

CURRICULUM

Valid for the study cycle 2026-2028

"Aurel Vlaicu" University of Arad

Faculty of Exact Sciences

Department **Mathematics and Computer Science**

Name of program **Applied computer science in technology, economics and science**

Field of studies **Informatics**

Type of program **Professional**

Length of program / number of ECTS credits **2 years /120 credits**

Type of education **With attendance**

Graduate title earned **Master in informatics**

1. MISSION STATEMENT

An integral part of the Faculty of Exact Sciences, the master's program, Applied Computer Science in Science, Technology and Economics has as main mission the training of specialists in computer science, programming, databases, in the spirit of democracy, equal opportunities and human personality development.

2. OBJECTIVES

- Development of skills to analyze economic and social facts and phenomena and to propose solutions;
- Capitalizing on the knowledge acquired by graduates in professional and scientific projects in order to meet the challenges of the Romanian and European economy;
- Training skills to develop and use methods, procedures and tools of scientific research, as well as developing in graduates the ability to formulate scientific explanations for economic and social phenomena and processes
- Stimulating the interest of graduates for continuous professional, scientific and specialized training in order to effectively adapt to the requirements of the knowledge-based society;
- Training of professional communication skills in English, of effective integration in both work teams and multinational / international research teams.

3. COMPETENCIES AND EXPECTED LEARNING OUTCOMES DEVELOPED WITHIN THE STUDY PROGRAM)

Professional competencies:

C1. Presents the results of the analyses
C2. Provide technical documentation
C3. Carry out ICT security tests
C4. Create data models
C5. Analyze software specifications
C6. Use application-specific interfaces
C7. Apply statistical analysis techniques
C8. Performs visual presentation of data
C9. Use databases

C10. Interpret current data
C11. Develop data processing applications
C12. Synthesize information
C13. Uses data processing techniques
Scientific
C14. Performs risk analysis
C15. Perform data analysis
C16. Identify statistical models

Transversal competencies:

CT1. Think analytically
CT2. Approach challenges positively
CT3. He is attentive to details

CT4. It works efficiently
CT5. Work in teams

Nr. crt.	LEARNING OUTCOMES			Subjects Contributing to the Achievement of Learning Outcomes
	Knowledge	Skills	Responsibility and Autonomy	
C1. Presents the results of the analyses				
	The graduate: a) describes the fundamental concepts of algorithms and data structures b) identifies the stages of an information processing workflow c) explains data flow models d) formulates logical structures for implementation	The graduate: a) carries out the steps for analyzing an information process b) analyzes the information in a given system c) performs searches and simulations in specific digital environments	The graduate: a) coherently applies work standards in process design b) demonstrates professionalism in developing algorithmic logic c) applies effective teamwork techniques	Validated computing Research project in validated computing Biological Neural Networks Fundamentals Internship Scientific research methodologies Scientific seminar
C2. Provide technical documentation				
	The graduate: a) knows the types of software documentation (user manuals, technical documentation, specifications) b) understands the structure and format of technical documentation c) explains the importance of standardization and clarity in documentation	The graduate: a) drafts clear and coherent documentation for software applications b) uses tools for editing and managing documentation c) adapts technical content for different audiences	The graduate: a) prepares documentation in accordance with project requirements b) adheres to quality standards and professional ethics c) takes responsibility for the accuracy of the information provided	E-business Research project in artificial intelligence Scientific seminar Dissertation thesis
C3. Carry out ICT security tests				
	The graduate: a) knows the fundamental principles of cybersecurity b) is familiar with security protocols in networks and encryption methods c) understands common vulnerabilities of ICT systems	The graduate: a) identifies and remedies security vulnerabilities b) uses automated security testing tools c) configures and implements security controls	The graduate: a) plans and executes security tests b) complies with security standards and regulations	Programming on mobile platforms Advanced Architectures in Computer Networks Ethics and academic integrity
C4. Create data models				
	The graduate: a) describes modeling concepts (relational, object-oriented, etc.) b) knows types of relationships between entities c) understands database normalization	The graduate: a) designs conceptual and logical data models b) uses ER diagrams c) optimizes data structures	The graduate: a) maintains data consistency and integrity b) adapts models to application requirements c) applies best practices in data design	Mathematics for Data Science Database programming Simulation and modeling techniques Biological Neural Networks Fundamentals Image Recognition Agentic AI Statistical Learning
C5. Analyze software specifications				
	The graduate: a) explains the software development life cycle b) knows programming languages and paradigms c) identifies types of applications and their purposes d) understands the impact of architectural decisions on system performance, scalability, reliability, and maintainability	The graduate: a) designs and implements functional software applications b) tests and validates the developed applications c) applies best practices in development	The graduate: a) meets project deadlines and requirements b) demonstrates initiative and perseverance in completing software products c) applies professional standards in the development process	Validated computing Research project in artificial intelligence E-business Advanced Architectures in Computer Networks Introduction to Machine Learning Internship Image Recognition Agentic AI

	e) possesses knowledge of relevant technologies and frameworks for implementing different architectures f) understands the concepts of continuous integration (CI) and continuous delivery (CD) in the context of software architectures			
C6. Use application-specific interfaces				
	The graduate: a) describes types of graphical and command-line interfaces b) understands UX/UI principles c) is familiar with the specifics of software applications	The graduate: a) interacts efficiently with application interfaces b) uses menus, forms, and specific commands c) adapts their workflow based on the application being used	The graduate: a) efficiently organizes their activities using software interfaces b) focuses on optimizing the workflow c) adheres to best usage practices	E-business Introduction to Machine Learning Validated computing
C7. Apply statistical analysis techniques				
	The graduate: a) understands fundamental concepts of statistics b) is familiar with data analysis methods c) can use software for statistical analysis	The graduate: a) collects and processes raw data b) selects and correctly applies statistical techniques c) interprets statistical results to support decision-making	The graduate: a) collaborates with experts to validate statistical models b) takes responsibility for the analysis performed	Mathematics for Data Science Simulation and modeling techniques Validated computing Advanced probability and bayesian statistics Research project in validated computing Image Recognition Statistical Learning
C8. Performs visual presentation of data				
	The graduate: a) is proficient in markup languages and styling (HTML, CSS) b) understands concepts of responsive design c) recognizes elements of visual identity	The graduate: a) creates attractive and functional interfaces b) integrates visual components with application logic c) optimizes websites for various devices	The graduate: a) adheres to branding and accessibility requirements b) applies current web standards c) collaborates with the design and back-end teams	Dissertation thesis Internship Biological Neural Networks Fundamentals Programming on mobile platforms E-business Image Recognition
C9. Use databases				
	The graduate: a) describes types of database management systems b) explains concepts of database administration and security c) understands notions of backup, replication, and transactions	The graduate: a) creates, modifies, and maintains databases b) optimizes queries and data structures c) implements security policies	The graduate: a) ensures data confidentiality and integrity b) implements backup and recovery policies c) maintains system performance	Database programming Internship Dissertation thesis E-business
C10. Interpret current data				
	The graduate: a) understands the structure and characteristics of large data sets b) is familiar with technologies and methodologies for data interpretation c) has knowledge of data	The graduate: a) identifies trends and relationships within data b) creates clear and informative visualizations c) writes conclusions based on interpreted data	The graduate: a) makes decisions based on data analysis and interpretation b) communicates results to stakeholders c) respects the confidentiality and integrity of the	Scientific research methodologies Advanced probability and bayesian statistics Scientific seminar Ethics and academic integrity Image Recognition Agentic AI

	visualization for decision support		analyzed data	Statistical Learning
C11. Develop data processing applications				
	The graduate: a) knows programming languages used in data processing b) possesses knowledge of parallel and distributed processing technologies c) can identify data structures and algorithms for efficient data handling	The graduate: a) develops scalable applications for data processing b) tests and optimizes application performance	Absolventul: The graduate: a) creates applications in compliance with technical and ethical requirements b) makes autonomous decisions regarding software solution architecture c) ensures maintenance of the developed applications	Database programming Introduction to Machine Learning Programming on mobile platforms Simulation and modeling techniques Research project in validated computing Research project in artificial intelligence Ethics and academic integrity Image Recognition Agentic AI
C12. Synthesize information				
	The graduate: a) researches information related to a given topic b) knows methods for collecting, classifying, and evaluating information from various sources c) critically summarizes new and complex information related to a given topic	The graduate: a) correctly interprets information gathered on a given topic b) selects the necessary information to solve a specific problem c) uses digital tools to support information synthesis	The graduate: a) uses the available information coherently b) demonstrates professionalism in managing the information at their disposal c) can work independently or in multidisciplinary teams	Mathematics for Data Science Modelling and optimizing decisions Ethics and academic integrity Scientific research methodologies Scientific seminar Dissertation thesis Agentic AI
C13. Uses data processing techniques Scientific				
	The graduate: a) has knowledge of the collection, analysis, and interpretation of scientific data b) understands the fundamental principles of scientific data processing c) provides support for integrating data from multiple sources	The graduate: a) applies techniques and tools for querying and manipulating data b) utilizes technologies for selecting and filtering scientific data c) applies advanced tools and methodologies for scientific data analysis	The graduate: a) selects data processing methods that uphold scientific rigor b) ensures data use in accordance with ethical standards c) interprets and presents results in a coherent and rigorous manner	Database programming Biological Neural Networks Fundamentals Introduction to Machine Learning Scientific research methodologies Ethics and academic integrity Dissertation thesis Statistical Learning
C14. Performs risk analysis				
	The graduate: a) knows methods for risk assessment and classification b) provides mathematical formulations for risk analysis problems c) has knowledge of decision theory to compare alternatives based on risk	The graduate: a) evaluates the impact of risks and plans measures to reduce them b) integrates risk analysis into decision-making c) utilizes information technologies for risk analysis	The graduate: a) takes responsibility for proposed decisions b) makes informed decisions to minimize risks c) collaborates effectively with management teams	Mathematics for Data Science Simulation and modeling techniques Modelling and optimizing decisions Advanced Architectures in Computer Networks Agentic AI
C15. Perform data analysis				
	The graduate: a) knows the fundamental principles of data analysis b) understands data structures and query optimization	The graduate: a) applies advanced modeling techniques b) plans and executes data analysis projects	The graduate: a) applies best practices in data analysis b) respects the confidentiality of the	Database programming Mathematics for Data Science Scientific seminar Research project in

	c) understands the behavior of systems evolving over time	c) integrates data analysis into decision-making processes d) utilizes AI and machine learning algorithms for advanced data analysis	data used c) determines optimal solutions through scenario analysis based on data d) contributes to modeling complex phenomena through advanced data analysis	validated computing Advanced probability and bayesian statistics Statistical Learning
C16. Identify statistical models				
	The graduate: a) provides knowledge about standard statistical models b) selects appropriate statistical models c) is familiar with model validation techniques	The graduate: a) creates and validates statistical models b) tests statistical models through simulations c) applies optimization techniques to refine statistical models	The graduate: a) interprets and communicates model results b) connects statistical theory with practical applications in technical and scientific fields	Mathematics for Data Science Simulation and modeling techniques Advanced probability and bayesian statistics Statistical Learning
CT1. Think analytically				
	The graduate: a) understands the principles of critical and analytical thinking b) is familiar with methods and tools used for problem analysis c) knows techniques for organizing and processing information relevant to decision-making	The graduate: a) identifies, formulates, and structures complex problems b) applies mathematical methods to solve complex problems c) compares and evaluates options based on objective criteria	The graduate: a) critically evaluates information and makes responsible decisions based on validated calculations b) has the ability to work independently in problem analysis c) takes responsibility for the quality and accuracy of the analytical process	Scientific research methodologies Mathematics for Data Science Modelling and optimizing decisions Validated computing Biological Neural Networks Fundamentals Research project in validated computing Advanced Architectures in Computer Networks Scientific seminar Image Recognition Statistical Learning
CT2. Approach challenges positively				
	The graduate: a) is familiar with problem-solving and decision-making strategies b) has knowledge of methods to address complex challenges in dynamic environments c) knows validation techniques involving error management	The graduate: a) develops problem-solving strategies b) has the ability to analyze challenges objectively c) is flexible in adapting to unpredictable situations	The graduate: a) has the ability to maintain a positive and motivating attitude for themselves and the team b) makes responsible decisions even under uncertainty c) takes initiative and responsibility in problem resolution	Scientific research methodologies Mathematics for Data Science Modelling and optimizing decisions Validated computing Volunteering Image Recognition
CT3. He is attentive to details				
	The graduate: a) understands the principles and standards of accuracy in the field b) knows methodologies for verification and control of results c) is familiar with techniques for error detection and	The graduate: a) applies standards and procedures to ensure consistency and precision b) manages complex details c) utilizes tools and technologies for detail verification	The graduate: a) takes responsibility for the results obtained b) maintains a high standard of precision c) can collaborate on various projects requiring heightened attention to detail	Mathematics for Data Science Database programming Validated computing Dissertation thesis Ethics and academic integrity Scientific research methodologies

	correction			Biological Neural Networks Fundamentals Programming on mobile platforms Advanced probability and bayesian statistics Agentic AI
CT4. It works efficiently				
	The graduate: a) knows techniques and tools for process optimization b) has knowledge of advanced methods for solving problems requiring unconventional approaches	The graduate: a) develops skills in strategic analysis and planning b) builds practical competencies in organization and efficiency in professional environments c) applies knowledge in an organized manner to solve specific problems d) uses specific techniques to quickly and accurately assess complex situations	The graduate: a) works effectively in interdisciplinary contexts b) engages in rigorous checks and careful organization of processes c) respects ethical standards and responsibly manages resources	Simulation and modeling techniques Modelling and optimizing decisions Validarea calculelor numerice Programming on mobile platforms Research project in validated computing Image Recognition Agentic AI Advanced Architectures in Computer Networks Advanced probability and bayesian statistics Agentic AI Statistical Learning
CT5. Work in teams				
	The graduate: a) understands the principles of teamwork dynamics b) knows the roles and individual responsibilities within a team c) is familiar with digital tools for effective collaboration and communication in teams	The graduate: a) collaborates efficiently with other team members to achieve objectives b) communicates clearly, listens actively, and provides constructive feedback c) uses collaborative digital tools to organize and coordinate team work d) contributes to constructive conflict resolution and maintains a positive work environment	The graduate: a) participates actively and responsibly in diverse teams, demonstrating autonomy and initiative b) understands and respects individual and collective roles and responsibilities c) supports and promotes effective collaboration within the team	Programming on mobile platforms E-business Ethics and academic integrity Research project in artificial intelligence Scientific seminar Agentic AI Volunteering

4. ACADEMIC CAREER DEVELOPMENT

The graduates of the Master of Science (MSc) program in “**Applied computer science in technology, economics and science**”, according to the Romanian Occupational Catalogue (COR – ISCO-08), can be hired in the following positions:

2511 – code 251101 Computer System Designer
2120 – code 212011 - Statistician Advisor

5. FINAL STIPULATIONS

The Curriculum will be approved, according to the Law 199/2023 by the university Senate and after being signed on each page the President of the Senate. Approved Curriculum valid for study cycle 2026-2028.

6. ANALYZIS OF THE CURRICULUM

For the curriculum of the Master of Science (MSc) program “Applied computer science in technology, economics and science”, the classification of the courses is presented in the following tables:

- The total number of courses divided in categories according the subject type (proficiency, synthesis, advanced):

No. Crt.	Subject Type	Hours Study program	
		Hours	Ratio %
1	Fundamentals (DF)	238	26,6 %
2	Specialty (DS)	630	70,3%
3	Complementary (DC)	28	3,1 %
TOTAL		896	100,00%

- The total number of hours of this program is 896, divided as follows:

- Compulsory requirements	784hours
- Internship.....	112hours
- Internship to prepare the Master Thesis	112 hours
Total.....	896hours

- Curriculum structure, according course types (compulsory and elective):

Course	Hours per curriculum	
	Hours	Ratio %
Compulsory courses (including practice)	812	90,6%
Elective courses	84	9,4%
TOTAL Ob+Op	896	100%

- The ratio between lectures and practice (seminars, laboratories, projects, internship) is 1:2,04 (294 course hours / 602 practice hours), complying with the ARACIS regulations.
- The Master of Science (MSc) program in “**Applied computer science in technology, economics and science**” complies with the national qualifications provided by the Government Decree HG 192/2026.
- The courses included in the curriculum and the subjects studied are perfectly aligned with the Master’s degree program in the field of Informatics. (HG 192/2026).
- The curriculum of the Master of Science (MSc) program in “**Applied computer science in technology, economics and science**” complies with the European Credit Transfer and Accumulation System (ECTS) and with the Law 199/2023 on the organizing of university master studies.

7. TIME SKEDULLING OF THE ACADEMIC YEAR (WEEKS)

Year	Didactic activities (weeks)		Exams (weeks)			Practice	Holiday (weeks)		
	Sem. I	Sem. II	Winter session	Summer session	Retake session		Winter	Between semesters	Summer
Year I	14	14	3	3	2		2	1	12
Year II	14	14	3	2	1	112*	2	1	-

*The 112 hours of practical training are mandatory and take place in the 2- year.

8. HOURS PER WEEK OF COMPULSORY AND ELECTIVE COURSES

Year	Semester I (hours / week)		Semester II (hours / week)	
	Compulsory courses	Elective courses	Compulsory courses	Elective courses
I	14	0	14	0
II	8	6	7	7

9. REQUIREMENTS FOR PASSING, PROMOTION AND COMEBACK

The requirements for passing (admission to the next academic year), promotion or comeback to studies are stated in the [RAPS Regulations](#).

10. THE MASTER THESIS

The requirements for preparing, submitting and defending the Master Thesis are stated in the [Regulation on the organization and conduct of bachelor/diploma and dissertation examinations](#).

- Communicating the subjects for the Master Thesis: semester 2r
- Preparing the Master Thesis: – the semesters 3 and 4
- Submitting and defending the Master Thesis: July – 2rd year
- The final exam consists of defending the Master Thesis (10 credits)

11. THE ECTS CREDITS ASSOCIATED WITH THE MASTER PROGRAM

Total 120 credits

- 90 credits for compulsory courses
- 30 credits for elective courses
- 2 credits for facultative courses

RECTOR

Dr.Habil. Ramona LILE

DEAN

Professor, PHD Sorin-Florin NĂDĂBAN

HEAD OF DEPARTMENT

Associate Professor, PhD Lorena Camelia POPA

CURRICULUM
Academic year 2026-2027
Year I

Code	Subject	Course status	S.I./ Sem (hrs)	Hours per week and Evaluation type											
				1 st Semester 14 weeks						Semestrul II 14 săptămâni					
				C	S	L	Pr	Ev	C	C	S	L	Pr	C	K
COMPULSORY COURSES															
GmDF1O01	Învăţare statistică/ Statistical Learning	DF	119	2	-	2	-	Ex	7	-	-	-	-	-	-
GmDF1O02	Matematică pentru Data Science/ Mathematics for Data Science	DF	133	1	2	-	-	Ex	7	-	-	-	-	-	-
GmDf1O03	Programarea bazelor de date/Database programming	DF	133	2	1	-	-	Ex	7	-	-	-	-	-	-
GmDS1O04	Tehnici de simulare şi modelare/ Simulation and modeling techniques	DS	119	2	-	1	-	Ex	7	-	-	-	-	-	-
GmDC1O05	Etică şi integritate academică / Ethics and academic integrity	DC	36	1	-	-	-	C	2						
GmDS2O07	Calculare numerice validate / Validated computing	DS	133	-	-	-	-	-	-	2	-	1	-	Ex	7
GmDS2O08	Modelarea şi optimizarea deciziilor/ Modelling and optimizing decisions	DS	133	-	-	-	-	-	-	2	-	1	-	Ex	7
GmDS2O09	Proiect de cercetare în calcule numerice validate/ Research project in validated computing	DS	47	-	-	-	-	-	-	-	-	-	2	V	3
	TOTAL			8	3	3	-	-	30	4	-	2	2	-	17
ELECTIVE COURSES															
	Pachet 1														
GmDS2A11	Recunoaştere de imagini/ Image Recognition	DS	108	-	-	-	-	-	-	1	-	2	-	Ex	6
GmDS2A12	Agenţi autonomi/ Agentic AI	DS	108	-	-	-	-	-	-	1	-	2	-	Ex	6
	Pachet 2														
GmDS2A21	E-business/ E-business	DS	133	-	-	-	-	-	-	1	-	2	-	Ex	7
GmDS2A22	Programare pe platforme mobile/ Programming on mobile platforms	DS	133	-	-	-	-	-	-	1	-	2	-	Ex	7
	TOTAL			-	-	-	-	-	-	2	-	4	-	-	13
TOTAL				8	3	3	-	-	30	6	-	6	2	-	30

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Legend: C – Lecture; S – Seminar; L – Laboratory; P – Project; SI – Individual Study; Ev – Evaluation; K – Credits;
DF - Fundamentals course; DS – Specialty course; DC – Complementary course

CURRICULUM
Academic year 2027-2028
Year II

Code	Subject	Course status	S.I./ Sem (hrs)	Hours per week and Evaluation type											
				1 st Semester 14 weeks						Semestrul II 14 săptămâni					
				C	S	L	Pr	Ev	C	C	S	L	Pr	C	K
COMPULSORY COURSES															
GmDF3O01	Introducere în Machine Learning/ Introduction to Machine Learning	DF	119	2	-	2	-	Ex	7	-	-	-	-	-	-
GmDS3O02	Arhitecturi avansate în rețele de calculatoare/ Advanced Architectures in Computer Networks	DS	133	1	-	2	-	Ex	7	-	-	-	-	-	-
GmDS3O03	Fundamente ale rețelelor neuronale biologice/ Biological Neural Networks Fundamentals	DS	133	2	-	1	-	Ex	7	-	-	-	-	-	-
GmDF3O04	Probabilități avansate si statistică baeziană/ Advanced probability and bayesian statistics	DF	133	1	-	-	2	Ex	7	-	-	-	-	-	-
GmDC3O05	Metodologia cercetării științifice/ Scientific research methodologies	DC	36	1	-	-	-	V	2	-	-	-	-	-	-
GmDS4O06	Practică de specialitate/ Internship	DS	88	-	-	-	-	-	-	112 hours of practice				C	8
GmDS4O07	Seminarul științific/ Scientific seminar	DS	158	-	-	-	-	-	-	-	-	-	3	V	8
GmDS4O08	Proiect de cercetare în inteligență artificială/ Research project in artificial intelligence	DS	108	-	-	-	-	-	-	-	-	-	3	C	6
GmDS4O09	Elaborarea lucrării de disertație/ Dissertation thesis	DS	88	-	-	-	-	-	-	-	-	-	8	C	8
TOTAL				7	-	5	2	-	30	-	-	-	14	-	30
FACULTATIVE COURSES															
GmDC4F10	Voluntariat	DC	22	-	-	-	-	-	-	-	-	2	-	C	2

Activity	Evaluation	Credits
Final exam for the Master's degree	Exam	10

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