SYLLABUS

Academic year 2024-2025

Year of study I / Semester I

1. **Information on academic program**

1.1. University	**„1 Decembrie 1918" University of Alba Iulia**
1.2. Faculty	**Faculty of Informatics and Engeneering**
1.3. Department	**Informatics, Mathematics and Electronics**
1.4. Field of Study	**Computer Science**
1.5. Cycle of Study	**Undergraduate**
1.6. Academic programme / Qualification	**Computer Science** **ESCO-08: 2512/ Software developers** **Analyst 251201** **Computer System Programmer 251204** **Computer System Engineer 251203**

2. **Information of Course Matter**

2.1. **Course**		***Mathematical and computational logics***			2.2. **Code**	CSE 102	
2.3. **Course Leader**			Wainberg Dorin				
2.4. **Seminar Tutor**			Wainberg Dorin				
2.5. Academic Year	**I**	2.6. Semester	**I**	2.7. Type of Evaluation (E – final exam/ CE - colloquy examination / CA -continuous assessment)	**E**	2.8. Type of course (**C**– Compulsory, **Op** – optional, **F -** Facultative)	**C**

3. Course Structure (Weekly number of hours)

3.1. Weekly number of hours	*3*	3.2. course	*2*	3.3. seminar, laboratory	*1*
3.4. Total number of hours in the curriculum	*42*	3.5. course	*28*	3.6. seminar, laboratory	*14*

Allocation of time:	Hours
Individual study of readers	**20**
Documentation (library)	**10**
Home assignments, Essays, Portfolios	**10**
Tutorials	-
Assessment (examinations)	***2***
Other activities…….	-

3.7 Total number of hours for individual study	58
3.8 Total number of hours according to the curricula	42
3.9 Total number of hours per semester	100
3.10 Number of ECTS	4

4. Prerequisites (*where applicable*)

4.1. curriculum-based	**-**
4.2. competence-based	-

5. Requisites (*where applicable*)

5.1. course-related	Room equipped with video projector / board
5.2. seminar/laboratory-based	Room equipped with video projector / board

6. Specific competences to be acquired (chosen by the course leader from the programme general competences grid)

Professional competences	CP3 (1 ECTS), CP 26 (2 ECTS), CP32 (1 ECTS)
Transversal competences	Not applicable

7. Course objectives (as per the program specific competences grid)

7.1 General objectives of the course	The discipline Computational logics aims to provide students opportunities to identify and use knowledge of the laws of human reasoning, for the purposes of mastering proper expertise and especially for their enforcement in the areas of artificial intelligence, analysis and synthesis of logic circuits, the automatic demonstration theorems, the logic programming.
7.2 Specific objectives of the course	Acquiring fundamental knowledge concerning the discipline specific concepts: formal systems, judgments and sentences, modal logic elements, probability, predicate logic elements; training in problem solving skills necessary for circuit design and optimization of computer systems based on structural formulas, representing information in memory computer systems.

8. Course contents

8.1 Course (learning units)	**Teaching methods**	**Remarks**
1. Propositional Logic: Logical operations, Logical equivalence of formulas, Duality law	***Lecture, conversation, exemplification***	2 ore
2. Decision Problem. Perfect normal forms.	***Lecture, conversation, exemplification***	2 ore
3. Propositional calculus elements: The concept of formula. True formulas	***Lecture, conversation, exemplification***	2 ore
4. Deduction theorem. Rules of propositional calculus.	***Lecture, conversation, exemplification***	2 ore
5. Logically equivalent formulas. Deductibility theorems. Formulas in propositional algebra and propositional calculus.	***Lecture, conversation, exemplification***	2 ore
6. No contradiction and completeness of propositional calculus. Independence of propositional calculus axioms.	***Lecture, conversation, exemplification***	2 ore
7. Predicate calculus: Definitions of predicates and quantifiers. Normal forms.	***Lecture, conversation, exemplification***	2 ore
8. Predicate calculus formulas and axioms.	***Lecture, conversation, exemplification***	2 ore
9. Noncontradiction and narrowly completeness of predicate calculus. Theorems of predicate calculus.	***Lecture, conversation, exemplification***	2 ore
10. Equivalent formulas in predicate calculus. Axioms of predicate calculus.	***Lecture, conversation, exemplification***	2 ore
11. Numeral: positional representation of numbers, algorithms for crossing a number from one base to another, the four operations in various numeral, numeral 2, 8, 16; characteristic elements.	***Lecture, conversation, exemplification***	2 ore
12. Representation of numerical information in memory computer systems: fixed-point representation of numerical information, floating point representation of numerical information, arithmetic operations with floating point numbers, IEEE P754 Standard	***Lecture, conversation, exemplification***	2 ore
13. Boolean functions and their realization: the notion of Boolean function of several variables, Boolean operations AND, OR, NOT	***Lecture, conversation, exemplification***	2 ore
14. The operation of AND gate, OR gate, NOT gate circuits; Implementation of Boolean functions. Boolean functions applications	***Lecture, conversation, exemplification***	2 ore
Seminars-laboratories	**Teaching methods**	
1 Logic sentences – applications	***Laboratory activities, exemplification, conversation***	2 ore
2. Elements of propositional calculus – applications	***Laboratory activities, exemplification, conversation***	2 ore
3. Predicate calculus – applications	***Laboratory activities, exemplification, conversation***	2 ore
4. Numeral – applications	***Laboratory activities, exemplification, conversation***	2 ore
5. Representation of numerical information in memory computer systems – applications	***Laboratory activities, exemplification, conversation***	2 ore
6. Boolean functions and their realization	***Laboratory activities, exemplification, conversation***	2 ore
7. The operation of AND gate, OR gate, NOT gate circuits; Implementation of Boolean functions. Boolean functions applications	***Laboratory activities, exemplification, conversation***	2 ore
References - M. Ben-Ari: Mathematical Logic for Computer Science, Ed. Springer, 2001.		

- M. Lupea, A. Mihis: A Computational Approach to Classical Logics and Circuits, Editura Presa Universitară Clujeană, Cluj-Napoca, 2016.
- Teodor Stihi, *Introducere in logica simbolica,* Ed. BIC ALL, Bucuresti 1999;
- Michael R. Genesereth, Nils J. Nislsson, *Logical Foundations of Artificial Intelligence*, Morgan Kaufmann Publishers, 1988
- S. Russell and P. Norvig, *Artificial Intelligence. A Modern Approach*, Prentice Hall, 1995
- Moise Cocan, Bogdana Pop, *Logica computationala,*Ed. Albastra, Cluj-Napoca, 2006
- Gh. Stefan, V. Bistriceanu, *Circuite integrate digitale – probleme – proiectare,* Ed. Albastra, Cluj-Napoca, 2000
- Boian F., *Sisteme de operare interactive,* Ed. Libris, 1994
- Aldea M., *Logica computationala,* Seria Didactica, Alba Iulia, 2009.

9. Corroboration of course contents with the expectations of the epistemic community's significant representatives, professional associations and employers in the field of the academic program

10. Assessment

Activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of final grade
10.4 Course	*Final evaluation*	*Written paper*	50%
10.5 Seminar/laboratory	*Continuous assessment*	*Tests during the semester*	50%
10.6 Minimum performance standard: Modelling and solving some medium complexity level problems, using the mathematical and computer sciences knowledge.			

Submission date | Course leader signature | Seminar tutor signature

Date of approval by Department members | Department director signature