ΔΗΜΟΚΡΙΤΕΙΟ ΠΑΝΕΠΙΣΤΗΜΙΟ ΘΡΑΚΗΣ

COURSE OUTLINE

(1) GENERAL

SCHOOL	School of Sciences			
ACADEMIC UNIT	Department of Informatics			
LEVEL OF STUDIES	Undergraduate			
COURSE CODE	718SKOE	**SEMESTER**	7th	
COURSE TITLE	Computational Economics			
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**
Lectures			2	5
Tutorial Exercises			1	
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*	Specialized General Knowledge, Skills Development			
PREREQUISITE COURSES:	Linear algebra, statistics, and probability theory Fundamental programming proficiency in Python, R, or MATLAB			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes			
COURSE WEBSITE (URL)				

(2) 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*

The course constitutes an interdisciplinary field that combines economic theory, mathematical modeling, and numerical computational techniques for the analysis of complex economic phenomena. It employs simulations, algorithmic methods, and computational experiments to study dynamic systems, markets, and economic policies under conditions of uncertainty.

Upon successful completion of the course, the student will be able to:

- Understand the application of computational methods to economic problems.

- Model economic phenomena and simple economic systems using algorithmic approaches.
- Analyze data and simulate systems in complex financial markets.
- Utilize computational models to detect extreme phenomena in stock market indices.

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
Working independently
Team work
Criticism and self-criticism
Production of free, creative and inductive thinking

(3) SYLLABUS

1. Introduction to Computational Economics
2. Introduction to Macroeconomics for Computer Scientists
3. Financial Markets and Macroeconomics Linkages
4. Introduction to Stochastic Processes
5. Optimization and Decision Making
6. Time Series Theory - Financial Market Time Series
7. Linear Models for Time Series Analysis and Forecasting
8. Dynamic Economic Systems - Chaos and Economics
9. Complexity & Markets
10. Derivative Products
11. Machine Learning for Financial Time Series Prediction
12. FinTech Technologies - Cryptocurrencies
13. Case Study on Financial Time Series - Extreme Value Detection

(4) 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*	Learning process support through the moodle online platform (interaction, assignments, auxiliary material) Announcements via central department website Use email to communicate.
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.*	

Activity	***Semester workload***
Lectures	26x2=52
Tutorial Exercises	13x2=26
Project	25
Examination	2x1= 2
Independent Study	20
Course total	***125***

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	
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.*	Short assignments (10%). Written final examination (90%) covering problem-solving from different course modules (notes are not permitted)." Or Alternative option: Exemption project with presentation (100% of grade)

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
- Related academic journals:

- **Introduction to Computational Methods for Economics and Business Studies" by Athanasios Stavrakoudis Published by Kleidarithmos Publications**, 2012 (in Greeks)
- **Computational Economics - David A. Kendrick, Princeton University Press, 2011.**
- **Time Series Analysis - James D. Hamilton, Princeton University Press, 1994.**
- Chaos, Complexity, And Nonlinear Economic Theory (Series On Advances In Mathematics For Applied Sciences) by Wei-bin Zhang (Author) World Scientific, 2023.
- *Applied Computational Economics and Finance, M.J.*Miranda & P.L.Fackler, The MIT Press Cambridge, Massachusetts London, England , 2002.
- Sargent & Stachurski – *Quantitative Economics with Python* (online) https://python.quantecon.org/intro.html
- – *Numerical Methods in Economics,* **Kenneth L. Judd**, The MIT Press, 1998.