COURSE OUTLINE

1. GENERAL

SCHOOL	SCHOOL OF ENGINEERING, UNIVERSITY OF PATRAS		
DEPARTMENT	DEPARTMENT OF COMPUTER ENGINEERING AND INFORMATICS		
LEVEL OF COURSE	UNDERGRADUATE, CORE ELECTIVE		
COURSE CODE	CEID_NE562	**SEMESTER OF STUDIES**	SPRING SEMESTER
COURSE TITLE	DATA MINING AND MACHINE LEARNING		

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 thewhole of the course, give the weekly teaching hours and the total credits*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
Lectures	2	2
Recitation sections	2	2
Laboratory Exercises	1	1
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).	TOTAL	5

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialised, general knowledge, skills development
PREREQUISITE COURSES:	There are no prerequisite courses. It is however recommended that students have at least a basic knowledge of Data Structures, Algorithms, Statistics, and Database Management Systems
TEACHING AND ASSESSMENT LANGUAGE:	Greek. Instruction may be given in English if foreign students attend the course.
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBPAGE (URL)	https://eclass.upatras.gr/courses/CEID1159/

2. LEARNING OUTCOMES

Leraning 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 data mining and machine learning concepts and understand the issues that are specific to efficient implementation of such systems.
2. Have understood the differences between alternative conceptions of data mining, as evidenced in both research and application.
3. Have understood the basic issues behind the various algorithms used for finding.
4. Be able to understand and characterize the kinds of patterns that can be discovered by association rule mining to describe how to extend a relational system to find patterns using association rules.
5. 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 a software system.
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 Abilities

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. COURSE CONTENT

1. Introduction (basic notion of data science, data mining and machine learning)
2. Preprocessing and Data Compression
3. Classification Algorithms
4. Clustering Algorithms
5. Association rule discovery algorithms
6. Bayesian networks, neural networks.
7. Web Mining
8. Spatial Data Mining
9. Temporal Data Mining
10. Data Mining from sequences

4. TEACHING AND LEARNING METHODS - ASSESSMENT

TEACHING METHOD *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES *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.
TEACHING ORGANIZATION *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*	

Δραστηριότητα	***Φόρτος Εργασίας Εξαμήνου***
Lectures	26
Laboratory	13
Recitation	26
Project	30
Essay writing	10
Study and analysis of bibliography	40
Total number of hours for the Course	145

STUDENT ASSESSEMNT *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) Written examination (70% of the final grade). (2) Project (30% of the final grade)

5. RECOMMENDED LITERATURE

1. Mohammed J. Zaki and Wagner Meira, Jr, Data Mining and Machine Learning: Fundamental Concepts and Algorithms Second Edition, Cambridge University Press, March 20202.
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, 3nd Edition, 2012.
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.
12. Steven S. Skiena, The Data Science Design Manual, Springer 2017
13. Ethem Alpaydın, Introduction to Machine Learning, Fourth Edition, 2020, MIT