

SYLLABUS
Academic year 2025-2026

Dean,
Prof. dr. eng. Vasile-Ion Manta

1. Program data

1.1 Higher education institution	“Gheorghe Asachi” Technical University of Iași
1.2 Faculty	Automatic Control and Computer Engineering
1.3 Department	Computers
1.4 Field of studies	Computers and Information Technology
1.5 The cycle of studies ¹	Master
1.6 Study program	Artificial Intelligence

2. Subject data

2.1 Name of the subject / Code	Edge Computing Applications (<i>Aplicații Edge Computing</i>) / AI.208						
2.2 Course coordinator	-						
2.3 Application instructor	Lect. dr. eng. Stefan-Daniel Achirei / Assist. drd. eng. Daniel Vecliuc						
2.4 Year of study ²	2	2.5 Semester ³	1	2.6 Type of assessment ⁴	colloquium	2.7 Type of subject ⁵	DID

3. Estimated total time of daily activities (hours per semester)

3.1 Number of hours per week		3.2 lectures		3.3a sem.		3.3b laboratory		3.3c project	2
3.4 Total hours in curriculum ⁶		3.5 lectures		3.6a sem.		3.6b laboratory		3.6c project	28
Distribution of the time fund ⁷									No. hours
Study by textbook, course support, bibliography and notes									30
Additional documentation in the library, on specialist electronic platforms and in the field									20
Preparation of seminars/labs/projects, assignments, reports and portfolios									20
Tutorial ⁸									-
Examinations ⁹									2
Other activities:									-
3.7 Total hours of individual study ¹⁰	72								
3.8 Total hours per semester ¹¹	100								
3.9 Number of credits	4								

4. Prerequisites (where applicable)

4.1 curriculum ¹²	
4.2 competences	

5. Conditions (where applicable)

5.2 conducting the project ¹³	<ul style="list-style-type: none"> Laboratory room with computers and Internet access The Visual Studio (academic license) and PyCharm programming environments; jupyter notebooks
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6. Specific competences accumulated¹⁴

¹ Bachelor / Master

² 1-4 for Bachelor's, 1-2 for Master's

³ 1-8 for Bachelors, 1-3 for Masters

⁴ Exam, colloquium or VP A/R – from the curriculum

⁵ DF - fundamental subject, DID - subject in the field, DS - specialized subject or DC - complementary subject - from the education plan

⁶ It is equal to 14 weeksx number of hours from point 3.1 (similar for 3.5, 3.6abc)

⁷ The lines below refer to the individual study; the total is completed at point 3.7.

⁸ Between 7 and 14 hours

⁹ Between 2 and 6 hours

¹⁰ The sum of the values on the previous lines, which refer to the individual study.

¹¹ The sum of the number of hours of direct teaching activity (3.4) and the number of hours of individual study (3.7); must be equal to the number of credits allocated to the subject (point 3.9)x 25 hours per credit.

¹² Mention the subjects that must be passed previously or equivalent

¹³ Computing technique, software packages, experimental stands, etc.

¹⁴ Competencies from the G1 and G1bis Grids of the study program, adapted to the specifics of the subject, for which credits are allocated (www.rncis.ro or the faculty website)

Number of credits assigned to the subject ¹⁵ :		4	Distribution of credits per competences ¹⁶
Professional competences	CP1	Knowledge of advanced concepts of computer science and information technology and the ability to work with these concepts.	0.7
	CP2	Scientific and practical research in the field of artificial intelligence.	0.7
	CP3	Problem solving using artificial intelligence methods and techniques.	1.6
	CP4	Design and development of artificial intelligence systems.	
	CP5	Utilization of artificial intelligence tools and technologies.	0.7
	CP6		
	CPS1		
	CPS2		
Transversal competences	CT1	Legislation compliant application of the intellectual property rights and of the principles, norms and values of the professional ethics code within their own strategies for rigorous, effective and responsible work.	0.2
	CT2	Application of communication techniques and effective group work; developing empathic interpersonal communication skills and assuming leadership roles/functions in a multi-specialized team.	0.1
	CT3	Creating opportunities for continuous training and the effective utilization of learning resources and techniques for personal development.	
	CTS		

7. Objectives of the subject (resulting from the grid of specific competences accumulated)

7.1 General objective of the subject	This semester-long project provides students with hands-on experience in applying Edge AI to solve a real-world problem.
7.2 Specific objectives	The goal of this course is to encompass various aspects of the Artificial Intelligence Master's curriculum, including algorithm selection, data processing, model development, and deployment on edge devices.

8. Contents

8.2c Project	Teaching methods ¹⁷	Remarks
<p>Edge AI in Smart Home</p> <p>Week 1: Define the problem and the project scope</p> <ul style="list-style-type: none"> Introduction to Smart Surveillance and the role of Edge AI Identify challenges in traditional practices Form project teams and assign roles Develop a project proposal outlining the problem statement and goals <p>Week 2: Literature Review</p> <ul style="list-style-type: none"> Conduct a literature review on Edge AI applications in surveillance Explore existing solutions and identify gaps <p>Week 3-4: Technology Stack for Edge AI</p> <ul style="list-style-type: none"> Select suitable Edge AI algorithms and frameworks for the project (ONNX Runtime, TensorFlow Lite, TFLite Micro, ML Kit for Firebase, PyTorch Mobile, Core ML, Embedded Learning Library (ELL), Apache MXNet, etc) Set up development environment and tools <p>Week 5-7: Gather data for training and testing the Edge AI model</p> <ul style="list-style-type: none"> Identify data sources (e.g., sensors, cameras, online datasets) Implement data collection mechanisms Preprocess and clean the collected data for training Annotate data for the specific Edge AI application <p>Week 8-12: Build and deploy the Edge AI model for Smart Home Surveillance</p> <ul style="list-style-type: none"> Implement the chosen Edge AI algorithm for home monitoring and event detection Optimize the model for edge device resource constraints Deploy the model on edge devices (SoC Platform, Nvidia Jetson, 	General and individual explanations, individual/team work	

¹⁵ From the education plan

¹⁶ The credits allocated to the subject are distributed on professional and transversal competences according to the specifics of the subject

¹⁷ Case study, demonstration, exercise, error analysis, etc.

Raspberry Pi, Edge TPU, etc.) <ul style="list-style-type: none"> Conduct testing in a real-world controlled environment. Week 13-14: Refine the project based on feedback and prepare for final presentation <ul style="list-style-type: none"> Gather feedback from peers and instructors Refine the Edge AI model based on feedback and testing results Prepare a final project report and presentation 		
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Project references:

- Edge AI Technology Report, ARM Foundation, 2023
- X. Wang, Y. Han, V. C. M. Leung, D. Niyato, X. Yan and X. Chen, "Convergence of Edge Computing and Deep Learning: A Comprehensive Survey," in IEEE Communications Surveys & Tutorials, vol. 22, no. 2, pp. 869-904, Secondquarter 2020, doi: 10.1109/COMST.2020.2970550.
- Z. Zhou, X. Chen, E. Li, L. Zeng, K. Luo and J. Zhang, "Edge Intelligence: Paving the Last Mile of Artificial Intelligence With Edge Computing," in Proceedings of the IEEE, vol. 107, no. 8, pp. 1738-1762, Aug. 2019, doi: 10.1109/JPROC.2019.2918951.
- W. Shi, J. Cao, Q. Zhang, Y. Li and L. Xu, "Edge computing: Vision and challenges", IEEE Internet Things J., vol. 3, no. 5, pp. 637-646, Oct. 2016.
- Learning on the edge, MIT News, [online] <https://news.mit.edu/2022/machine-learning-edge-microcontroller-1004>
- Technique enables AI on edge devices to keep learning over time, MIT News [online] <https://news.mit.edu/2023/technique-enables-ai-edge-devices-keep-learning-over-time>
- Edge Intelligence: Edge Computing and ML [online] <https://viso.ai/edge-ai/edge-intelligence-deep-learning-with-edge-computing/>
- Machine Learning On Edge Devices: Benchmark Report [online] <https://www.edge-ai-vision.com/2019/11/machine-learning-on-edge-devices-benchmark-report/>

9. Corroboration of the contents of the subject with the expectations of representatives of the epistemic community, professional associations and representative employers in the field related to the program¹⁸

An "Natural Language Processing" course directly addresses the IT industry's demand for NLP systems, as the industry seeks Large Language Models solutions due to the large addressabilit..

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Weight in the final grade
10.4a Colloquium	Acquired practical knowledge (quantity, correctness, accuracy)	Final project presentation: <ul style="list-style-type: none"> Practical demonstrations Oral answers 	30% (minimum 5)
10.4d Project	The quality of the completed project, the correctness of the project documentation, and the justification of the chosen solutions	<ul style="list-style-type: none"> Practical demonstrations Oral answers Assessment of progress during project hours through discussions with students, questions, and checks of practical results obtained 	70% (minimum 5)
10.5 Minimum performance standard ¹⁹ : grade 5 in the colloquium and project work			

Date of completion,
4 December 2023

Signature of course coordinator,
Lect. dr. eng. Stefan-Daniel Achirei

Signature of application instructor,
Lect. dr. eng. Stefan-Daniel Achirei

Signature of application instructor,
Assist. drd. eng. Daniel Vecliuc

Date of approval in the department,
7 December 2023

Director of department,
Assoc. prof. dr. eng. Andrei Stan

¹⁸The connection with other subjects, the usefulness of the subject on the labor market

¹⁹The minimum performance standard from the competences grid of the study program is customized to the specifics of the subject, if applicable.