ANEXA 1

CURRICULUM
Valid for the study cycle 2026-2028
"Aurel Vlaicu" University of Arad

Faculty of Exact Sciences
Department **Mathematics and Computer Science**
Master's Degree Program: **Artificial Intelligence (in English)**
Fundamental Field: **Exact Sciences**
Master's Field: **COMPUTER SCIENCE**
Type of Master's Program: **PROFESSIONAL**
Duration / number of credits: **2 years / 120 credits**
Form of education: **full-time**
Graduate title: **Master's Degree in Artificial Intelligence**

1. MISSION OF THE STUDY PROGRAM

The mission of the Artificial Intelligence master's program, taught in English, is to train specialists with advanced competencies in the design, development, and implementation of AI-based systems, capable of responding to current and future labor market demands and contributing to the development of the digital society.

The master's program is fully aligned with the mission of the Faculty of Exact Sciences:

- encouraging critical thinking oriented toward research in computer science and related applications;
- improving the educational offer by developing and cultivating a professional environment that leads to obtaining scholarships aimed at improving knowledge;
- overcoming national barriers toward a European and international dimension by building communication skills to excel in the profession.

The mission of the program is consistent with the strategy of "Aurel Vlaicu" University of Arad, contributing to:

- the development of cutting-edge fields in education and research;
- increasing the relevance of the educational offer;
- strengthening relationships with the socio-economic environment.

2. OBJECTIVES OF THE STUDY PROGRAM

- Developing advanced technical competencies in modeling, analysis, and development of AI-based solutions
- Developing the ability to apply AI methods in real-world contexts through projects, case studies, and interdisciplinary applications
- Developing research, critical analysis, and innovation competencies in AI
- Developing competencies for designing, developing, and integrating intelligent software systems
- Developing transversal competencies such as communication, teamwork, and project management
- Promoting ethical, responsible, and explainable use of AI systems

- Adapting graduates' competencies to current and emerging labor market requirements in AI and digital technologies

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

Professional competencies

C1. Analyze large datasets
C2. Apply statistical analysis techniques
C3. Normalize data
C4. Perform data cleaning
C5. Use databases
C6. Manage databases
C7. Use data processing techniques
C8. Create data models
C9. Extract information from data
C10. Interpret current data
C11. Present analysis results
C12. Design the information system
C13. Write scientific papers, academic works, and technical documentation
C14. Develop software prototypes
C15. Define the software architecture
C16. Use software libraries

Transversal competencies

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

Nr. crt.	LEARNING OUTCOMES			Subjects Contributing to the Achievement of Learning Outcomes
	Knowledge	**Skills**	**Responsibility and Autonomy**	
C1. Analyze large datasets				
	The graduate: a) knows the fundamental concepts of large-scale data analysis b) understands the types and structure of large datasets c) knows methods for identifying patterns in data d) understands the principles of distributed data processing	**The graduate:** a) analyzes large datasets using specific tools b) identifies relevant patterns and correlations in data c) uses efficient data processing techniques d) applies methods for reducing data volume	**The graduate:** a) responsibly manages large volumes of data b) ensures the quality and relevance of the analyses performed c) selects appropriate methods depending on the context d) follows best practices in data analysis	• Data Science • Machine Learning • Neural Networks • AI-driven Risk Analysis • Research Project in AI • Natural Language Processing & LLMs • LLM Applications and Prompt Engineering
C2. Apply statistical analysis techniques				
	The graduate: a) descriptive and inferential statistics b) statistical distributions and hypothesis testing c) regression and correlation methods d) probabilistic modeling principles	**The graduate:** a) applies statistical methods b) interprets statistical results c) selects appropriate methods d) uses statistical software	**The graduate:** a) validates correctness of analyses b) critically interprets results c) avoids misuse of statistical methods d) takes responsibility for decisions	• Mathematics for Data Science • Data Science • Machine Learning • Linear Programming and Convex Optimization • Advanced probability and bayesian statistics • Natural Language Processing & LLMs
C3. Normalize data				
	The graduate: a) data normalization concepts b) database normal forms	**The graduate:** a) applies normalization techniques b) restructures	**The graduate:** a) ensures data integrity b) applies modeling standards	• Advanced Databases • Data Science

	c) functional dependencies d) redundancy impact	databases c) removes redundancy d) optimizes structure	c) documents changes d) maintains consistency	
C4. Perform data cleaning				
	The graduate: a) data cleaning methods b) types of errors c) handling missing values d) impact of incorrect data	**The graduate:** a) identifies incorrect data b) corrects errors c) applies preprocessing techniques d) validates consistency	**The graduate:** a) ensures data quality b) follows processing standards c) documents cleaning process d) verifies results	• Data Science • Machine Learning • AI-driven Risk Analysis
C5. Use databases				
	The graduate: a) understands database models b) understands query languages c) knows table and relationship structures d) understands query optimization	**The graduate:** a) queries databases b) manages data in information systems c) creates data structures d) uses administration tools	**The graduate:** a) respects data security b) ensures correctness of queries c) manages access to data d) uses resources efficiently	• Advanced Databases • Data Science • Natural Language Processing & LLMs
C6. Manage databases				
	The graduate: a) database administration b) security mechanisms c) backup and recovery d) performance optimization	**The graduate:** a) administers databases b) monitors performance c) implements security policies d) optimizes data access	**The graduate:** a) ensures data availability b) protects sensitive data c) manages incidents d) complies with regulations	• Advanced Databases • Data Science
C7. Use data processing techniques				
	The graduate: a) preprocessing methods b) data transformations c) dimensionality reduction d) feature selection	**The graduate:** a) applies transformation techniques b) selects relevant features c) reduces dimensionality d) prepares data for models	**The graduate:** a) chooses appropriate methods b) ensures processing quality c) documents steps d) validates results	• Data Science • Machine Learning • Computer Vision using AI • Neural Networks • Natural Language Processing & LLMs
C8. Create data models				
	The graduate: a) conceptual modeling b) relational models c) logical models d) data representation	**The graduate:** a) designs data models b) defines relationships c) creates database schemas d) uses modeling tools	**The graduate:** a) ensures correctness b) documents structures c) follows standards d) optimizes models	• Advanced Databases • Data Science • Mathematics for Data Science • Advanced probability and bayesian statistics • Natural Language Processing & LLMs
C9. Extract information from data				
	The graduate:	**The graduate:**	**The graduate:**	• Machine Learning

	a) data mining methods b) machine learning algorithms c) classification and clustering d) pattern recognition	a) applies extraction algorithms b) identifies relevant patterns c) uses ML models d) interprets results	a) validates models b) avoids incorrect interpretations c) ensures transparency d) uses methods correctly	• Neural Networks • Computer Vision using AI • Agentic AI • AI-driven Risk Analysis • AI for Cybersecurity • LLM Applications and Prompt Engineering
C10. Interpret current data				
	The graduate: a) principles of data analysis b) data structure and query optimization c) behavior of evolving systems	**The graduate:** a) applies advanced modeling techniques b) plans and conducts analysis projects c) integrates data analysis into decision-making d) uses AI and ML for advanced analysis	**The graduate:** a) applies best practices b) respects data confidentiality c) determines optimal solutions d) contributes to modeling complex phenomena	• Data Science • Machine Learning • Neural Networks • AI-driven Risk Analysis • Linear Programming and Convex Optimization • Research Project in AI • AI for Social/Economic Sciences • AI for Cybersecurity • AI for Engineering • Internship • Disertation Thesis • Natural Language Processing & LLMs
C11. Present analysis results				
	The graduate: a) visualization methods b) data communication c) types of charts d) storytelling	**The graduate:** a) creates visualizations b) presents results c) writes reports d) adapts communication	**The graduate:** a) communicates clearly b) avoids misinterpretation c) follows ethical standards d) adapts to audience	• Communication • Data Science • Research Project in AI • Disertation Thesis • AI for Social/Economic Sciences • LLM Applications and Prompt Engineering • Ethics and academic integrity
C12. Design the information system				
	The graduate: a) information systems b) component integration c) architectures d) system requirements	**The graduate:** a) designs systems b) integrates components c) analyzes requirements d) optimizes solutions	**The graduate:** a) ensures system functionality b) evaluates performance c) manages risks d) makes technical decisions	• Agentic AI • Intro to Robotics • AI for Engineering • Internship • AI for Engineering • Internship • Disertation Thesis
C13. Write scientific papers, academic works, and technical documentation				
	The graduate: a) research methodology b) structure of academic work c) citation d) academic ethics	**The graduate:** a) writes papers b) performs critical analysis c) synthesizes information d) presents results	**The graduate:** a) respects academic ethics b) avoids plagiarism c) assumes responsibility d) contributes to research	• Scientific Research Methodology • Research Project in AI • Disertation Thesis • Scientific Seminar • Ethics and academic integrity

C14. Develop software prototypes				
	The graduate: a) development lifecycle b) prototyping c) development tools d) testing	**The graduate:** a) builds prototypes b) implements features c) tests applications d) iterates solutions	**The graduate:** a) meets requirements b) delivers functional solutions c) improves prototypes d) collaborates in teams	• Agentic AI • Prompt Engineering • Computer Vision using AI • Intro to Robotics • Research Project in AI • Internship • Disertation Thesis
C15. Define the software architecture				
	The graduate: a) software architectures b) design patterns c) distributed systems d) system integration	**The graduate:** a) designs architectures b) defines components c) selects technologies d) documents systems	**The graduate:** a) ensures scalability b) follows standards c) evaluates solutions d) assumes decisions	• Agentic AI • Intro to Robotics • Machine Learning • Research Project in AI • AI for Cybersecurity
C16. Use software libraries				
	The graduate: a) structure and functionality of libraries b) popular libraries c) dependency management	**The graduate:** a) integrates libraries b) uses predefined functions c) documents usage	**The graduate:** a) selects appropriate libraries b) respects licenses c) contributes to maintainability	• Machine Learning • Neural Networks • Computer Vision using AI • Prompt Engineering • Natural Language Processing & LLMs
CT1. Think analytically				
	The graduate: a) understands problem-solving paradigms in computer science, including those related to algorithms, data structures, and computational complexity b) is familiar with quantitative and qualitative methods for analyzing data, systems, and processes c) knows mathematical and computational models used in the evaluation and optimization of solutions.	**The graduate:** a) develops rational and coherent solutions based on reasoned analysis and critical evaluation of alternatives b) applies formal models and logical inference techniques in solving computer science problems and in decision-making c) analyzes the behavior and performance of computer systems d) uses tools and technologies to validate hypotheses and verify results.	**The graduate:** a) demonstrates initiative in selecting and applying appropriate analytical methods b) demonstrates responsibility regarding the impact of decisions based on data analysis or implemented models c) has the ability to rationally and convincingly justify technical and methodological choices within projects.	• Data Science • Machine Learning • Neural Networks • AI-driven Risk Analysis • Linear Programming and Convex Optimization • Research Project in AI • AI for Social/Economic Sciences • AI for Cybersecurity • AI for Engineering • Internship • Disertation Thesis • Natural Language Processing & LLMs • LLM Applications and Prompt Engineering • Scientific Seminar
CT2. Approach challenges positively				
	The graduate: a) has knowledge of problem-solving methods and decision-making in situations of uncertainty b) is familiar with the concepts of critical thinking and creative	**The graduate:** a) quickly identifies and analyzes the nature of a problem or challenge within an IT project or process b) remains focused and proactive in the face of obstacles, maintaining	**The graduate:** a) has the ability to manage emotions and reactions when facing challenges b) demonstrates an open and flexible attitude toward change, uncertainty, and	• Scientific Seminar • Communication • Scientific reserch methodology • Scientific Seminar • LLM Applications and Prompt Engineering • Volunteering

	thinking.	both individual and team motivation c) integrates negative feedback in a constructive manner.	difficulties c) shows receptiveness to continuous learning and self-improvement in the context of challenges.	
CT3. He is attentive to details				
	The graduate: a) has in-depth knowledge of quality standards in software development and automated/manual testing b) understands the importance of details in technical specifications, source code, protocols, data models, algorithms, and structures c) is familiar with validation/verification techniques, auditing, requirements analysis, and debugging.	**The graduate:** a) identifies errors, inconsistencies, or ambiguities in code, documentation, or processes b) applies rigorous methodologies in software verification and validation c) develops clear and comprehensive documentation, complying with formal and structural requirements d) develops applications or modules with a high level of accuracy.	**The graduate:** a) demonstrates initiative in identifying and correcting details that may lead to errors b) maintains a critical and reflective attitude toward their own work c) maintains a high level of quality throughout all phases of projects.	• Data Science • Machine Learning • Mathematics for Data Science • Neural Networks • AI-driven Risk Analysis • Linear Programming and Convex Optimization • Research Project in AI • AI for Social/Economic Sciences • AI for Cybersecurity • AI for Engineering • Natural Language Processing & LLMs • Advanced Databases • Computer Vision using AI • Advanced probability and bayesian statistics • Agentic AI • Intro to Robotics • Scientific reserch methodology • Scientific Seminar • LLM Applications and Prompt Engineering • Volunteering

4. FINAL OUTCOMES

Graduates of the Artificial Intelligence master's program (in English), according to the Romanian Occupational Classification (COR - ISCO-08), may be employed in the following positions:

- 2511 Systems analysts – code 251101 – Information systems designer
- 2512 Software designers – code 251201 – Analyst

5. FINAL STIPULATIONS

The study plans are considered approved, in accordance with Law 199/2023 on higher education, after their approval in the Senate meeting and after the handwritten signature of the Senate President is applied on each page of the document.

Aproved Curriculum valid for study cycle 2026–2028.

6. ANALYZIS OF THE CURRICULUM

For the curriculum of the Master's program in Artificial Intelligence (taught in English), the distribution of courses by category is as follows:

No.crt.	Subject Type	Hours	Study program
1	Fundamentals (DF)	322	34,8%
2	Specialty (DS)	560	60,6%
3	Complementary (DC)	42	4,6%
TOTAL		924	100%

- The total number of hours of this program is 924 divided as follows:
  - Compulsory requirements ..... **924 hours**
  - Internship (included in the 924) **112hours**
  - Internship to prepare the Disertation Thesis (included in the 924) **112hours**

  Total **924 hours**

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

Courses	Hours per curriculum	
	Hours	Ratio %
Compulsory courses (including practice)	840	90,9%
Elective courses	84	9,1%
TOTAL Ob+Op	924	100%

- The ratio between lectures and practical activities (seminars, laboratories, projects, internships) is 1:2.88 (238 hours of lectures and 686 hours of practical activities, including seminars, laboratories, projects, and internship practice), in compliance with ARACIS regulations.
- The Master's program in Artificial Intelligence (taught in English) falls within the field of Computer Science, alongside the programs provided in Government Decision (HG) 606/2026.
- The curriculum of the Master's program in Artificial Intelligence (taught in English) complies with the European Credit Transfer and Accumulation System (ECTS) and Law 199/2023 regarding the organization of Master's university studies, which stipulates a study duration of 2 years, a total of 120 credits, and 60 credits per academic year

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	112*	2	1	12
Year II	14	14	3	2	1	112**	2	1	-

* The 112 internship hours are mandatory and are carried out in the second semester of the second year.
** For the preparation of the dissertation thesis, distributed over the 14 weeks of the second semester.

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	10	6	14	0

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: October
- Preparing the Master Thesis: November – June
- Submitting and defending the Master Thesis: July
- The final exam consists of defending the Master Thesis (10 credits)

1. THE ECTS CREDITS ASSOCIATED WITH THE MASTER PROGRAM

Total 120 **credits**

- 110 credits for compulsory courses
- 10 credits for elective courses
- 2 credits for facultative courses

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„Aurel Vlaicu“ University of Arad
Faculty of Exact Sciences
Department: Mathematics and Computer Science
Field: Informatics
Study program: Artificial Intelligence

CURRICULUM
Academic year 2026-2027
Year I

Code	Subject	Course status	S.I./ Sem (hrs)	Hours per week and Evaluation type											
				1st Semester 14 weeks						2st Semester 14 weeks					
				C	S	L	Pr	Ev	C	C	S	L	Pr	C	K
COMPULSORY COURSES															
GmGF1O01	Stiinta datelor/ Data Science	DF	119	2	-	2	-	Ex	7	-	-	-	-	-	-
GmGF1O02	Matematică pentru Data Science/ Mathematics for Data Science	DF	133	1	2	-	-	Ex	7	-	-	-	-	-	-
GmGF1O03	Baze de date avansate/ Advanced Databases	DF	133	1	-	2	-	Ex	7	-	-	-	-	-	-
GmGS1O04	Viziune computerizata cu IA/ Computer Vision using AI	DS	133	1	-	2	-	Ex	7	-	-	-	-	-	-
GmGC1O05	Etică și integritate academică/ Ethics and academic integrity	DC	36	1	-	-	-	V	2						
GmGF2O06	Probabilități avansate si statistică baeziană/ Advanced probability and bayesian statistics	DF	133	-	-	-	-	-	-	1	2	-	-	Ex	7
GmGF2O07	Invatare automata/ Machine Learning	DF	119	-	-	-	-	-	-	2	-	2	-	Ex	7
GmGS2O08	Agenți autonomi/ Agentic AI	DS	133	-	-	-	-	-	-	1	-	2	-	Ex	7
GmGS2O09	Introducere in Robotica/ Intro to Robotics	DS	133	-	-	-	-	-	-	1	-	2	-	Ex	7
GmGC2O10	Comunicare/ Communication	DC	36	-	-	-	-	-	-	-	1	-	-	V	2
TOTAL				**6**	**2**	**6**	**-**	**-**	**30**	**5**	**3**	**6**	**-**	**-**	**30**

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

„Aurel Vlaicu“ University of Arad
Faculty of Exact Sciences
Department: Mathematics and Computer Science
Field: Informatics
Study program: Artificial Intelligence

CURRICULUM
Academic year 2027-2028
Year II

Code	Subject	Course status	S.I./ Sem (hrs)	Hours per week and Evaluation type											
				1st Semester 14 weeks						1st Semester 14 weeks					
				C	S	L	Pr	Ev	C	C	S	L	Pr	C	K
COMPULSORY COURSES															
GmGS3O01	Analiza de risc cu IA/ AI-driven Risk Analysis	DS	108	1	-	2	-	Ex	6	-	-	-	-	-	-
GmGF3O02	Retele neuronale/ Neural Networks	DF	108	1	-	2	-	Ex	6	-	-	-	-	-	-
GmGC3O03	Metodologia cercetarii stiintifice/ Scientific reserch methodology	DC	36	1	-	-	-	V	2	-	-	-	-	-	-
GmGF3O04	Procesarea limbajelor și LLMs/ Natural Language Processing & LLMs	DF	108	1	-	2	-	Ex	6						
GmGS4O05	Practică/ Internship	DS	88	-	-	-	-	-	-	112 hours - Internship				C	8
GmGS4O06	Seminarul științific/ Scientific seminar	DS	158	-	-	-	-	-	-	-	-	-	3	V	8
GmGS4O07	Proiect de cercetare în IA/ Research project in AI	DS	158	-	-	-	-	-	-	-	-	-	3	C	8
GmGS4O08	Elaborarea lucrării de disertație / Disertation Thesis	DS	38	-	-	-	-	-	-	-	-	-	8	C	6
	TOTAL			**4**	**-**	**6**	**-**	**-**	**20**	**-**	**-**	**-**	**14**	**-**	**30**
ELECTIVE COURSES															
	Pachet 1														
GmGS3A11	Aplicații LLM și Ingineria prompturilor/LLM Applications and Prompt Engineering	DS	83	1	-	2	-	Ex	5	-	-	-	-	-	-
GmGS3A12	Programare liniară și optimizare convexă/Linear programming and convex optimization	DS	83	1	-	2	-	Ex	5	-	-	-	-	-	-
	Pachet 2														
GmGS3A21	IA în științe sociale/economice AI for Social/economic sciences	DS	83	1	-	-	2	Ex	5	-	-	-	-	-	-
GmGS3A22	IA pentru securitate cibernetica AI for Cybersecurity	DS	83	1	-	-	2	Ex	5	-	-	-	-	-	-
GmGS3A23	IA pentru inginerie AI for Engineering	DS	83	1	-	-	2	Ex	5	-	-	-	-	-	-
	TOTAL			**2**	**-**	**2**	**2**	**-**	**10**	**-**	**-**	**-**	**-**	**-**	**-**
TOTAL				**6**	**-**	**8**	**2**	**-**	**30**	**-**	**-**	**-**	**14**	**-**	**30**
FACULTATIVE COURSES															
GmGC4F09	Voluntariat/ Volunteering	DC	22	-	-	-	-	-	-	-	-	2	-	V	2

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

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DF - Fundamentals course; DS – Specialty course; DC – Complementary course