

## COURSE OUTLINE

### 1. GENERAL

<b>SCHOOL</b>	SCIENCE		
<b>DEPARTMENT</b>	COMPUTER SCIENCE		
<b>LEVEL OF STUDIES</b>	UNDERGRADUATE		
<b>COURSE CODE</b>	803EΔEE	<b>SEMESTER</b>	8 <sup>TH</sup>
<b>COURSE TITLE</b>	LOGIC AND LOGIC PROGRAMMING		
<b>TEACHING ACTIVITIES</b> <i>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.</i>		<b>TEACHING HOURS PER WEEK</b>	<b>ECTS CREDITS</b>
Lectures		2	5
Laboratory sessions		2	
<i>Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.</i>			
<b>COURSE TYPE</b> <i>Background, General Knowledge, Scientific Area, Skill Development</i>	Scientific Area		
<b>PREREQUISITES:</b>	Discrete Mathematics (102ΓΥΥΚ)		
<b>TEACHING &amp; EXAMINATION LANGUAGE:</b>	Greek		
<b>COURSE OFFERED TO ERASMUS STUDENTS:</b>	No		
<b>COURSE URL:</b>	-		

### 2. LEARNING OUTCOMES

<p><b>Learning Outcomes</b> <i>Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.</i></p> <p>The purpose of the course is to introduce to the scientific area of Logic and Logic Programming by presenting its historical development, studying mature technologies, and describing modern trends regarding a wide range of practical applications.</p> <p>Specifically, the course material aims to introduce the principles of Logic Programming through a review of Propositional Logic and Predicate Logic. The aim is the methodical recognition of the uses of logic mainly in software development through the use of the Prolog programming language. Through Prolog, the basic concepts of logic programs are examined, such as facts, rules, questions, and simple and complex terms. Recursive data structures, truncation, and logical operators are taught with practical examples. Also demonstrated is the use of Prolog for the implementation of input/output processes as well as dynamic knowledge generation. Through examples, reference is made to practical applications of Prolog to modern problems of Artificial Intelligence.</p> <p>Upon successful completion of the course, participants will be able to:</p> <ul style="list-style-type: none"> <li>• understand the basic principles of mathematical logic, propositional logic and first-order logic.</li> <li>• recognize equivalent logical propositions and explain proof methods.</li> <li>• understand and apply the various methods of logical proof.</li> <li>• be familiar with the Prolog programming language</li> <li>• represent knowledge and solve logical expressions.</li> </ul>
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- manipulate predicates with the Prolog programming language.
- understand the concept of recursion and design recursive rules.
- to create logic programs with the possibility of dynamically modifying knowledge.

### General Skills

Name the desirable general skills upon successful completion of the module

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

- Search, analysis and synthesis of data and information, ICT Use
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- Decision making
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- Production of new research ideas
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### 3. COURSE CONTENT

1. Introduction to Set Theory
2. Turing Machines
3. Propositional logic: Semantics, operators, satisfiability, equivalence, standard forms
4. Propositional logic: Inference, logical proof, correctness and completeness, resolution principle
5. Propositional logic: Proof, axioms, Gentzen systems
6. Predicate logic: Terms, predicates, quantifiers, semantics, interpretation, substitution, unification
7. Predicate logic: Equivalences, inference mechanism, inference rules
8. Logic programming: Predicates, facts, rules, queries
9. Logic programming: complex terms, tracing, trees
10. Logic programming: Recursion, recursive programming with lists
11. Logic programming: Cut/program optimisation
12. Logic programming: Input/output procedures
13. Logic programming: Dynamic program modification

### 4. LEARNING & TEACHING METHODS - EVALUATION

<b>TEACHING METHOD</b> <i>Face to face, Distance learning, etc.</i>	Face to face	
<b>USE OF INFORMATION &amp; COMMUNICATIONS TECHNOLOGY (ICT)</b> <i>Use of ICT in Teaching, in Laboratory Education, in Communication with students</i>	Use of ICT: <ul style="list-style-type: none"> <li>• Prolog software</li> <li>• Email</li> <li>• Lecture notes at the distance education platform</li> </ul>	
<b>TEACHING ORGANIZATION</b> <i>The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research &amp; analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation,</i>	<b>Activity</b>	<b>Workload/semester</b>
	Lectures	26 x 2 = 52 hours
	Laboratory sessions	13 x 2 = 26 hours
	Personal study	45 hours
	Exams	2 x 1 = 2 hours

<i>project. Etc.</i>  <i>The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.</i>		
	<b>Total</b>	<b>125</b>
<p align="center"><b>STUDENT EVALUATION</b></p> <p><i>Description of the evaluation process</i></p> <p><i>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</i></p> <p><i>Please indicate all relevant information about the course assessment and how students are informed</i></p>	Written exam with Short Answer Questions	

## 5. SUGGESTED BIBLIOGRAPHY

- Prolog: Προγραμματισμός σε Λογική για Τεχνητή Νοημοσύνη, Μ. Μαρακάκης, Εκδόσεις Νέων Τεχνολογιών [www.newtech-pub.com](http://www.newtech-pub.com)
- Τεχνητή Νοημοσύνη, Βλαχάβας, Κεφάλας, Βασιλειάδης, Κόκκορας, Σακελαρίου, Εκδόσεις Β. Γκιούρδας <http://aibook.csd.auth.gr>
- Τεχνητή Νοημοσύνη: μια σύγχρονη προσέγγιση, Stuart Russell & Peter Norvig, Εκδόσεις Κλειδάριθμος

## ANNEX OF THE COURSE OUTLINE

### Alternative ways of examining a course in emergency situations

<b>Teacher (full name):</b>	
<b>Contact details:</b>	Email
<b>Supervisors: (1)</b>	YES
<b>Evaluation methods: (2)</b>	Written examination with distance learning methods (100%)
<b>Implementation Instructions: (3)</b>	The exam will be conducted using the distance learning platform. Each student must log in to the platform with their passwords in order to participate in the exam. The exam will consist of multiple choice and short answer questions. Each student will be assigned a different set of questions, drawn randomly from a subject bank.

(1) Please write YES or NO

(2) Note down the evaluation methods used by the teacher, e.g.

- *written assignment* or/and exercises
- written or oral examination with distance learning methods, provided that the integrity and reliability of the examination are ensured.

(3) 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.