COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ECONOMICS AND MANAGEMENT SCIENCE		
ACADEMIC UNIT	DEPARTMENT OF ECONOMICS		
LEVEL OF STUDIES	BSc		
COURSE CODE	OIK718	**SEMESTER**	3rd
COURSE TITLE	Intelligent Methods for Economic Data Analysis		

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**
Credits are awarded collectively for the course as a whole	4	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*	Optional – Special Background
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	https://ecourse.uoi.gr/course/

(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*

Knowledge & Understanding

- Explain the risk–return relationship, the CAPM, and the idea of multi-factor models at an introductory level.
- Describe the basic concepts of return construction (simple/log), rebalancing, and major data errors/biases (missing values, survivorship, look-ahead).
- Summarize the principles of linear regression (OLS), regularization (Ridge/Lasso), and decision trees/random forests.

Applying Knowledge & Understanding

- Implement simple analysis pipelines: data cleaning → feature construction → modeling → basic evaluation in Python or R.
- Apply OLS, Ridge/Lasso, and Decision Trees/Random Forests to public datasets (e.g., Fama–French, Yahoo Finance) and compare performance.
- Construct basic features (momentum, moving averages, volatility, simple accounting ratios).

Making Judgments

- Identify and mitigate common design flaws (look-ahead, survivorship, overfitting) and choose an appropriate validation/evaluation procedure.

- Assess the economic significance of results (e.g., Sharpe, turnover, transaction costs) and justify model/feature choices.

Communication

- Produce concise, well-structured technical memos and presentations with clear tables/figures and correct terminology (beta, alpha, factor, regularization).

Learning Skills

- Reproduce simple empirical results (e.g., beta/alpha estimation or a basic factor regression) and document code/steps.
- Identify next steps for improvement (alternative features).

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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…*
	…….

Disciplinary competence: solid grounding in basic asset-pricing concepts and introductory machine learning.
Analytical & numerical skills: data cleaning/transformation, basic modeling, and computation of evaluation metrics.
Problem-solving & reasoned judgment: selecting appropriate methods; detecting/correcting biases and design flaws.
Digital literacy & reproducibility: use of Python/R, well-organized notebooks, and well-documented code.
Communication: clear, concise deliverables (reports/figures) using correct economic and technical terminology.
Professionalism & ethics: meeting deadlines; adherence to data/compliance rules and academic integrity.

(3) SYLLABUS

This course introduces the fundamentals of financial asset valuation and entry-level machine learning for financial data. Students will become familiar with the risk–return relationship, the Capital Asset Pricing Model (CAPM), and the idea of multi-factor models, while learning data preparation for analysis, modeling, and transparent evaluation. The syllabus covers return construction (simple vs. logarithmic), portfolio rebalancing, and common data issues such as missing values, survivorship bias, and look-ahead bias. It then presents core prediction tools, with emphasis on linear regression (OLS). Methods of regularization (Ridge/Lasso) and tree-based models (Decision Trees/Random Forests) are introduced. The course places particular emphasis on feature engineering for financial data—momentum, moving averages, volatility, and simple accounting ratios. The course is supported using Python or R and public datasets (e.g., the Fama–French library, Yahoo Finance, etc.).

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	In person
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Use of Microsoft Office Excel, Python and R
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography,*	

Activity	*Semester workload*
Lectures	52
Supervised Study	48

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*	Non-supervised study: 50 Course total: ***150***
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.*	The course includes lectures, exercises (30%), and a final written examination (70%). The examination may include multiple-choice questions, short-answer questions, problem-solving exercises, and economic interpretation of results.

(5) ATTACHED BIBLIOGRAPHY

Core Textbook

- Koundouri, P., & Pittis, N. (2025). Decision Theory: Applications in Finance. Diplografia. ISBN 978-618-5198-67-1.

Recommended Bibliography

- Alpaydin, E. (2022). Introduction to Machine Learning (M. K. Ketipi, Trans.). Broken Hill Publishers Ltd.