



MINISTERUL EDUCAȚIEI
UNIVERSITATEA „AUREL VLAICU” DIN ARAD
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SYLLABUS

1. Study programme

1.1. Higher education institution	„Aurel Vlaicu” University of Arad
1.2. Faculty	of Exact Sciences
1.3. Department	Department of Mathematics and Computer Science
1.4. Field of study	Informatics
1.5. Study level	2024-2025
1.6. Ciclul de studii	Bachelor
1.7. Study programme / Qualification	Computer Science
1.8. Form of education	Full – Time study

2. Course details

2.1. Name of the course	Mathematical and Computational Logic
2.2. Course coordinator	Sida Lavinia Elisabeta
2.3. Seminar/laboratory/project coordinator	Sida Lavinia Elisabeta
2.4. Study year	1
2.5. Semester	1
2.6. Evaluation type	summative
2.7. Course type	compulsory

3. Estimated total time (hours per semester)

3.1. Hours per week	4
3.2. Lecture hours per week	2
3.3. Seminar/laboratory/project hours per week	2
3.4. Total hours per curriculum	56
3.5. Lecture hours per semester	28
3.6. Seminar/laboratory/project hours per semester	28
Time division [hrs]	
3.4.1. Independent study from textbooks, course support, bibliography and notes	30
3.4.2. Additional reading (libraries, specialized electronic platforms and field research)	25
3.4.3. Preparing of seminars/laboratories/projects, homework, papers, portfolios and essays	7
3.4.4. Tutorial coaching	3
3.4.5. Examinations	4
3.4.6. Other activities	0
3.7. Total individual study hours	69
3.8. Total hours per semester	125
3.9. Number of ECTS credits	5

4. Prerequisites (if applicable)

4.1. Curriculum related	Basic knowledge of mathematics according to the high school curriculum.
4.2. Competence related	Operation with mathematical concepts and methods.

5. Conditions (if applicable)

5.1. for the lecture	Internet access The classroom is equipped with a blackboard Computer/Laptop and Video projector
5.2. for the seminar	
5.3. for the laboratory	Internet access Specific equipment and apparatus Blackboard
5.4. for the project	

6. Specific educational objectives (competences to be acquired)

6.1. Professional skills	C3.Using computer tools in interdisciplinary context; C4.Using the theoretical bases of computers and formal models.
6.2. Transversal skills	CT1.Applying the rules of organized and efficient work, of responsible attitudes towards teaching-scientific field, to value the own creative potential, while respecting the principles and norms of professional ethics. CT3.Using of efficient methods and techniques for learning, informing, research and development of the capacity to value knowledge, adapting to the requirements of a dynamic society and communicating in English and in an Internationally widespread language.

7. Course outcomes (resulting from the specific educational objectives to be acquired)

7.1. General outcomes	- The student should develop the skills to correctly apply the accumulated knowledge to solve different types of problems. - The student must train and develop his ability to think and analyze logic problems.
7.2. Specific outcomes	- The student is able to demonstrate that he has acquired sufficient knowledge to understand the basic notions. - The student is able to recognize the main classes/types of logic problems and select the appropriate methods and techniques for solving them. - The student can create projects for the mathematical modeling of concrete problems.

8. Outline (if applicable)

8.1 Lecture Outline	Teaching methods	Remarks
1. Boolean algebras 1.1 Definition and examples. 1.2 Properties of Boolean algebra 2. Calculus of sentences 2.1 The language of propositional calculus 2.2 The semantic approach to sentence calculus 2.3 Canonical forms for logical expressions from the calculus of sentences 2.4 The principles of mathematical logic 3. Calculation of predicates 3.1 The language of the calculation of predicates 3.2 The semantic approach to the calculation of predicates 3.3 Operations with predicates 3.4 Predicative formulas 3.5 Deductibility 4. Boolean functions 4.1 Boolean functions 4.2 Normal forms of Boolean functions 4.3 Simplifying Boolean functions 4.4 Physical realization of Boolean functions 4.5 Contact schemes 4.6 Delucre function of a dipole with contacts 5. The basics of set theory in computational logic 5.1 Definition and examples 5.2 Operations with sets 5.3 Axioms of set theory 6. The basics of the theory of relations in computational logic 6.1 Definition of relations. Properties 6.2 Partition of a set 6.3 Order relations. Equivalence relations. 6.4 Functional relationships 7. The bases of the algebraic theory of computational logic 8. Numerical bases for computational logic	<ul style="list-style-type: none"> • Interactive exposure • The debate • Problematisation • The lecture 	
8.2 Lecture References		
1. Eduard Halic, <i>Logică și teoria numerelor</i> , Editura Universității "Aurel Vlaicu", Arad, 2006. 2. Ioan Dzitac, <i>Logică computațională: Material de studiu pentru învățământ la distanță</i> , 2011. 3. M. Reghiș, <i>Elemente de teoria mulțimilor și de logică matematică</i> , Ed. Facla, Timișoara, 1981. 4. http://ro.scribd.com/doc/47640200/Eduard-Halic-Logica-si-Teoria-Numerelor 5. Course and seminar notes, SUMS, 2022 6. Andrei Mărcuș, <i>Introducere în Logica matematică și teoria mulțimilor</i> , Editura Casa Cărții de Știință, 2019		

7. Avigad, J., *Mathematical Logic and Computation*, Cambridge University Press, 2022.
8. Ben-Ari, M., *Mathematical Logic for Computer Science*, Springer London, 2012.
9. Bourbaki, N., *Description of Formal Mathematics*, Springer, 2004.
10. Constantin, D., Ștefan, A. F., *Logică computațională-fundamente algoritmice și matematice*, Tiparg, 2016.
11. Foster, T., *Logic, Computation and Set Theory*, CRC Press, 2002.

8.3 Seminar Outline	Teaching methods	Remarks
8.5 Laboratory Outline	Teaching methods	Remarks
1. Boolean algebras 1.1 Definition and examples. 1.2 Properties of Boolean algebra 2. Calculus of sentences 2.1 The language of propositional calculus 2.2 The semantic approach to sentence calculus 2.3 Canonical forms for logical expressions from the calculus of sentences 2.4 The principles of mathematical logic 3. Calculation of predicates 3.1 The language of the calculation of predicates 3.2 The semantic approach to the calculation of predicates 3.3 Operations with predicates 3.4 Predicative formulas 3.5 Deductibility 4. Boolean functions 4.1 Boolean functions 4.2 Normal forms of Boolean functions 4.3 Simplifying Boolean functions 4.4 Physical realization of Boolean functions 4.5 Contact schemes 4.6 Delucre function of a dipole with contacts 5. The basics of set theory in computational logic 5.1 Definition and examples 5.2 Operations with sets 5.3 Axioms of set theory 6. The basics of the theory of relations in computational logic 6.1 Definition of relations. Properties 6.2 Partition of a set 6.3 Order relations. Equivalence relations. 6.4 Functional relationships 7. The bases of the algebraic theory of computational logic 8. Numerical bases for computational logic	<ul style="list-style-type: none"> • Interactive exposure • The debate • Problematisation 	
8.6 Laboratory References		
1. Eduard Halic, <i>Logică și teoria numerelor</i> , Editura Universității “Aurel Vlaicu”, Arad, 2006. 2. Ioan Dzitac, <i>Logică computațională: Material de studiu pentru învățământ la distanță</i> , 2011. 3. M. Reghiș, <i>Elemente de teoria mulțimilor și de logică matematică</i> , Ed. Facla, Timișoara, 1981. 4. http://ro.scribd.com/doc/47640200/Eduard-Halic-Logica-si-Teoria-Numerelor 5. Course and seminar notes, SUMS, 2022 6. Andrei Mărcuș, <i>Introducere în Logica matematică și teoria mulțimilor</i> , Editura Casa Cărții de Știință, 2019 7. Avigad, J., <i>Mathematical Logic and Computation</i> , Cambridge University Press, 2022. 8. Ben-Ari, M., <i>Mathematical Logic for Computer Science</i> , Springer London, 2012. 9. Bourbaki, N., <i>Description of Formal Mathematics</i> , Springer, 2004. 10. Constantin, D., Ștefan, A. F., <i>Logică computațională-fundamente algoritmice și matematice</i> , Tiparg, 2016. 11. Foster, T., <i>Logic, Computation and Set Theory</i> , CRC Press, 2002.		
8.7 Project Outline	Teaching methods	Remarks
8.8 Project Outline		

9. Correlation of course outline with the expectations of the epistemic community, professional associations and representative employers within the field of the program

The content of the discipline is consistent with what is done in other university centers in the country and abroad. In order to better adapt the content of the discipline to the requirements of the labor market, meetings were held both with representatives of the business environment and with mathematics and computer science teachers from the Arad pre-university education.

10. Evaluation / Grading (if applicable)

Activity type	Evaluation criteria	Evaluation methods	Percentage of the final grade
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10.1. Lecture	<ul style="list-style-type: none"> • completeness of knowledge; • logical coherence; • degree of assimilation of the specialized language; <p>• the criteria for attitudinal aspects: seriousness, interest in the topic addressed</p>	Written assessment (final exam session)	80%
10.2. Seminar			
10.3. Laboratory	<ul style="list-style-type: none"> • the ability to operate with assimilated knowledge; • the ability to apply in practice; <p>• criteria include attitudinal aspects: conscientiousness, interest in individual and team study</p>	Current written works: assignments, projects. Evaluation of the final essay (in the exam session) Active participation in the seminars.	20%
10.4. Project			
10.5 Minimal performance standard Knowing the fundamental elements of theory, solving some simple applications.			

Course coordinator
Sida Lavinia

Seminar/laboratory/project
coordinator
Sida Lavinia

Head of the Department
Lector Popa Lorena

Dean
Prof.univ.dr. Sorin-Florin NĂDĂBAN