COURSE OUTLINE

GENERAL

SCHOOL	Sciences and Engineering		
ACADEMIC UNIT	Computer Science		
LEVEL OF STUDIES	1st Cycle		
COURSE CODE	MATH-420	**SEMESTER**	Spring/Fall
COURSE TITLE	Time Series Modeling and Forecasting		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
	2.5	6
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialization
PREREQUISITE COURSES:	MATH-325, MATH-326
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English
IS THE COURSE OFFERED TO ERASMUS STUDENTS	
COURSE WEBSITE (URL)	

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

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

- use basic time series concepts and terminology
- select the appropriate univariate or multivariate time series methods according to their aims
- 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 or R.
- identify trend and seasonality in time series and perform smoothing techniques
- use Box-Jenkins methodology for ARIMA models
- use forecasting methods and choose the best forecasting model based on various criteria
- perform the appropriate statistical tests to detect unit roots and non-stationarity problems
- model volatility using GARCH-type models.

- concisely summarize results of time series analysis in writing

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

Search for, analysis and synthesis of data and information, with the use of the necessary technology

Decision-making

Working independently

Team work

Project planning and management

Production of free, creative and inductive thinking

SYLLABUS

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

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	*Use of ICT in teaching / Χρήση ΤΠΕ* *Communication with students / Επικοινωνία με Φοιτητές*
TEACHING METHODS	

The manner and methods of teaching are described in detail. *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	***Activity***	***Semester workload***
	Lectures	**35**
	Preparation, homework	**50**
	Assignment/Projects	**30**
	Midterm and Final Exam preparation	**33**
	Final Exam	**2**
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	- Theoretical and Programming Assignments - Midterm Exam - Final Exam	

ATTACHED BIBLIOGRAPHY

Required Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Chatfield, C. and Xing, H.	The Analysis of Time Series (7th edition)	Chapman & Hall/CRC Texts in Statistical Science	2019	978-1498795630

Recommended Textbooks/Reading:

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

Mills, T.C.	The Foundations of Modern Time Series Analysis	Palgrave Macmillan	2011	978-0-230-29018-1	