



Course Code	Course Title	ECTS Credits
MATH-420	Time Series Modeling and Forecasting	6
Prerequisites	Department	Semester
MATH-325, MATH-326	Computer Science	Fall/Spring
Type of Course	Field	Language of Instruction
Elective	Mathematics	English
Level of Course	Lecturer	Year of Study
1 st Cycle	Prof. Haritini Tsangari	4 th
Mode of Delivery	Work Placement	Co-requisites
Face-to-Face	N/A	None

Objectives of the Course:

The main objectives of the course are to:

- Provide students with the knowledge necessary to handle modern time series techniques
- Cover both the theory and application of time series analysis
- Provide students with the necessary skills to identify and handle trend, seasonality and non-stationarity of time series
- Introduce students to ARIMA models
- Provide students with the necessary skills for forecasting and choosing the best model for their data
- Cover GARCH-type models for volatility
- Get acquainted with and use the SPSS package for time series analysis.

Learning Outcomes:

After completion of the course students are expected to be able to:

1. use basic time series concepts and terminology
2. select the appropriate univariate or multivariate time series methods according to their aims

3. apply a suite of time series methods to their own data using various time series data manipulation methods with a software package such as SPSS.
4. identify trend and seasonality in time series and perform smoothing techniques
5. use Box-Jenkins methodology for ARIMA models
6. use forecasting methods and choose the best forecasting model based on various criteria
7. perform the appropriate statistical tests to detect unit roots and non-stationarity problems
8. model volatility using GARCH-type models.
9. concisely summarize results of time series analysis in writing

Course Contents:

1. Multiple regression analysis for time series data
2. The components of a time series model
3. Trend and seasonality tests
4. Smoothing of time series
5. Forecasting techniques and model selection.
6. Additive and multiplicative models
7. Box-Jenkins methodology for ARIMA models
8. Random walks, stationary and non-stationary processes, unit-root tests
9. Volatility models (GARCH-type models)

Learning Activities and Teaching Methods:

Lectures, Practical Exercises and Assignments, Lab Presentations, Lab Tutorials.

Assessment Methods:

Homework, Mid-Term, Final Exam

Required Textbooks/Reading:

Title	Authors	Publisher	Year	ISBN
Introduction to time series and forecasting (3rd edition)	Brockwell, P.J. and Davis, R.A.	Springer Texts in Statistics	2016	ISBN: 978-3-319-29852-8 (Print) 978-3-319-29854-2 (Online)*

*E-book available: <http://link.springer.com/book/10.1007/978-3-319-29854-2>

Recommended Textbooks/Reading:

Title	Authors	Publisher	Year	ISBN
Forecasting, Time Series, and Regression	Bowerman, B. L., O'Connell, R. and Koehler, A.	Duxbury	2005	9780534409777
The Foundations of Modern Time Series Analysis	Mills, T.C.	Palgrave Macmillan	2011	978-0-230-29018-1