COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering		
DEPARTMENT	Electrical and Computer Engineering		
LEVEL OF STUDY	Undergraduate		
COURSE UNIT CODE	9.019	**SEMESTER**	9th
COURSE TITLE	Machine Learning and Knowledge Mining		

COURSEWORK BREAKDOWN	**TEACHING WEEKLY HOURS**	**ECTS Credits**
Theory (Lectures)	3	2
Tutorial	1	1
Exercises	1	1
TOTAL	**5**	**4**

COURSE UNIT TYPE	Deepening / Consolidation of specialty knowledge
PREREQUISITES	
LANGUAGE OF INSTRUCTION/EXAMS	Greek
COURSE DELIVERED TO ERASMUS STUDENTS	No
WEB PAGE (URL)	https://eclass.hmu.gr/courses/ECE136/

(2) LEARNING OUTCOMES

LEARNING OUTCOMES

The goal of the course "Machine Learning and Knowledge Mining" is to provide the students with the necessary knowledge and familiarity concerning fundamental machine learning techniques and algorithms that cover a wide range of different applications of the subject (supervised / unsupervised learning). The aim is the students to acquire critical ability to choose the appropriate methodology for each machine learning problem by understanding advantages and disadvantages of each methodology.

Upon successful completion of the course the student will be able to:

1. To apply learning techniques with supervision (classification, prediction) and without supervision (clustering, associations).

2. To recognize and use the Statistical Models and the Bayes rule.

3. To recognize and use the support vector machines

4. Combine and implement self-organizing models: Self-Organizing Maps (SOM)

5. To implement in applications of the Clustering and the K-media algorithm

6. Apply Reinforcement Learning and implement Dimensionality reduction and Sparse Dictionary Learning.

7. To recognize and use applications of knowledge extraction from the contents, structure and use of the world wide web.

General Skills

- Autonomous & Independent work
- Teamwork
- Search, analysis and synthesis of data and information, using the necessary technologies
- Decision making
- Promoting liberal, creative and inductive/deductive thinking
- Work in an interdisciplinary environment
- Adapt to new situations
- Project Planning and Management

(3) SYLLABUS

Theoretical Lecture Units

• Learning techniques with supervised learning (classification, prediction) and without supervision (clustering, associations),
• Statistics Models and the Bayes rule, Support vector machines,
• Clustering and the K-media algorithm,
• Reinforcement Learning,
• tools for extracting knowledge from the content, structure and use of the World Wide Web.
• Related technologies (Statistics, Machine Learning, DBMS, OLAP).

• Objectives and stages of knowledge extraction.
• Knowledge extraction techniques.
• Methods of knowledge representation.
• Pre-processing of data. Clearing, transforming and reducing data.
• Discrimination and creation of hierarchies of concepts. Representation of knowledge.
• Data and problem relevance, background knowledge, information interest measures, input and output data representation, exploratory data analysis & visualization techniques.
• Character analysis. Generalization of features, suitability of features, comparison of classes, statistical measures.

Laboratory Exercises

In the laboratory students are going to develop individual and group work on all the above topics using technologies / tools Python, matlab, prolog, prosthesis.

(4) TEACHING METHODS - ASSESSMENT

MODE OF DELIVERY	In-Class Face-to-Face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	▪ Use of ICT in teaching ▪ Use of ICT in laboratory training ▪ Use of ICT in communicating with students through the electronic platform e-class
TEACHING ORGANIZATION	

Method description/Activity	Semester Workload
Lectures	52
Laboratory	13
Non-guided personal study	15
Small individual theoretical exercise	15
Group laboratory exercise	15
Weekly individual exercise	10
Total Contact Hours	**120**

ASSESSMENT METHODS

Language of Evaluation: Greek

Evaluation methods:
1. Written final exam (40%)
• by solving problems
• with multiple choice questions
2. Group theory work (report and oral examination) (25%)
3. Laboratory group work (report and oral examination) (20%)
4. Weekly home-exercises (15%)

The evaluation criteria are announced to the students at the beginning of the semester and are posted on the course website in eClass.

(5) RECOMMENDED BIBLIOGRAPHY

--***Recommended Bibliography:***

- *Κ. Διαμαντάρας, Τεχνητά Νευρωνικά Δίκτυα, εκδόσεις Κλειδάριθμος, 2007*
- *Ι. Βλαχάβας, Π. Κεφαλάς, Ν. Βασιλειάδης, Φ. Κόκκορας, Η. Σακελλαρίου, Τεχνητή Νοημοσύνη - Γ' Έκδοση, ISBN: 978-960-8396-64-7, Έκδοση/Διάθεση: Εκδόσεις Πανεπιστημίου Μακεδονίας, 2011*
- *Haykin, Simon. Νευρωνικά δίκτυα και μηχανική μάθηση / Simon Haykin · μετάφραση Ελένη Γκαγκάτσιου. - 3η έκδ. - Αθήνα : Παπασωτηρίου, 2010*
- *T. Mitchell. Machine Learning. McGraw-Hill (International Edition), 1997.*
- *C. Bishop. Pattern Recognition and Machine Learning. Springer, 2007.*
- *K. Murphy. Machine Learning: A Probabilistic Perspective. MIT Press, 2012.*

- ***Relevant Scientific Journals:***

- *Artificial Intelligence*
- *IEEE Transactions on Pattern Analysis and Machine Intelligence*
- *IEEE Transactions on Neural Networks and Learning Systems*