■ CE711 - Theory of automata and formal languages

GENERAL

SCHOOL	EXACT SCIENCES		
DEPARTMENT	MATHEMATICS		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	CE711	**SEMESTER**	G
COURSE TITLE	THEORY OF AUTOMATA AND FORMAL LANGUAGES		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS**
Lectures	4	6

COURSE TYPE	Skills Development
PREREQUISITE COURSES	-
LANGUAGE OF TEACHING AND EXAMINATIONS	Greek/English
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	http://eclass.uowm.gr/

LEARNING OUTCOMES

Learning Outcomes
• Introductory Concepts: Automata, Computability, Complexity, Concepts, Definitions, Theorems, Proofs and Types of Proofs. • Abstract Machines and Languages: Introduction, the Elementary Machine (EM). Finite State Machines (FSM). Finite Automaton (FA), Causative Finite Automaton (CFA), Non-Acausative Finite Automaton (NAFA), Acceptance Trees (AT), Finite Automata with e-Transitions (FAWET), Equivalence of NAFA and FAWET, Minimization of a CFA, Repeatability Theorem, • Finite Automata and Grammars, Chomsky Hierarchy Grammars, Regular Sets (RS),

Regular Sets and Finite Automata, Finding the Regular Expression of a FA, Capabilities and Deficiencies of FAs.

- Stacked Finite Automata (SFA), Non-Acausal Finite Stacked Automata (NAFSA), Causative Finite Stacked Automata (CFSA), Acceptance with Empty Layer, Equivalence of SAF and Context-Independent Languages.
- Turing Machines (TM), Introduction, Mathematical Description, Useful Tricks for TM Construction, TM Modifications, TM as a Process.
- Unsolvability, the Church-Turing Theorem, Universal TM, the Termination Problem. Computational Complexity, NP-completeness.

General Competencies

- Search for, analysis and synthesis of data and information, with the use of the necessary technology.
- Decision making.
- Production of free, creative and inductive thinking.

CONTENT OF THE COURSE

Familiarity with:

- Abstract Machines and Languages: Introduction, Elementary Machine (EM), Finite State Machines (FSM). Finite Automaton (FA), Causative Finite Automaton (CFA), Non-Acausative Finite Automaton (NAFA), Acceptance Trees (AT), Finite Automata with e-Transitions (FAWET), Equivalence of NAFA and FAWET, Minimization of a CFA, Repeatability Theorem,
- Finite Automata and Grammars, Chomsky Hierarchy Grammars, Regular Sets (RS), Regular Sets and Finite Automata, Finding the Regular Expression of a FA, Capabilities and Deficiencies of FAs,
- Stacked Finite Automata (SFA), Non-Acausative Stacked Finite Automata (NASFA), Causative Stacked Finite Automaton (CSFA), Acceptance with Empty Layer, Equivalence of SFA and Context-Independent Languages,
- Turing Machines (TM), Introduction, Mathematical Description, Useful Tricks for Constructing TM, Modifications of TM, TM as a Process,
- unsolvability, the Church-Turing Theorem, Universal TM, the Termination Problem. Computational Complexity, NP-completeness.

TEACHING AND LEARNING METHODS - EVALUATION

TEACHING METHOD	In the classroom.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of e-class. Communication through face-to-face discussions and e-mails.
TEACHING ORGANIZATION	**Activity** | **Semester Workload**

	Lectures: 52 hours Individual Study: 98 hours Course Total (25 hours per ECTS): 150 hours
STUDENT EVALUATION	Written final examination 100%.

RECOMMENDED BIBLIOGRAPHY

1. Elements of computation theory, Lewis Harry R., Papadimitriou Christos Ch. (Greek)
2. INTRODUCTION TO THE THEORY OF COMPUTATION, SIPSER MICHAEL.