# IE 412 APPLIED TIME SERIES ANALYSIS (3 0 3) ECTS: 5

## 2023-2024 SPRING

| LECTURER: | ASSISTANT: |
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| Assoc. Prof. Dr. Özlem Türker Bayrak | Elif Ecem Çeltek |
| **Office:** PB04  **email:** ozlemt@cankaya.edu.tr | **Office:** L305  **email:** elifecemceltek@cankaya.edu.tr |

**LECTURE:** Friday 09:20-12:10  at H313

**COURSE OBJECTIVES:**

- to give a basic knowledge and understanding of time series analysis and its applications

- to provide skill in collecting data from various databases as well as modeling and forecasting it by using statistical package programs will be pursued during the course.

**LEARNING OUTCOMES:**

On successful completion of the course, the students will have developed:

1. knowledge and understanding of time series analysis and its applications.
2. skills in modeling and forecasting time series data.
3. skills in using time series package program.
4. skills in collecting data from databases.
5. skills in report writing.

On successful completion of the course, all students will be aware of ethical issues.

**REFERENCE BOOKS**

- Brockwell, P.J. & Davis, R.A. Introduction to Time Series and Forecasting (2nd ed.), Springer, 2002.
- Janacek, G.J. Practical Time Series, Arnold, 2001.
- Cryer, J.D. & Chan, K-S. Time Series Analysis with Applications in R (2nd ed.), Springer, 2008.
- Cowpertwait, P.S.P. & Metcalfe, A.V. Introductory Time Series with R, Springer, 2009.

## COURSE OUTLINE

**Week 1:** Introduction to time series.

**Week 2:** Components of time series, stationarity, autocorrelation function.

**Week 3:** Stationarity, transformation methods to make a nonstationary series stationary.

**Week 4:** Stationary models: AR.

**Week 5:** Stationary models: MA.

**Week 6:** Stationary models: ARMA.

**Week 7:** Model identification of stationary non-seasonal time series.

**Week 8:** Estimation of stationary non-seasonal models.

**Week 9:** Forecasting stationary non-seasonal time series.

**Week 10:** Non-stationary models: ARIMA, unit root tests.

**Week 11:** Seasonal models: SARMA, SARIMA.

**Week 12:** Model identification of seasonal time series.

**Week 13:** Estimation and forecasting of seasonal models.

**Week 14:** Tests for seasonal unit roots.


**COMPUTER USAGE:** R with RStudio; Word

**GRADING:**

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| 1 Homework | 10% |
| 1 Project | 20% |
| 1 Midterm | 30% |
| 1 Final | 40% |

- Homework and Project should be submitted via weboline. Late submissions or submissions via email or hardcopy are not accepted.
- Students who do not submit homework or project get NA.
- Attendance to the lectures is obligatory.
- All announcements will be made via webonline. Thus, please regularly check your student emails.

**OFFICE HOURS:**

- Wednesday 10:00-12:00 for the lecturer.
- You can also consult with the instructor via email and arranging an appointment.
- But **do not reply** webonline messages directly from the email sent to you by the lecturer since the system does not sent it to the lecturer. You have to first connect to the webonline and then write your message. Instead, you can directly use email address.
- However, realize that the instructor might not be available by the time you send a message/email. So please do not rush to get an immediate response.