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	Post graduate		
COURSE CODE	DDCD103	SEMESTER	FALL (1st)
COURSE TITLE	ANALYSIS AND MANAGEMENT OF SPATIAL-TEMPORAL DATA		

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	5
Laboratory-Project	1	2.5
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).	Total	7.5

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialised general knowledge, skills development
PREREQUISITE COURSES:	There are no prerequisites. It is however recommended that students have at least a basic knowledge of Data Structures, Algorithms, Statistics, and Database Management Systems.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Instruction may be given in English if foreign students attend the course.
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes.
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/CEID1168/

(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*

At the end of this course the student will:

1. Have acquired basic knowledge in management and analysis of big data, machine learning concepts, and be able to understand the issues that are specific to efficient implementation of such systems.
2. Have understood the differences between alternative employment of different spatial and temporal data mining algorithms, tools and techniques, as evidenced in both research and application.
3. Have understood the basic issues behind the various algorithms used for classification, clustering and association mining in big data.
4. Be able to use advanced data structures for the efficient management of big data of high dimensionality
5. Be able to use techniques and tools for the management and analysis of streaming data.
6. Be able to compare and contrast each of the following techniques, providing examples of

when each strategy is superior: decision trees, neural networks, and belief networks.

At the end of the course the student will have further developed the following skills/competences:

1. Ability to understand the various concepts of data mining and machine learning algorithms and systems, and how these concepts are interrelated with the performance of software systems
2. Ability to apply these concepts in order to design and implement efficient decision support systems.
3. Ability to work cooperatively in order to solve problems that arise during the construction of a full-fledged working software system.

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…*
	…….

Search for, analysis and synthesis of data and information, with the use of the necessary technology
Decision-making
Project planning and management
Production of free, creative and inductive thinking
Production of new research ideas

(3) SYLLABUS

Data preprocessing, data cleansing, feature extraction, feature selection; Singular Value Decomposition; introduction to basic signal processing methods (DFT, wavelets), data compression (scalar and vector quantization, lossless and lossy compression); extraction of knowledge from spatial and temporal databases; clustering, classification, prediction, decision trees, association mining, Bayesian networks; spatial access methods (k-d trees, quadtrees, z-ordering, space filing curves, R-trees); general purpose multimedia indexing, GEMINI; spatial and temporal databases; techniques for searching by content in multimedia databases (time series, images, videos); fractals in databases; self-similarity of data; fractal dimension; applications in biomedical databases; data stream management and analysis.

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*	We use Information and Communications Technology in communication with students. We use e_class, e_mail, forum
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.*	

Activity	*Semester workload*
Lectures	26
Laboratory	13
Project	50
Essay writing	20
Study and analysis of bibliography	40

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	Paper presentation (including preparation) and discussion	40
	Course total	189 hours
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.*	(1) Project (30% of the final grade) (2) Written examination (40% of the final grade) (3) Paper presentation (20% of the final grade) (4) Paper summaries (10% of the final grade)	

(4) ATTACHED BIBLIOGRAPHY

Books:

1. *Mohammed J. Zaki, Wangner Meira Jr., Εξόρυξη και Ανάλυση Δεδομένων: Βασικές Έννοιες και Αλγόριθμοι, 2017.*
2. *Tan, Steinbach, Kumar, Introduction to Data Mining, Addison-Wesley, 2007.*
3. *Μ. Βαζιργιάννης, Μ. Χαλκίδη, Εξόρυξη Γνώσης από Βάσεις Δεδομένων, Τυπωθήτω, Δαρδάνος,2003.*
4. *Margaret Dunham, Data Mining Introductory and Advanced Topics, Pearson Education, 2003.*
5. *Α. Νανόπουλος, Γ. Μανωλόπουλος, Εισαγωγή στην Εξόρυξη Δεδομένων και στις Αποθήκες Δεδομένων, Εκδόσεις Νέων Τεχνολογιών, 2008.*
6. *T. M. Mitchell, Machine Learning, McGraw Hill, 1997.*
7. *I.H. Witten, E. Frank, Data Mining, Practical Machine Learning Tools and Techniques with Java Implementations, Morgan Kaufmann, October, 1999.*
8. *Jiawei Han, Micheline Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann, 2nd Edition, 2006.*
9. *David J. Hand, Heikki Mannila and Padhraic Smyth, Principles of Data Mining, MIT Press, 2000.*
10. *S. Chakrabarti, Mining the Web: Discovering Knowledge from Hypertext Data, Morgan-Kaufmann Publishers 2003.*
11. *C. Faloutsos, Searching Multimedia Databases by Content, Kluwer Academic Press, 1996.*

Scientific Journals:

Data Mining and Knowledge Discovery, KDD Explorations, ACM TKDD, IEEE-TKDE, ACM-TODS/TOIS, JIIS, J. ACM, VLDB J., Info. Sys., Machine Learning, Artificial Intelligence, Knowledge and Information Systems, IEEE-PAMI, etc.