



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. Ciclu 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	Automata, computability and complexity
2.2. Course coordinator	Dragoi Vlad-Florin
2.3. Seminar/laboratory/project coordinator	Dragoi Vlad-Florin
2.4. Study year	2
2.5. Semester	2
2.6. Evaluation type	Exam
2.7. Course type	Mandatory

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	39
3.4.2. Additional reading (libraries, specialized electronic platforms and field research)	
3.4.3. Preparing of seminars/laboratories/projects, homework, papers, portfolios and essays	20
3.4.4. Tutorial coaching	
3.4.5. Examinations	10
3.4.6. Other activities	
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	
4.2. Competence related	Knowledge of a programming language

5. Conditions (if applicable)

5.1. for the lecture	Lecture room equipped with video projector, internet connection and software tools
5.2. for the seminar	
5.3. for the laboratory	Laboratory room equipped with networked computers, internet connection and adequate software
5.4. for the project	

6. Specific educational objectives (competences to be acquired)

6.1. Competențe profesionale	C1.Programming in high level programming languages; C2.Development and maintenance of computer applications; C3.Using computer tools in interdisciplinary context; C4.Using the theoretical bases of computers and formal models;
6.2. Competențe transversale	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. CT2.Efficient conduct of the activities organized in an inter-disciplinary group and developing the personal communication skills, networking and collaboration with various groups; 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	During this lecture, the students will be familiarized with the main topics on complexity theory, automata and computability theory
7.2. Specific outcomes	Students will be able to determine the theoretical complexity of an algorithm. They will recognize the complexity class on the studied problem.

8. Outline (if applicable)

8.1 Lecture Outline	Teaching methods	Remarks
1. Introduction to set theory, mathematical proof, recurrence, enumeration techniques 2. Automata: finite automata, deterministic and non-deterministic finite automata, regular languages, free-context grammars, formal languages and grammars 3. Computability and decidability: decidable languages, undecidable problems, Turing machine, Church-Turing thesis, universal Turing machine 4. Complexity theory: P vs NP, PSPACE, algorithmic complexity	Presentation Lecture using video projector and the internet Web search Interactive discussions Examples	4 hours 8 hours 8 hours 8 hours
8.2 Lecture References 1. J.E. Savage: Models of Computation: Exploring the Power of Computing, 2008, http://cs.brown.edu/~jes/book/ 2. J.E. Savage: "Models of Computation", Addison-Wesley, 1998. 3. M. Sipser: "Introduction to the Theory of Computation", 2nd edition, Thomson Course Technology 2006. 4. D.P. Bovet, P. Crescenzi: „Introduction to the Theory of Complexity”, Prentice Hall, UK, 1994.		

8.3 Seminar Outline	Teaching methods	Remarks
Model, test and simulation of algorithms: 1. Classic problems and reductions (SubsetSum, Perfect SubsetSum, SAT, etc.) 2. Testing sets (sorting, membership, etc.) 3. Linear algebra problems (matrix-vector multiplication, determinat, rank, etc.) 4. Other applications (cryptography:lattice and code-based problems)	Case studies Examples Individual study Brainstorming Practical challenges	
8.4 Seminar References 1. J.E. Savage: Models of Computation: Exploring the Power of Computing, 2008, http://cs.brown.edu/~jes/book/ 2. J.E. Savage: "Models of Computation", Addison-Wesley, 1998. 3. M. Sipser: "Introduction to the Theory of Computation", 2nd edition, Thomson Course Technology 2006. 4. D.P. Bovet, P. Crescenzi: „Introduction to the Theory of Complexity”, Prentice Hall, UK, 1994.		
8.5 Laboratory Outline	Teaching methods	Remarks
8.6 Laboratory Outline		
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

This course is taught in similar programs at many universities, both in Romania and abroad. For a better matching with the demands of the labor market, meetings with employers' representatives, business representatives, and specialty teachers from the pre-university education system have been organized. Using English brings and added value to the program, enabling the hiring of graduates by multinational companies (both abroad and in Romania).

10. Evaluation / Grading (if applicable)

Activity type	Evaluation criteria	Evaluation methods	Percentage of the final grade
10.1. Lecture	<input type="checkbox"/> Level of mastering the domain-specific vocabulary <input type="checkbox"/> Logical consistency <input type="checkbox"/> Extent of correctness and completeness of knowledge <input type="checkbox"/> Responsibility <input type="checkbox"/> Commitment <input type="checkbox"/> Resolution	Final written exam at the end of the semester	40%
		Active participation	10%
10.2. Seminar	<input type="checkbox"/> Ability to use the knowledge <input type="checkbox"/> Ability to apply theoretical knowledge to practical cases <input type="checkbox"/> Responsibility <input type="checkbox"/> Commitment <input type="checkbox"/> Resolution	Partial written exam during the semester	30%
		Independent work, homework	10%
		Active participating	10%
10.3. Laboratory			
10.4. Project			
10.5 Minimal performance standard			
Proper mastering of the basics, understanding the fundamental notions/concepts, fluent with the domain-specific vocabulary, and able to analyze and explain simple cases.			

Course coordinator
Dragoi Vlad-Florin

Seminar/laboratory/project coordinator
Dragoi Vlad-Florin

Head of the Department
Lector Popa Lorena

Dean
Prof.univ.dr. Nadaban Sorin