ANEXA 1

CURRICULUM
Valid for the study cycle 2025-2027
"Aurel Vlaicu" University of Arad

Faculty of Exact Sciences
Department: **Mathematics and Computer Science**
Name of program: **Mathematical modeling in science and technology**
Field of studies: **Mathematics**
Type of program:**Professional**
Length of program / number of ECTS credits:**2 years /120 credits**
Type of education: **Full – Time study**
Graduate title earned : **Master in mathematics**

1. MISSION STATEMENT

The teaching and research mission of the master study programme in question fits the profile and speciality of the Faculty of Exact Sciences and aims the enhancement of the research capacity within the field of „Mathematics" and the improvement of the educational process and last but not least the opening of european opportunities through its international dimension.

2. OBJECTIVES

- Developing the analysis and synthesis capacity;
- Forming professionals in the field of mathematics that are recognized as such in the labour market;
- Perfecting communication skills (in English) specific for the activity domain as a mean to access more attractive jobs;
- Preparing for career opportunities in domains that do not necessarily have mathematatics as the primary development goal.

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

Professional competences
C1.Performs analytical mathematical calculations
C2. Synthesizes information
C3. Thinks abstractly
C4. Communicates mathematical information
C5. Studies relationships between quantities
C6. Uses data processing techniques
C7. Applies statistical analysis techniques
C8. Performs data analysis
C9. Identify statistical models
C10. Apply scientific methods
C11. Conducts scientific research
C12. Apply the principles of ethics and scientific integrity in research activities

Transversal competences
CT1. Think analytically
CT2. Approach challenges positively
CT3. He is attentive to details
CT4. It works efficiently
CT5. Work in teams

No. crt.	LEARNING OUTCOMES			Subjects Contributing to the Achievement of Learning Outcomes
	Knowledge	**Skills**	**Responsibility and Autonomy**	
C1.Performs analytical mathematical calculations				
	The graduate: a) knows advanced concepts in mathematical analysis, algebra, analytic geometry, differential equations, etc.	The graduate: a) performs complex analytical mathematical calculations accurately, applying rules and	The graduate: a) has the ability to perform complex calculations b) verifies and validates results obtained through	Special Chapters of algebra Special chapters of mathematical analysis Special chapters of geometry Shape optimization

	b) understands theories, formulas, and analytical calculation techniques: differentiation, integration, limits, series, transformations c) is familiar with methods for solving equations and problems with initial or boundary conditions analytically and numerically	theorems rigorously b) uses various computational technologies to carry out analytical mathematical calculations and determine solutions to domain-specific problems c) solves equations and logical-mathematical problems	critical analysis c) takes responsibility for choosing the correct calculation methods d) applies efficient work techniques in multidisciplinary teams	Data science Mathematical optimization Statistic Data Analysis and Processing
C2. Synthesizes information				
	The graduate: a) conducts research on 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) classifies available information according to context c) selects necessary information for solving a specific problem d) uses digital tools to support information synthesis	The Graduate: a) coherently uses available information b) demonstrates professionalism in managing available information c) can work autonomously or in multidisciplinary teams	Hilbert space operators Data science Convex Analysis Fuzzy logic and quantum logic Research project in mathematical logic Theory of Dilatation and Operatorial Models Stochastic Systems and Prediction Fuzzy Functional Analysis Shape optimization Special Chapters of Stability Theory Mathematical models in economics Neural models for artificial intelligence Mathematical optimization Methodology of Scientific Research Research project in mathematical modeling Simulation and modeling techniques Ethics and professional deontology Simulation research project Elaboration of the dissertation thesis Dynamic Systems and Optimal Control Statistic Data Analysis and Processing Modelling and optimizing decisions
C3. Thinks abstractly				
	The graduate: a) understands the fundamental concepts underlying abstract thinking: axioms, theorems, proofs, structures, functions, relations, and abstract data types b) knows the principles of mathematical and formal logic, as well as methods of proof c) formulates observations and differentiates notions, properties, and assertions	The Graduate: a) provides examples of how to use basic theoretical concepts and results to solve exercises and problems related to topics covered in the curriculum. b) represents and formulates concepts and problems in abstract, symbolic, or formal terms c) creates abstract representations for computer science	The Graduate: a) demonstrates intellectual autonomy in exploring and manipulating abstract concepts b) finds solutions to practical, operational, or conceptual problems across a wide range of contexts c) generates argumentative procedures to support solutions	Special Chapters of algebra Hilbert space operators Special chapters of mathematical analysis Shape optimization Data science Convex Analysis Fuzzy logic and quantum logic Special Chapters of Stability Theory Mathematical models in economics Neural models for artificial intelligence Theory of Dilatation and

	from fundamental mathematical disciplines through examples and counterexamples	structures such as: trees, graphs, recursive functions, and object classes.		Operatorial Models Mathematical optimization Stochastic Systems and Prediction Fuzzy Functional Analysis Methodology of Scientific Research Research project in mathematical modeling Simulation and modeling techniques Ethics and professional deontology Elaboration of the dissertation thesis Dynamic Systems and Optimal Control Statistic Data Analysis and Processing Special chapters of geometry Modelling and optimizing decisions
C4. Communicates mathematical information				
	The graduate: a) knows advanced mathematical terminology in both Romanian and English b) understands conventions for notation, symbolism, and the formal presentation of mathematical content c) translates practical problems into mathematical language d) is capable of expressing mathematical problems or theorems with practical implications in everyday language	The graduate: a) drafts rigorous proofs, logical arguments, and detailed explanations using specific language b) solves a problem in the field by employing appropriate symbols, language, and mathematical tools c) interprets and explains graphs, tables, mathematical models, and numerical or symbolic results	The graduate: a) communicates and interprets the solution to a problem b) compares alternative solutions using specific mathematical language c) presents ideas and processes using suitable symbols, language, and mathematical tools d) demonstrates rigor and intellectual discipline in drafting and presenting their mathematical results	Special Chapters of algebra Hilbert space operators Special chapters of mathematical analysis Shape optimization Data science Convex Analysis Fuzzy logic and quantum logic Research project in mathematical logic Special Chapters of Stability Theory Mathematical models in economics Neural models for artificial intelligence Theory of Dilatation and Operatorial Models Mathematical optimization Stochastic Systems and Prediction Fuzzy Functional Analysis Methodology of Scientific Research Research project in mathematical modeling Simulation and modeling techniques Ethics and professional deontology Simulation research project Elaboration of the dissertation thesis Dynamic Systems and Optimal Control Statistic Data Analysis and Processing Special chapters of geometry Modelling and optimizing decisions
C5. Studies relationships between quantities				

	The Graduate: a) Has the ability to analyze and interpret complex relationships between quantities in interdisciplinary contexts. b) Possesses knowledge of advanced methodologies for modeling and verifying relationships between quantities. c) Can develop and evaluate hypotheses based on relationships between quantities in scientific research. d) Has the capacity to communicate and argue relationships between quantities in a clear and academic manner.	The Graduate: a) Can examine and interpret relationships between variables in advanced mathematical, economic, scientific, or social problems. b) Can use statistical, mathematical, or computational techniques to construct and validate models involving relationships between variables. c) Can formulate and test hypotheses related to quantitative relationships within research projects. d) Can draft reports, presentations, or scientific publications that highlight and interpret relationships between variables.	The Graduate: a) Assumes responsibility for the validity and accuracy of data interpretation and identified relationships. b) Takes the liberty to choose relevant techniques and tools specific to the problem, assuming responsibility for the results obtained. c) Manages the research process autonomously, ensuring scientific rigor and academic integrity. d) Assumes responsibility for clearly and argumentatively presenting and explaining conclusions, asserting independence in drafting and supporting scientific works.	Hilbert space operators Shape optimization Data science Convex Analysis Fuzzy logic and quantum logic Mathematical models in economics Neural models for artificial intelligence Theory of Dilatation and Operatorial Models Mathematical optimization Stochastic Systems and Prediction Fuzzy Functional Analysis Research project in mathematical modeling Simulation and modeling techniques Dynamic Systems and Optimal Control Statistic Data Analysis and Processing Modelling and optimizing decisions
C6. Uses data processing techniques				
	The Graduate: a) Knows methods and techniques for data collection, processing, and analysis. b) Identifies appropriate basic concepts for organizing data in databases. c) Explains the choice of basic models for organizing and managing data in databases.	The Graduate: a) Collects, processes, and analyzes relevant data and information. b) Stores and updates data appropriately. c) Applies statistical methods for description, estimation, and hypothesis testing. d) Creates relevant graphical visualizations to support data interpretation.	The Graduate: a) Interprets and communicates data processing results responsibly. b) Shows interest in comparatively analyzing results obtained from solving problems with pre-existing data. c) Can work individually or in teams on projects involving the manipulation and analysis of real or simulated data.	Shape optimization Data science Special Chapters of Stability Theory Mathematical models in economics Mathematical optimization Stochastic Systems and Prediction Research project in mathematical modeling Simulation and modeling techniques Dynamic Systems and Optimal Control Statistic Data Analysis and Processing Modelling and optimizing decisions
C7. Applies statistical analysis techniques				
	The Graduate: a) Demonstrates advanced knowledge of fundamental concepts and modern methods of statistical analysis, including descriptive and inferential statistics, regression, analysis of variance, and multivariate models. b) Understands the theoretical principles underlying statistical methods, including their assumptions, limitations, and conditions of applicability. c) Integrates statistical knowledge with the	The Graduate: a) Selects and applies appropriate statistical methods based on the nature of the data and research objectives. b) Utilizes specialized computational tools to perform complex statistical analyses. c) Critically interprets statistical results, formulating relevant conclusions supported by data. d) Visualizes and communicates results effectively, adapting their	The Graduate: a) Plans and autonomously conducts statistical analysis processes, taking responsibility for the correctness and relevance of the results. b) Critically evaluates data quality and the validity of methods used, adhering to scientific and ethical standards. c) Makes independent decisions regarding the selection of statistical techniques and the interpretation of results in complex contexts.	Data science Mathematical models in economics Mathematical optimization Stochastic Systems and Prediction Dynamic Systems and Optimal Control Statistic Data Analysis and Processing Modelling and optimizing decisions

	fundamentals of scientific research and data analysis in interdisciplinary and applied contexts.	presentation to the target audience.		
C8. Performs data analysis				
	The Graduate: a) Demonstrates advanced knowledge of the data lifecycle, from collection and cleaning to interpretation and reporting. b) Understands quantitative and qualitative data analysis methods, including exploratory analysis, predictive modeling, and inferential statistical analysis. c) Knows the structure and characteristics of different data types and their impact on the choice of analytical methods.	The Graduate: a) Applies appropriate data analysis methods based on research or project objectives. b) Utilizes digital tools and programming languages to process, analyze, and visualize data. c)Interprets and synthesizes analysis results, formulating relevant conclusions supported by data. d) Develops clear and coherent analytical reports, tailored to the target audience and the purpose of the analysis.	The Graduate: a) Plans and autonomously manages data analysis processes, from defining analytical questions to communicating results. b) Critically evaluates data quality and the validity of methods used, taking responsibility for the rigor and ethics of the analytical process. c) Makes independent decisions regarding the selection of techniques and the interpretation of results in complex and interdisciplinary contexts. d) Contributes to the development of a data-driven organizational culture, promoting the responsible and efficient use of extracted information.	Data science Mathematical models in economics Mathematical optimization Stochastic Systems and Prediction Dynamic Systems and Optimal Control Statistic Data Analysis and Processing Modelling and optimizing decisions
C9. Identify statistical models				
	The graduate: a) Demonstrates advanced knowledge of various types of statistical models, including linear, nonlinear, probabilistic, Bayesian models, as well as models for longitudinal or hierarchical data. b) Understands the theoretical foundations of building and validating statistical models, along with the assumptions and limitations associated with each type of model. c) Is familiar with model selection criteria (e.g., AIC, BIC, adjusted R^2, cross-validation) and their impact on the interpretation of results.	The graduate: a) Analyzes complex datasets to identify relevant statistical models based on the nature of the variables and the research objectives. b) Applies estimation and validation techniques for models using specialized software tools. c) Interprets the parameters and performance of statistical models, formulating rigorous, data-supported conclusions. d) Compares and selects alternative models, justifying the choice based on statistical criteria and the applied context.	The graduate: a) Plans and independently leads the process of identifying and validating statistical models in research projects or applied analyses. b) Critically evaluates the appropriateness of the models used, taking responsibility for the accuracy and relevance of the results. c) Makes independent decisions regarding model selection, adapting them to the specifics of the data and analytical objectives. d) Promotes the responsible use of statistical modeling, adhering to ethical principles and best practices in research and analysis.	Data science Mathematical models in economics Mathematical optimization Stochastic Systems and Prediction Research project in mathematical modeling Simulation and modeling techniques Dynamic Systems and Optimal Control Statistic Data Analysis and Processing Modelling and optimizing decisions
C10. Apply scientific methods				
	The graduate: a) Approaches scientific texts on a given topic constructively. b) Selects and organizes the necessary information for conducting research.	The graduate: a) Applies scientific methods and techniques to investigate current phenomena or practical issues. b) Revises and integrates	The graduate: a) Writes, edits, and presents scientific texts. b) Takes responsibility for the accuracy, coherence, and clarity of the information presented.	Special Chapters of algebra Hilbert space operators Special chapters of mathematical analysis Shape optimization Data science Convex Analysis

	c) Compares and distinguishes related concepts and their properties within advanced mathematical disciplines. d) Understands the stages of the scientific methodology: formulating a hypothesis, modeling the problem, selecting the method, experimenting, analyzing results, and validating or rejecting the hypothesis.	prior knowledge into contemporary studies. c) Utilizes digital technology in their research endeavors. d) Recognizes and analyzes the necessary and/or sufficient conditions in mathematical statements and specifies their role in proofs.	c) Analyzes and interprets research results responsibly. d) Adapts techniques and strategies used for solving routine problems to tackle synthesis problems and those with a higher degree of complexity.	Fuzzy logic and quantum logic Special Chapters of Stability Theory Mathematical models in economics Neural models for artificial intelligence Theory of Dilatation and Operatorial Models Mathematical optimization Stochastic Systems and Prediction Fuzzy Functional Analysis Methodology of Scientific Research Research project in mathematical modeling Simulation and modeling techniques Simulation research project Elaboration of the dissertation thesis Dynamic Systems and Optimal Control Statistic Data Analysis and Processing Special chapters of geometry Modelling and optimizing decisions
C11. Conducts scientific research				
	The graduate: a) Demonstrates advanced knowledge of the Methodology of Scientific Research, including hypothesis formulation, experimental design, and qualitative and quantitative methods. b) Understands the ethical and deontological principles of research, as well as applicable national and international regulations. c) Is familiar with modern techniques for data collection and analysis, as well as methods for validating and interpreting results in interdisciplinary contexts.	The graduate: a) Formulates relevant research questions and testable hypotheses, aligned with the literature and the needs of the field. b) Designs and conducts scientific studies, applying rigorous methods for data collection, analysis, and interpretation. c) Writes scientific papers and research reports, using appropriate academic language and adhering to citation and structuring standards. d) Utilizes digital and statistical tools to support the research process.	The graduate: a) Plans and independently carries out research activities, from defining objectives to disseminating results. b) Critically evaluates information sources, methods, and research conclusions, taking responsibility for the scientific rigor of the approach. c) Adheres to principles of ethics and scientific integrity, avoiding plagiarism, data manipulation, and other unethical practices. d) Actively contributes to the advancement of knowledge in their field of specialization through participation in conferences, publication of articles, and involvement in collaborative research projects.	Methodology of Scientific Research Research project in mathematical logic Research project in mathematical modeling Simulation and modeling techniques Ethics and professional deontology Simulation research project Elaboration of the dissertation thesis
C12. Apply the principles of ethics and scientific integrity in research activities				
	The graduate: a) Demonstrates in-depth knowledge of research ethics principles, including informed consent,	The graduate: a) Consistently applies ethical and integrity principles at all stages of research: design, data	The graduate: a) Takes responsibility for adhering to ethical and integrity standards in individual or collaborative	Research project in mathematical logic Methodology of Scientific Research Research project in

	confidentiality, participants' rights, and the responsible use of data. b) Is familiar with scientific integrity standards, such as avoiding plagiarism, data falsification, and fabrication, as well as adhering to academic publishing standards. c) Understands the legal and institutional framework regulating research activities at both national and international levels.	collection, analysis, interpretation, and dissemination. b) Identifies and manages ethical dilemmas that may arise in research activities, proposing solutions in accordance with professional standards. c) Prepares necessary ethical documentation (e.g., ethics approval requests, consent forms), complying with institutional and deontological requirements. d) Uses sources and data responsibly, respecting copyright and academic citation norms.	projects. b) Acts as a role model for ethical best practices, contributing to the prevention and correction of unethical behavior in research. c) Makes autonomous decisions in complex ethical situations, demonstrating discernment and professional responsibility. d) Promotes a culture of ethics and scientific integrity within academic and professional environments through training, mentoring, and institutional engagement.	mathematical modeling Simulation and modeling techniques Ethics and professional deontology Simulation research project Elaboration of the dissertation thesis
CT1. Think analytically				
	The graduate: a) Demonstrates advanced knowledge of the concepts and models of analytical thinking, including logical reasoning, causal analysis, critical evaluation of information, and evidence-based decision-making. b) Understands methods for structuring complex problems, such as SWOT analysis, decision analysis, logical modeling, and systemic approaches. c) Is familiar with techniques for assessing the validity and coherence of arguments in academic and professional contexts.	The graduate: a) Analyzes complex problems by breaking them down into essential components, identifying causal relationships and relevant factors. b) Critically evaluates information and arguments, identifying reasoning errors, cognitive biases, and sources of uncertainty. c) Formulates rational and well-argued solutions based on data, facts, and logical principles. d) Applies analytical methods in decision-making, within interdisciplinary contexts and under conditions of uncertainty.	The graduate: a) Takes responsibility for the quality of the analytical process, demonstrating rigor, objectivity, and coherence in reasoning. b) Makes autonomous decisions in complex situations, relying on critical evaluation of alternatives and consequences. c) Promotes analytical thinking within teams and organizations, contributing to the development of a culture of reflection and informed decision-making. d) Demonstrates initiative in applying analytical thinking to solve real-world problems in academic, professional, or social contexts.	Special Chapters of algebra Hilbert space operators Special chapters of mathematical analysis Shape optimization Data science Convex Analysis Fuzzy logic and quantum logic Research project in mathematical logic Special Chapters of Stability Theory Mathematical models in economics Neural models for artificial intelligence Theory of Dilatation and Operatorial Models Mathematical optimization Stochastic Systems and Prediction Fuzzy Functional Analysis Methodology of Scientific Research Research project in mathematical modeling Simulation and modeling techniques Ethics and professional deontology Simulation research project Elaboration of the dissertation thesis Dynamic Systems and Optimal Control Statistic Data Analysis and Processing Special chapters of geometry Modelling and optimizing decisions
CT2. Approach challenges positively				
	The graduate: a) Is knowledgeable about	The graduate: a) Identifies and analyzes	The graduate: a) Takes responsibility for	Special Chapters of algebra Hilbert space operators

	concepts and theories related to resilience, emotional intelligence, and positive thinking, applicable in professional and personal contexts. b) Understands the psychological and social mechanisms of stress and uncertainty responses, as well as effective adaptation strategies. c) Is familiar with models of positive leadership and change management relevant for constructively addressing challenges within teams and organizations.	challenges objectively, maintaining a balanced and solution-oriented attitude. b) Applies emotional self-regulation and effective communication strategies to manage conflicts and pressures constructively. c) Transforms obstacles into opportunities for learning and growth, demonstrating cognitive flexibility and openness to change. d) Encourages a positive attitude within the team, contributing to maintaining a collaborative and motivating work environment.	their own reactions to challenges, demonstrating emotional maturity and professionalism. b) Makes autonomous decisions in difficult situations, maintaining a constructive and progress-oriented perspective. c) Acts as a role model for positive behavior, positively influencing team dynamics and organizational culture. d) Promotes resilience and positive thinking in complex contexts, contributing to the sustainable development of professional and academic environments.	Special chapters of mathematical analysis Shape optimization Data science Convex Analysis Fuzzy logic and quantum logic Research project in mathematical logic Special Chapters of Stability Theory Mathematical models in economics Neural models for artificial intelligence Theory of Dilatation and Operatorial Models Mathematical optimization Stochastic Systems and Prediction Fuzzy Functional Analysis Research project in mathematical modeling Simulation and modeling techniques Ethics and professional deontology Simulation research project Elaboration of the dissertation thesis Dynamic Systems and Optimal Control Statistic Data Analysis and Processing Special chapters of geometry Modelling and optimizing decisions Specialized practice Volunteering
CT3. He is attentive to details				
	The graduate: a) Understands the importance of accuracy and precision in academic and professional activities, especially in writing, analysis, research, and decision-making. b) Recognizes the impact of minor errors on final outcomes in contexts such as data analysis, scientific writing, project management, or professional communication. c) Is familiar with methods and techniques for quality verification and control, applicable across various fields.	The graduate: a) Identifies inconsistencies, errors, or omissions in documents, data, or processes, demonstrating a rigorous and systematic approach. b) Applies review and verification techniques to ensure the correctness and coherence of information. c) Adheres to formatting, structuring, and presentation standards when drafting texts, reports, or scientific papers. d) Monitors details in complex activities without losing sight of the overall project objectives.	The graduate: a) Takes responsibility for the accuracy of their work, demonstrating rigor and professionalism in delivering results. b) Works independently with a high level of attention to detail, even under pressure or tight deadlines. c) Contributes to maintaining quality standards within the team by providing constructive feedback and supporting quality control processes. d) Demonstrates consistency and discipline in verification and validation activities, helping to reduce risks and increase efficiency.	Special Chapters of algebra Hilbert space operators Special chapters of mathematical analysis Shape optimization Data science Convex Analysis Fuzzy logic and quantum logic Research project in mathematical logic Special Chapters of Stability Theory Mathematical models in economics Neural models for artificial intelligence Theory of Dilatation and Operatorial Models Mathematical optimization Stochastic Systems and Prediction Fuzzy Functional Analysis Methodology of Scientific Research Research project in

				mathematical modeling Simulation and modeling techniques Ethics and professional deontology Simulation research project Elaboration of the dissertation thesis Dynamic Systems and Optimal Control Statistic Data Analysis and Processing Special chapters of geometry Modelling and optimizing decisions
CT4. It works efficiently				
	The graduate: a) Knows principles and methods for efficient work organization, including planning, task prioritization, and time management. b) Understands concepts of personal productivity and professional performance in both individual and team contexts. c) Is familiar with digital tools and modern activity management techniques useful for optimizing work processes.	The graduate: a) Plans and structures activities efficiently, setting clear objectives, realistic deadlines, and appropriate resources. b) Manages time and workload, adapting to priorities and deadlines without compromising quality. c) Uses agile or traditional tools and methods to increase efficiency in individual or collaborative projects. d) Monitors progress and optimizes workflows by identifying and eliminating bottlenecks or resource waste.	The graduate: a) Takes responsibility for achieving established goals, demonstrating consistency and results-orientation. b) Works autonomously and efficiently in complex contexts, maintaining a balance between quality, time, and resources. c) Contributes to improving team efficiency by proposing solutions and best organizational practices. d) Shows initiative in the continuous improvement of work methods, adapting to changes and learning from experience.	Capitole speciale de algebra Hilbert space operators Special chapters of mathematical analysis Shape optimization Data science Convex Analysis Fuzzy logic and quantum logic Research project in mathematical logic Mathematical models in economics Neural models for artificial intelligence Theory of Dilatation and Operatorial Models Mathematical optimization Stochastic Systems and Prediction Fuzzy Functional Analysis Methodology of Scientific Research Research project in mathematical modeling Simulation and modeling techniques Simulation research project Dynamic Systems and Optimal Control Statistic Data Analysis and Processing Special chapters of geometry Modelling and optimizing decisions Specialized practice
CT5. Work in teams				
	a) The graduate: a) Understands the principles of effective collaboration, including group dynamics, team roles, interpersonal communication, and conflict resolution. b) Comprehends collaborative work models such as multidisciplinary, self-organized, and virtual teams.	The graduate: a) Collaborates effectively with team members, actively contributing to the achievement of common goals while respecting diverse opinions and perspectives. b) Communicates clearly and constructively, adapting communication style to the team context	The graduate: a) Takes responsibility for their own role within the team, respecting deadlines and commitments. b) Demonstrates autonomy in fulfilling individual tasks, efficiently integrating them into collective activities. c) Contributes to evaluating and improving team	Shape optimization Data science Mathematical models in economics Mathematical optimization Stochastic Systems and Prediction Methodology of Scientific Research Research project in mathematical modeling Statistic Data Analysis and

	c) Is familiar with facilitation and team coordination techniques applicable in academic and professional contexts.	and the needs of other members. c) Participates in team decision-making, supporting well-founded arguments and accepting consensus. d) Contributes to conflict management and maintaining a positive work environment through empathy, active listening, and a cooperative attitude.	performance by providing constructive feedback and proposing solutions. d) Promotes collaboration and mutual learning, acting as a facilitator of a team culture based on trust and respect.	Processing Modelling and optimizing decisions Specialized practice Volunteering

4. ACADEMIC CAREER DEVELOPMENT

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

2120 – cod 212002 – expert mathematician
2120 – cod 212013 – statistical inspector

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.

Aproved Curriculum valid for study cycle 2025-2027.

6. ANALYZIS OF THE CURRICULUM

- For the curriculum of the Master of Science (MSc) program in "**Mathematical modeling in science and technology**", 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	proficiency course (DA)	266	29,7%
2	synthesis course (DT)	350	39,1%
3	advanced course (DU)	280	31,2%
TOTAL		896	100%

- The total number of hours of this program is 896 divided as follows:
  - Compulsory requirements ..... **784 hours**
  - Internship..... **112hours**
  - Internship to prepare the Master Thesis (included in the 784)..... **70hours**

  Total **896 hours**

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

Courses	Hours per curriculum	
	Hours	Ratio %
Compulsory courses (including practice)	742	82,8%
Elective courses	154	17,2%
TOTAL Ob+Op	896	100%

- The ratio between practice (seminars, laboratories, projects, internship) and lecturer is 1,66 complying with the ARACIS regulations.
- The Master of Science (MSc) program in "**Mathematical modeling in science and technology**" complies with the national qualifications provided by the Government Decree HG 412/2025.
- The courses included in the Curriculum and the subjects studied are perfectly aligned with the Bachelor program (BSc) in Mathematics (HG 412/2025)
- The curriculum of the Master of Science (MSc) program in "**Mathematical modeling in science and technology**"complies with the European Credit Transfer and Accumulation System (ECTS) and with the Romanian Law 288/2004 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	112*	2	1	12
Year II	14	14	3	2	1	70**	2	1	-

*The 112 hours of practical training are mandatory and take place in the first year.
** Distributed along the 14 weeks of Sem.II

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	11	3	11	3
II	9	5	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)

11. THE ECTS CREDITS ASSOCIATED WITH THE MASTER PROGRAM

Total 120 **credits**

- 98 credits for compulsory courses
- 22 credits for elective courses
- 2 credits for facultative courses

RECTOR
Associate Professor, PhD Teodor-Florin CILAN

DEAN
Professor, PHD Sorin-Florin NĂDĂBAN

HEAD OF DEPARTMENT
Associate Professor, PhD Lorena Camelia POPA

„Aurel Vlaicu“ University of Arad
Faculty of Exact Sciences
Department: Mathematics and Computer Science
Field:Mathematics
Study program: Mathematical modeling in science and technology

CURRICULUM

Academic year 2024-2025
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															
GmEA1O01	Capitole speciale de algebră / Special Chapters of algebra	DA	122	1	1	-	-	Ex	6	-	-	-	-	-	-
GmEA1O02	Operatori pe spații Hilbert / Hilbert space operators	DA	108	2	1	-	-	Ex	6	-	-	-	-	-	-
GmEU1O03	Capitole speciale de analiză matematică / Special chapters of mathematical analysis	DA	122	1	1	-	-	Ex	6	-	-	-	-	-	-
GmEU1O04	Optimizarea formelor / Shape optimization	DU	108	2	-	1	-	Ex	6	-	-	-	-	-	-
GmEU1O05	Etică și deontologie profesională / Ethics and professional deontology	DT	36	1	-	-	-	C	2						
GmET2O06	Practică de specialitate / Specialized practice	DT	112 ore											C	3
GmEA2O07	Data science/ Data science	DA	108	-	-	-	-	-	-	1	-	2	-	Ex	6
GmEA2O08	Analiză convexă/ Convex Analysis	DA	108	-	-	-	-	-	-	2	1	-	-	Ex	6
GmEA2O09	Logică fuzzy și logică cuantică / Fuzzy logic and quantum logic	DA	108	-	-	-	-	-	-	2	-	1	-	Ex	6
GmET2O10	Proiect de cercetare în logică matematică / Research project in mathematical logic	DT	47	-	-	-	-	-	-	-	-	-	2	C	3
	TOTAL			**7**	**3**	**1**	**-**	**-**	**24**	**5**	**1**	**3**	**2**	**-**	**24**
ELECTIVE COURSES															
	Pachet 1														
GmET1A11	Capitole speciale de teoria stabilităţii / Special Chapters of Stability Theory	DT	108	1	2	-	-	Ex	6	-	-	-	-	-	-
GmET1A12	Modele matematice în economie / Mathematical models in economics	DT	108	1	2	-	-	Ex	6	-	-	-	-	-	-
	Pachet 2														
GmEU2A21	Modele neuronale pentru inteligența artificială / Neural models for artificial intelligence	DU	108	-	-	-	-	-	-	1	2	-	-	Ex	6
GmEU2A22	Teoria dilatării și modele operatoriale / Theory of Dilatation and Operatorial Models	DU	108	-	-	-	-	-	-	1	2	-	-	Ex	6
	TOTAL			**1**	**2**	**-**	**-**	**-**	**6**	**1**	**2**	**-**	**-**	**-**	**6**
TOTAL				**8**	**5**	**1**	**-**	**-**	**30**	**6**	**3**	**3**	**2**	**-**	**30**

RECTOR
Associate Professor, PhD Teodor-Florin CILAN

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Professor, PHD Sorin-Florin NĂDĂBAN

HEAD OF DEPARTMENT
Associate Professor, PhD Lorena Camelia POPA

Legend: C – Lecture; S – Seminar; L – Laboratory; P – Project; SI – Individual Study; Ev – Evaluation; K – Credits;
DA– proficiency course; DT – synthesis course; DU – advanced course

„Aurel Vlaicu“ University of Arad
Faculty of Exact Sciences
Department: Mathematics and Computer Science
Field: Mathematics
Study program: Mathematical modeling in science and technology

CURRICULUM
Academic year 2025 - 2026
Year II

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															
GmEA3O01	Optimizare matematică/ Mathematical optimization	DA	108	2	1	-	-	Ex	6	-	-	-	-	-	-
GmEU3O02	Sisteme stochastice şi predicţie / Stochastic Systems and Prediction	DU	122	1	1	-	-	Ex	6	-	-	-	-	-	-
GmET3O03	Metodologia cercetării ştiinţifice / Methodology of Scientific Research	DT	72	1	1	-	-	C	4	-	-	-	-	-	-
GmET3O04	Proiect de cercetare în modelare matematică / Research project in mathematical modeling	DT	72	-	-	-	2	C	4	-	-	-	-	-	-
GmEU3O05	Analiză funcţională fuzzy / Fuzzy Functional Analysis	DU	158	-	-	-	-	-	-	2	-	1	-	Ex	8
GmEU4O06	Tehnici de simulare şi modelare / Simulation and modeling techniques	DU	144	-	-	-	-	-	-	2	-	2	-	Ex	8
GmET4O07	Proiect de cercetare în simulare / Simulation research project	DT	122	-	-	-	-	-	-	-	-	-	2	C	7
GmET4O08	Elaborarea lucrării de disertaţie/ Elaboration of the dissertation thesis	DT	50	-	-	-	-	-	-	-	-	-	5	C	7
	TOTAL			**4**	**3**	**-**	**2**	**-**	**20**	**4**	**-**	**3**	**7**	**-**	**30**
ELECTIVE COURSES															
	Pachet 1														
GmEU3A31	Sisteme dinamice şi control optimal / Dynamic Systems and Optimal Control	DU	97	1	1	-	-	Ex	5	-	-	-	-	-	-
GmEU3A32	Analiza şi prelucrarea datelor statistice / Statistic Data Analysis and Processing	DU	97	1	1	-	-	Ex	5	-	-	-	-	-	-
	Pachet 2														
GmEU4A41	Capitole speciale de geometrie / Special chapters of geometry	DU	83	1	-	2	-	Ex	5	-	-	-	-	-	-
GmEU4A42	Modelarea şi optimizarea deciziilor / Modelling and optimizing decisions	DU	83	1	-	2	-	Ex	5	-	-	-	-	-	-
	TOTAL			**2**	**1**	**2**	**-**	**-**	**10**	**-**	**-**	**-**	**-**	**-**	**-**
TOTAL				**6**	**4**	**2**	**2**	**-**	**30**	**4**	**-**	**3**	**7**	**-**	**30**
FACULTATIVE COURSES															
GmET4F09	Voluntariat / Volunteering	DT	22	-	-	-	-	-	-	-	-	2	-	C	2

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

RECTOR
Associate Professor, PhD Teodor-Florin CILAN

DEAN
Professor, PHD Sorin-Florin NĂDĂBAN

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