INDUSTRIAL ENGINEERING DEPARTMENT
IE 360
Statistical Forecasting and Time Series
Spring 2021

Type:	Required
Credits/ECTS:	3 Credits / 6 ECTS
Class/Laboratory/PS schedule:	Tuesday 09:00-10:50 – Regular Class Thursday 09:00-09:50 – Regular Class Thursday 10:00-10:50 – Problem Session
Instructor:	Mustafa Gökçe Baydoğan Office: M4082 (mustafa.baydogan@boun.edu.tr) Office Hours: Tuesday 11:00-12:00 and Thursday 13:00-14:00
Teaching assistant:	TBD
Student assistant:	TBD

Course Description:
Exploring data patterns; moving averages, simple and double exponential smoothing, smoothing methods with seasonal data, Holt-Winter method; simple and multiple regression; regression with time series data; ARIMA models; Box-Jenkins method for forecasting; demand management and applications.

Lectures will be held online through live zoom sessions. The sessions will also be recorded so that you can go over relevant material later. Class attendance is very important and strongly encouraged. Office hours will also be held online by appointment.

Reference Books:
- Introduction to Time Series Analysis and Forecasting, Montgomery, Jennings, and Kulahci, 2008, Wiley.
- Business Forecasting, 8th Edition, John E. Hanke and Dean W. Wichern, 2005, Pearson Prentice Hall, ISBN: 0-13-122856-0

Course objectives (and program outcomes):
This course aims to provide an overview of forecasting methodologies and their applications. We aim to develop, design and compare different forecasting methods. We discuss techniques for selecting the best method that fits specific decision-making requirements of an organization. The discussion will be motivated using case studies and industry projects. By the end of the course the students should be able to
- Understand decomposing data with respect to trend and seasonal variations
- Use sample autocorrelation in identifying patterns in the data set
- Incorporate external variables in explaining the behaviour of a response variable
- Decide which forecasting method to use for estimating the future values of a time series Considering these objectives, this course mainly addresses the following student outcomes of the industrial engineering undergraduate program:

- *Student Outcome (b):* An ability to design and conduct experiments, as well as to analyze and interpret data
- *Student Outcome (k):* An ability to use the techniques, skills, and modern engineering tools necessary for industrial engineering practice.
- *Student Outcome (g):* Ability to communicate effectively

Software Use:
We will be using R as the main statistical tool (There will be a number of tutorial lectures and examples using R). You will be submitting your homework and project online as an HTML file) on Github (Markdown, https://www.markdownguide.org/, language will be used).

Topics covered:

Topic	Topic
1 (1.5 week)	Introduction - A review of basic statistical concepts
2 (2.5 weeks)	Exploring data patterns
3 (2 weeks)	Moving averages and smoothing methods
4 (1.5 week)	Simple and multiple linear regression
5 (2 weeks)	Regression with time series data and Generalized Additive Models
6 (2.5 weeks)	Time Series Analysis - ARIMA methods

Grading Criteria:
5 Homework (6% each), Class Project (25%), 3 quizzes (15%), Final Exam (30%).

Tentative due dates: TBD

Requirements:
- Class attendance is very important and strongly encouraged.
- As part of a group, you will be asked to present homework or examples.
- For the class project, you will apply techniques from the course on a real life problem. This will be organized like a challenge. You are expected to create a workflow that can provide forecasts every day before a predetermined deadline (i.e. before 23.59). We will have in-class presentations (approx. 10 min. for each group) in the last week of the course.
- Academic integrity is expected. Your work is to be your own.

Prepared by, and date of preparation: Mustafa Gökçe Baydoğan, March 2021