COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY		
ACADEMIC UNIT	DEPARTMENT OF STATISTICS		
LEVEL OF STUDIES	1st Cycle (UNDERGRADUATE)		
COURSE CODE	**6023**	**SEMESTER**	**4th**
COURSE TITLE	**LINEAR MODELS**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
	4	8

COURSE TYPE	Core - Scientific Field
PREREQUISITE COURSES:	6012 ESTIMATION AND HYPOTHESIS TESTING
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	https://www.dept.aueb.gr/en/stat/content/linear-models-8-ects

(2) LEARNING OUTCOMES

Learning outcomes
Upon completion of the course, students will be able to handle issues related to: correlation coefficient, bivariate and multivariate normal distribution, simple and multiple linear regression, inference in linear regression, hypothesis testing & diagnostics, transformations, general linear model , algorithmic methods of selecting "best" (sub) model multicollinearity and dummy variables.
General Competences
Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Decision-making Production of free, creative and inductive thinking

(3) SYLLABUS

Introduction to regression, fitting a straight line, and coefficient estimates. Properties of estimated coefficients, mean and variance, confidence intervals, hypothesis testing, and estimation of the variance of the data. Predicted values. ANOVA for the straight-line

model, (R^2), and the F-test. Introduction to the multivariate normal distribution, quadratic forms, expected values of quadratic forms, distributions of quadratic forms, and independence of quadratic forms. Definition of multiple regression and examples. Design matrix, introduction to dummy variables, general form of the linear model, least-squares (LS) estimates, properties of estimators (using matrix notation). Unbiased estimation of the unknown variance. Estimates of predicted values, error estimates, and their properties (using projection matrices), maximum likelihood estimation, likelihood ratio test (LRT), and the general linear hypothesis (R\beta=r), with examples. Multiple correlation coefficient, ANOVA for the model, partial F-tests, sequential F-tests, and examples. Ordinary residuals, standardized residuals, studentized residuals, tests for normality, Q-Q plots, basic diagnostic plots for checking model assumptions, added-variable plots, and other diagnostic plots and tests for model assumptions. Simple transformations, influence statistics, the concept of multicollinearity, and diagnostic tests. One-way analysis of variance. Sum-to-zero parameterization, corner-point parameterization, design matrix, estimated coefficients, and ANOVA for the model. Two-way analysis of variance: the saturated and additive models. Explanation of parameterizations, design matrix, estimated coefficients, and ANOVA for the model. Selection of the best regression model: forward, backward, stepwise, and all-possible-regressions methods.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face to Face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	YES
TEACHING METHODS	

Activity	*Semester workload*
Lectures	120
tutorials	40
student's study	40
Course total	***200***

STUDENT PERFORMANCE EVALUATION	WRITTEN EXAMINATION AT THE END OF THE SEMESTER

(5) ATTACHED BIBLIOGRAPHY

- *Κούτρας, Μ. Και Ευαγγελάρας, Χ. (2010). Ανάλυση Παλινδρόμησης: Θεωρία και Εφαρμογές, Σταμούλης*
- *Δ. Στογιάννης, Φ. Σιάννης (2024). Ανάλυση Παλινδρόμησης, Εκδόσεις Παπαζήση, ISBN: 978-960-02-4218-8*
- *Draper N.R. and Smith, H. (1997). Εφαρμοσμένη Ανάλυση Παλινδρόμησης,*

Παπαζήσης

- *Montgomery, D.C., Peck, E.A. and Vining, G.G. (2012). Introduction to Linear Regression Analysis, Wiley.*
- *Weisberg, S. (2014). Applied Linear Regression, Wiley*