	3	10
Prerequisites					

Language of Instruction	English
Course Level	Ph.D.
Course Type	Elective
Course Coordinator	
Instructors	Prof.Dr.Rauf Nişel
Assistants	
Goals	The objective of the course is to help students to develop and extend their knowledge and skills about complex and advance research designs to enrich the portfolio of methods to be used in their research analysis.
Content	The course is designed to give students opportunity to do complex and advance analysis and to create new research models based on the data obtained from primary or secondary sources.

Course Learning Outcomes	Program Learning Outcomes	Teaching Methods	Assessment Methods
Solutions to multi-factor problems in system engineering by multivariate statistical methods	1,2,3,4,5,6,7,12	1,2,3,4	A,B,C,D
Decision making in multivariate environment in system engineering	1,2,3,4,5,6,7,12	1.2.3.4	A,B,C,D
Effective project planning	1,2,3,4,5,6,7,8,10,12	1.2	C,D
Designing multivariate research models	1,2,3,4,5,6,7,10,12	1,2,3,4	A,B,C,D
Validating constructed multivariate research models	1,2,3,4,5,6,7,12	1,2,3,4	A,B,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	Introduction to complex experimental designs	Textbook
2	Completely Randomized design	Textbook
3	Randomized Block Design	Textbook
4	Factorial experiments	Textbook
5	Analysis of covariance models (ANCOVA)	Textbook
6	Multivariate Analysis of Variance models (MANOVA)	Textbook
7	Anova and manova models with repeated measures	Textbook
8	Exploratory and confirmatory factor analysis	Textbook
9	Multivariate data analysis in regression models	Textbook
10	Canonical Correlation Analysis	Textbook
11	Binary logistic regression models	Textbook
12	Multinomial logistic regression models	Textbook
13	Discriminant analysis	Textbook
14	Cluster Analysis	Textbook

RECOMMENDED SOURCES	
Textbook	Joseph F. Hair Jr. and Others, Multivariate Data analysis (7 th Edition), Prentice Hall, 2010
Additional Resources	Lecture Notes

MATERIAL SHARING	
Documents	
Assignments	Students are required to read the assigned topics and to submit a short report before the scheduled class session
Exams	Midterm and Final Exams

ASSESSMENT		
IN-TERM STUDIES	NUMBER	PERCENTAGE
Mid-terms	1	20
Assignment	4	20
Lab Work		
Term Project	1	60
Total		100
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE	1	40
CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE	1	60
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.					x
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					x

	research; to solve and interpret complex situations encountered in this process.				
6	Ability to lead multi-disciplinary teams; to develop solution approaches in complicated situations and to take responsibility.				x
7	Ability to develop novel and/or original ideas and methods; to develop innovative solutions for the design of systems, parts or the processes.				x
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.			x	
9	Ability to master a foreign language (English) at the European Language Portfolio B2 General Level to communicate orally or in writing.		x		
10	Ability to recognize social, scientific and ethical values in the process of collection, interpretation and publishing of data, and in all professional activities.			x	
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 (Excluding the exam weeks: 12x Total course hours)	14	3	42
Hours for off-the-classroom study (Pre-study, practice)	14	9	126
Midterm examination	1	2	2
Homework	4	6	24
Project	1	1	60
Final examination	1	1	5
Total Work Load			259
Total Work Load / 25 (h)			10,36
ECTS Credit of the Course			10