COURSE OUTLINE

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	ELECTRICAL AND COMPUTER ENGINEERING DEPT.		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**ECE_INF940**	**SEMESTER**	**9**
COURSE TITLE	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 the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures	3	
Practice exercises	1	
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (4).	4	5

COURSE TYPE *general background, special background, specialised, general knowledge, skills development*	Specialised
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	https://www.ece.uop.gr/

(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 aim of this course is the introduction to the fundamental principles of the Computational Intelligence, the symbolic representation and the reasoning about intelligent systems.

After the successful completion of the course, the students will be able to:

At the knowledge level:

- know a grounded definition of the term “machine learning” in order to deal with real life systems
- comprehend a new paradigm in modelling intelligent systems
- understand supervised machine learning techniques
- understand unsupervised machine learning techniques
- comprehend the modeling with neural networks as a problem solving technique
- reproduce three neural networks models
- describe the fundamentals of the genetic algorithms

- comprehend the modeling with genetic algorithms as a problem solving technique
- choose appropriate genetic algorithms techniques

At the skill level:

- apply supervised machine learning techniques
- apply unsupervised machine learning techniques
- apply neural networks models as a problem solving technique
- use three neural networks models
- apply genetic algorithms as a problem solving technique
- use genetic algorithms

At the level of abilities:

- integrate the above mentioned notions in order to achieve machine learning.

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, analysis and synthesis of data and information using appropriate tools and technology
- Adapting to new situations
- Decision-making
- Working independently
- Team work
- Working in an international environment
- Production of free, creative and inductive thinking

(3) SYLLABUS

The course lectures cover the following thematic areas:

1. Basic notions. What is Machine Learning?
2. Supervised Machine Learning: introduction, models, and techniques.
3. Exercises
4. Unsupervised Machine Learning: introduction, models, and techniques.
5. Exercises
6. Neural networks: introduction, the neuron model, perceptron.
7. Exercises
8. Multi-layer perceptrons.
9. Exercises
10. Hopfield neural networks.
11. Kohonen neural networks.
12. Genetic algorithms: introduction, genetic processes, general genetic algorithm, examples and applications, schema theorem.
13. Exercises

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Face to face in-class lecturing</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>• Slides of the presentation of the theoretical part of the course
• Guidelines for the exercises
• Suggested solutions for each exercise will be provided following the completion of each exercise
• Support of teaching procedure through the e-Class platform
• Specialized software relevant to the course</td></tr>
<tr><td>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</td><td><table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td>Practical examples and exercises – focusing on problem solving</td><td>13</td></tr>
<tr><td>Exercises</td><td>26</td></tr>
<tr><td>Study of lectures and bibliography</td><td>47</td></tr>
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<tr><td>Course Total</td><td>125 hours (5 ECTS)</td></tr>
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<tr><td>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.</td><td>Final written exam that includes:
• Solving exercises
• Multiple choice questions
• Comparative evaluation of theory elements
Practical part, exercises and solving problems
<u>Remarks:</u>
• The final grade results from the weighting of the theoretical and practical parts with weights of 75% and 25%, respectively.
• The evaluation is done in the Greek language</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- S. Russell, P. Norvig. Artificial Intelligence: A Modern Approach, 2005.
- M. Negnevitsky. Artificial Intelligence: A Guide to Intelligent Systems, 3rd edition, Tziolas Publications, 2018.