COURSE OUTLINE

(1) GENERAL

SCHOOL	Social Sciences		
ACADEMIC UNIT	Cultural Technology and Communication		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	MATH 601	**SEMESTER**	6
COURSE TITLE	ADVANCED ARTIFICIAL INTELLIGENCE		

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	1	2
Laboratories	2	3
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).	3	5

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Core Course/General Background
PREREQUISITE COURSES:	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.aegean.gr/courses/131363/

(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 students will be in the position to:

- Understand the basic principles of machine learning
- Get familiar with the supervised and unsupervised learning
- Implement basic techniques for artificial neural network training
- Understand the basic structure of fuzzy systems
- Understand and implement fuzzy system training algorithms
- Comprehend and implement evolutionary computation algorithms

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
Adapting to new situations
Decision-making
Project planning and management
Respect for difference and multiculturalism
Respect for the natural environment
Showing social, professional and ethical responsibility and

Working independently	*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
• Adapting to new situations
• Decision-making
• Working independently
• Team work
• Project planning and management
• Production of free, creative and inductive thinking
• Working in an interdisciplinary environment

(3) SYLLABUS

Basic concepts of machine learning. Supervised machine learning, unsupervised machine learning. Basic structure kai function of the artificial neuron. Basic structures and training of feedforward neural networks. The back-propagation training algorithm. Basic structure and training if fuzzy systems. Evolutionary computation algorithms such as swarm intelligence algorithms.

The course is structured as follows:

1. Introduction

2. Structure single artificial neuron and neural network

3. Training rules of a neural network: what are they.

4. Delta rule

5. Feedforward neural networks

6. Gradient Descent algorithm

7. Back-propagation algorithm

8. Fuzzy logic and fuzzy sets

9. Fuzzy systems and their training

10. Evolutionary algorithms: basic structure

11. Swarm Intelligence algorithms

12. Cybernetics

13. Summary

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Face-to-face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>Use of open source software such as OCTAVE and Anaconda based Python.</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>13 *1 hours =13 hours</td></tr>
<tr><td>Lectures’ study</td><td>13*5 hours = 65 hours</td></tr>
<tr><td>Laboratory Practice</td><td>13*2 = 26 hours</td></tr>
<tr><td>Laboratory Preparation and semester assignment</td><td>33 hours</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course total</td><td>137 hours</td></tr>
</table>
</td></tr>
<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>The final examination is the main tool to evaluate student’s performance. In this exam the student gets involved in solving complex programming problems.

During semester, each student is also invited to carry out optional homework tests. If the student accepts the invitation, these tests will be positively considered in student’s final evaluation.

The evaluation criteria are clearly announced during the first lecture and in the e-class web site.</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- Λ. Ηλιάδης, Α. Παπαλεωνίδας, Υπολογιστική Νοημοσύνη & Ευφυείς Πράκτορες, Εκδόσεις Τζιόλας, Αθήνα, 2017.
- JohnHaugeland, "Τεχνητή Νοημοσύνη", Εκδόσεις Κάτοπτρο, 1992.