

COURSE INFORMATION					
Course Title	Code	Semester	L+P Hour	Credits	ECTS
<b>TIME SERIES ANALYSIS AND FORECASTING</b>	<b>ESYE648</b>		<b>3+0</b>	<b>3</b>	<b>10</b>

<b>Prerequisites</b>	A background in statistics at the level of ISE254.
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<b>Language of Instruction</b>	English
<b>Course Level</b>	Ph.D
<b>Course Type</b>	Elective
<b>Course Coordinator</b>	
<b>Instructors</b>	Prof. Dr. Ali Taylan Ula
<b>Assistants</b>	
<b>Goals</b>	To introduce the basic principles and methods of time series analysis and forecasting.
<b>Content</b>	Stationarity. Autocovariance and autocorrelation functions. General linear process. Stationary models: AR, MA, ARMA. Model identification. Estimation. Diagnostic checks. Nonstationary models: ARIMA. Seasonal models. Forecasting. Statistical package applications.

Course Learning Outcomes	Program Learning Outcomes	Teaching Methods	Assessment Methods
Ability to analyze an equally spaced time series with no gaps.	2	1,3	A,C
Ability to specify the model of a time series, and make parameter estimates.	5	1,3	A,C
Ability to do model diagnostic checks.	5	1,3	A,C
Ability to consider trend and seasonality.	5	1,3	A,C
Ability to do forecasting.	5	1,3	A,C
Ability to use AR, MA, ARMA, ARIMA and seasonal ARIMA models.	5	1,3	A,C
Ability to use statistical package MINITAB.	5	3	A,C
Awareness of ethical values.	10		A,C

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

<b>COURSE CONTENT</b>		
<b>Week</b>	<b>Topics</b>	<b>Study Materials</b>
1	Introduction. Stationarity.	Lecture Notes
2	Autocovariance, Autocorrelation and Partial Autocorrelation Functions.	Lecture Notes
3	General Linear Model.	Lecture Notes
4	Moving Average (MA) Models.	Lecture Notes
5	Autoregressive (AR) Models.	Lecture Notes
6	Mixed AR and MA (ARMA) Models.	Lecture Notes
7	MIDTERM EXAM I Model Identification.	Lecture Notes
8	Model Estimation.	Lecture Notes
9	Diagnostic Checks.	Lecture Notes
10	Nonstationary Models. Differencing. ARIMA Models.	Lecture Notes
11	Seasonal ARIMA Models.	Lecture Notes
12	MIDTERM EXAM II Forecasting. MINITAB Applications.	Lecture Notes
13	Forecasting. MINITAB Applications.	Lecture Notes
14	Forecasting. MINITAB Applications.	Lecture Notes

<b>RECOMMENDED SOURCES</b>	
<b>Textbook</b>	Lecture notes were used.
<b>Additional Resources</b>	

<b>MATERIAL SHARING</b>	
<b>Documents</b>	
<b>Assignments</b>	6 Homeworks.
<b>Exams</b>	2 Midterm Exams, Final, 2 Quizzes.

<b>ASSESSMENT</b>		
<b>IN-TERM STUDIES</b>	<b>NUMBER</b>	<b>PERCENTAGE</b>
Mid-terms	2	76
Assignment	6	8
Quizzes	2	8
Attendance		8
<b>Total</b>		<b>100</b>
<b>CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE</b>		35
<b>CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE</b>		65
<b>Total</b>		<b>100</b>

<b>COURSE CATEGORY</b>	Expertise Courses
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<b>COURSE'S CONTRIBUTION TO PROGRAM</b>						
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.					
2	Ability to complement and apply knowledge by scientific methods utilizing limited or missing data; to use knowledge in different disciplines effectively					X

	by blending them.					
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.					
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.					X
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.					

<b>ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION</b>			
Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration (Excluding the exam weeks: 12x Total course hours)	12	3	36
Hours for off-the-classroom study (Pre-study, practice)	14	10	140
Midterm examination	2	2	4
Homework	6	10	60

Project			
Final examination	1	2	2
<b>Total Work Load</b>			242
<b>Total Work Load / 25 (h)</b>			9,68
<b>ECTS Credit of the Course</b>			10