ARTIFICIAL INTELLIGENCE

1. GENERAL

SCHOOL	SCHOOL OF ENGINEERING
DEPARTMENT	CIVIL ENGINEERS / Msc Applied Mathematics
LEVEL OF STUDIES	Msc – Level 7
COURSE CODE	**SEMESTER** 1st SEMESTER
COURSE TITLE	ARTIFICIAL INTELLIGENCE

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	3	7,5
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	SCIENTIFIC AREA
PREREQUISITES:	NO
TEACHING & EXAMINATION LANGUAGE:	GREEK
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.duth.gr/courses/TMA529/

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The aim of the course is to provide students with the necessary theoretical documentation of the topics being developed and familiarize them, through group or individual assignments, with how to use the basic tools of artificial intelligence in various fields of application. This provides an in-depth understanding of the core concepts of the course.

More specifically, at the end of the course the student

1. Knows what artificial/computational intelligence is.

2. Knows how to solve problems through solution search techniques and their most important algorithms.

3. Knows about genetic algorithms and how to apply them to various problems

3. Knows the operation of biological and artificial neural networks (ANNs) and especially multi-layer feedforward ANNs.

4. Knows the basic concepts and algorithms of machine learning

5. Knows how to solve problems in the above areas of knowledge.

By participating in the exercises and carrying out individual tasks, the student implements and applies the basic knowledge of the course to selected problems using specialized educational software. At the end of the course the student will have developed the following skills:

1. Ability to choose the most appropriate method of solving problems that require the use of artificial intelligence techniques.

2. Ability to use and program specialized software to apply artificial neural networks, genetic algorithms and techniques for finding solutions to problems found in various fields of science

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,	*Project design and management*
ICT Use	*Equity and Inclusion*
Adaptation to new situations	*Respect for the natural environment*
Decision making	*Sustainability*
Autonomous work	*Demonstration of social, professional and moral responsibility and sensitivity to gender issues*
Teamwork	
Working in an international environment	*Critical thinking*
	Promoting free, creative and inductive reasoning
Working in an interdisciplinary environment	
Production of new research ideas	

- Search, analysis and synthesis of data and information, using the necessary technologies.
- Autonomous work.
- Production of free, creative and inductive thinking.
- Decision making.

3. COURSE CONTENT

Definitions and applications of artificial intelligence. Problem representation and solving, solution search techniques (Blind search algorithms, heuristics, guided search algorithms, game playing, nature inspired algorithms). Evolutionary computations (Introduction to genetic algorithms (GA), finding solutions and optimization using GA, applications). Introduction to machine learning and artificial neural networks (Basic concepts in neural computing, biological and artificial neurons, basic ANN structures and models, learning processes, the back-propagation algorithm and learning agents, other types of ANN).

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Synchronous distance learning
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	The lectures of the course are done using the Microsoft Powerpoint program. MsTeams/ e-class, webmail are also used. When required, the internet connection is used during the course, when reference is made to material from various websites or a presentation of appropriate learning material is deemed necessary. Specialized software is used to teach programming exercises. The e-Class is used to post the educational material and assignments (in electronic format), as well as to inform and guide the students. Theory and exercises are taught with demonstrative use of software. Communication with students is done via e-mail, e-Class

TEACHING ORGANIZATION

The ways and methods of teaching are described in detail.

Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.

The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.

Activity	Workload/semester
Lectures	39
Assignments per module	63
Literature study and analysis	78

STUDENT EVALUATION

Description of the evaluation process

Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others

Please indicate all relevant information about the course assessment and how students are informed

Homework per subject unit (mandatory) 100%. They are combined with oral exams on the assignments and the subject unit they cover

5. SUGGESTED BIBLIOGRAPHY

-ΥΠΟΛΟΓΙΣΤΙΚΗ ΝΟΗΜΟΣΥΝΗ ΚΑΙ ΕΦΑΡΜΟΓΕΣ Μπούταλης Ι., Συρακούλης Γ. Εκδόσεις Κρίκος, ΑΦΟΙ ΠΑΠΑΜΑΡΚΟΥ ΟΕ

-ΤΕΧΝΗΤΗ ΝΟΗΜΟΣΥΝΗ Ι. Βλαχάβας, Π. Κεφαλάς, Ν. Βασιλειάδης, Φ. Κόκκορας, Η. Σακελλαρίου, ΕΤΑΙΡΙΑ ΑΞΙΟΠΟΙΗΣΗΣ ΚΑΙ ΔΙΑΧΕΙΡΙΣΗΣ ΠΕΡΙΟΥΣΙΑΣ ΤΟΥ ΠΑΝΕΠΙΣΤΗΜΙΟΥ ΜΑΚΕΔΟΝΙΑΣ
-ΥΠΟΛΟΓΙΣΤΙΚΗ ΝΟΗΜΟΣΥΝΗ & ΕΥΦΥΕΙΣ ΠΡΑΚΤΟΡΕΣ Ηλιάδης Λ., Παπαλεωνίδας Α,. Εκδόσεις Τζιόλα

Relative Scientific Journals:
- IEEE Transactions on Intelligent Systems
- IEEE Transactions on Fuzzy Systems
- Neurocomputing

ANNEX OF THE COURSE OUTLINE

Alternative ways of examining a course in emergency situations

Teacher (full name):	IOANNIS BOUTALIS
Contact details:	ybout@ee.duth.gr
Supervisors: (1)	NO
Evaluation methods: (2)	Homework (100%)
Implementation Instructions: (3)	Homework should be submitted via eclass on specified dates. Oral exams follow for each assignment and the related material unit

(7) Please write YES or NO

(8) Note down the evaluation methods used by the teacher, e.g.
   6. *written assignment* or/and exercises
   7. written or oral examination with distance learning methods, provided that the integrity and reliability of the examination are ensured.

(9) In the **Implementation Instructions** section, the teacher notes down clear instructions to the students:

a) in case of **written assignment and / or exercises:** the deadline (e.g. the last week of the semester), the means of submission, the grading system, the grade percentage of the assignment in the final grade and any other necessary information.

b) in case of **oral examination with distance learning methods:** the instructions for conducting the examination (e.g. in groups of X people), the way of administration of the questions to be answered, the distance learning platforms to be used, the technical means for the implementation of the examination (microphone, camera, word processor, internet connection, communication platform), the hyperlinks for the examination, the duration of the exam, the grading system, the percentage of the oral exam in the final grade, the ways in which the inviolability and reliability of the exam are ensured and any other necessary information.

c) in case of **written examination with distance learning methods**: the way of administration of the questions to be answered, the way of submitting the answers, the duration of the exam, the grading system, the percentage of the written exam of the exam in the final grade, the ways in which the integrity and reliability of the exam are ensured and any other necessary information.

There should be an attached list with the Student Registration Numbers only of students eligible to participate in the examination.