# COURSE OUTLINE

## (1) GENERAL

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|---|---|---|---|
| **SCHOOL** | SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY | | |
| **ACADEMIC UNIT** | DEPARTMENT OF STATISTICS | | |
| **LEVEL OF STUDIES** | 1st Cycle (UNDERGRADUATE) | | |
| **COURSE CODE** | **6176** | **SEMESTER** | **6th** |
| **COURSE TITLE** | **Generalized Linear Models** | | |

| **INDEPENDENT TEACHING ACTIVITIES** | **WEEKLY TEACHING HOURS** | **CREDITS** |
|---|---|---|
| Lectures | 4 | 8 |
| Workshops | | |
| Labs | 2 | |
| | | |

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| **COURSE TYPE** | Compulsory |
| **PREREQUISITE COURSES:** | 6012 – ESTIMATION AND HYPOTHESIS TESTING<br>6023 – LINEAR MODELS |
| **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/generalized-linear-models-8-ects |

## (2) LEARNING OUTCOMES

| **Learning outcomes** |
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| Understanding generalized linear models, the statistical analysis techniques implied and their properties, as well as the ability to apply these methods in data analysis and interpreting the results, and in some depth understanding of the theoretical issues that arise. |
| **General Competences** |
| • Search, analysis and synthesis of data and information, using the necessary technologies<br>• Autonomous work<br>• Promotion of free, creative and inductive thinking |

## (3) SYLLABUS

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GLM Theory: Covariance matrix and the Wald test. Maximum likelihood estimation: scores and their distribution, asymptotic distribution of the maximum likelihood estimators and the likelihood ratio. The exponential distributions family. Generalized linear model likelihood analysis, maximum likelihood estimation in the generalized linear model: the scores, the Fisher information and the Newton-Raphson algorithm. Relation to weighted least squares. Inference for coefficients. Deviance from the saturated model. Models with an unknown scale parameter. Residuals.
Applications, examples: binomial data: Link functions, coefficients interpretation, inference, overdispersion. One factor analysis (categorical or continuous), two or more factors analysis, with or without interactions: parameterizations, design matrices, coefficients interpretation. Probit and clog-log models examples. Poisson and log-linear models. Contingency tables, odds ratio and log-linear parameters. Multinomial and multinomial product, equivalency with log-linear, log-linear and logistic regression. Independence, group independence, conditional independence, uniform dependence. Overdispersion, overdispersion test and dispersion index, the negative binomial model and other alternatives.

Prerequisite basic knowledge of Linear Algebra.

## (4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY<br>Face-to-face, Distance learning, etc.</td><td>Face-to-face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</td><td>YES</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>52</td></tr>
<tr><td>Tutorial</td><td>26</td></tr>
<tr><td>Assignment</td><td>20</td></tr>
<tr><td>Self Study</td><td>102</td></tr>
<tr><td>Course Total</td><td>200</td></tr>
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<tr><td>STUDENT PERFORMANCE EVALUATION<br>.</td><td>Written examination at the end of the semester<br>Bonus based on delivering assignments.<br>Information is available at eclass</td></tr>
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## (5) ATTACHED BIBLIOGRAPHY


- Agresti, A. (2015), Foundations of Linear and Generalized Linear Models, Wiley Series in Probability and Statistics
- Agresti, A. (2012), Categorical Data Analysis, 3rd edition, Wiley Series in Probability and Statistics
- Dobson & Barnett (2008), An Introduction to Generalized Linear Models, Taylor & Francis.
- Fox (2008), Applied Regression Analysis and Generalized Linear Models, Kindle
- Hosmer, D.W. and Lemeshow, S. (1989, 2000), Applied Logistic Regression. New York: Wiley.
- Kateri (2016), Contingency Table Analysis, Birkhauser Boston Inc
- McGullagh, P and Nelder, J.A. (1989), Generalized Linear Models, London: Chapman and Hall.