COURSE OUTLINE

(1) GENERAL

SCHOOLS	ENGINEERING, NATURAL SCIENCES
ACADEMIC UNIT/UNITS	COMPUTER ENGINEERING AND INFORMATICS DEPARTMENT, DEPARTMENT OF MATHEMATICS
TITLE OF MASTER'S DEGREE	*MSC in Data Driven Computing and Decision Making*
LEVEL OF STUDIES	POSTGRADUATE

COURSE CODE	MCDA114	**SEMESTER**	B

COURSE TITLE	MULTIVARIATE DATA ANALYSIS AND STATISTICAL INFERENCE

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	3	7.5
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
PREREQUISITE COURSES:	MCDA101
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/MATH1073/

(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 goal of this course is to present the basic concepts as well as important methods of Multivariate Statistical Data Analysis. The concepts of multidimensional statistical analysis are first introduced and the multidimensional normal distribution is studied. Multivariate Analysis of Variance and Multivariate Linear Regression are presented below. Finally, two basic methods of factorial analysis (Principal Component Analysis and Correspondence Analysis) as well as methods of classification and Hierarchical grouping of multidimensional data are introduced and studied. After successful completion of the course, students will be able to combine statistical theory, the choice of appropriate methodology and its application to multidimensional data analysis problems.

- Search for, analysis and synthesis of data and information, with the use of the necessary technology.
- Adapting to new situations.
- Decision making.
- Working independently.
- Team work.
- Ability to promote free, productive and inductive thinking.
- Working in an interdisciplinary environment.

(3) SYLLABUS

Multivariate data. Data Matrices and Measurement Scales. Multivariate Random Variables and Samples. The Multivariate Normal Distribution. Sampling from Multivariate Normal and Statistical Inference.

One-way MANOVA for independent and dependent samples and related controls. Generalization of linear regression and its application in the interpretation-prediction of more than one dependent variables.

Principal Components Analysis. Finding the main components resulting from the analysis of tables (covariances and correlations respectively). Sample core components and statistical inference using large data samples.

Correspondence Analysis. Study of analysis in matrix tables (dual input tables).

Discriminant Analysis and Classification. Study of group separation rules. Hierarchical and Nonhierarchical Clustering Methods.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Lectures (face to face)
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Support of the course via the online platform *eClass* of University of Patras. • Use of specific software (SPSS, R, MINITAB etc.).

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*	Activity	Semester workload
	Lectures	39
	Study (no driven)	100
	Solving suggested exercises	45
	Final examination	3.5
	Total number of hours for the Course (25 hours of work-load per ECTS credit)	*187.5*

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.*	**Assessment Language:** Greek **Assessment Language for Erasmus students:** English **Assessment methods:** • Homework (**30%**): Theoretical and practical data analysis. • Presentation and development of topics from international bibliography (**30%**). • Written examination (**40%**). Minimum passing grade: 5 Maximum passing grade: 10

(5) ATTACHED BIBLIOGRAPHY

• Anderson, T.W. (2003). An Introduction to Multivariate Statistical Analysis. 3rd ed. Wiley.
• Hardle, W. and Simar L. (2007). *Applied Multivariate Statistical Analysis*. Springer (ebook).
• Johnson, R.A and Wichern, D.W. (2007). *Applied Multivariate Statistical Analysis*. 6th ed. Pearson.
• Timm, N. H. (2002). *Applied Multivariate Analysis*. Springer (ebook).

(in Greek)
• Καρλής, Δ. (2005). *Πολυμεταβλητή Στατιστική Ανάλυση.* Εκδόσεις Σταμούλης.