COURSE OUTLINE

(1) GENERAL

SCHOOL	School of Economics and Management Science		
ACADEMIC UNIT	Department of Economics		
LEVEL OF STUDIES	6		
COURSE CODE	OIK902	**SEMESTER**	7th
COURSE TITLE	Special Cases in Econometrics		

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	4	6 ECTS
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*	Special background, skills development
PREREQUISITE COURSES:	Mathematics for Economists I & II, Statistics I & II, Econometrics I &II
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
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*

A. Knowledge and Understanding

On successful completion of this course, students are expected to:

- **Comprehend** in depth the **fundamental principles** of Linear Algebra (vectors, matrices, determinants, inversion, matrix operations) as the essential mathematical underpinning of Econometrics.
- **Know** the core **statistical concepts** (random variable, expected value, variance) and the properties of **key distributions** (Normal, Student-t, χ^2, F-distribution) required for econometric inference.
- **Grasp** the theoretical foundation and properties of the estimators for the **Classical Linear Model (CLM)** and the **Generalized Linear Model (GLM)** using matrix notation.
- **Be familiar** with the **Ordinary Least Squares (OLS)** and **Maximum Likelihood (ML)** methods for parameter estimation within the CLM and GLM frameworks.
- **Recognise** and **interpret** the concept of the **variance-covariance matrix** of the errors (Ω) in the Generalized Linear Model, as well as the issues of **autocorrelation** and

heteroscedasticity.

B. Intellectual and Practical Skills

On successful completion of this course, students will be able to:

- **Apply** the necessary **algebraic operations** with matrices (product, inversion, derivative of a quadratic form) to derive and understand econometric formulae.
- **Calculate** the **estimators** for the parameters of the Classical and Generalized Linear Models using the **mathematical form** of the OLS and ML methodologies.
- **Conduct tests of statistical significance** (t-statistics, F-statistic) to evaluate the significance of parameters and the overall model.
- **Assess** the **goodness-of-fit** of the model using the **coefficient of determination (R^2)** and the **Analysis of Variance (ANOVA)** table.
- **Formulate** and **estimate** the **Classical Linear Model with Linear Restrictions**, employing the appropriate techniques.
- **Utilise** econometric theory to understand the challenges, problems, and solutions encountered in **applied econometrics**.

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…*
	…….

Analysis and Synthesis: The ability to search, analyse, and synthesise complex data and information.

Critical Thinking: The ability to exercise critical self-reflection and judgment, and to foster free, creative, and inductive thinking when evaluating and interpreting results.

Autonomous Work: The ability to work independently and solve problems in specialised subject areas.

Decision Making: The ability to make decisions based on rigorous scientific analysis and the rational interpretation of econometric outcomes.

(3) SYLLABUS

Linear Algebra

- Vectors and Matrices
- The concept of the Vector Space
- Types and Forms of Matrices
- The vector as a matrix form: Transpose Vector
- Operations with vectors and matrices
- Determinant of a Matrix: singular and non-singular matrix
- Matrix Inversion
- Derivative of linear, bilinear, and quadratic forms
- Maximum and Minimum of a quadratic form

Statistics

- Random experiment, sample space, and events
- The concept of the Random Variable: discrete and continuous random variable
- Expected Value and Variance of a random variable
- Moment Generating Function and Characteristic Function of a random variable
- Useful Distributions: Normal and standard normal distribution, Student-t, Chi-squared (χ^2) and F-distribution

The Classical Linear Model with Matrices

- The Ordinary Least Squares (OLS) Method: parameter estimation
- The Maximum Likelihood (ML) Method: model likelihood, parameter estimation
- Properties of OLS and ML Estimators: Gauss-Markov Theorem, consistency of estimators
- Testing Statistical Significance: t-statistics
- Model Evaluation: coefficient of determination (R^2), F-statistic, Analysis of Variance (ANOVA) table
- The Classical Linear Model with Linear Restrictions

The Generalized Linear Model with Matrices

- Interpretation of the Omega Matrix (Ω): autocorrelation, heteroscedasticity, seemingly unrelated regressions
- The Ordinary Least Squares (OLS) Method: parameter estimation
- The Maximum Likelihood (ML) Method: model likelihood, parameter estimation

(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*	Use of ICT in teaching, and communication with students
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*	
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.*	Final written exam

Activity	***Semester workload***
Lectures	52h
Directed study	48h
Non-directed study	50h
Course total	***150h***

(5) ATTACHED BIBLIOGRAPHY

- Σίμος, Θ.: Τεχνικές οικονομετρίας και ανάλυσης χρονολογικών σειρών
- Τζαβαλής, Η.: Οικονομετρία
- Δρεττάκης Μ.: Θεωρητική Οικοκομετρία I & II
- Magnus, J.R. and Neudecker,H.: Matrix differential calculus with applications in statistics and econometrics