SYLLABUS

1. Program Information

1.1 Higher education institution	AUREL VLAICU UNIVERSITY OF ARAD
1.2 Faculty	ENGINEERING
1.3 Department	DEPARTMENT OF AUTOMATION, INDUSTRIAL ENGINEERING AND TEXTILES
1.4 Field of study	AUTOMATION, APPLIED INFORMATICS AND INTELLIGENT SYSTEMS
1.5 Cycle of studies	BACHELOR OF SCIENCE
1.6 Study Programme/Qualification	AUTOMATION AND APPLIED INFORMATICS (IN ENGLISH)

2. Discipline Data

2.1 Name of the discipline	DIGITAL ELECTRONICS
2.2 Course activity holder	Prof.univ.habil.dr.eng. Marius M. BĂLAȘ
2.3 Instructor of the laboratory activity	Assist. univ.drd. Daniel ALEXUȚĂ
2.4 Year of study	3
2.5 Semester	1
2.6 Type of assessment	Summative: EXAMINATION
2.7 Discipline regime	DS-compulsory

3. Timpul total estimat (hours pe semestru ale activităţilor didactice)

3.1 Number of hours per week	3	of which 3.2 course	2	3.3 laboratories	1
3.4 Total hours in the curriculum	42	of which 3.5 course	28	3.6 laboratories	14
Distribution of the time fund					Hours
Study by textbook, course material, bibliography and notes					30
Additional documentation in the library, on specialized electronic platforms and in the field					12
Preparation of seminars/laboratories, assignments, papers, portfolios and essays					12
Tutorial					2
Examination					2
Other activities...					
3.7 Total hours of individual study					58
3.8 Total hours per semester					100
3.9 Number of credits					4

4. Precondiţii (acolo unde este cazul)

4.1 of curriculum	Electrical Engineering, Physics, Chemistry, Mathematical Analysis, Linear Algebra, Numerical Methods, Computer Programming, Analysis and Synthesis of Numerical Devices, Linear Electronic Circuits.
4.2 of competences	Basic concepts in Linear Electronic Circuits and Computer architecture.

5. Condiţii (acolo unde este cazul)

5.1 of course	Interactive whiteboard, Electronics Workbench.
5.2 of laboratory	General Purpose Electronic Laboratory Equipment and Various Electronic Circuits. Infinit Technologies stands. Software (free): Electronics Workbench, Xilinx ISE14.7, AMD Vivado Design Suite.

6. Specific competences acquired

Professional competences	C2. Design electronic systems: Is able to identify, describe and creatively apply the operating principles of combinational (encoders, decoders, multiplexers, demultiplexers, arithmetic circuits, etc.) and sequential (flip-flops, counters, registers, memories, FPGAs, mixed, etc.) circuits. Can understand, analyze and creatively use VLSI digital electronic circuits with CAD software and HDL simulations. C7. Perform laboratory tests: Plan and execute engineering experiments using specific laboratory equipment. Analyzes and interprets experimental data to validate hypotheses or technical performances. Is able to correctly and creatively use laboratory instrumentation (oscilloscope, signal generator, logic analyzer, etc.) for testing and performance evaluation. Methodological and organizational skills: • Is able to plan and carry out experimental laboratory activities according to established procedures. • Demonstrates the ability to organize and manage the human and technical resources necessary for design, testing and automated production.
Transversal competences	CT3. Think analytically: • Think analytically. • Think critically. • Think creatively.

7. Learning Outcomes

Knowledge	• Knowledge of electronic schematics and methods of designing digital electronic systems. • Knowledge in electronic circuit simulation programs. • Use of specific laboratory equipment. • Data analysis and interpretation. • Think creatively and innovatively.
Skills	• Makes electronic schematics and printed circuit boards using specialized software (Xilinx ISE, Vivado). • Performs simulations to verify the functionality and viability of systems designed prior to manufacturing. • Plans and executes engineering experiments using specific laboratory equipment. • Analyzes and interprets experimental data for the validation of hypotheses or technical performances. • Think analytically.

Responsibilities and autonomy	• Evaluates and optimizes the performance of the designed system, taking responsibility for the choice of technical solutions. • Can work independently or in a team to implement and test automation solutions in a real professional environment. • Has the ability to manage technical projects responsibly and on time. • Has availability for continuous learning and professional adaptation in emerging fields (intelligent automation, IoT, AI in control). • Approach problems critically.

8. Objectives of the discipline (resulting from the grid of specific competences accumulated)

8.1 General objective of the discipline	The Digital Electronics discipline aims to deepen students' knowledge in the field of digital electronics, with emphasis on the area of new technologies, such as FPGA, which instead of the conventional operation based on instruction programs proposes parallel program architectures. The fundamental method by which the current digital electronic circuits are designed and developed, respectively the modeling of their structure and operation through HDL programming languages, is taught.
8.2 Specific objectives	• Students delve into the com plex technological itinerary, which starts from the elaboration of the schematics, goes through their testing through simulation and ends with the creation of netlist files that allow the implementation of the schematics on chips • Development of skills in analysis and synthesis of - combinational and sequential diagnostic circuits; • Development of practical laboratory skills for the proper assembly, testing and measurement of digital electronic circuits; • Correlation of theoretical models with experimental results, by interpreting and analyzing the obtained data.

9. Course Content

9.1 Course	**Teaching methods**	**Observations**
1. Combinational logic circuits	Interactive whiteboard display	4 hours
2. Sequential Logic Circuits	Interactive whiteboard display	4 hours
3. VLSI Technologies	Interactive whiteboard display	4 hours
4. Hardware Description Languages	Interactive whiteboard display	4 hours
5. FPGA	Interactive whiteboard display	4 hours
6. Mixed circuit	Interactive whiteboard display	2 hours
7. Applications of digital circuits	Interactive whiteboard display	6 hours
	TOTAL	**28 hours**

Course bibliography	1. J. Lueke. "Analog and Digital Circuits for Electronic Control System Applications", Newnes Elsevier, 2005. 2. M. Bălaș. „Digital Electronics." Course support, electronic version, 2025. 3. M. Bălaș. „Digital Electronics." Laboratory support, electronic version, 2025.

9.2 Laboratory	**Teaching methods**	**Observations**
1. Encoding and decoding 2. Mutiplexing and demultiplexing 3. RAM Memories 4. Field Programmable Gates Areas FPGA 5. ISE Design Suite 6. Generating schemas and VHDL code 7. ISE and Vivado libraries	Interactive whiteboard displays, circuit design and testing.	Each laboratory takes 2 hours
	TOTAL	**14 ore**
Laboratory bibliography	1. M. Bălaș. „Digital Electronics." Laboratory support, electronic version, 2025. 2. Infinit Technologies Manuals. 3. AMD Vivado Design Suite. User Manual.	

10. Corroboration/validation of the contents of the discipline with the expectations of the representatives of the epistemic community, professional associations and employers' representatives in the field related to the program

The content of the discipline is in line with what is done in other universities in the country and abroad. In order to better adapt the content of the discipline to the requirements of the labor market, meetings were held both with representatives of the business environment and with other specialized professors from other higher education centers in the country or abroad.
The discipline is developed on the basis of internationally recognized field textbooks.
- some of the examples presented during the course, laboratory and seminar were debated at national and international conferences and lectures;
- the promotion of the teaching degree to the position of teacher was made on the basis of publications in the field.

11. Assessment

Type of activity	Evaluation criteria	Evaluation method	Percentage of the final grade
11.1 Course	Acquiring theoretical knowledge, understanding the fundamental principles of analysis and synthesis of digital circuits. Enables the analysis and design of digital circuits with the help of CAD-HDL technologies (ISE Design Suite Vivado).	Written exam. Questions with topics taken from the course. Course activity.	60%
11.2 Laboratory	Theoretical training and prior documentation, practical work in the laboratory, compliance with safety regulations, quality and accuracy of the samples, documentation and reporting of results. Ability to design and manufacture a digital circuit in Electronics Workbench, Xilinx ISE and Vivado.	Verification along the way. Elaboration of an application report on an electronic circuit.	40%

11.3 Minimum Performance Standard

In order to obtain the minimum passing grade, the students must fulfill the following minimum performance standards, in accordance with the learning outcomes declared for the subject:

1. Knowledge of the fundamental concepts: The student must understand the basic notions of digital electronics: Boolean algebra and fundamental logical operations, combinational and sequential logic circuits; the principles of operation of latches, flip-flops.

2. Application of standard methods of analysis and synthesis: The student must be able to correctly use truth tables, simplify logical functions (Karnaugh), analyze the structures and functioning of combinational (adders, comparators, multiplexers, decoders) and sequential: (counting, registers, finite state machines) basic circles.

3. Solving elementary problems: The student must be able to solve problems of low difficulty, such as: determining the logical expression corresponding to a given digital circuit, building a simple combinatorial circuit starting from a functional requirement, analyzing the behavior of flip-flops in different input conditions.

4. Correct use of technical terminology: The student must adequately use specialized terminology, such as: logic functions, logic gates, combinational circuits vs. sequential circuits, latch, flip-flop, counts, registers. Conceptual errors regarding the differences between combinatorial and sequential circuits or the operation of logic gates are incompatible with promotion.

5. Interpretation of results and correlation with physical functioning: The student must demonstrate the ability to: interpret the operation of a simple digital circuit based on a truth table, explain the succession of states in a sequential system, identify possible inconsistencies or erroneous functions in elementary digital circuits.

Students must obtain a grade greater than or equal to 5 in both the written exam (66% weight) and the laboratory (34% weight).

Date of completion	Signature of the course holder	Signature of the laboratory holder
20.09.2025	Prof.univ.habil.dr.eng. Marius Mircea Bălaș	Asist. eng. Daniel Alexuță

Date of approval in the department
26.09.2025

Signature of the department director
Assoc.prof. dr.eng. Valentin Dan Muller

Date of approval in the faculty council
29.09.2026

Approval from the Dean
Senior lecturer.dr.eng. Corina-Anca Mnerie

SYLLABUS

1. Program Information

1.1 Higher education institution	AUREL VLAICU UNIVERSITY OF ARAD
1.2 Faculty	ENGINEERING
1.3 Department	DEPARTMENT OF AUTOMATION, INDUSTRIAL ENGINEERING AND TEXTILES
1.4 Field of study	AUTOMATION, APPLIED INFORMATICS AND INTELLIGENT SYSTEMS
1.5 Cycle of studies	BACHELOR OF SCIENCE
1.6 Study Programme/Qualification	AUTOMATION AND APPLIED INFORMATICS (IN ENGLISH) (AIA-E)

2. Course Information

2.1 Name of the discipline	SOFTWARE SYSTEMS ENGINEERING
2.2 Course activity holder	Prof.univ.habil.dr.eng. Marius M. BALAS
2.3 Instructor of the project activity	Prof.univ.habil.dr.eng. Marius M. BALAS
2.4 Year of study	3
2.5 Semester	2
2.6 Type of assessment	Summative: EXAMINATION
2.7 Discipline regime	DS-compulsory

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

3.1 Number of hours per week	4	of which 3.2 course	2	3.3 project	2
3.4 Total hours in the curriculum	56	of which 3.5 course	28	3.6 project	28
Distribution of the time fund					hours
Study by textbook, course material, bibliography and notes					8
Additional documentation in the library, on specialized electronic platforms and in the field					4
Preparation of seminars/laboratories, assignments, papers, portfolios and essays					4
Tutorial					1
Examination					2
Other activities...					
3.7 Total hours of individual study					19
3.8 Total hours per semester					75
3.9 Number of credits					3

4. Preconditions (where applicable)

4.1 of curriculum	Applied Informatics, Computer Programming and Programming Languages, Algorithm Design, Object-Oriented Programming, Systems Theory, Digital Electronics.
4.2 of competences	Information technology competences.

5. Conditions (where applicable)

5.1 course	Interactive whiteboard, Microsoft Office.
5.2 project	Software (free): StarUML

6. Specific competencies acquired

Professional competencies	C9. Develop open-source software • Analysis and specification of software requirements through formal and semi-formal methods; • Design of software architecture and modular structures, oriented towards reuse and scalability; • Use of programming languages and development environments for the implementation of program systems; • Application of testing, verification and validation methods to ensure the quality of the software product; • Configuration management and version control in a collaborative environment; • Integration of security, performance and interoperability aspects into software solutions. Methodological and organizational skills: • Application of software engineering models and standards; • Management of the software product lifecycle, from conception to retirement; • Planning and management of software projects (resource estimation, risk assessment, technical documentation).
Transversal competencies	CT1. Work in teams • Multidisciplinary teamwork and effective communication with stakeholders; • Ability to continuously learn and adapt to emerging technologies; • Critical thinking and solution orientation in solving complex problems; • Compliance with ethical and legal principles in the development and operation of software.

7. Learning Outcomes

Knowledge	• Identifies open-source platforms and libraries for the development of technical software applications; • Knows the principles of systems engineering; • Knows the principles and stages of teamwork; • Knows ways of communication and effective collaboration.
Skills	• Uses open-source platforms and libraries for the development of technical software applications; • Applies licensing and collaboration principles in open-source software projects, complying with the open-source community standards; • Actively participates in team activities, contributing to the achievement of common goals; • Demonstrates the ability to negotiate and resolve conflicts constructively.
Responsibilities and autonomy	• Evaluates and optimizes the performance of the designed system, assuming responsibility for choosing technical solutions;

	• Can work independently or in a team to implement and test programming solutions in a real professional environment; • Has the ability to manage technical projects responsibly and on time. • Has availability for continuous learning and professional adaptation in emerging fields (IoT, AI); • Assumes his/her own tasks and respects the team's deadlines; • Contributes to a positive and productive climate in the team.

8. Objectives of the discipline (resulting from the grid of specific competences accumulated)

8.1 General objective of the discipline	Software Systems Engineering studies the principles, methods and techniques of analysis, design, implementation, testing and maintenance of complex software systems. It combines engineering and management concepts with practices specific to software development, aiming to ensure the quality, reliability, performance and security of applications. At its core is the management of the entire software product lifecycle, from requirements definition to decommissioning, with a focus on architecture, modularity, interoperability and sustainability.
8.2 Specific objectives	• Introduction to Systems Engineering; • Management of the entire life cycle of software products; • Software architecture design and modular design; • Development and validation methods; • Analyzing the performance of software products; • Modeling and analysis of software application requirements.

9. Course Content

9.1 Course	**Teaching methods**	**Observations**
1. Introduction to Systems Engineering	Interactive whiteboard display	2 hours
2. Software systems	Interactive whiteboard display	4 hours
3. Approaching complicated software systems	Interactive whiteboard display	2 hours
4. Life cycles	Interactive whiteboard display	4 hours
5. Software development stages	Interactive whiteboard display	6 hours
6. Concrete methodologies	Interactive whiteboard display	4 hours
7. UML in Software Systems Engineering	Interactive whiteboard display	4 hours
8. Industry 4.0	Interactive whiteboard display	2 hours
	TOTAL	**28 hours**
Course bibliography	4. NASA. Systems Engineering Handbook, 1995. 5. Cornelia Novac Ududec. Ingineria sistemelor de programe, Editura Alma Mater, Bacău, 2011. 6. MKLabs. StarUML Documentation, 2017.	

	7. Bălaș M.M. Ingineria Sistemelor cu aplicaţii în transporturi. Ediţie electronică, UAV Arad, 2025.

9.2 Project	Teaching methods	Observations
1. Class Diagrams and Object Diagrams. 2. Use Case Diagrams. 3. Behavior Diagrams (Statechart, Activity, Interaction, Sequence, Collaboration). 4. Implementation Diagrams (Component, Deployment). 5. Elaboration of the project. 6. Project implementation and testing. 7. Presentation and evaluation of the project.	Interactive whiteboard presentations, exemplifications and experimental tests.	Each work takes 2 hours
	TOTAL	**14 ore**
Project bibliography	1. MKLabs. StarUML Documentation, Nov 15, 2017. 2. Bălaș M.M. Ingineria Sistemelor cu aplicaţii în transporturi. Ediţie electronică, UAV Arad, 2025.	

10. Corroboration/validation of the contents of the discipline with the expectations of the representatives of the epistemic community, professional associations and employers' representative in the field related to the program

The content of the course and the project have been developed and adapted according to the requests of the department that manages the study program and the expectations of the representatives of the epistemic community and the representative employers in the field related to the study program. The discipline also touches on the newest achievement in the field, code editing with the help of generative artificial intelligence.

11. Assessment

Type of activity	Evaluation criteria	Evaluation method	Percentage of the final grade
11.1 Course	Solving some topics taken from the course taught during the semester.	Written exam. Course activity.	50%
11.2 Project	Elaboration of a Star UML project, with the theme proposed by the teacher or at the student's choice.	Defending, discussing and assessing the project.	50%

11.3 Minimum performance standard

In order to obtain the minimum passing grade, the student must meet the following minimum performance standards, in accordance with the learning outcomes declared for the discipline:

1. Knowledge of the fundamental concepts of software systems engineering. The student must understand basic notions, including: the life cycle of a software system (sequential, iterative, agile models); software requirements (functional and non-functional), fundamental design principles (modularity, abstraction, separation of responsibilities).

2. Correct application of standard methods and techniques in program engineering: specification and modeling of requirements (basic UML diagrams), design of software

components at the functional level, evaluation of software quality at the elementary level (metrics, testing principles).
3. Solving some elementary problems of analysis and software design: a diagram of use cases for a simple system, a diagram of classes, modeling a functional flow through diagrams of activities or sequences, a simplified architecture for a system of low complexity.
4. Proper use of technical terminology: requirements, specifications, components, modules, interfaces, architectural design, class diagram, sequence diagram, integration, validation and verification, software maintenance, release, release. Confusion between fundamental terms (e.g. between requirements and specifications, between architecture and component design) is incompatible with promotion.
5. Interpreting the results and understanding the role of the stages in the life cycle. The student must be able to explain the role of each stage of the life cycle of a software system, correlate the functional requirements with the design solutions, identify problems in structuring a software system.
Students must obtain grades higher than 5 in the course (60% weight) and in the project (40% weight).

Date of completion 20.09.2025 | Signature of the course holder Prof.univ.habil.dr.eng. Marius Mircea Bălaș | Signature of the laboratory holder Prof.univ.habil.dr.eng. Marius Mircea Bălaș

Date of approval in the department 26.09.2025 | Signature of the department director Assoc.prof. dr.eng. Valentin Dan Muller

Date of approval in the faculty council 29.09.2026 | Approval from the Dean Senior lecturer.dr.eng. Corina-Anca Mnerie

SYLLABUS

1. Program Information

1.1 Higher education institution	AUREL VLAICU UNIVERSITY OF ARAD
1.2 Faculty	ENGINEERING
1.3 Department	DEPARTMENT OF AUTOMATION, INDUSTRIAL ENGINEERING AND TEXTILES
1.4 Field of study	AUTOMATION, APPLIED INFORMATICS AND INTELLIGENT SYSTEMS
1.5 Cycle of studies	BACHELOR OF SCIENCE
1.6 Study Programme/Qualification	AUTOMATION AND APPLIED INFORMATICS (IN ENGLISH) (AIA-E)

2. Course Information

2.1 Name of the discipline	MODELING, IDENTIFICATION AND SIMULATION
2.2 Course activity holder	Prof.univ.habil.dr.eng. Marius M. BALAS
2.3 Instructor of the project activity	Assist.drd.eng. Daniel ALEXUȚĂ
2.4 Year of study	3
2.5 Semester	1
2.6 Type of assessment	VERIFICATION
2.7 Discipline regime	DS-compulsory

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

3.1 Number of hours per week	4	of which 3.2 course	2	3.3 project	2
3.4 Total hours in the curriculum	56	of which 3.5 course	28	3.6 project	28

Distribution of the time fund	hours
Study by textbook, course material, bibliography and notes	14
Additional documentation in the library, on specialized electronic platforms and in the field	14
Preparation of seminars/laboratories, assignments, papers, portfolios and essays	12
Tutorial	2
Examination	2
Other activities...	0
3.7 Total hours of individual study	44
3.8 Total hours per semester	100
3.9 Number of credits	4

4. 4. Preconditions (where applicable)

4.1 of curriculum	Systems Theory, Electrical Engineering, Physics, Mathematical Analysis, Linear Algebra, Numerical Methods, Computer Programming.
4.2 of competences	Basic concepts in Electrical Engineering, Physics, Mechanics, Systems Theory and Programming.

5. Conditions (where applicable)

5.1 course	Interactive whiteboard, Microsoft Office, Matlab.
5.2 project	Interactive whiteboard, Matlab-Simulink.

6. Specific competences acquired

Professional competences	C3. Include new products in the production process: • Modelling of physical and technical systems, use of input–output concepts, differential echoes and block schemes. • Identification of system parameters: application of experimental and numerical methods to determine the models of real systems based on input-output data, use of regression techniques, algorithms of identification in time or frequency. C8. Model and simulate sensors: • Use modeling and simulation environments (MATLAB/Simulink, etc.) to analyze transient and stationary responses. • Validation by comparison between simulation and experimental data. Methodological and organizational skills: • Is able to plan and carry out experimental laboratory activities according to established procedures. • Demonstrates the ability to organize and manage the human and technical resources necessary for design, testing and automated production.
Transversal competences	CT3. Think analytically: • Think analytically. • Think critically. • Think creatively.

7. Learning Outcomes

Knowledge	• He has knowledge of the operation of some methods, algorithms, equipment. • Identify how certain products can be included in production. • Knows how to mathematically model dynamical systems. • Basic knowledge of sensors and measuring equipment.
Skills	• Documents and implements procedures for introducing a new product into the manufacturing flow. • Develop functional models for sensors and interface circuits using simulation software. • Evaluates the system's response to variations in physical parameters by numerical simulation.
Responsibilities and autonomy	• Evaluates and optimizes the performance of the designed system, taking responsibility for the choice of technical solutions. • Can work independently or in a team to implement and test automation solutions in a real professional environment. • Has availability for continuous learning and professional adaptation in emerging fields (intelligent automation, IoT, AI in control). • Has the ability to manage technical projects responsibly and on time.

8. Objectives of the discipline (resulting from the grid of specific competences accumulated)

8.1 General objective of the discipline	The discipline Modeling, Identification and Simulation aims to train the theoretical and practical skills necessary for the analysis, description, mathematical representation and simulation of dynamical systems in the field of engineering. The main aim is to provide the student with conceptual tools and software for understanding the behavior of complex themes, for determining models based on experimental data and for validating and optimizing technical solutions through numerical simulation.
8.2 Specific objectives	At the end of the course, the student will be able to: • Explain the principles and steps of the dynamical system modeling-process and the relationships between input, state and output variables. • Build mathematical models for different types of systems (electrical, mechanical, thermal, hydraulic) using differential equations, block schemes, and flowcharts. • Apply identification methods for estimating model parameters and structure based on experimental data. • Use simulation software environments (MATLAB/Simulink, etc.) to analyze transient and steady state behavior. • It compares the results of the simulation with the experimental ones, evaluating the accuracy, stability and robustness of the model. • Integrate the resulting models into design, tuning and automatic control tasks. • Develops the capacity for critical analysis and synthesis, in order to select the appropriate methods for each type of system and objective

9. Course Content

9.1 Course	**Teaching methods**	**Observations**
8. Mathematical models, definitions and classification	Interactive whiteboard display	4 hours
9. Time and frequency modeling	Interactive whiteboard display	2 hours
10. Examples for a DC motor	Interactive whiteboard display	2 hours
11. Transient response analysis	Interactive whiteboard display	2 hours
12. Transfer functions and transfer loci	Interactive whiteboard display	4 hours
13. Numerical integration	Interactive whiteboard display	2 hours
14. Modeling environments. Matlab-Simulink, StarUML	Interactive whiteboard display	4 hours
15. Regression methods	Interactive whiteboard display	2 hours
16. Model optimization. Garden method	Interactive whiteboard display	2 hours
17. Applications: modeling of vehicles, buildings, etc.	Interactive whiteboard display	4 hours
	TOTAL	**28 hours**

Course bibliography	8. V. Bălaş. „Introducere în teoria sistemelor”. Editura Universităţii „Aurel Vlaicu” din Arad, 2013. 9. O. Cangea. „Identificarea sistemelor”, Matrix Rom, 2008. 10. O. Proştean, I. Filip, C. Vaşar, I. Szeidert. „Modelare şi simulare”, Orizonturi Universitare, Timişoara, 2006. 11. N.E. Leonard, S.W. Levine. „Using MATLAB to Analyze and Design Control Systems”, Addison-Wesley Publishing Company, 1995. 12. M. Bălaş. „Modeling, identification and simulation. Course.”, electronic edition, 2025.

9.2 Project	**Teaching methods**	**Observations**
1. Modeling and simulation environments 2. Automobile modeling 3. Wagon modeling 4. Greenhouse modeling 5. Modeling hybrid buildings 6. Modeling of hydraulic systems 7. Analysis of individual project themes 8. Project design and guidance 9. Implementation of projects 10. Completion of projects 11. Testing and Shortening of Projects 12. Project Testing 13. Presentation and assessing of projects 14. Presentation and assessing of projects	Exhibits on the interactive whiteboard, making and testing models.	Each work takes 2 hours
	TOTAL	**28 hours**
Project Bibliography	1. V. Bălaş. „Introducere în teoria sistemelor”. Editura Universităţii „Aurel Vlaicu” din Arad, 2013. 2. N.E. Leonard, S.W. Levine. „Using MATLAB to Analyze and Design Control Systems”, Addison-Wesley Publishing Company, 1995. 3. M. Bălaş. „Modeling, identification and simulation. Course. ", electronic edition, 2025. 4. M. Bălaş. „Project guide in modeling, identification and simulation. Automotive modeling. Greenhouse modeling”, ediţie electronică, 2025.	

10. Corroboration/validation of the contents of the discipline with the expectations of the representatives of the epistemic community, professional associations and employers' representatives in the field related to the program

The content of the discipline is in line with what is done in other universities in the country and abroad. In order to better adapt the content of the discipline to the requirements of the labor market, meetings were held both with representatives of the business environment and with other specialized professors from other higher education centers in the country or abroad.

The discipline is developed on the basis of internationally recognized field textbooks.

- some of the examples presented during the course, laboratory and seminar were debated at national and international conferences and lectures;

- the promotion of the teaching degree to the position of teacher was made on the basis of publications in the field.

11. Assessment

Type of activity	Evaluation criteria	Evaluation method	Percentage of the final grade
11.1. Course	Solving some topics taken from the course taught during the semester.	Written exam. Course activity.	65%
11.2. Project	Elaboration of a project in Matlab-Simulink, with the theme of the student's choice, from a set of themes proposed by the teacher.	Presentation of the project and assessment.	35%

11.3 Minimum performance standard

In order to obtain the minimum passing grade, the student must meet the following minimum performance standards, in accordance with the learning outcomes declared for the subject:

1. Knowledge of the fundamental notions of modeling and simulation: types of models (deterministic, stochastic, continuous, discrete, hybrid), differential equations as a tool for describing small dynasty systems, fundamental notions about numerical simulation and associated software.

2. Application of standard methods of modeling dynamical systems: modeling by differential equations and transfer functions, representations in the space of states for simple systems, linearization of their nonlinear models around equilibrium points, elementary discretization of continuous models.

3. Solving simple numerical simulation problems: simulating a simple dynamical system using a standard platform (e.g.: MATLAB/Simulink), generating basic graphs for responses over time (step response, state evolutions), interpreting the results obtained and identifying typical behaviors (stabilization, divergence, transient regime).

4. Correct use of field-specific terminology: mathematical model, differential equation, transfer function, state variables, outputs, inputs, parameters, simulation, numerical integration, integer, etc.

5. Analysis and interpretation of the simulation results: correct interpretation of the system's behavior based on the simulated results, conclusions on the stability and performance of the model, highlighting the limitations of the models and factors that may affect the accuracy of the simulation.

Students must obtain grades higher than 5 in the course (60% weight) and in the project (40% weight).

Date of completion	Signature of the course holder	Signature of the laboratory holder
20.09.2025	Prof.univ.habil.dr.eng. Marius Mircea Bălaș	Assist.eng. Daniel Alexuță

Date of approval in the department	Signature of the department director
26.09.2025	Assoc.prof. dr.eng. Valentin Dan Muller

Date of approval in the faculty council	Approval from the Dean
29.09.2026	Senior lecturer.dr.eng. Corina-Anca Mnerie

SYLLABUS

1. Program Information

1.1. Higher education institution	AUREL VLAICU UNIVERSITY OF ARAD
1.2. Faculty	ENGINEERING
1.3. Department	AUTOMATION, INDUSTRIAL ENGINEERING, TEXTILES AND TRANSPORT
1.4. Field of study	AUTOMATION, APPLIED INFORMATICS AND INTELLIGENT SYSTEMS
1.5. Cycle of studies	BACHELOR OF SCIENCE
1.6. Study Programme/Qualification	AUTOMATION AND APPLIED INFORMATICS (IN ENGLISH) (AIA-E)

2. Course Information

2.1. Name of the discipline	ARTIFICIAL INTELLIGENCE
2.2. Course activity holder	Prof.univ.habil.dr.eng. Valentina E. BĂLAŞ
2.3. Laboratory and project activity instructor	Assistant drd. Daniel ALEXUŢĂ
2.4. Year of study	3
2.5. Semester	2
2.6. Type of assessment	Summative - EXAMEN
2.7. Discipline regime	DS - compulsory

3. Estimated Total Time (hours per semester of didactic activities)

3.1. Number of hours per week	4	of which 3.2 course	2	3.3 Laboratory+Project	1+1
3.4. Total hours in the curriculum	56	of which 3.5 courses	28	3.6 Laboratory+Project	28
Time Pool Distribution					Hours
Study by textbook, course material, bibliography and notes					20
Additional documentation in the library, on specialized electronic platforms and in the field					7
Preparation of projects/laboratories, assignments, reports, portfolios and essays					7
Tutorial					6
Examination					2
Other activities					2
3.7. Total hours of individual study					**44**
3.9. Total hours per semester					**100**
3.10. Number of appropriations					**4**

4. Preconditions (where applicable)

4.1. of curriculum	Computational Logic, Algorithms and Data Structures, Large Program Techniques, Neuro-Fuzzy Systems, Systems Theory, Automatic Tuning Engineering.

4.2. of competences	Knowledge of programming elements, data structures, linear algebra and probabilities necessary for the implementation and analysis of AI algorithms.

5. Conditions (where applicable)

5.1. of the course	Interactive whiteboard, laptop and appropriate software.
5.2. of the laboratory and project	Laboratory room, properly equipped: computers, network, Internet connection, specialized software.

6. Specific Competencies Acquired

Professional competencies	C5. Design control systems C9. Develop open source software
Transversal competencies	CT3. Think analytically

7. Learning Outcomes

Knowledge	• Understands the basic and advanced principles of automatic control (feedback, stability, adjustment) and their application in the design of automated systems affected by nonlinearity and uncertainty. • Know the structure, operation and interaction of hardware and software components in an industrial control system (sensors, actuators, controllers, interfaces). • Identifies open-source platforms and libraries for the development of technical software applications; • Knows the principles of systems engineering; • Knows the principles and stages of teamwork; • Know ways to communicate and collaborate effectively.
Skills	• Design automatic control structures for industrial processes using mathematical models and performance criteria. • Integrates and configures hardware components (PLCs, microcontrollers, industrial communication networks) and software into a functional automatic control/control system. • Uses open-source platforms and libraries for the development of technical software applications; • Applies licensing and collaboration principles in open source software projects, complying with the standards of the open-source community; • Actively participates in team activities, contributing to the achievement of common goals; • Think analytically, critically and above all creatively.
Responsibilities and autonomy	• Evaluates and optimizes the performance of the designed system, taking responsibility for choosing technical solutions. • Can work independently or in a team to implement and test automation solutions in a real professional environment. • Has the ability to manage technical projects responsibly and on time.

	• It has availability for continuous learning and adaptation in emerging fields (intelligent automation, IoT, AI in control).

8. Objectives of the discipline (resulting from the grid of specific competences accumulated)

8.1. General objective of the folding discs	To develop students' ability to design, implement and evaluate algorithms, models and intelligent methods of representation, learning and decision in automated systems, in order to increase their autonomy, adaptation and performance.
8.2. Specific objectives	• Applying AI (search, reasoning, learning) methods in solving machine engineering problems. • Design and analysis of intelligent algorithms for decision-making in autonomous systems. • Use of machine learning techniques for modeling and identifying processes (expert systems, neural networks, genetic algorithms). • Implementation of fuzzy, neuro-fuzzy or hybrid systems for decision-making, optimization or intelligent control. • Evaluating the performance and robustness of AI solutions in automated driving applications. • Creating AI applications using specific programs: Visi-Rule, Clips, Prolog, Matlab. • Manifesting a positive and responsible attitude towards the field of artificial intelligence.

9. Course Content

9.1 Course	**Teaching methods**	**Observations**
1.Introductory notions, Brief history	Exhibition on the interactive whiteboard, discussions to clarify concepts	2 hours
2.Agenţi inteligenţi	Exhibition on the interactive whiteboard, discussions to clarify concepts	4 hours
3.Structure of expert systems	Exhibition on the interactive whiteboard, discussions to clarify concepts	2 hours
4.Representation of knowledge	Exhibition on the interactive whiteboard, discussions to clarify concepts	2 hours
5.Control and search strategies	Exhibition on the interactive whiteboard, discussions to clarify concepts	6 hours
6.Fuzzy Systems	Exhibition on the interactive whiteboard, discussions to clarify concepts	4 hours
7.Neural networks	Exhibition on the interactive whiteboard, discussions to clarify concepts	4 hours

8.Genetic algorithms	Exhibition on the interactive whiteboard, discussions to clarify concepts	2 hours
9.Hybrid technologies and ML	Exhibition on the interactive whiteboard, discussions to clarify concepts	2 hours
	TOTAL	**28 hours**
Course bibliography	1. Valentina E. Balas. Artificial Intelligence – course support, updated electronic format, 2025. 2. Ali Ahmadian, Soheil Salahshour, Valentina E. Balas, Dumitru Baleanu, Uncertainty in Computational Intelligence-Based Decision Making, Elsevier, 2024. 3. Chiranjibe Jana, Madhumangal Pal, Valentina Emilia Balas and Roland R. Yager, Picture Fuzzy Logic and Its Applications in Decision Making Problems, in series Advanced Studies in Complex Systems: Theory and Applications, Elsevier 2023. 4. Valentina E. Balas, Vijender Kumar Solanki, Raghevendra Kumat, Recent Advances in Internet of Things and Machine Learning. Real-World Applications, Intelligent Systems Reference Library 2015, Springer 2022. 5. Balas, Valentina E.; Fodor, J.; Várkonyi-Kóczy, A.R.; Dombi, J.; Jain, L.C. (Eds.) – Soft Computing Applications, Series: Advances in Intelligent Systems and Computing, Vol. 195, Springer 2013. 6. LPA VisiRule. 7. Matlab, Fuzzy Toolbox, NN Toolbox, GA Toolbox. 8. GeeksforGeeks – AI Search Algorithms – https://www.geeksforgeeks.org/search-algorithms-in-ai/.	

9.2 Laboratory	**Teaching methods**	**Observations**
1. VisiRule expert decision-making systems	Computer modeling + simulation with the LPA expert systems development package.	8 hours
2. Fuzzy Systems	Computer modeling+simulation using Matlab – fuzzy toolbox	2 hours
3. Neural networks	Computer modeling+simulation using Matlab – AI – NN toolbox	2 hours
4. Genetic algorithms	Computer modeling+simulation using Matlab – AI – GA toolbox	2 hours
	TOTAL	**14 hours**
Laboratory bibliography	1. Valentina E. Balas. Artificial Intelligence – Laboratory Tutor, Updated Electronic Format, 2025. 2. LPA VisiRule. 3. Matlab, Fuzzy Toolbox, NN Toolbox, GA Toolbox.	

9.3 Project	**Teaching methods**	**Observations**

Use of the LPA package and the VisiRule component in applications.	Computer modeling and simulations	4 hours
Using the Matlab Fuzzy Logic Toolbox in applications.	Computer modeling and simulations	2 hours
Using the Matlab Neural Networks Toolbox. in applications.	Computer modeling and simulations	2 hours
Using the Matlab Genetic Algorithms Toolbox in applications.	Computer modeling and simulations	2 hours
Case studies	Computer modeling and simulations	2 hours
Recovery. Presentation of the project	Computer modeling and simulations	2 hours
	TOTAL	**14 hours**
Project bibliography	1. Valentina E. Balas. Artificial Intelligence – Laboratory Tutor, Updated Electronic Format, 2025. 2. LPA VisiRule. 3. Matlab, Fuzzy Toolbox, NN Toolbox, GA Toolbox 4. The collection of *IEEE Transactions on Fuzzy Systems* 1993-2025.	

10. Corroboration of the contents of the discipline with the expectations of the representatives of the epistemic community, professional associations and employers representative in the field related to the program

The content of the discipline is in line with what is done in other university centers in the country and abroad. In order to better adapt the content of the discipline to the requirements of the labor market, meetings were held both with representatives of the business environment and with other specialized professors from other higher education centers in the country or abroad. The discipline is developed on the basis of internationally recognized field textbooks.

- some of the examples presented during the course and the laboratory were discussed at national and international conferences and lectures;
- The promotion of the teaching degree to the position of teacher was made on the basis of publications in the field of artificial intelligence.

11. Assessment

Type of activity	Evaluation criteria	Evaluation methods	Percentage of final grade
11.1 Course	Acquiring theoretical knowledge, understanding the fundamental principlesof analysis and synthesis of electronic power circuits.	Written exam. Course activity.	50%
11.2 Laboratory	Theoretical training and prior documentation, laboratory work, compliance with safety regulations,	Verification along the way.	25%

	quality and accuracy of - measurements and reporting of results.	Laboratory activity.	
11.3 Project	Analyzing the theme chosen by the student, the solutions, the realization and drafting of the project.	Supporting and analysing projects	25%

11.4 Minimum Performance Standard

1. Basic theoretical knowledge. The student must be able to explain the fundamental concepts of AI (heuristics, knowledge representation, elementary statistical models).

2. Application in simple problems. The student must be able to implement and run at least one elementary AI algorithm.

Students must obtain a grade greater than or equal to 5 in both the written exam (50% weight) and the laboratory (25% weight) and project (25% weight).

Date of completion Signature of the course holder Signature of the laboratory/project instructor
20.09.2025 Prof.habil.dr.eng. Valentina E. Balas Asist.eng. Daniel Alexuţă

Date of approval in the department Signature of the department director
26.09.2025 Assoc.Prof.dr.eng. Valentin Dan Muller

Date of approval in the faculty council Approval from the Dean
29.09.2026 Senior lecturer.dr.eng. Corina-Anca Mnerie

SYLLABUS

1. Program Information

1.1. Higher education institution	AUREL VLAICU UNIVERSITY OF ARAD
1.2. Faculty	ENGINEERING
1.3. Department	AUTOMATION, INDUSTRIAL ENGINEERING, TEXTILES AND TRANSPORT
1.4. Field of study	AUTOMATION, APPLIED INFORMATICS AND INTELLIGENT SYSTEMS
1.5. Cycle of studies	BACHELOR OF SCIENCE
1.6. Study Programme/Qualification	AUTOMATION AND APPLIED INFORMATICS (IN ENGLISH) (AIA-E)

2. Course Information

2.1. Name of the discipline	DYNAMIC DISCRETE EVENT SYSTEMS
2.2. Course activity holder	Prof.univ.habil.dr.eng. Valentina Emilia BĂLAȘ
2.3. Laboratory activity instructor	Senior Lecture dr.eng. Corina-Anca MNERIE
2.4. Year of study	3
2.5. Semester	2
2.6. Type of assessment	EXAMINATION
2.7. Discipline regime	DS - compulsory

3. Estimated Total Time (hours per semester of didactic activities)

3.1. Number of hours per week	3	of which 3.2 course	2	3.3 Laboratory	1
3.4. Total hours in the curriculum	42	of which 3.5 courses	28	3.6 Laboratory	14
Time Pool Distribution					Hours
Study by textbook, course material, bibliography and notes					15
Additional documentation in the library, on specialized electronic platforms and in the field					5
Preparation of seminars/laboratories, assignments, papers, portfolios and essays					5
Tutorial					3
Examination					3
Other activities					2
3.7. Total hours of individual study					**33**
3.8. Total hours per semester					**75**
3.9. Number of credits					**3**

3. **Preconditions** (where applicable)

4.1. of curriculum	Physics, Electrical Engineering, Linear Electronic Circuits, Measurements and Transducers, Computer Programming and Use, Systems Theory, Modeling and Simulation.
4.2. of competences	The continuity of the applicative capitalization of the acquired knowledge allows a gradual passage through the chapters, in

	close relation with the theme of the previously studied disciplines.

4. **Conditions** (where applicable)

5.1. of course	Classroom, equipped with interactive whiteboard, laptop and appropriate software.
5.2. of laboratory	Laboratory room, properly equipped: computers, network, Internet connection, specialized software.

6. Specific Competencies Acquired

Professional competencies	- C5 – Design control systems
Transversal competencies	- CT2 – Comply with regulations - CT3 – Think Analytically

7. Learning Outcomes

Knowledge	The student/graduate: • Understands the basic and advanced principles of automatic control (feedback, stability, tuning) and their application in the designof automated themes. • Know the structure, operation and interaction of hardware and software components in an industrial control system (sensors, actuators, controllers, interfaces). • Know the principles of professional ethics and deontology. • Is familiar with applicable procedures and quality standards. • Processes information, ideas and concepts • Solve problems • Think creatively and innovatively
Skills	The student/graduate: • Design automatic control structures for industrial processes using mathematical models and performance criteria. • Integrates and configures hardware components (PLCs, microcontrollers, industrial communications networks) and software in a single SISFunctional automatic control/adjustment theme. • Correctly apply the regulations, procedures and social instructions to the activity. • Proposes solutions to improve compliance with the rules. • Think analytically • Think critically • Think creatively
Responsibilities and autonomy	The student/graduate: • Evaluates and optimizes the performance of the designed system, taking responsibility for choosing technical solutions. • Can work independently or in a team to implement and test automation solutions in a real professional environment.

	• Has the ability to manage technical projects responsibly and on time. • It has availability for continuous learning and professional adaptation in emerging fields (intelligent automation, IoT, AI in control). • Respects the principles of professional ethics in all activities. • Contributes to the promotion of an organizational culture based on compliance and integrity. • Approaches problems critically. • Analyzes experimental laboratory data.

8. Objectives of the discipline (resulting from the grid of specific competences accumulated)

8.1 General objective of the discipline	The general objective of the discipline is to develop the theoretical and practical skills necessary for the modeling, analysis and control of dynamic systems whose evolution is determined by the appearance of discrete events, with applicability in automation, robotics, production, transport and information systems. The course aims to provide students with a solid understanding of concepts, modeling tools (automatons, graphs, petri nets), analysis methods, surveillance and control techniques, so that they can design and optimize real systems with discrete behavior.
8.2 Specific objectives	-Understand the fundamental concepts of modeling dynamical systems with discrete events, including states, events, transitions, and sequential evolution of the system. -Familiarize yourself with the main modeling formalisms used for DES, such as finite automata, event graphs, activity graphs, petri nets, and state charts. -Developing the ability to model and represent complex industrial processes and technical systems through standardised formalisms. -Analysis of the behavior of DES systems, including accessibility analysis, deadlock detection, competition determination, and conflict identification. -Application of performance criteria in the evaluation of discrete event systems: response times, capacity, resource utilization, ordering and synchronization. -Development of competencies for supervised control of DES systems, including constraint generation and enforcement, supervisor automation, and policy-based control. -Use of Petri nets for modeling, simulation and analysis of production systems, logistics flows or robotic systems with discrete behavior. -Training the ability to identify and eliminate bottlenecks and design conflict-free systems by optimizing the model and adjusting the structure.

	-Use of specific software tools for modeling and simulation of DES (e.g.: PIPE, Petri Net Tools, Matlab/Simulink – Stateflow). -Integration of DES methods in modern perspectives, such as Industry 4.0, cyber-physical systems, intelligent production lines, IoT and collaborative robotics. -Development of the ability to work in a team in the realization of models, simulations and case studies, as well as professional presentation of the results.

9. Course Content

9.1 Course	**Teaching methods**	**Observations**
1. The specifics of discrete event systems	Presentation with multimedia tools, debates and discussions on concrete examples to clarify the concepts presented	4 hours
2. General Principles of Modeling	Presentation with multimedia tools, debates and discussions on concrete examples to clarify the concepts presented	6 hours
3. Behavioral Property Analysis Techniques	Presentation with multimedia tools, debates and discussions on concrete examples to clarify the concepts presented	4 hours
4. Structural Property Analysis Techniques	Presentation with multimedia tools, debates and discussions on concrete examples to clarify the concepts presented	4 hours
5. Synthesis techniques	Presentation with multimedia tools, debates and discussions on concrete examples to clarify the concepts presented	4 hours
6. Case studies	Presentation with multimedia tools, debates and discussions on concrete examples to clarify the concepts presented	6 hours
	TOTAL	**28 hours**

Bibliography course:

1. Valentina E. Balas, Dynamic Systems with Discrete Events, course support – updated electronic version, 2025.
2. B. Hrúz, M.C. Zhou, Modeling and Control, of Discrete-event Dynamic Systems with Petri Nets and Other Tool, Springer, 2007.

3. Learning aboutt Pettri Nett Toolbox, Forr Use witth MATLAB, Verrsion 2.11, UAIC Iasi, 2005.
4. Discrete Event Systems, UAIC, 2007.

Virtual teaching material:

5. O. Pastravanu s.a., Applications of Petri nets in the study of mechanical systems with discrete events, Gh. Asachi Publishing House, 2002, http://www.ac.tuiasi.ro/pntool/book1/Paginacarte.html.
6. Petri net Toolbox, Version 2.3, 2009, http://www.ac.tuiasi.ro/pntool/.
7. Laboratory work, http://www.ac.tuiasi.ro/pntool/book1/Cuplab.htm#lab.
8. Petri Nets, http://www.informatik.uni-hamburg.de/TGI/PetriNets/.

9.2 Laboratory	**Teaching methods**	**Observations**
1. Modeling of physical-technical systems whose dynamics are driven by events.	Problem solving and computer modeling+simulation using the Matlab PN Tool environment	2 hours
2. Use of Petri Net Toolbox to investigate non-timed Petri Net patterns.	Problem solving and computer modeling+simulation using the Matlab PN Tool environment	2 hours
3. Studying the occurrence of deadlock phenomena in systems with shared resources.	Problem solving and computer modeling+simulation using the Matlab PN Tool environment	2 hours
4. Design of controllers for discrete event processes using the formalism of non-timed Petri gratings.	Problem solving and computer modeling+simulation using the Matlab PN Tool environment	2 hours
5. Using Petri Net Toolbox for analyzing the structural properties of non-timed Petri nets.	Problem solving and computer modeling+simulation using the Matlab PN Tool environment	2 hours
6. Use of the Petri Net Toolbox in the case of deterministic timed Petri net models.	Problem solving and computer modeling+simulation using the Matlab PN Tool environment	2 hours
7. Make-up sessions.	Problem solving and computer modeling+simulation using the Matlab PN Tool environment	2 hours
	TOTAL	14 hours

Bibliography laboratory:
1. Valentina E. Balas, Dynamic Systems with Discrete Events, course support – updated electronic version, 2025.
2. Corina-Anca Mnerie, Dynamic Systems with Discrete Events, Laboratory Support – Updated Electronic Version, 2025.
3. B. Hrúz, M.C. Zhou, Modeling and Control, of Discrete-event Dynamic Systems with Petri Nets and Other Tool, Springer, 2007.
4. Learning about Petri Net Toolbox, Forr Use witth MATLAB, Verrsion 2.11, UAIC Iasi, 2005
5. Discrete Event Systems, UAIC, 2007

Virtual teaching material:
6. O. Pastravanu s.a., Applications of Petri nets in the study of mechanical systems with discrete events, Gh. Asachi Publishing House, 2002, http://www.ac.tuiasi.ro/pntool/book1/Paginacarte.html.
7. Petri net Toolbox, Version 2.3, 2009, http://www.ac.tuiasi.ro/pntool/.
8. Laboratory work, http://www.ac.tuiasi.ro/pntool/book1/Cuplab.htm#lab.
9. Petri Nets, http://www.informatik.uni-hamburg.de/TGI/PetriNets/.

10. Corroboration of the contents of the discipline with the expectations of the representatives of the epistemic community, professional associations and employers representative in the field related to the program

The content of the discipline is in accordance with what is done in other university centers in the country and abroad.
In order to better adapt the content of the discipline to the requirements of the labor market, meetings were held both with representatives of the business environment and with other specialized professors from other higher education centers in the country or abroad.
The discipline is developed on the basis of internationally recognized field textbooks.
Some of the examples presented during the course and the laboratory were discussed at national and international conferences and lectures.

11. Assessment

Type of activity	**Evaluation criteria**	**Evaluation methods**	**Percentage of final grade**
11.1 Course	Knowledge Understanding	Written Paper	70%
11.2 Laboratory	- knowledge and understanding; - the ability to explain and interpret; - complete and correct resolution of requirements.	- the certified applicative activity/laboratory/practical work/project, etc. - Semester testing - Fears control - scientific activities	Evaluation of laboratory activities 20% Active presence 10%
11.3 Minimum Performance Standard			
1. The student knows what the main concepts are, recognizes them, defines them correctly and solves a simple application; 2. The specialized language is simple, but correctly used; 3. Minimum grade 5 in the laboratory and minimum grade 5 in the written paper;			

Date of completion	Signature of the course holder	Signature of the laboratory instructor
20.09.2025	Prof.habil.dr.eng. Valentina E. Balas	Senior lecturer.dr.eng. Corina Anca Mnerie

Date of approval in the department	Signature of the department director
26.09.2025	Assoc.Prof. dr.eng. Valentin Dan Muller

Date of approval in the faculty council	Approval from the Dean
29.09.2026	Senior lecturer.dr.eng. Corina-Anca Mnerie

SYLLABUS

1. Program Information

1.1 Higher Education Institution:	AUREL VLAICU UNIVERSITY OF ARAD
1.2 Faculty:	FACULTY OF ENGINEERING
1.3 Department:	AUTOMATION, INDUSTRIAL ENGINEERING, TEXTILES AND TRANSPORTS
1.4 Field of Study:	SYSTEMS ENGINEERING
1.5 Study Cycle:	BACHELOR OF SCIENCE
1.6 Study Program / Qualification:	AUTOMATION AND APPLIED INFORMATICS (IN ENGLISH) (AIA-E)

2. Course Information

2.1 Course Title:	GENERAL ECONOMICS
2.2 Course Lecturer:	Assoc.Prof. Dr. Teodor Florin Cilan
2.3 Seminar Instructor:	Univ.Assist. PhD Candidate Melinda Petronela Luca
2.4 Year of Study:	3
2.5 Semester	2
2.6 Type of Assessment:	Verification (Final Evaluation)
2.7 Course Status:	DC- compulsory

3. Estimated Total Time (hours per semester of didactic activities)

3.1 Hours per week:	2	of which 3.2 lecture	1	3.3 seminar	1
3.4 Total hours in the study plan	28	of which 3.5 lecture	14	3.6 seminar	14
Time allocation:					hours
Study based on course materials, bibliography					5
Additional documentation in library, specialized databases, or field work					5
Preparation for seminars/labs, essays, portfolios					5
Tutoring					5
Examinations					2
Other activities...					
3.7 Total hours of individual study					22
3.8 Total hours per semester					50
3.9 Number of credits					2

4. Preconditions (where applicable) 4.1 of curriculum	
4.2 of competences	

5. Conditions (where applicable) 5.1 course	Interactive whiteboard
5.2 seminar/laboratory	Interactive whiteboard

6. Specific Competencies Acquired

Professional Competencies	**C3.** Include new products in the production process
Transversal Competencies:	**CT2**. Complies with regulations and professional standards.

7. Learning Outcomes

Knowledge	• Identifies how certain products can be included in the production process from an economic perspective.
Skills	• Documents and implements relevant economic concepts and procedures for integrating new products into production. • Ensures students' understanding of the economic implications of adapting technologies and resources to market and product requirements.
Responsibilities and autonomy	• Demonstrates the ability to manage techno-economic projects responsibly, respecting deadlines and objectives.

8. Objectives of the discipline (resulting from the grid of specific competences accumulated)

8.1 General objective of the discipline	To develop an economic way of thinking as a basis for studying other economic disciplines and for building a solid understanding of economic principles.
8.2 Specific objectives	• After completing the course and passing the final assessment, students will be able to: • Understand the role and importance of economics and political economy within the system of sciences. • Understand the role and functions of the economic system within the broader social system. • State the conditions for the functioning of a market economy. • Explain the law of demand and supply and their interrelations. • Understand the concept of market equilibrium. • Identify the main types of markets and their forms of competition. • Recognize the functions and forms of the market. • Explain the role and importance of credit and banks in the economy. • Identify main types of exchanges and describe how commodity, stock, and currency exchanges operate. • Emphasize the importance of economic resources and production factors. • Define and analyze efficiency, productivity, profitability, and production costs. • Understand unemployment and inflation: causes, effects, and control methods. • Identify and calculate income categories and macroeconomic indicators.

	• Explain the multiplier and accelerator effects. • Understand key concepts of consumption, living standards, and welfare. • Distinguish between economic growth and development and their main models. • Analyze the cyclical nature of economic activity and globalization processes.

9. Course Content

9.1 Course	**Teaching methods**	**Observations**
1. The role and functions of economic science (Stages, purpose, and object)	Presentation, lecture, conversation, direct instruction	1 hour
2. The exchange economy and the market economy (The economic system; The natural economy, the exchange economy, and the market economy).	Presentation, lecture, conversation, direct instruction	2 hours
3. Economic agents specific to the market economy; Banks and credit; Stock exchange	Presentation, lecture, conversation, direct instruction	1 hour
4. The mechanism of the market economy (Mechanism; Market; Market segments).	Presentation, lecture, conversation, direct instruction	1 hour
5. Economic laws and economic policy; The law of supply and demand; Competition	Presentation, lecture, conversation, direct instruction	1 hour
6. The functioning of the market economy; Economic resources and factors of production	Presentation, lecture, conversation, direct instruction	1 hour
7. Economic performance (efficiency, productivity, profitability)	Presentation, lecture, conversation, direct instruction	1 hour
8. Production Cost	Presentation, lecture, conversation, direct instruction	1 hour
9. Price	Presentation, lecture, conversation, direct instruction	1 hour
10. Macroeconomic results	Presentation, lecture, conversation, direct instruction	1 hour
11. Economic growth	Presentation, lecture, conversation, direct instruction	1 hour
12. Economic cyclicality	Presentation, lecture, conversation, direct instruction	1 hour
13. The current global economy	Presentation, lecture, conversation, direct instruction	1 hour
14. International economic relations	Presentation, lecture, conversation, direct instruction	1 hour
		14
Course bibliography	1. Angelescu C. (ed.), *Economics*, 6th Edition, Economica Publishing House, 2003.	

	2. Cioarnă Al., Cilan T., Csorba L., *Microeconomics*, Aurel Vlaicu University Press, Arad, 2011. 3. Cioarnă Al.; Cilan T.; Csorba L., Macroeconomie, Editura Universității „Aurel Vlaicu", Arad, 2011; 4. Cioarnă Al.; Cilan T.; Csorba L., Microeconomics, e-course, Moodie platform, "Aurel Vlaicu" University of Arad; 5. Cioarnă Al.; CiIan T., General Economy, Mirton Publishing House, Timișoara, 2006; 6. Cretoiu Gh. and collaborators, Economy, All Back Publishing House, 2003. 7. Dobrota N., Political Economy, Economic Publishing House, 1997. 8. Negucioiu A. (coordinator), Political Economy, Vol. I and II, George Barițiu Publishing House, Cluj - Napoca, 1998. 9. Popescu C. and collaborators, Competitive Microeconomics, Editura Economica, 1997. 10. Samuelson P.A., Nordhaus W., Political Economy, Teora Publishing House, 2000. 11. Hardwick Ph., Langmead Jh., Khan B., Introduction to Modern Political Economy, Bucharest, Polirom Publishing House, 2002. 12. Whitehead G., Economia, Timișoara, Sedona Publishing House, 1997. 13. Dictionary of Economics, Economic Publishing House, 1998. 14. Electronic course uploaded on the S.U.M.S. platform, 2025

9.2 Seminar	**Teaching methods**	**Observations**
1. The role and functions of economics (Stages, purpose and object)	Discussion of basic concepts, solving practical applications	1 hour
2. Economic agents specific to the market economy; Banks and credit; Stock exchange; Market economy mechanism (Mechanism; Market; Market Segments)	Discussion of basic concepts, solving practical applications	2 hours
3. Economic laws and economic policy; The Law of Supply and Demand; Competition)	Discussion of basic concepts, solving practical applications	1 hour
4. The functioning of the market economy; Economic resources and factors of production	Discussion of basic concepts, solving practical applications	1 hour
5. Results of the activity of economic agents; Usefulness; Quality; Value	Discussion of basic concepts, solving practical applications	1 hour

6. Performanţe economice (Eficienţa, Productivitate, Rentabilitate)	Discussion of basic concepts, solving practical applications	1 hour
7. Production cost	Discussion of basic concepts, solving practical applications	1 hour
8. Dysfunctions of the market economy; Unemployment; Inflation. Unemployment – inflation – economic growth relations.	Discussion of basic concepts, solving practical applications	1 hour
9. Income (distribution, salary, profit, interest, rent)	Discussion of basic concepts, solving practical applications	1 hour
10. Macroeconomic results. System of National Accounts.	Discussion of basic concepts, solving practical applications	1 hour
11. How macroeconomic results are used. The multiplier principle.	Discussion of basic concepts, solving practical applications	1 hour
12. Growth Economic cyclicality	Discussion of basic concepts, solving practical applications	1 hour
13. International Economic Relations. Efficiency of foreign trade.	Discussion of basic concepts, solving practical applications	1 hour
		14
Bibliography seminar	1. Angelescu C. (ed.), Economics, 6th Edition, Economica Publishing House, 2003. 2. Cioarnă Al., Cilan T., Csorba L., Microeconomics, Aurel Vlaicu University Press, Arad, 2011. 3. Cioarnă Al.; Cilan T.; Csorba L., Macroeconomie, Editura Universității ,,Aurel Vlaicu", Arad, 2011; 4. Cioarnă Al.; Cilan T.; Csorba L., Microeconomics, e-course, Moodie platform, "Aurel Vlaicu" University of Arad; 5. Cioarnă Al.; CiIan T., General Economy, Mirton Publishing House, Timișoara, 2006; 6. Cretoiu Gh. and collaborators, Economy, All Back Publishing House, 2003. 7. Dobrota N., Political Economy, Economic Publishing House, 1997. 8. Negucioiu A. (coordinator), Political Economy, Vol. I and II, George Barițiu Publishing House, Cluj - Napoca, 1998. 9. Popescu C. and collaborators, Competitive Microeconomics, Editura Economica, 1997. 10. Samuelson P.A., Nordhaus W., Political Economy, Teora Publishing House, 2000.	

	11. Hardwick Ph., Langmead Jh., Khan B., Introduction to Modern Political Economy, Bucharest, Polirom Publishing House, 2002. 12. Whitehead G., Economia, Timișoara, Sedona Publishing House, 1997. 13. Dictionary of Economics, Economic Publishing House, 1998. 14. Electronic seminar uploaded on the S.U.M.S. platform, 2025

10. Corroboration/validation of the course content with the expectations of representatives of the epistemic community, professional associations, and representative employers in the field related to the program

The content and teaching methods were discussed with specialists from Aurel Vlaicu University, other universities in Romania and abroad (within the Erasmus program), and representatives from the economic and business sectors.

11. Assessment

Type of activity	Evaluation criteria	Evaluation method	Percentage of final grade
11.1 Course	Knowledge of specific terminology, ability to use specific concepts	Examination	85%
11.2 Seminar	Participation in activities and accuracy of answers	Direct questions and practical applications	15%
11.3 Minimum performance standard Knowledge of the context of use of microeconomic theories and models. Proper use of microeconomic terminology in explaining economic and social phenomena.			

Date of completion Signature of the course holder Signature of the seminar/laboratory instructor

20.09.2026 Assoc.Prof.dr. Teodor Florin Cilan Asist.univ.drd. Melinda Petronela Luca

Date of approval in the department 25.09.2025

Director's signature departament
Assoc.Prof. dr.eng. Dan Valentin Muller

Date of approval in the faculty council 29.09.2026

Approval from the Dean
Senior lecturer.dr.eng. Corina-Anca Mnerie

SYLLABUS

1. Program Information

1.1 Higher education institution	AUREL VLAICU UNIVERSITY OF ARAD
1.2 Faculty	FACULTY OF ENGINEERING
1.3 Department	AUTOMATION, INDUSTRIAL ENGINEERING, TEXTILES AND TRANSPORTS
1.4 Field of study	AUTOMATION, APPLIED INFORMATICS AND INTELLIGENT SYSTEMS
1.5 Study Cycle	BACHELOR OF SCIENCE
1.6 Study Program/Qualification	AUTOMATION AND APPLIED INFORMATICS (IN ENGLISH) (AIA-E)

2. Course Information

2.1 Course Title	PERIPHERAL CIRCUITS AND PROCESS INTERFACES
2.2 Course Lecturer	Senior Lecturer eng. George Cătălin CRIȘAN
2.3 Seminar/Laboratory Instructor	Senior Lecturer eng. George Cătălin CRIȘAN
2.4 Year of Study	3
2.5 Semester	1
2.6 Type of Assessment	EXAMINATION
2.7 Course Status	DS-Optional

3. Estimated Total Time (hours per semester of didactic activities)

3.1 Hours per week	3	of which 3.2 lecture	2	3.3 Laboratory	1
3.4 Total hours in the study plan	42	of which 3.5 lecture	28	3.6 Laboratory	14

Time allocation:	Hours
Study based on course materials, bibliography	10
Additional documentation in library, specialized databases, or field work	9
Preparation for seminars/labs, essays, portfolios	10
Tutoring	2
Examinations	2
Other activities...	0
3.7 Total hours of individual study	33
3.8 Total hours per semester	75
3.9 Number of credits	3

4. Preconditions (where applicable)

4.1 of curriculum	Computer Architecture, Microprocessor and Microcontroller-Based Systems.
4.2 of competences	Use of the basics of computer architecture and operation of microprocessors. Understanding the operating principles of the central unit and the data, address and control buses. Ability to work with logic diagrams and circuit-level representations. Fundamental knowledge of microcontroller programming and configuration.

	Ability to interpret technical documentation (datasheets, block diagrams).

5. Conditions (where applicable)

5.1 of conducting the course	Classroom with smart whiteboard.
5.2 of conducting the laboratory	Classroom with smart whiteboard.

6. Specific competencies acquired

Professional competencies	C8. Model and simulate sensors
Transversal competencies	CT1. Work in teams - Work confidently within a group, each doing his or her part in serving the whole. CT2. Comply with regulations - Comply with the rules, regulations and guidelines related to a particular field or sector and apply them in their daily work.

7. Learning Outcomes

Knowledge	Graduate: • knows the general principles of computer system architectures and the role of peripheral circuits; • explains the operation of peripheral circuits for interrupts, data transfer (parallel/serial) and timing; • describes the functionality of system buses (ISA, PCI, PCMCIA) and numeric and analogue input/output modules; • Understand the basic concepts of designing process interfaces for microprocessor and microcontroller systems.
Skills	Graduate: • uses standard peripheral circuitry to implement interrupt, transfer and timing functions; • apply methods for configuring and testing numeric and analogue input/output modules; • design and integrate process interfaces into an automated driving system; • drafts and interprets technical documentation on peripheral circuits and interfaces.
Responsibilities and autonomy	Graduate: • takes responsibility for the correct implementation and configuration of peripheral circuits; • makes autonomous decisions in choosing and adapting process interfaces to a given technical context; • complies with standards and best practices in the field of electronics and automation; • collaborates effectively in multidisciplinary teams for the design and testing of computing systems.

8. Objectives of the discipline (resulting from the grid of specific competences accumulated)

8.1 General objective of the discipline	The discipline aims to train knowledge and skills regarding the principles of operation, use and design of peripheral circuits and process interfaces, necessary for their integration into computing systems and automated driving applications based on microprocessors and microcontrollers.
8.2 Specific objectives	Explain the principles of computing system architectures and the role of peripheral circuits in their operation. Describe and use peripheral circuits for interrupts, parallel transfer, serial transfer, and timing (e.g., i8259A, i8255, i8251, i8253/i8254, TL16C450, etc.). Understand and apply the operating principles of bus controllers (ISA, PCI, PCMCIA) and digital and analog input/output modules. Design and configure input/output modules for automated driving systems with microprocessors/microcontrollers. Design and implement process interfaces, ensuring compatibility and functionality between equipment; Drafts and interprets technical documentation related to the design and use of peripheral circuits and interfaces.

9. Course contents

9.1 Course	**Teaching methods**	**Observations**
1. Perfect Circuits 1.1. General principles of computing system architectures	Lecture, dialogue, educational clips	2 hours
1.2. Peripheral circuits specific to the implementation of interrupting systems (IBM PC system based on the i8259A interrupt controller, Motorola system based on the 68901 interrupt controller)	Lecture, dialogue, educational clips	4 hours
1.3. Peripheral circuits specific to parallel information transfer (i8255, Motorola68230)	Lecture, dialogue, educational clips	2 hours
1.4. Peripheral circuits specific to serial information transfer (i8251, TL16C450, Motorola 68564)	Lecture, dialogue, educational clips	2 hours
1.5. Tiptimer/counter peripheral circuits (i8253/i8254)	Lecture, dialogue, educational clips	2 hours
2. Process interfaces 2.1. Bus controllers and system buses: ISA, PCI, PCMCI	Lecture, dialogue, educational clips	4 hours
2.2. Numerical input/output modules	Lecture, dialogue, educational clips	2 hours
2.3. Analogue input/output modules	Lecture, dialogue, educational clips	2 hours
3. Design of input/output modules	Lecture, dialogue, educational clips	4 hours

3.1. Design of the input/output system of an automated driving system equipped with a microprocessor/microcontroller		
3.2. Design of process interfaces	Lecture, dialogue, educational clips	4 hours
	Total	28 hours
Course bibliography	1. Crisan George Catalin – Peripheral Circuits and Process Interfaces, course in electronic format, 2025. 2. D.A. Patterson, J.L. Hennessy, "Computer Organisation and Design. The Hardware/Software Interface Fifth Edition", ed. Morgan Kaufman, Boston, 2014. 3. F. Blasinger, M. Scheicher, "Digital Interfaces and Bus Systems for Communication", M.K. Juchheim GmbH & Co, Fulda, 2001.	

9.2 Laboratory	**Teaching methods**	**Observations**
1. i8259A interrupt controller circuit. Study and experimentation of the interrupt system	Examples, case studies, problematization, educational videos	1 hour
Study and experimentation of the PIO i8255 circuit	Examples, case studies, problematization, educational videos	1 hour
Study and experimentation of the i8254 PIT circuit	Examples, case studies, problematization, educational videos	1 hour
Study and experimentation of the serial communication circuit TL16C450	Examples, case studies, problematization, educational videos	1 hour
Study and experimentation of the numerical input/output system of the ADA1100 interface	Examples, case studies, problematization, educational videos	1 hour
Study and experimentation of the analog input system of the ADA1100 interface	Examples, case studies, problematization, educational videos	1 hour
Study and experimentation of the analog output system of the ADA1100 interface	Examples, case studies, problematization, educational videos	1 hour

Hardware design and development of software drivers for a series of input-output systems specific to given applications supported by the microcontroller P89C51RD2	Project	7 hours
	Total	14 hours
Laboratory bibliography	1. Crișan George Cătălin – Peripheral Circuits and Process Interfaces, course in electronic format, 2025. 2. MCS51 Microcontrollers, INTEL. 3. phyCORE-P89C51 Hardware Manual", Phytec, August 2001 edition. 4. GPIO Extension Board Hardware Manual", Phytec, Edition September2001 5. , phyCORE Development Board LD. 5. V Board Hardware Manual", Phytec, July 2001 edition. 6. LCD Module Data Sheet DEM20486 SYH-LY", Display Electronik GmbH, 2003. 7. ADA1100. User manual", RTD L.T.D. 1996.	

10. Corroboration/validation of the course content with the expectations of representatives of the epistemic community, professional associations, and representative employers in the field related to the program

The contents of the discipline are correlated with the requirements of the academic community and professional organizations in the field of electronics and automation, as well as with the expectations of employers who require practical skills in the design and use of peripheral circuits and process interfaces.

11. Assessment

Type of activity	Evaluation criteria	Evaluation methods	Percentage of final grade
11.1 Course	Level of understanding of the principles of computer system architectures, operation of peripheral circuits and process interfaces.	Written test with grid questions and open-ended questions	70%
11.2 Laboratory	The correctness and functionality of the proposed technical solution, the design of the input/output modules and the quality of the technical documentation made.	Project	30%
11.3 Minimum Performance Standard The graduate demonstrates knowledge of the fundamental notions regarding the architecture of computing systems and the role of peripheral circuits.			

Identifies the main types of peripheral (interrupts, parallel/serial transfer, timer/counter) and bus (ISA, PCI) circuits. Explain, at a basic level, the operating principles of numeric and analogue input/output modules. Develop a simple solution for designing an I/O interface for a microprocessor or microcontroller system.

Date of completion	Signature of the course holder	Signature of the seminar holder
20.09.2025	Senior lect.dr.eng. Crișan George Cătălin	Senior lect.dr.eng. Crișan George Cătălin

Date of approval in the department	Signature of the department director
26.09.2026	Assoc.Prof. dr.eng. Valentin Dan Muller

Date of approval in the faculty council	Approval from the Dean
29.09.2026	Senior lecturer.dr.eng. Corina-Anca Mnerie

SYLLABUS

1. Program Information

1.1 Higher education institution	AUREL VLAICU UNIVERSITY OF ARAD
1.2 Faculty	FACULTY OF ENGINEERING
1.3 Department	AUTOMATION, INDUSTRIAL ENGINEERING, TEXTILES AND TRANSPORT
1.4 Field of study	AUTOMATION, APPLIED INFORMATICS AND INTELLIGENT SYSTEMS
1.5 Cycle of studies	BACHELOR OF SCIENCE
1.6 Study Programme/Qualification	AUTOMATION AND APPLIED INFORMATICS (IN ENGLISH) (AIA-E)

2. Data about the discipline

2.1 Name of the discipline	LABOUR AND SOCIAL SECURITY LAW
2.2 Course activity holder	Senior Lecturer dr. eng. George Cătălin CRIȘAN
2.3 Seminar/laboratory activity holder	
2.4 Year of study	3
2.5 Semester	2
2.6 Type of assessment	VERIFICATION
2.7 Discipline regime	DC-optional

3. Total estimated time (hours per semester of teaching activities)

3.1 Hours per week	1	of which 3.2 lecture	1	3.3 Seminar/laboratory	0
3.4 Total hours in the study plan	14	of which 3.5 lecture	14	3.6 Seminar/laboratory	0

Time allocation:	Hours
Study based on course materials, bibliography	20
Additional documentation in library, specialized databases, or field work	2
Preparation for seminars/labs, essays, portfolios	10
Tutoring	2
Examinations	2
Other activities...	0
3.7 Total hours of individual study	36
3.8 Total hours per semester	50
3.9 Number of credits	2

4. Preconditions (where applicable)

4.1 of curriculum	This is not the case
4.2 of competences	This is not the case

5. Conditions (where applicable)

5.1 of conducting the course	Classroom with smart board
5.2 of conducting the seminar and laboratory	This is not the case

6. Specific skills acquired

Professional competencies	
Transversal competencies	CT2. Comply with regulations – Comply with the rules, regulations and guidelines related to a particular field or sector and apply them in their daily work

7. Learning Outcomes

Knowledge	Graduate: • know and explain the fundamental principles of labour law and the social security system, as well as the historical evolution and conceptual framework of these areas. • describes and interprets the main legislative provisions applicable to employment relations (Labour Code, related legislation, European normative acts). • identifies the rights and obligations incumbent on employers and employees within the legal employment relationship. • understands and analyzes the legal mechanisms regarding the conclusion, execution, modification and termination of the individual employment contract. • knows the structure and functioning of social security systems (pensions, health, unemployment, accidents at work and occupational diseases). • understands the role of institutions with responsibilities in the field of labor relations (ITM, CNPP, other authorities) and the procedures for control, inspection and conflict resolution.
Skills	Graduate: • correctly apply labor and social security legislation in the analysis of concrete situations encountered in organizations or in professional practice. • prepares and verifies documents specific to employment relationships (individual employment contracts, addenda, decisions, internal regulations, internal procedures). • identifies and manages situations of legal non-compliance and makes appropriate recommendations for the employer or employee. • uses legislative tools and databases to update information and inform correct legal decisions. • analyse and interpret practical cases on wage rights, working time, leave, maternity protection, collective relations and disciplinary liability. • It assesses the legal risks arising from non-compliance with labour legislation and proposes preventive measures.
Responsibilities and autonomy	Graduate: • demonstrates professional responsibility in the interpretation and application of the legal rules on employment relations and social security. • takes legally justifiable decisions in human resources, consulting or management activities, within the limits of professional competence.

	• collaborates effectively with control institutions, social partners and internal departments of the organisation to solve problems related to labour and social protection. • acts proactively to comply with the law and to prevent labor disputes. • demonstrates autonomy in documenting, updating and applying the ever-changing legislation in the field of labour and social security.

8. Objectives of the discipline (resulting from the grid of specific competences acumulated)

8.1 General objective of the discipline	To form a solid and applied understanding of the rules, institutions and mechanisms specific to labor law and social security, so that the graduate can correctly interpret and apply national and European legislation in the management of labor relations and social protection situations.
8.2 Specific objectives	• Understanding the legal framework governing employment relationships, including fundamental principles, sources of law and competent institutions. • Formation of the competence to analyze the manner of conclusion, modification, suspension and termination of the individual employment contract. • Developing the capacity to apply labor legislation in concrete situations and correctly managing specific documents (CIM, addendums, decisions, regulations). • Acquiring the essential notions in the field of occupational safety and health (OSH), with a focus on the employer's obligations, employees' rights and the prevention of occupational risks. • Understanding the functioning of social security systems, compulsory benefits and contributions, as well as protection mechanisms in the event of illness, unemployment, maternity, pension or work-related injury. • Analysis and resolution of practical cases regarding individual and collective labor conflicts, as well as the use of legal means of information and control. • Capacity building to interpret European rules on the coordination of social security systems and labour mobility within the EU.

9. Contents

9.1 Course	**Teaching methods**	**Observations**
Introduction to Labour Law: Principles, Sources, Institutions	Lecture, dialogue, educational clips	3h
Individual employment contract: conclusion, modification, suspension, termination	Lecture, dialogue, educational clips	4h
Rights and obligations of the parties. Working time, pay, liability	Lecture, dialogue, educational clips	3h
Occupational safety and health (OSH) regulations	Lecture, dialogue, educational clips	2h

Social security system and European coordination	Lecture, dialogue, educational clips	2h
	Total	14 hours

Course bibliography	Labor Code – Law no. 53/2003, republished, with subsequent amendments and completions. Law no. 319/2006 on occupational health and safety, with GD 1425/2006 for the Methodological Norms. Law no. 76/2002 on the unemployment insurance system and the stimulation of employment. Law no. 263/2010 on the unitary system of public pensions, updated. Regulations (EC) no. 883/2004 and no. 987/2009 on the coordination of social security systems in the EU. Ștefănescu, I. T. (2023). Theoretical and practical treatise on labour law, Universul Juridic Publishing House. Țiclea, A. (2022). Labor Law – revised edition, Universul Juridic Publishing House. Course in electronic format, 2025.

9.2 Seminar/workshop	**Teaching methods**	**Observations**
Seminar bibliography		

10. Corroboration/validation of the contents of the discipline with the expectations of the representatives of the epistemic community, professional associations and employers representative in the field related to the program

The contents of the discipline were correlated and validated by consulting representatives of the epistemic community, professional associations and relevant employers in the field of labour relations and social security, so that the structure of the topics, the competences pursued and the learning outcomes reflect the current requirements of the labour market, professional standards and the real needs of organisations in terms of the application of labour legislation and the management of labour systems. social protection.

11. Assessment

Type of activity	Evaluation criteria	Evaluation methods	Percentage of final grade
11.1 Course	the level of understanding of the legislation and general principles of the Republic of Moldova, the capacity for legal analysis and interpretation.	written test/ grid and open questions.	100%
11.2 Seminar/Workshop			

11.3 Minimum Performance Standard

In order to pass the discipline, the student must demonstrate an understanding of the essential elements of labor and social security law, correctly identify the main institutions and norms applicable to employment relationships and social protection systems, adequately apply the legal provisions in simple or standardized situations, and elaborate the minimum required documents at an acceptable level of legal accuracy.

Date of completion	Signature of the course holder	Signature of the seminar/laboratory instructor
20.09.2025	Senior Lecturer dr.eng. Cătălin George Crișan	

Date of approval in the department	Signature of the department director
26.09.2025	Assoc.Prof. dr.eng. Valentin Muller

Date of approval in the faculty council	Approval from the Dean
29.09.2026	Senior lecturer.dr.eng. Corina-Anca Mnerie

SYLLABUS

1. Program Information

1.1 Higher education institution	AUREL VLAICU UNIVERSITY OF ARAD
1.2 Faculty	FACULTY OF ENGINEERING
1.3 Department	AUTOMATION, INDUSTRIAL ENGINEERING, TEXTILES AND TRANSPORTS
1.4 Field of study	AUTOMATION, APPLIED INFORMATICS AND INTELLIGENT SYSTEMS
1.5 Study Cycle	BACHELOR OF SCIENCE
1.6 Study Program/Qualification	AUTOMATION AND APPLIED INFORMATICS (IN ENGLISH) (AIA-E)

2. Course Information

2.1 Course Title:	LABOR PROTECTION AND LEGISLATION IN AUTOMATION
2.2 Course Lecturer:	Senior Lecturer dr.eng. George Cătălin CRIȘAN
2.3 Seminar/Laboratory Instructor:	
2.4 Year of Study:	3
2.5 Semester	2
2.6 Type of Assessment:	VERIFICATION
2.7 Course Status:	DC-Optional

3. Estimated Total Time (hours per semester of didactic activities)

3.1 Hours per week	1	of which 3.2 lecture	1	3.3 Seminar/laboratory	0
3.4 Total hours in the study plan	14	of which 3.5 lecture	14	3.6 Seminar/laboratory	0

Time allocation:	Hours
Study based on course materials, bibliography	20
Additional documentation in library, specialized databases, or field work	2
Preparation for seminars/labs, essays, portfolios	10
Tutoring	2
Examinations	2
Other activities...	0
3.7 Total hours of individual study	36
3.8 Total hours per semester	50
3.9 Number of credits	2

4. Preconditions (where applicable)

4.1 of curriculum	This is not the case
4.2 of competences	This is not the case

5. Conditions (where applicable)

5.1 of conducting the course	Classroom with smart board
5.2 of conducting the seminar and laboratory	This is not the case

6. Specific Competencies Acquired

Professional Competencies	
Transversal Competencies	CT2. Comply with regulations – Comply with rules, regulations, and guidelines related to a specific field or sector and apply them in their day-to-day work.

7. Learning Outcomes

Knowledge	Graduate: • knows the general principles of prevention and protection laid down in OSH legislation. • understand the risk-risk relationship and the methods of assessing occupational risks. • knows the legislative requirements and European directives on the **placing on the market and compliance of machines.** • understand the obligations of job managers and the related legal responsibilities.
Skills	Graduate: • identifies hazards and assesses the risks of occupational injury and disease. • apply the pyramid of the effectiveness of prevention measures and select the appropriate measures. • interprets and applies European and national regulations in practical work. • drafts risk assessment and compliance documentation for equipment and workplaces.
Responsibilities and autonomy	Graduate: • assumes responsibility for the correct application of occupational health and safety rules. • makes autonomous decisions on the choice and implementation of prevention measures. • comply with ethical and legal obligations as a manager or manager of the workplace. • promotes a culture of safety and health at work.

8. Objectives of the discipline (resulting from the grid of specific competences accumulated)

8.1 General objective of the discipline	The main objective of Labor Protection and Automation Legislation is to develop skills regarding labor legislation, accident risk assessment, placing machines on the market, prevention and protection activities required by Romanian legislation.
8.2 Specific objectives	• understanding the general principles of prevention and protection provided by the legislation in the field of occupational safety and health; • developing the capacity to identify hazards and assess the risks of occupational accidents and illnesses, using specific methods;

	• training of skills to correlate danger – risk – prevention measures, applying the pyramid of effectiveness of measures; • knowledge of the legislative requirements and European directives regarding the placing on the market of cars; • acquisition of the ability to analyze and interpret the procedures for assessing the conformity of machinery; • awareness and enforcement of the obligations of workplace managers in relation to the legal requirements of OSH.

9. Course Contents

9.1 Course	**Teaching methods**	**Observations**
Legislation in the field of occupational safety and health – principles of prevention and protection;	Lecture, dialogue, educational clips	6 hours
Assessment of the risks of accidents and occupational diseases (hazard-risk relationship; risk assessment methods; pyramid of the effectiveness of prevention measures);	Lecture, dialogue, educational clips	2 hours
Placing machines on the market (legislative requirements, European directives);	Lecture, dialogue, educational clips	2 hours
Machinery conformity (conformity assessment of machinery placed on the market);	Lecture, dialogue, educational clips	2 hours
Obligations of job managers	Lecture, dialogue, educational clips	2 hours
Total		14 hours
Course bibliography	Crișan George Cătălin - Course support, electronic format, ISO 45001, 2025 standard.	

9.2 Seminar/workshop	**Teaching methods**	**Observations**
Seminar bibliography		

10. Corroboration/validation of the course content with the expectations of representatives of the epistemic community, professional associations, and representative employers in the field related to the program

The contents of the discipline are aligned with national legislation and European directives in the field of occupational safety and health and reflect the expectations of the academic community, professional organizations and employers, aiming at the formation of practical skills in risk assessment, machine compliance and the application of the principles of prevention and protection at work.

11. Assessment

Type of activity	Evaluation criteria	Evaluation methods	Percentage of final grade
11.1 Course	Level of understanding of general OSH legislation and principles, ability to explain the hazard-risk relationship and knowledge of machinery compliance requirements.	Written test/grid and open questions.	100%
11.2 Seminar/Workshop			
11.3 Minimum Performance Standard • The graduate must demonstrate that he/she has mastered the fundamental notions of occupational health and safety legislation; • explain the general principles of prevention and protection; • correctly identify obvious hazards and describe the hazard-risk relationship; • know the basic requirements for placing on the market and compliance of machinery.			

Date of completion 20.09.2025 | Signature of the course holder Senior Lecturer dr.eng. George Cătălin Crișan | Signature of the seminar instructor

Date of approval in the department 26.09.2025 | Signature of the department director Assoc.Prof. dr.eng. Valentin Dan Muller

Date of approval in the faculty council 29.09.2026 | Approval from the Dean Senior lecturer.dr.eng. Corina-Anca Mnerie

SYLLABUS

1. Program Information

1.1 Higher education institution	AUREL VLAICU UNIVERSITY OF ARAD
1.2 Faculty	FACULTY OF ENGINEERING
1.3 Department	AUTOMATION, INDUSTRIAL ENGINEERING, TEXTILES AND TRANSPORTS
1.4 Field of study	AUTOMATION, APPLIED INFORMATICS AND INTELLIGENT SYSTEMS
1.5 Cycle of studies	BACHELOR OF SCIENCE
1.6 Study Programme/Qualification	AUTOMATION AND APPLIED INFORMATICS (IN ENGLISH) (AIA-E)

2. Course Information

2.1 Course Title:	COMPUTER NETWORKS
2.2 Course Lecturer:	Senior Lecturer dr.eng. George Cătălin CRIȘAN
2.3 Seminar/Laboratory Instructor:	Senior Lecturer dr.eng. George Cătălin CRIȘAN
2.4 Year of Study:	3
2.5 Semester	1
2.6 Type of Assessment:	EXAMINATION
2.7 Course Status:	DS-compulsory

3. Estimated Total Time (hours per semester of didactic activities)

3.1 Hours per week	5	of which 3.2 lecture	2	3.3 Laboratory+Project	2+1
3.4 Total hours in the study plan	70	of which 3.5 lecture	28	3.6 Laboratory+Project	42
Time allocation:					Hours
Study based on course materials, bibliography					30
Additional documentation in library, specialized databases, or field work					10
Preparation for seminars/labs, essays, portfolios					5
Tutoring					5
Examinations					5
Other activities...					
3.7 Total hours of individual study					55
3.8 Total hours per semester					125
3.9 Number of credits					5

4. Preconditions (where applicable)

4.1 of curriculum	This is not the case
4.2 of competences	This is not the case

5. Conditions (where applicable)

5.1 of conducting the course	This is not the case
5.2 of conducting the laboratory and project	Using your PC/laptop computer

6. Specific competencies acquired

Professional Competencies	
Transversal Competencies	CT3. Think analytically

7. Learning Outcomes

Knowledge	The graduate must: Processes information, ideas and concepts Solve problems Think creatively and innovatively
Skills	The graduate must: Think analytically Think critically Think creatively
Responsibilities and autonomy	The graduate must: Approach issues critically Analyze experimental laboratory data Develop new installations

8. Objectives of the discipline (resulting from the grid of specific competences accumulated)

8.1 General objective of the discipline	The discipline aims to form a solid base of knowledge and practical skills regarding the structure, operation and security of computer networks, so that students can design, configure and evaluate simple networks, using equipment and software applications specific to the field.
8.2 Specific objectives	Explain the fundamental principles of computer networks and reference models (OSI, TCP/IP). Describe and apply IP addressing mechanisms (IPv4, IPv6) and associated network protocols. Recognize and use network equipment (switch, router, UTP cables, RJ45 connectors) for interconnecting systems; Configure and test a local area network (LAN) by applying wiring, connecting, and verification procedures. Use network traffic monitoring and analysis software applications (e.g. Wireshark). Develop technical documentation related to the implemented networks (schematics, reports, diagrams). Apply network security measures and configure basic VLAN networks. Develops the ability to work in a team and take responsibility in network configuration and testing projects.

9. Course contents

9.1 Course	**Teaching methods**	**Observations**
Network topology	Lecture, dialogue, educational clips	4 hours
TCP/IP Model	Lecture, dialogue, educational clips	4 hours

Application Tier	Lecture, dialogue, educational clips	4 hours
Transport level	Lecture, dialogue, educational clips	4 hours
Network Tier	Lecture, dialogue, educational clips	4 hours
Data link level	Lecture, dialogue, educational clips	4 hours
VLAN networks	Lecture, dialogue, educational clips	2 hours
Network security	Lecture, dialogue, educational clips	2 hours
	Total	28 hours
Course bibliography	1. Odom, W. – CCNA Routing and Switching, 2016. 2. Tanenbaum, A. – Computer Networks, 2003. 3. Crișan George Cătălin – Course support in electronic format, 2025.	

9.2 Laboratory	**Teaching methods**	**Observations**
Introduction, IP Addressing	Lecture, dialogue, educational clips	8 hours
OSI and TCP/IP model	Lecture, dialogue, educational clips	8 hours
UTP Cabling	Lecture, dialogue, educational clips, practical use of TP network cable, RJ45 jacks, crimping pliers	8 hours
Router Configuration	Lecture, dialogue, educational clips	4 hours
	Total	28 hours
Laboratory bibliography	1. Odom, W. – CCNA Routing and Switching, 2016. 2. Tanenbaum, A. – Computer Networks, 2003. 3. Crișan George Cătălin – Laboratory support in electronic format, 2025.	
9.3 Project	**Teaching methods**	**Observations**
Introduction, IP Addressing	Lecture, dialogue, educational clips	4
OSI and TCP/IP model	Lecture, dialogue, educational clips	4

UTP Cabling	Lecture, dialogue, educational clips, practical use of TP network cable, RJ45 jacks, crimping pliers	4
Router Configuration	Lecture, dialogue, educational clips	2
	Total	14 hours
Project bibliography	1. Odom, W. – CCNA Routing and Switching, 2016. 2. Tanenbaum, A. – Computer Networks, 2003. 3. Crișan George Cătălin – Course support in electronic format, 2025.	

10. Corroboration/validation of the course content with the expectations of representatives of the epistemic community, professional associations, and representative employers in the field related to the program

The contents of the discipline are correlated with the requirements of the academic and professional community, as well as with the expectations of employers in the IT&C field regarding the basic skills in the design and administration of computer networks.

11. Assessment

Type of activity	Evaluation criteria	Evaluation methods	Percentage of final grade
11.1 Course			
	Level of understanding and explanation of fundamental concepts (topologies, reference models, protocols);	examination	50%
	The quality and accuracy of the technical documentation developed (schematics, diagrams, reports);	examination	10%
11.2 Laboratory/Project			
	The correctness and functionality of the proposed solutions in the laboratory and project activities;	Laboratory tests	10%
	Ability to apply theoretical knowledge in solving practical problems (IP addressing, router configuration, UTP cabling);	Laboratory tests	10%
	Ability to use specific software tools (e.g. Wireshark) for monitoring and diagnostics;	Laboratory tests	20%
11.3 Minimum performance standard: Knowledge of the fundamentals (topologies, TCP/IP, IPv4, IPv6, security)			

Date of completion	Signature of the course holder	Signature of the seminar
20.09.2025	Senior lect.dr.eng. George Cătălin Crișan	Senior lect.dr.eng. George Cătălin Crișan

Date of approval in the department	Signature of the department director
26.09.2026	Assoc.prof.dr.eng. Valentin Dan Muller

Date of approval in the faculty council	Approval from the Dean
29.09.2026	Senior lecturer.dr.eng. Corina-Anca Mnerie

SYLLABUS

1. Program Information

1.1 Higher education institution	AUREL VLAICU UNIVERSITY OF ARAD
1.2 Faculty	FACULTY OF ENGINEERING
1.3 Department	AUTOMATION, INDUSTRIAL ENGINEERING, TEXTILES AND TRANSPORTS
1.4 Field of study	AUTOMATION, APPLIED INFORMATICS AND INTELLIGENT SYSTEMS
1.5 Study Cycle	BACHELOR OF SCIENCE
1.6 Study Program/Qualification	AUTOMATION AND APPLIED INFORMATICS (IN ENGLISH) (AIA-E)

2. Course Information

2.1 Course Title:	PROCUREMENT SYSTEMS AND PROCESS INTERFACES
2.2 Course Lecturer:	Senior lecturer dr. eng. George Cătălin CRIȘAN
2.3 Seminar/Laboratory Instructor:	Senior lecturer dr. eng. George Cătălin CRIȘAN
2.4 Year of Study:	3
2.5 Semester	1
2.6 Type of Assessment:	EXAMINATION
2.7 Course Status:	DS-Optional

3. Estimated Total Time (hours per semester of didactic activities)

3.1 Hours per week	3	of which 3.2 lecturer	2	3.3 Laboratory	1
3.4 Total hours in the study plan	42	of which 3.5 lecturer	28	3.6 Laboratory	14

Time allocation:	Hours
Study based on course materials, bibliography	10
Additional documentation in library, specialized databases, or field work	9
Preparation for seminars/labs, essays, portfolios	10
Tutoring	2
Examinations	2
Other activities...	0
3.7 Total hours of individual study	33
3.8 Total hours per semester	75
3.9 Number of credits	3

4. Preconditions (where applicable)

4.1 of curriculum	Computer Architecture, Microprocessor and Microcontroller-Based Systems.
4.2 of competences	Use of the basics of computer architecture and operation of microprocessors. Understanding the operating principles of the central unit and the data, address and control buses. Ability to work with logic diagrams and circuit-level representations. Fundamental knowledge of microcontroller programming and configuration.

	Ability to interpret technical documentation (datasheets, block diagrams).

5. Conditions (where applicable)

5.1 of conducting the course	Classroom with smart whiteboard.
5.2 of conducting the laboratory	Classroom with smart whiteboard.

6. Specific Competencies Acquired

Professional competencies	C8. Model and simulate sensors
Transversal competencies	CT1. Work in teams - Work confidently within a group, each doing his or her part in the service of the whole. CT2. Comply with regulations - Comply with the rules, regulations and guidelines related to a specific field or sector and apply them in their daily work.

7. Learning Outcomes

Knowledge	Graduate: • knows and explains the principles of data acquisition, the components of the measurement chain and the essential characteristics of sensors and transducers. • describes and interprets the operation of DAQ equipment, conversion modules and signal conditioning systems. • understands the types of industrial interfaces and protocols used in processes (analog, digital, serial, fieldbus, industrial Ethernet). • Recognizes the performance parameters of the measurement systems (resolution, accuracy, errors, response time). • understands the hardware-software architectures used in the integration of procurement systems with PLCs, SCADA and HMIs.
Skills	Graduate: • configures and operates data acquisition systems using dedicated platforms (NI, Siemens, Beckhoff, etc.). • Select and integrate sensors and transducers suitable for the requirements of an industrial process. • correctly apply industrial communication protocols and interfaces for process data transfer. • analyzes and evaluates the performance of procurement systems, calculating and interpreting specific errors. • uses specialized software (LabVIEW, MATLAB, TIA Portal, TwinCAT) for visualization, processing and storage of process data.
Responsibilities and autonomy	Graduate: • demonstrates responsibility in the configuration and operation of procurement systems, adhering to the principles of correct and safe measurement.

	• assumes substantiated technical decisions regarding the selection of equipment and the organization of data flows in an industrial process. • works autonomously in diagnosing errors and optimizing purchasing systems and process interfaces. • collaborates efficiently with multidisciplinary teams (automation, maintenance, IT) in the implementation of hardware-software solutions. • demonstrates the ability to adapt to emerging technologies in the field of industrial instrumentation and process communications.

8. Objectives of the discipline (resulting from the grid of specific competences accumulated)

8.1 General objective of the discipline	To train the skills necessary for the understanding, design and use of modern data acquisition systems and process interfaces, through the integration of sensors, transducers, measuring equipment and hardware-software platforms used in industrial automation.
8.2 Specific objectives	• Familiarizing the student with the principles of data acquisition, the stages of the measurement chain and the criteria for selecting equipment. • Development of the ability to configure and operate hardware and software interfaces used in industrial processes. • Training of skills in analyzing the performance of measurement systems (accuracy, resolution, errors, response time). • Practice integrating sensors and transducers into practical assemblies and automated systems. • Development of defect diagnosis skills and optimization of procurement and process control flows.

9. Contents

9.1 Course	**Teaching methods**	**Observations**
Introduction to Data Acquisition and the Measurement Chain	Lecture, dialogue, educational clips	4 hours
Sensors and transducers used in industrial processes	Lecture, dialogue, educational clips	4 hours
Signal conditioning and analog-to-digital conversion	Lecture, dialogue, educational clips	4 hours
Data acquisition systems and platforms	Lecture, dialogue, educational clips	4 hours
Process interfaces and communication protocols	Lecture, dialogue, educational clips	4 hours
Integration of DAQ systems with PLC, SCADA and HMI	Lecture, dialogue, educational clips	4 hours
Advanced applications in procurement and process control	Lecture, dialogue, educational clips	4 hours
	Total	28 hours
Course bibliography	1. Bentley, J. P. (2021). Principles of Measurement Systems, Pearson.	

	2. Johnson, C., Moradi, M. (2020). Process Control Instrumentation Technology, Pearson. 3. National Instruments (2023). DAQ Fundamentals Guide (online manual). 4. MDPI & IEEE (2019–2024). Articles on procurement systems and industrial IoT. 5. Technical codes and documentation of DAQ and PLC equipment manufacturers (Beckhoff, Siemens, NI, Schneider). 6. Crisan George Catalin – Peripheral Circuits and Process Interfaces, course in electronic format, 2025.

9.2 Laboratory	**Teaching methods**	**Observations**
Introduction to DAQ and Hardware Platform Configuration	Examples, case studies, problematization, educational videos	2 hours
Measurement of analog signals with real sensors	Examples, case studies, problematization, educational videos	2 hours
Signal conditioning and filtering	Examples, case studies, problematization, educational videos	2 hours
A/D conversion and multipoint acquisition	Examples, case studies, problematization, educational videos	2 hours
Industrial Interfaces and Communications	Examples, case studies, problematization, educational videos	2 hours
DAQ integration with PLC and SCADA	Examples, case studies, problematization, educational videos	2 hours
Integrated design: procurement, processing and control	Project	2 hours
	Total	14 hours

Laboratory bibliography	1. Ungureanu-Anghel Dan – Peripheral Circuits and Process Interfaces, course in electronic format. 2. MCS51 Microcontrollers, INTEL. 3. phyCORE-P89C51 Hardware Manual", Phytec, August 2001 Edition 4. GPIO Extension Board Hardware Manual", Phytec, Edition September2001 5. phyCORE Development Board LD 5. V Board Hardware Manual", Phytec, July 2001 edition 6. LCD Module Data Sheet DEM20486 SYH-LY", Display Electronik GmbH, 2003 7. "ADA1100. User manual", RTD L.T.D. 1996. 8. Crișan George Cătălin – Peripheral Circuits and Process Interfaces, course in electronic format, 2025.

10. Corroboration/validation of the contents of the discipline with the expectations of the representatives of the epistemic community, professional associations and employers representative in the field related to the program

The contents of the discipline are correlated with the requirements of the academic community and professional organizations in the field of electronics and automation, as well as with the expectations of employers who require practical skills in the design and use of peripheral circuits and process interfaces.

11. Assessment

Type of activity	Evaluation criteria	Evaluation methods	Percentage of final grade
11.1 Course	Level of understanding of the principles of computing system architectures, the operation of procurement systems and process interfaces.	Written test with grid questions and open-ended questions	70%
11.2 Laboratory	The correctness and functionality of the proposed technical solution, the design of the input/output modules and the quality of the technical documentation made.	Project	30%
11.3 Minimum Performance Standard • The graduate demonstrates knowledge of the fundamental notions regarding the architecture of computing systems and the role of peripheral circuits; • identifies the main types of peripheral circuits (interrupts, parallel/serial transfer, timer/counter) and buses (ISA, PCI); • explains, at a basic level, the operating principles of numeric and analogue input/output modules; • Develop a simple solution for designing an I/O interface for a microprocessor or microcontroller system.			

Date of completion 20.09.2025

Signature of the course holder Senior lecturer.dr.eng. Crișan G. Cătălin

Signature of the laboratory instructor Senior lecturer.dr.eng. Crișan G. Cătălin

Date of approval in the department 26.09.2025

Signature of the department director Assoc.prof.dr.eng. Valentin Dan Muller

Date of approval in the faculty council 29.09.2026

Approval from the Dean Senior lecturer.dr.eng. Corina-Anca Mnerie

SYLLABUS

1. Program Information

1.1 Higher Education Institution:	AUREL VLAICU UNIVERSITY OF ARAD
1.2 Faculty:	FACULTY OF ENGINEERING
1.3 Department:	AUTOMATION, INDUSTRIAL ENGINEERING, TEXTILES AND TRANSPORTS
1.4 Field of Study:	AUTOMATION, APPLIED INFORMATICS, AND INTELLIGENT SYSTEMS
1.5 Study Cycle:	BACHELOR OF SCIENCE
1.6 Study Program / Qualification:	AUTOMATION AND APPLIED INFORMATICS (IN ENGLISH) (AIA-E)

2. Course Information

2.1 Course Title:	DATA SECURITY
2.2 Course Lecturer:	Senior Lecturer dr.eng. Daniel DRAGU
2.3 Seminar/Laboratory Instructor:	Senior Lecturer dr.eng. Daniel DRAGU
2.4 Year of Study:	3
2.5 Semester	1
2.6 Type of Assessment:	VERIFICATION
2.7 Course Status:	DS-optional

3. Estimated Total Time (hours per semester of didactic activities)

3.1 Hours per week:	3	of which 3.2 lecture	2	3.3 project	1
3.4 Total hours in the study plan	42	of which 3.5 lecture	28	3.6 project	14

Time allocation:	hours
Study based on course materials, bibliography	20
Additional documentation in library, specialized databases, or field work	10
Preparation for seminars/labs, essays, portfolios	20
Tutoring	10
Examinations	4
Other activities...	4
3.7 Total hours of individual study	58
3.8 Total hours per semester	100
3.9 Number of credits	4

4. 4. Preconditions (where applicable)

4.1 of curriculum	-
4.2 of competences	-

5. Conditions (where applicable)

5.1 of conducting the course	Classroom equipped with a laptop, interactive whiteboard, appropriate software
5.2 of conducting the seminar and laboratory	Laboratory room properly equipped: computers, network, Internet connection, specialized software / online.

6. Specific Competencies Acquired

Professional Competencies	• C6 – Defines data processes
Transversal Competencies:	• CT2 – Complies with regulations

7. Learning outcomes

Knowledge	The student / graduate: - Knows algorithms for data processing and analysis - Knows the principles and stages of teamwork
Skills	The student / graduate: - Creates algorithms for data processing and analysis in industrial and engineering applications. - Uses programming languages (e.g., Python, R) and ICT tools to transform raw data into useful information. - Actively participates in team activities, contributing to the achievement of common objectives.
Responsibilities and autonomy	The student / graduate: - Evaluates and optimizes the performance of the designed system, assuming responsibility for selecting technical solutions. - Is open to continuous learning and professional adaptation in emerging fields (intelligent automation, IoT, AI in control). - Takes responsibility for personal tasks and meets the deadlines set within the team. - Contributes to a positive and productive team environment.

8. Objectives of the discipline (resulting from the grid of specific competences accumulated)

8.1 General objective of the discipline	Developing basic knowledge related to information security, data transmission through public networks, evaluation of information system security, detection of security breaches, implementation of security measures, and risk management.
8.2 Specific objectives	Students will be able to demonstrate that they have acquired knowledge in the use of security techniques in multi-user and distributed operating systems, concepts of authorization and authentication, information encryption mechanisms, intrusion detection techniques, methods of protecting software systems, transaction security, packet filtering, and risk assessment.

9. Course Content

9.1 Course	Teaching methods	Observations

1. Data Security - basic concepts	Presentation, description, explanations, examples, dialogue, interaction	4 hours
2. Types of cyber attacks	Presentation, description, explanations, examples, dialogue, interaction	4 hours
3. Malitious software. Types, propagation, and solutions	Presentation, description, explanations, examples, dialogue, interaction	8 hours
4. Access levels	Presentation, description, explanations, examples, dialogue, interaction	4 hours
5. Protective measures	Presentation, description, explanations, examples, dialogue, interaction	8 hours
	TOTAL	**28 hours**
Course bibliography: 1. Daniel Dragu, *Data Security– Course Notes,* electronic version, 2025. 2. Graham, James, Ryan Olson, and Rick Howard, eds. Cyber security essentials. CRC Press, 2016.		

9.2 Project	**Teaching methods**	**Observations**
Configuration of security measures on computing devices across various operating systems	Design, implementation, testing	14 hours
	TOTAL	14 hours
Project bibliography: **1.** Daniel Dragu, *Data Security – Course Notes,* electronic version, 2025. **2.** Graham, James, Ryan Olson, and Rick Howard, eds. Cyber security essentials. CRC Press, 2016.		

10. Corroboration/validation of the course content with the expectations of representatives of the epistemic community, professional associations, and representative employers in the field related to the program

The course content is aligned with the syllabi of similar courses at other universities, both nationally and internationally. To better adapt the course content to labor market requirements, meetings were held with representatives from the business environment, and similar study programs from other universities were reviewed and analyzed.
The teaching materials were developed based on representative textbooks in the field, recognized and appreciated by the academic community.
Some of the examples presented during laboratory applications are derived from communications, lectures, project assignments, and other similar materials.

11. Assessment

Type of activity	Evaluation criteria	Evaluation methods	Percentage of final grade

11.1 Course	Knowledge and understanding of theoretical concepts, ability to apply	Written assignment / Multiple-choice test	50%
11.2 Project	- Correct and efficient application of concepts in problem-solving - Active participation	Presentation, oral defense	40% + 10%
11.4 Minimum performance standard			
- The student demonstrates knowledge of the main concepts, provides accurate definitions, and is capable of developing a basic application. - The student correctly uses the relevant technical terminology, even if in a simplified form. - The student achieves a minimum passing grade of 5 in laboratory assessments. - The student successfully completes a minimum required number of tasks, including theoretical questions and practical exercises.			

Date of completion | Signature of the course holder | Signature of the seminar/laboratory instructor

20.09.2025 | Senior Lecturer dr.eng. Daniel Dragu | Senior Lecturer dr.eng. Daniel Dragu

Date of approval in the department | Signature of the department director

26.09.2025 | Assoc.Prof. dr.eng. Valentin Dan Muller

Date of approval in the faculty council | Approval from the Dean

29.09.2026 | Senior lecturer.dr.eng. Corina-Anca Mnerie

SYLLABUS

1. Program Information

1.1 Higher Education Institution:	AUREL VLAICU UNIVERSITY OF ARAD
1.2 Faculty:	FACULTY OF ENGINEERING
1.3 Department:	AUTOMATION, INDUSTRIAL ENGINEERING, TEXTILES AND TRANSPORTS
1.4 Field of Study:	AUTOMATION, APPLIED INFORMATICS, AND INTELLIGENT SYSTEMS
1.5 Study Cycle:	BACHELOR OF SCIENCE
1.6 Study Program / Qualification:	AUTOMATION AND APPLIED INFORMATICS (IN ENGLISH) (AIA-E)

2. Course Information

2.1 Course Title:	SECURITY OF COMPUTER SYSTEMS
2.2 Course Lecturer:	Senior Lecturer dr.eng. DANIEL DRAGU
2.3 Seminar/Laboratory Instructor:	Senior Lecturer dr.eng. DANIEL DRAGU
2.4 Year of Study:	3
2.5 Semester	1
2.6 Type of Assessment:	VERIFICATION
2.7 Course Status:	DS-optional

3. Estimated Total Time (hours per semester of didactic activities)

3.1 Hours per week:	3	of which 3.2 lecture	2	3.3 project	1
3.4 Total hours in the study plan	42	of which 3.5 lecture	28	3.6 project	14

Time allocation:	hours
Study based on course materials, bibliography	14
Additional documentation in library, specialized databases, or field work	12
Preparation for seminars/labs, essays, portfolios	10
Tutoring	10
Examinations	10
Other activities...	2
3.7 Total hours of individual study	58
3.8 Total hours per semester	100
3.9 Number of credits	4

4. 4. Preconditions (where applicable)

4.1 of curriculum	-
4.2 of competences	-

5. Conditions (where applicable)

5.1 of conducting the course	Classroom equipped with a laptop, interactive whiteboard, appropriate software
5.2 of conducting the seminar and laboratory	Laboratory room properly equipped: computers, network, Internet connection, specialized software / online.

6. Specific Competencies Acquired

Professional Competencies	• C6 – Defines data processes
Transversal Competencies:	• CT2 – Complies with regulations

7. Learning outcomes

Knowledge	The student / graduate: - Knows algorithms for data processing and analysis - Knows the principles and stages of teamwork
Skills	The student / graduate: - Creates algorithms for data processing and analysis in industrial and engineering applications. - Uses programming languages (e.g., Python, R) and ICT tools to transform raw data into useful information. - Actively participates in team activities, contributing to the achievement of common objectives.
Responsibilities and autonomy	The student / graduate: - Evaluates and optimizes the performance of the designed system, assuming responsibility for selecting technical solutions. - Is open to continuous learning and professional adaptation in emerging fields (intelligent automation, IoT, AI in control). - Takes responsibility for personal tasks and meets the deadlines set within the team. - Contributes to a positive and productive team environment.

8. Objectives of the discipline (resulting from the grid of specific competences accumulated)

8.1 General objective of the discipline	Developing basic knowledge related to information security, data transmission through public networks, evaluation of information system security, detection of security breaches, implementation of security measures, and risk management.
8.2 Specific objectives	Students will be able to demonstrate that they have acquired knowledge in the use of security techniques in multi-user and distributed operating systems, concepts of authorization and authentication, information encryption mechanisms, intrusion detection techniques, methods of protecting software systems, transaction security, packet filtering, and risk assessment.

9. Course Content

9.1 Course	Teaching methods	Observations

6. Basic concepts in cybersecurity	Presentation, description, explanations, examples, dialogue, interaction	4 hours
7. Cyber attacks	Presentation, description, explanations, examples, dialogue, interaction	4 hours
8. Malware: types, propagation, and solutions	Presentation, description, explanations, examples, dialogue, interaction	8 hours
9. Access levels	Presentation, description, explanations, examples, dialogue, interaction	4 hours
10. Protective measures	Presentation, description, explanations, examples, dialogue, interaction	8 hours
	TOTAL	**28 hours**

Course bibliography:

3. Daniel Dragu, *Security of Computer Systems – Course and Laboratory Notes,* electronic version, 2025.
4. Graham, James, Ryan Olson, and Rick Howard, eds. Cyber security essentials. CRC Press, 2016.

9.2 Project	**Teaching methods**	**Observations**
Configuration of security measures on computing devices across various operating systems	Design, implementation, testing	14 hours
	TOTAL	14 hours

Project bibliography:

3. Daniel Dragu, Security of Computer Systems – Course and Laboratory Notes, electronic version, 2025.
4. Graham, James, Ryan Olson, and Rick Howard, eds. Cyber security essentials. CRC Press, 2016.

10. Corroboration/validation of the course content with the expectations of representatives of the epistemic community, professional associations, and representative employers in the field related to the program

The course content is aligned with the syllabi of similar courses at other universities, both nationally and internationally. To better adapt the course content to labor market requirements, meetings were held with representatives from the business environment, and similar study programs from other universities were reviewed and analyzed.
The teaching materials were developed based on representative textbooks in the field, recognized and appreciated by the academic community.
Some of the examples presented during laboratory applications are derived from communications, lectures, project assignments, and other similar materials.

11. Assessment

Type of activity	Evaluation criteria	Evaluation methods	Percentage of final grade
11.1 Course	Knowledge and understanding of theoretical concepts, ability to apply	Written assignment / Multiple-choice test	50%
11.2 Project	- Correct and efficient application of concepts in problem-solving - Active participation	Presentation, oral defense	40% + 10%
11.4 Minimum performance standard			
- The student demonstrates knowledge of the main concepts, provides accurate definitions, and is capable of developing a basic application. - The student correctly uses the relevant technical terminology, even if in a simplified form. - The student achieves a minimum passing grade of 5 in laboratory assessments. - The student successfully completes a minimum required number of tasks, including theoretical questions and practical exercises.			

Date of completion	Signature of the course holder	Signature of the project instructor
20.09.2025	Senior Lecturer dr.eng. Daniel Dragu	Senior Lecturer dr.eng. Daniel Dragu

Date of approval in the department	Signature of the department director
26.09.2025	Assoc.Prof. dr.eng. Valentin Dan Muller

Date of approval in the faculty council	Approval from the Dean
29.09.2026	Senior lecturer.dr.eng. Corina-Anca Mnerie

SYLLABUS

5. Program Information

1.1. Higher education institution	AUREL VLAICU UNIVERSITY OF ARAD
1.2. Faculty	FACULTY OF ENGINEERING
1.3. Department	AUTOMATION, INDUSTRIAL ENGINEERING, TEXTILES AND TRANSPORTS
1.4. Field of study	AUTOMATION, APPLIED INFORMATICS AND INTELLIGENT SYSTEMS
1.5. Study Cycle	BACHELOR OF SCIENCE
1.6. Study Program/Qualification	AUTOMATION AND APPLIED INFORMATICS (IN ENGLISH) (AIA-E)

6. Course Information

2.1 Course Title:	CLOUD COMPUTING
2.2 Course Lecturer:	Senior Lecturer dr.eng. Daniel DRAGU
2.3 Seminar/Laboratory Instructor:	Senior Lecturer dr.eng. Daniel DRAGU
2.4 Year of Study:	3
2.5 Semester	1
2.6 Type of Assessment:	EXAMINATION
2.7 Course Status:	DS-compulsory

7. 3. Estimated Total Time (hours per semester of didactic activities)

3.1. Hours per week	4	of which 3.2 lecture	2	Laboratory	2
3.4. Total hours in the study plan	56	of which 3.5 lecture	28	Laboratory	28
Time allocation:					Hours
Study based on course materials, bibliography					15
Additional documentation in library, specialized databases, or field work					14
Preparation for seminars/labs, essays, portfolios					20
Tutoring					8
Examinations					4
Other activities...					8
3.7 Total hours of individual study					69
3.8 Total hours per semester					125
3.9 Number of credits					5

8. Preconditions (where applicable)

4.1. of curriculum	-
4.2. of competences	-

9. Conditions (where applicable)

5.1. of conducting the course	Classroom equipped with smart board, computers and appropriate / online software

5.2. of conducting the seminar and laboratory	Properly. equipped laboratory room: computers, network, Internet connection, specialized / online software

10. Specific competencies acquired

Professional competencies	• C6 – Establish data processes
Transversal competencies	• CT1 – Work in teams • CT2 – Comply with regulations

11. Learning Outcomes

Knowledge	The student/graduate: • Understand algorithms and data structures, programming paradigms and languages used in the field of automation • Know ways to communicate and collaborate effectively • Know the principles of professional ethics and deontology
Skills	The student/graduate: • Use programming languages (e.g. Python, R) and ICT tools to transform raw data into useful information. • Actively participates in team activities, contributing to the achievement of common goals. • Propose solutions to improve compliance with rules and procedures
Responsibilities and autonomy	The student/graduate: • Evaluates and optimizes the performance of the designed system, taking responsibility for choosing technical solutions. • It has availability for continuous learning and professional adaptation in emerging fields (intelligent automation, IoT, AI in control). • . Assumes their own tasks and respects the deadlines set in the team • Manifestation of ethical behavior and a professional attitude in the engineering activity.

12. Objectives of the discipline (resulting from the grid of specific competences accumulated)

8.1.General objective of the discipline	Familiarize themselves with the concepts, technologies and practices associated with the use of the cloud.
8.2.Specific objectives	1. Understand cloud concepts and technologies; 2. Acquire skills in deploying and managing cloud resources; 3. Know cloud security practices.

13. Course Content

9.1 Course	**Teaching methods**	Observations

1. Fundamentals of Cloud Computing	Exposition, description, explanations, examples, dialogue, interaction	2 hours
2. Implementation of cloud computing concepts. Virtual machines, cloud instances		8 hours
3. Security and privacy in cloud computing		6 hours
4. Compliance Policies and Regulatory Compliance		4 hours
5. Case studies		4 hours
6. The impact of cloud technology on the IT industry and business		4 hours
	TOTAL	28 hours

Course Bibliography:

5. Daniel Dragu, Cloud computing – lecture and laboratory notes, electronic version, 2025.
6. Oracle Academy Courses - https://academy.oracle.com/.
7. Frans Kaashoek, Operating System Engineering, Massachusetts Institute of Technology, MIT Open CourseWare, 2012.
8. Antonopoulos, Nikos and Lee Gillam. "Cloud Computing, Principles, Systems and Applications." Cloud Computing (2010).

9.2 Laboratory	**Teaching methods**	Observations
1. Oracle Cloud Infrastructure - OCI 2. Cloud Account Creation in OCI 3. Set up your account 4. Virtualization. Creation of courts in OCI 5. Installing/updating apps 6. Security settings 7. Configuring the instance as a server. App launch	Exemplification on the computer. Functionality testing.	28 hours
	TOTAL	28 hours

Laboratory Bibliography:

1. Daniel Dragu, Cloud computing – lecture and laboratory notes, electronic version, 2025.
2. Oracle Academy Courses - https://academy.oracle.com/.
3. Antonopoulos, Nikos and Lee Gillam. "Cloud Computing, Principles, Systems and Applications." Cloud Computing (2010).

14. Corroboration/validation of the course content with the expectations of representatives of the epistemic community, professional associations, and representative employers in the field related to the program

The content of the discipline is in accordance with the discipline sheets of the discipline from other universities in the country and abroad. In order to better adapt the content of the discipline to the requirements of the labor market, meetings were held with both representatives of the business environment and other specialized professors.

The teaching material was developed on the basis of representative textbooks of the field, recognized and appreciated by the academic community.

The examples presented in the course and laboratory applications aim to familiarize students with the customs of the field.

15. Assessment

Type of activity	Evaluation criteria	Evaluation methods	Percentage of final grade
11.1 Course	Knowledge and understanding of theoretical concepts, ability to apply	Written Paper / Grid Test	50%
11.2 Laboratory	Correct and effective application of concepts in problem solving Active participation	Applicative activities / practical works	40% + 10%
11.3 Minimum Performance Standard 1. The student knows the main concepts, defines them correctly and builds a simple application; 2. The specialized language is simple, but correctly used; 3. Minimum grade of 5 in the laboratory; 4. To solve a minimum of topics well – questions and applications.			

Date of completion	Signature of the course holder	Signature of the seminar instructor
20.09.2025	Senior lecturer.dr.eng. Daniel Dragu	Senior lecturer.dr.eng. Daniel Dragu

Date of approval in the department	Signature of the department director
26.09.2025	Assoc. Prof. dr. ing. Valentin Dan Muller

Date of approval in the faculty council	Approval from the Dean
29.09.2026	Senior lecturer.dr.eng. Corina-Anca Mnerie

SYLLABUS

1. Program Information

1.1 Higher Education Institution:	AUREL VLAICU UNIVERSITY OF ARAD
1.2 Faculty:	FACULTY OF ENGINEERING
1.3 Department:	AUTOMATION, INDUSTRIAL ENGINEERING, TEXTILES AND TRANSPORTS
1.4 Field of Study:	AUTOMATION, APPLIED INFORMATICS, AND INTELLIGENT SYSTEMS
1.5 Study Cycle:	BACHELOR OF SCIENCE
1.6 Study Program / Qualification:	AUTOMATION AND APPLIED INFORMATICS (IN ENGLISH) (AIA-E)

2. Course Information

2.1 Course Title:	BUILDING SECURITY SYSTEMS
2.2 Course Lecturer:	Senior Lecturer dr.eng. DANIEL DRAGU
2.3 Seminar/Laboratory Instructor:	Senior Lecturer dr.eng. DANIEL DRAGU
2.4 Year of Study:	3
2.5 Semester	1
2.6 Type of Assessment:	VERIFICATION
2.7 Course Status:	

3. Estimated Total Time (hours per semester of didactic activities)

3.1 Hours per week:	3	of which 3.2 lecture	2	3.3 project	1
3.4 Total hours in the study plan	42	of which 3.5 lecture	28	3.6 project	14

Time allocation:	hours
Study based on course materials, bibliography	14
Additional documentation in library, specialized databases, or field work	12
Preparation for seminars/labs, essays, portfolios	10
Tutoring	10
Examinations	10
Other activities...	2
3.7 Total hours of individual study	58
3.8 Total hours per semester	100
3.9 Number of credits	4

4. 4. Preconditions (where applicable)

4.1 of curriculum	-
4.2 of competences	-

5. Conditions (where applicable)

5.1 of conducting the course	Classroom equipped with a laptop, interactive whiteboard, appropriate software
5.2 of conducting the seminar and laboratory	Laboratory room properly equipped: computers, network, Internet connection, specialized software / online.

6. Specific Competencies Acquired

Professional Competencies	• C6 – Defines data processes
Transversal Competencies:	• CT2 – Complies with regulations

7. Learning outcomes

Knowledge	The student / graduate: - Knows algorithms for data processing and analysis - Knows the principles and stages of teamwork
Skills	The student / graduate: - Creates algorithms for data processing and analysis in industrial and engineering applications. - Uses programming languages (e.g., Python, R) and ICT tools to transform raw data into useful information. - Actively participates in team activities, contributing to the achievement of common objectives.
Responsibilities and autonomy	The student / graduate: - Evaluates and optimizes the performance of the designed system, assuming responsibility for selecting technical solutions. - Is open to continuous learning and professional adaptation in emerging fields (intelligent automation, IoT, AI in control). - Takes responsibility for personal tasks and meets the deadlines set within the team. - Contributes to a positive and productive team environment.

8. Objectives of the discipline (resulting from the grid of specific competences accumulated)

8.1 General objective of the discipline	Developing basic knowledge related to information security, data transmission through public networks, evaluation of information system security, detection of security breaches, implementation of security measures, and risk management.
8.2 Specific objectives	Students will be able to demonstrate that they have acquired knowledge in the use of security techniques in multi-user and distributed operating systems, concepts of authorization and authentication, information encryption mechanisms, intrusion detection techniques, methods of protecting software systems, transaction security, packet filtering, and risk assessment.

9. Course Content

9.1 Course	Teaching methods	Observations

11. Risks and vulnerability assessment in buildings	Presentation, description, explanations, examples, dialogue, interaction	4 hours
12. Regulations and calculations in the field of building security	Presentation, description, explanations, examples, dialogue, interaction	4 hours
13. Physical and electronic security systems	Presentation, description, explanations, examples, dialogue, interaction	8 hours
14. Smart technologies in building security	Presentation, description, explanations, examples, dialogue, interaction	4 hours
15. Maintenance and management of security systems	Presentation, description, explanations, examples, dialogue, interaction	8 hours
	TOTAL	**28 hours**

Course bibliography:

5. Daniel Dragu, *Building SecuritySystems – Course Notes,* electronic version, 2025.
6. IGSU – *Guide for the Evacuation of Administrative Buildings*
7. Ioan Valentin Sita*, Building Automation*, U.T.Press, ISBN 978-606-737-750-7, Cluj-Napoca, 2025

9.2 Project	**Teaching methods**	**Observations**
Configuration of building security systems	Design, implementation, testing	14 hours
	TOTAL	14 hours

Project bibliography:

1. Daniel Dragu, *Building SecuritySystems – Course Notes,* electronic version, 2025.
2. IGSU – *Guide for the Evacuation of Administrative Buildings*
3. Ioan Valentin Sita*, Building Automation*, U.T.Press, ISBN 978-606-737-750-7, Cluj-Napoca, 2025

10. Corroboration/validation of the course content with the expectations of representatives of the epistemic community, professional associations, and representative employers in the field related to the program

The course content is aligned with the syllabi of similar courses at other universities, both nationally and internationally. To better adapt the course content to labor market requirements, meetings were held with representatives from the business environment, and similar study programs from other universities were reviewed and analyzed.
The teaching materials were developed based on representative textbooks in the field, recognized and appreciated by the academic community.
Some of the examples presented during laboratory applications are derived from communications, lectures, project assignments, and other similar materials.

11. Assessment

Type of activity	Evaluation criteria	Evaluation methods	Percentage of final grade

11.1 Course	Knowledge and understanding of theoretical concepts, ability to apply	Written assignment / Multiple-choice test	50%
11.2 Project	- Correct and efficient application of concepts in problem-solving - Active participation	Presentation, oral defense	40% + 10%
11.4 Minimum performance standard			
- The student demonstrates knowledge of the main concepts, provides accurate definitions, and is capable of developing a basic application. - The student correctly uses the relevant technical terminology, even if in a simplified form. - The student achieves a minimum passing grade of 5 in laboratory assessments. - The student successfully completes a minimum required number of tasks, including theoretical questions and practical exercises.			

Date of completion	Signature of the course holder	Signature of the project instructor
20.09.2025	Senior Lecturer dr.eng. Daniel Dragu	Senior Lecturer dr.eng. Daniel Dragu

Date of approval in the department	Signature of the department director
26.09.2025	Assoc.Prof. dr.eng. Valentin Dan Muller

Date of approval in the faculty council	Approval from the Dean
29.09.2026	Senior lecturer.dr.eng. Corina-Anca Mnerie

SYLLABUS

16. Program Information

1.1. Higher education institution	AUREL VLAICU UNIVERSITY OF ARAD
1.2. Faculty	FACULTY OF ENGINEERING
1.3. Department	AUTOMATION, INDUSTRIAL ENGINEERING, TEXTILES AND TRANSPORT
1.4. Field of study	AUTOMATION, APPLIED INFORMATICS AND INTELLIGENT SYSTEMS
1.5. Study Cycle	BACHELOR OF SCIENCE
1.6. Study Program/Qualification	AUTOMATION AND APPLIED INFORMATICS (IN ENGLISH) (AIA-E)

17. Course Information

2.1 Course Title:	OBJECT-ORIENTED PROGRAMMING
2.2 Course Lecturer:	S.l.dr.ing. Daniel DRAGU
2.3 Seminar/Laboratory Instructor:	S.l.dr.ing. Daniel DRAGU
2.4 Year of Study:	3
2.5 Semester	2
2.6 Type of Assessment:	EXAMINATION
2.7 Course Status:	DS-compulsory

18. Total estimated time

3.1. Hours per week	4	of which 3.2 lecture	2	Laboratory	2
3.4. Total hours in the study plan	56	of which 3.2 lecture	28	Laboratory	28

Time allocation:	Hours
Study based on course materials, bibliography	12
Additional documentation in library, specialized databases, or field work	10
Preparation for seminars/labs, essays, portfolios	12
Tutoring	5
Examinations	3
Other activities...	2
3.7 Total hours of individual study	44
3.8 Total hours per semester	100
3.9 Number of credits	4

19. Preconditions (where applicable)

4.1. of curriculum	-
4.2. of competences	-

20. Conditions (where applicable)

5.1. of conducting the course	Classroom equipped with laptop, video projector (if applicable) and appropriate / online software

5.2. of conducting the seminar and laboratory	Properly equipped laboratory room: computers, network, Internet connection, specialized / online software

21. Specific Competencies Acquired

Professional Competencies	• C6 – Establish data processes • C9 – Develop Open Source Software
Transversal Competencies:	• CT3 – Think Analytically

22. Learning Outcomes

Knowledge	The student/graduate: • Know algorithms for data processing and analysis. • Knows programming languages (e.g. C++, C#) • Understanding algorithms and data structures, programming paradigms and languages used in the field of automation • Identify open-source platforms and libraries for the development of technical software applications
Skills	The student/graduate: • Create algorithms for data processing and analysis in industrial and engineering applications. • Use programming languages and ICT tools to transform raw data into useful information. • It uses open-source platforms and libraries for the development of technical software applications.
Responsibilities and autonomy	The student/graduate: • Evaluates and optimizes the performance of the designed system, taking responsibility for choosing technical solutions. • Has the ability to manage technical projects responsibly and on time.

23. Objectives of the discipline (resulting from the grid of specific competences accumulated)

8.1. General objective of the discipline	Familiarize students with the principles and techniques of object-oriented programming, including concepts such as class, object, inheritance, polymorphism, and encapsulation, and develop practical skills for designing and implementing modular and reusable software applications.
8.2.Specific objectives	• Understand and apply the fundamental concepts of object-oriented programming (classes, objects, inheritance, polymorphism, encapsulation, abstraction). • Design modular and reusable software systems, using classes and objects that reflect real-world structures. • Implement effective solutions by using OOP principles in object-oriented programming languages (e.g., C#, Java, C++, Python, etc.). • Apply advanced memory management, exception handling, and resource management techniques within object-oriented programming. • Acquire teamwork and project management skills, collaborating on the development of object-oriented software applications.

24. Content

9.1 Course	**Teaching methods**	Observations
1. Introduction to OOP	Exposition, description, explanations, examples, dialogue, interaction	4 hours
2. Classes, objects		6 hours
3. Class members (fields, properties, methods, constructors, events).		4 hours
4. OOP Principles (Encapsulation, Inheritance, Polymorphism, Abstraction)		6 hours
5. Memory management. Handling exceptions		4 hours
6. Abstract interfaces and classes		4 hours
	TOTAL	28 hours
Course Bibliography: 9. Daniel Dragu, Object-oriented programming – course and laboratory notes, electronic version, 2025. 10. A, Niță, M. Niță, Object-oriented programming and visual programming, Microsoft.NET Framework.		

9.2 Laboratory	**Teaching methods**	Observations
1-7. Practical aspects based on the topics discussed in the course	Exemplification, testing of functionalities	28 hours
Laboratory Bibliography: 4. Daniel Dragu, Object-oriented programming – course and laboratory notes, electronic version, 2025. 5. A, Niță, M. Niță, Object-oriented programming and visual programming, Microsoft.NET Framework. 6. Diarmuid O' Ríordáin, BE, MEngSc, MIEI, A Course in C Programming, Department of Applied Mathematics, University College Cork, 6th Revision, 2018.		

25. Corroboration/validation of the course content with the expectations of representatives of the epistemic community, professional associations, and representative employers in the field related to the program

The content of the discipline is in accordance with the discipline sheets of the discipline from other universities in the country and abroad. In order to better adapt the content of the discipline to the requirements of the labor market, meetings were held with both representatives of the business environment and other specialized professors.

The teaching material was developed on the basis of representative textbooks of the field, recognized and appreciated by the academic community.

The examples presented in the course and laboratory applications aim to familiarize students with the customs of the field.

26. Assessment

Type of activity	Evaluation criteria	Evaluation methods	Percentage of final grade
11.1 Course	Knowledge and understanding of theoretical concepts, ability to apply	Written Paper / Grid Test	50%
11.2 Laboratory	• Correct and effective application of concepts in problem solving • Active participation	Applicative activities / practical works	40% + 10%
11.3 Minimum Performance Standard 1. The student knows the main concepts, defines them correctly and builds a simple application; 2. The specialized language is simple, but correctly used; 3. Minimum grade of 5 in the laboratory; 4. To solve a minimum of topics well – questions and applications.			

Date of completion	Signature of the course holder	Signature of the seminar holder
20.09.2025	Senior lecturer.dr.eng. Daniel Dragu	Senior lecturer.dr.eng. Daniel Dragu

Date of approval in the department	Signature of the department director
26.09.2025	Assoc. Prof. dr. eng. Valentin Dan Muller

Date of approval in the faculty council	Approval from the Dean
29.09.2026	Senior lecturer.dr.eng. Corina-Anca Mnerie

SYLLABUS

27. Program Information

1.1. Higher education institution	AUREL VLAICU UNIVERSITY OF ARAD
1.2. Faculty	FACULTY OF ENGINEERING
1.3. Department	AUTOMATION, INDUSTRIAL ENGINEERING, TEXTILES and TRANSPORT
1.4. Field of study	AUTOMATION, APPLIED INFORMATICS AND INTELLIGENT SYSTEMS
1.5. Study Cycle	BACHELOR OF SCIENCE
1.6. Study Program/Qualification	AUTOMATION AND APPLIED INFORMATICS (IN ENGLISH) (AIA-E)

28. Course Information

2.1 Course Title:	SYSTEMS WITH MICROPROCESSORS
2.2 Course Lecturer:	Senior lecturer.dr.eng. Daniel DRAGU
2.3 Seminar/Laboratory Instructor:	Senior lecturer.dr.eng. Daniel DRAGU
2.4 Year of Study:	3
2.5 Semester	2
2.6 Type of Assessment:	EXAMINATION
2.7 Course Status:	DS-compulsory

29. Estimated Total Time (hours per semester of didactic activities)

3.1. Hours per week	4	of which 3.2 course	2	3.3 Laboratory+Project	1+1
3.4. Total hours in the study plan	56	of which 3.5 courses	28	3.6 Laboratory+Project	28
Time allocation:					Hours
Study based on course materials, bibliography					13
Additional documentation in library, specialized databases, or field work					10
Preparation for seminars/labs, essays, portfolios					13
Tutoring					4
Examinations					2
Other activities...					2
3.7 Total hours of individual study					44
3.8 Total hours per semester					100
3.9 Number of credits					4

30. Preconditions (where applicable)

4.1. of curriculum	Physics, Numerical Methods, Analysis and Synthesis of Numerical Devices, Linear Electronic Circuits, Computer Architecture
4.2. of competences	The competences related to the subjects in the list of curriculum prerequisites.

31. Conditions (where applicable)

5.1. of conducting the course	Classroom equipped with laptop, smart board, computer network (if applicable) and appropriate software
5.2. of conducting the laboratory and project	Properly equipped laboratory room: computers, network, Internet connection, specialized software.

32. Specific Competencies Acquired

Professional Competencies	• C2 – Design electronic systems
Transversal Competencies	• CT3 – Think Analytically

33. Learning Outcomes

Knowledge	Graduate: • He has knowledge of electronic schematics and methods of designing electronic systems. • Has knowledge in simulation programs • Solve problems
Skills	Graduate: • Make electronic schematics and printed circuit boards using specialized software. • Perform simulations to verify the functionality and viability of systems designed before manufacturing • Think creatively
Responsibilities and autonomy	Graduate: • Can work independently or in a team to implement and test automation solutions in a real professional environment. • Has the ability to manage technical projects responsibly and on time. • It has availability for continuous learning and professional adaptation in emerging fields (intelligent automation, IoT, AI in control). • Develop new installations

34. Objectives of the discipline (resulting from the grid of specific competences accumulated)

8.1.General objective of the discipline	To develop the skills necessary for the understanding, design, and use of microprocessor-based systems, including familiarization with microprocessor architecture, their programming, and their integration into various systems and applications.
8.2.Specific objectives	• Understanding the architecture of microprocessors; • Programming microprocessors and microcontrollers • Interface with peripheral devices • Design of embedded systems • Documentation and presentation of projects

35. Content

9.1 Course	**Teaching methods**	Observations
Boolean algebra with transistors	Exposition, description, explanations, examples, dialogue, interaction	4 hours
Microprocessor Architectures		4 hours
Central processing unit		4 hours
Control of CPU processes		4 hours
The fetch-decode execute cycle		4 hours
Ways of addressing		4 hours
Instruction format. Instruction set		4 hours
	TOTAL	28 hours
Course Bibliography 1. D. Dragu, Microprocessor Systems – Lecture and Laboratory Notes, electronic version, 2025. 2. M. A. Mazidi, S. Naimi, The Avr Microcontroller And Embedded Systems Using Assembly And C, Pearson Education, Inc., 2017.		

9.2 Laboratory	**Teaching methods**	Observations
Laboratory Occupational Protection Measures Behavior and action in emergency situations Microprocessor. Microcontroller	Exemplification on the computer. Testing the functionalities.	2 hours
Microchip Atmel Studio		2 hour
Decision and repetitive instructions		2 hours
Subroutines in assembly language. Stack		2 hours
Programmer for microcontrollers		2 hours
Bit-based operators		2 hours
PC Communication - Microcontroller		2 hours
	TOTAL	14 hours
Laboratory Bibliography: 1. D. Dragu, Microprocessor Systems – Lecture and Laboratory Notes, electronic version, 2025. 2. M. A. Mazidi, S. Naimi, The Avr Microcontroller And Embedded Systems Using Assembly And C, Pearson Education, Inc., 2017.		

9.3 Project	**Teaching methods**	Observations
Designing, implementing and testing a software application or a microcontroller device with the role of data processing and process automation.	Design, implementation, testing	14 hours
	TOTAL	14 hours

Project Bibliography:

1. D. Dragu, Microprocessor Systems – Lecture and Laboratory Notes, electronic version, 2025.
2. M. A. Mazidi, S. Naimi, The Avr Microcontroller And Embedded Systems Using Assembly And C, Pearson Education, Inc., 2017.

36. Corroboration/validation of the course content with the expectations of representatives of the epistemic community, professional associations, and representative employers in the field related to the program

The content of the discipline is in accordance with the discipline sheets of the discipline from other universities in the country and abroad. In order to better adapt the content of the discipline to the requirements of the labor market, meetings were held with both representatives of the business environment and other specialized professors.

The teaching material was developed on the basis of representative textbooks of the field, recognized and appreciated by the academic community.

The examples presented in the course and laboratory applications aim to familiarize students with the customs of the field.

37. Assessment

Type of activity	Evaluation criteria	Evaluation methods	Percentage of final grade
11.1 Course	Knowledge and understanding of theoretical concepts, ability to apply	Written Paper / Grid Test	50%
11.2 Laboratory/Project	Correct and effective application of concepts in problem solving Active participation	Applicative activities / practical works	40% + 10%
11.3 Minimum Performance Standard 1. The student knows the main concepts, defines them correctly and builds a simple application; 2. The specialized language is simple, but correctly used; 3. Minimum grade of 5 in the laboratory; 4. To solve a minimum of topics well – questions and applications.			

Date of completion Signature of the course holder Signature of the laboratory/project instructor

20.09.2025 Senior lecturer.dr.eng. Daniel Dragu Senior lecturer.dr.eng. Daniel Dragu

Date of approval in the department Signature of the department director

26.09.2025 Assoc. Prof. dr. eng. Valentin Dan Muller

Date of approval in the faculty council Approval from the Dean

29.09.2026 Senior lecturer.dr.eng. Corina-Anca Mnerie

SYLLABUS

38. Program Information

1.1. Higher education institution	AUREL VLAICU UNIVERSITY OF ARAD
1.2. Faculty	FACULTY OF ENGINEERING
1.3. Department	AUTOMATION, INDUSTRIAL ENGINEERING, TEXTILES AND TRANSPORTS
1.4. Field of study	AUTOMATION, APPLIED INFORMATICS AND INTELLIGENT SYSTEMS
1.5. Study Cycle	BACHELOR OF SCIENCE
1.6. Study Program/Qualification	AUTOMATION AND APPLIED INFORMATICS (IN ENGLISH) (AIA-E)

39. Course Information

2.1 Course Title:	INTRODUCTION TO AUTOMATION AND AUTOMATIC TUNING ENGINEERING
2.2 Course Lecturer:	Senior lecturer.dr.eng. Corina Anca MNERIE
2.3 Seminar/Laboratory Instructor:	Senior lecturer.dr.eng. Corina Anca MNERIE
2.4 Year of Study:	3
2.5 Semester	1
2.6 Type of Assessment:	EXAMINATION
2.7 Course Status:	DS-mandatory

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40. Total estimated time

3.1. Hours per week:	5	of which 3.2 lecture	2	3.3 Laboratory+Project	2+1
3.4. Total hours in the study plan	70	of which 3.5 lecture	28	3.6 Laboratory+Project	42

Time allocation:	Hours
Study based on course materials, bibliography	20
Additional documentation in library, specialized databases, or field work	10
Preparation for seminars/labs, essays, portfolios	10
Tutoring	8
Examinations	5
Other activities...	2
3.7 Total hours of individual study	55
3.8 Total hours per semester	125
3.9 Number of credits	5

41. Preconditions (where applicable)

4.1. of curriculum	Physics, Electrical Engineering, Mechanics, Mathematical Analysis, Systems Theory.
4.2. of competences	Physics, Electrical Engineering, Mechanics, Mathematical Analysis, Systems Theory.

42. Conditions (where applicable)

5.1. of conducting the course	Classroom, equipped with laptop, video projector/smartboard and appropriate software.
5.2. of conducting the laboratory/project	Laboratory room, properly equipped: test stands, computers, network, Internet connection, specialized software.

43. Specific Competencies Acquired

Professional Competencies	C5. Design control systems C7. Perform laboratory tests
Transversal Competencies	CT3. Think analytically

44. Learning Outcomes

Knowledge	1. The student understands the basic principles of automatic control (feedback, feedforward, tuning) and their application in the design of automatic systems. 2. Know the structure, operation and interaction of hardware and software components in an industrial control system (sensors, actuators, controllers, interface elements). 3. Know the functions and algorithms of classical regulators. 4. Think creatively and innovatively.
Skills	1. Design the automatic control structure for simple industrial processes. 2. It uses mathematical models and performance criteria in the evaluation of a control system. 3. Integrates and configures hardware and software components into a functional automatic control/adjustment system. 4. Plan and execute engineering experiments using specific laboratory equipment. 5. Analyzes and interprets experimental data to validate hypotheses or technical performances. 6. Think analytically and critically.
Responsibilities and autonomy	1. Evaluates and optimizes the performance of the projected system, assuming responsibility for choosing technical solutions.

	2. Has the ability to manage technical projects responsibly and on time. 3. Can work independently or in a team to implement and test automation solutions in a real professional environment. 4. Analyze experimental data. 5. Develop new installs.

45. Objectives of the discipline (resulting from the grid of specific competences accumulated)

8.1.General objective of the discipline	The objective proposed within the discipline Introduction to Automation and Automatic Control Engineering is to provide students with the basic notions regarding the automatic management of processes (structures, algorithms and design methods) and to fit this discipline into the field of Systems Engineering.
8.2. Specific objectives	The course deals with the problem of automatic process management by identifying and putting the problem of automating a process, comparative analysis of different management solutions, ending with the design and implementation of these solutions. Basic management structures for a process are presented, the main components are studied, with a focus on regulators. The presentation of the regulators provides access to the links between the different technologies and the performance that can be achieved. The methods for analyzing performance in static and dynamic mode are presented. The main chapter of the course is dedicated to linear PID regulators, presenting the algorithm, implementation methods, design methods.

46. Content

9.1 Course	**Teaching methods**	Observations
1. Elements of Systems Engineering and Introduction to Automation - Introduction to Systems Engineering. Concepts, notions and methods specific to Systems Engineering. - Putting the problem in the management of the processes. Case studies.	Oral presentations based on visual support. examples, Final/intermediate discussions.	4 hours
2. Automatic DRIVING STRUCTURES - Structure and classification of Automatic Control Systems - Technical processes. Execution elements. Transducers	Oral presentations based on visual support. examples, Final/intermediate discussions.	4 hours

- Low-order mathematical models; Study of MM response of order 1 and 2		
3. Operating regimes. Quality indicators - Operating regimes of an automatic control system - Quality indicators used to evaluate the performance of an SRA	Oral presentations based on visual support. examples, Final/intermediate discussions.	2 hours
4. REGULATOR BASICS AND TUNING ALGORITHMS - P, PI, PD and PID tuning algorithms - Criteria and recommendations for choosing standard regulators - Two-position and three-position relay regulators	Oral presentations based on visual support. examples, Final/intermediate discussions.	4 hours
5. THE BEHAVIOR OF THE SYSTEMS IN PERMANENT REGIMES. QUALITY INDICATORS FOR PERFORMANCE ASSESSMENT - Operating regimes - Determination and calculation of constant steady state quantity values - Regulator-type induced properties on RAS in permanent regime - Connections between the performance of automatic control systems and the distribution of polyzeros	Oral presentations based on visual support. examples, Final/intermediate discussions.	2 hours
6. SETTING PARAMETERS TO REGULATORS USING EXPERIMENTAL DATA - Controllers for slow process management - Awarding PID regulators by the Ziegler-Nichols method based on the stability limit - Granting PID regulators by the Ziegler-Nichols method based on experimentally determined relationships	Oral presentations based on visual support. Examples, Final/Intermediate Discussions..	2 Hours
7. DESIGN OF AUTOMATIC REGULATION SYSTEMS BASED ON PULSATION (FREQUENCY) CHARACTERISTICS - General aspects of design in the field of pulsation; Quality indicators - Using Bode Diagrams in the Design of Automatic Tuning Systems	Oral presentations based on visual support. Examples, Final/Intermediate Discussions..	4 hours
8. OPTIMAL TUNING OF REGULATORS USING OPTIMAL CRITERIA - Methods for optimizing regulator parameters. General and specific aspects	Oral presentations based on visual support. examples, Final/intermediate discussions.	2 hours

- Method (criterion) of the optimal module (MO-m). - Symmetric Optimum (SO-m) Method (Criterion) - Extended symmetric optimum method (ESO-m)		
9. AUTOMATIC DIMMING SYSTEMS WITH DISTURBANCE COMPENSATION - Automatic driving systems with disturbance compensation. General issues - Open circuit automatic driving systems with disturbance compensation. - Automatic control systems with disturbance compensation	Oral presentations based on visual support. examples, Final/intermediate discussions.	2 hours
10. AUTOMATIC ADJUSTMENT SYSTEMS ACCORDING TO STATUS. - Adjustment by state. - Design of state-specific automatic adjustment systems by allocation method. - Extension of the structure in order to ensure the null adjustment error condition.	Oral presentations based on visual support. examples, Final/intermediate discussions.	2 hours
	Total	28 hours

Course bibliography:

1. I. Dumitrache and others: "Automatica" vol. 1. Romanian Academy Publishing House, 2010.
2. S. Preitl, R.E. Precup, Z. Preitl: "Structures and algorithms for automatic process management", University Horizons, Timișoara, 2009.
3. S. Preitl, Z. Preitl: "Introduction to Automatics: Automatic Process Management", University Horizons, Timișoara, 2014.
4. V. Bălaș: "The Theory of Systems", Aurel Vlaicu Publishing House, 2012.
5. K.A. Astrom, B. Wittenmark, "Computer-Controlled Systems," Prentice Hall, 1997
6. Åstrom, K.J., Hägglund, T. PID Controllers. Theory, Design and Tuning. Research Triangle Park, North Carolina, 1995.
7. C. Mnerie: "Introduction to Automation and Automatic Control Engineering", Course Material, electronic version, 2025.

9.2 Laboratory	**Teaching methods**	Observations
1. Recapitulative work of the necessary notions of TS. Representation of automatic systems by block schemes	Making schemes	2 hours
2. Automatic adjustment structures. Putting the problem of automation. Case studies Regulating the temperature in an enclosure Adjusting the speed of an engine	Mathematical modeling. Simulation	4 hours
3. Study of systems of order I and II	Matlab/Simulink Simulation	2 hours

4. Experiments using the PID trainer laboratory stand. Familiarization with laboratory equipment. Study of open and closed circuit structures. Simulation comparison and experimental results	Simulation, experimental determinations	4 hours
5. Experiments using the PID trainer IT 4406 laboratory stand. Proportional Engine Control/Proportional Light Control/Temperature Control	Experimental determinations, analytical calculations	2 hours
6. Experiments using the PID trainer laboratory stand. Motor PID Control./Light PID Control	Experimental determinations, analytical calculations	4 hours
7. Driving the DC motor, DC servo motor and stepper motors using the IT 4412 CONTROL APPLICATION TRAINING SYSTEM	Practical work – laboratory equipment	6 hours
8. Completion and presentation of laboratory work reports.		4 hours
	Total	28 hours

Laboratory bibliography:

1. I. Dumitrache and others: "Automatica" vol. 1. Romanian Academy Publishing House, 2010.
2. S. Preitl, R.E. Precup, Z. Preitl: "Structures and algorithms for automatic process management", University Horizons, Timișoara, 2009.
3. S. Preitl, Z. Preitl: "Introduction to Automatics: Automatic Process Management", University Horizons, Timișoara, 2014.
4. V. Bălaș: "The Theory of Systems", Aurel Vlaicu Publishing House, 2012.
5. K.A. Astrom, B. Wittenmark, "Computer-Controlled Systems," Prentice Hall, 1997
6. Åstrom, K.J., Hägglund, T. PID Controllers. Theory, Design and Tuning. Research Triangle Park, North Carolina, 1995
7. C. Mnerie: "Laboratory and Project Tutor - Automatic Tuning Engineering", electronic version, 2025.
8. Infinit Technology, Manual Experiment PID TRAINER IT-4406, https://infinit-technologies.com/product/it-4406-pid-trainer-with-applications/
9. Infinit Technologie, Experiment manual CONTROL APPLICATION TRAINER IT-4412, https://infinit-technologies.com/product/it-4412-control-application-training-system/

9.3 Project	**Teaching methods**	Observations
1. Interpreting the mcc documentation – reading/interpreting the graphs, parameters in the DataSheet 2. Problems of adjusting/driving the speed of electric motors (cc). Mathematical modeling, numerical calculation	Exposure, computer simulations, Internet search Experimental Determinations Using Quanser SRV02 Base Unit Laboratory Equipment	3 hours
3. Regulating structures used	Exposure, computer simulations	Minute

4. RG design methods used	Exposure, computer simulations	Minute
5. Specifying individual themes	Discussion	Minute
6. Project development	Design and implementation Experimental Determinations Using Quanser SRV02 Base Unit Laboratory Equipment	4 hours
7. Completion of projects	Design and implementation Experimental Determinations Using Quanser SRV02 Base Unit Laboratory Equipment	2 hours
8. Project support	Colloquium	2 hours
	Total	14 hours

Project bibliography:

1. I. Dumitrache and others: "Automatica" vol. 1. Romanian Academy Publishing House, 2010.
2. S. Preitl, R.E. Precup, Z. Preitl: "Structures and algorithms for automatic process management", University Horizons, Timișoara, 2009.
3. S. Preitl, Z. Preitl: "Introduction to Automatics: Automatic Process Management", University Horizons, Timișoara, 2014.
4. V. Bălaș: "The Theory of Systems", Aurel Vlaicu Publishing House, 2012.
5. K.A. Astrom, B. Wittenmark, "Computer-Controlled Systems," Prentice Hall, 1997.
6. Åstrom, K.J., Hägglund, T. PID Controllers. Theory, Design and Tuning. Research Triangle Park, North Carolina, 1995.
7. C. Mnerie: "Laboratory and Project Tutor - Automatic Tuning Engineering", electronic version, 2025.
8. Quanser SRV02 Base Unit Experiment For Matlab®/Simulink® Users – SUMS Electronic Documentation, 2019, https://www.quanser.com/products/rotary-servo-base-unit/.

10. Corroboration/validation of the course content with the expectations of representatives of the epistemic community, professional associations, and representative employers in the field related to the program

The content of the discipline is in line with what is done in other university centers in the country and abroad.
In order to better adapt the content of the discipline to the requirements of the labor market, meetings were held both with representatives of the business environment and with other specialized professors from other higher education centers in the country or abroad.
The discipline is developed on the basis of internationally recognized field textbooks.
Some of the examples presented during the course and seminar were discussed at national and international conferences and presentations.

11. Assessment

Type of activity	Evaluation criteria	Evaluation methods	Percentage of the final grade
11.1 Course	Students' ability to acquire knowledge.	Written paper/online test - final evaluation	50%
11.2 Project/laboratory	Active participation of students in laboratory work. Writing the reports/homework within the imposed deadlines	Evaluation along the way	25%
	Active participation of students in the project. Phased implementation and completion of the project on time	Evaluation along the way+final	25%
	Scientific research activity	Participation with applications in student scientific events	Can replace part of the project/lab evaluation max 25%
11.3 Minimum Performance Standard			
1. The student knows what the main concepts are, recognizes them, defines them correctly and solves a simple application. 2. Specialized language is simple, but correctly used. 3. Realization and support of the project, which must be passed with a minimum grade of 5. 4. To solve well a minimum of theoretical topics and applications. 5. Performing laboratory work in a proportion of 70%.			

Date of completion Signature of the course holder Signature of the laboraty/project instructor
20.09.2025 Senior lecturer.dr.eng. Corina Anca Mnerie Senior lecturer.dr.eng. Corina Anca Mnerie

Date of approval in the department director 26.09.2025 Signature of the department
Assoc.Prof. dr.eng. Valentin Dan Muller

Date of approval in the faculty council
29.09.2026

Approval from the Dean
Senior lecturer.dr.eng. Corina-Anca Mnerie

SYLLABUS

47. Program Information

1.1. Higher education institution	AUREL VLAICU UNIVERSITY OF ARAD
1.2. Faculty	FACULTY OF ENGINEERING
1.3. Department	AUTOMATION, INDUSTRIAL ENGINEERING, TEXTILES AND TRANSPORTS
1.4. Field of study	AUTOMATION, APPLIED INFORMATICS AND INTELLIGENT SYSTEMS
1.5. Study Cycle	BACHELOR OF SCIENCE
1.6. Study Program/Qualification	AUTOMATION AND APPLIED INFORMATICS (IN ENGLISH) (AIA-E)

48. Course Information

2.1 Course Title:	ELEMENTS OF ELECTRICAL EXECUTION
2.2 Course Lecturer:	Assoc. Prof. Dr. Valentin Dan MULLER
2.3 Seminar/Laboratory Instructor:	Assoc. Prof. Dr. Valentin Dan MULLER
2.4 Year of Study:	3
2.5 Semester	2
2.6 Type of Assessment:	VERIFICATION
2.7 Course Status:	DS-Optional

49. Estimated Total Time (hours per semester of didactic activities)

3.1. Hours per week	2	of which 3.2 lecture	1	3.3 Laboratory	1
3.4. Total hours in the study plan	28	of which 3.5 lecture	14	3.6 Laboratory	14
Time allocation:					Hours
Study based on course materials, bibliography					8
Additional documentation in library, specialized databases, or field work					5
Preparation for seminars/labs, essays, portfolios					2
Tutoring					2
Examinations					5
Other activities...					-
3.7 Total hours of individual study					22
3.8 Total hours per semester					50
3.9 Number of credits					2

50. Preconditions (where applicable)

4.1. of curriculum	Mathematical Analysis, Algebra, Physics, Electrical Engineering, Electrical Machinery
4.2. of competences	Knowledge and appropriate use of the notions specific to the discipline; Knowledge and deepening of some fundamental notions of special electric cars.

51. Conditions (where applicable)

5.1. of conducting the course	Classroom equipped with IT systems (video projector, etc.).

5.2. of conducting the laboratory	Specialized laboratories within the institution or within partner companies.

52. Specific competencies acquired

Professional Competencies	C5. Designcontrol systems - Develops devices that command and manage the behavior of other devices and systems, using the principles of engineering and electronics.
Transversal competencies	CT2. Comply with regulations - Comply with rules, regulations and guidelines relating to a specific field or sector and apply them in their day-to-day work

7. Learning Outcomes

Knowledge	Graduate: Understand the basic and advanced principles of automatic control (feedback, stability, tuning) and their application in the design of automated systems. Know the structure, operation and interaction of hardware and software components in an industrial control system (sensors, actuators, controllers, interfaces). Know the principles of professional ethics and deontology. He is familiar with the applicable procedures and quality standards.
Skills	Graduate: Design automatic control structures for industrial processes using mathematical models and performance criteria. Integrates and configures hardware components (PLCs, microcontrollers, industrial communication networks) and software into a functional automatic control/control system. Correctly apply activity-specific regulations, procedures, and instructions. Propose solutions to improve compliance with rules and procedures.
Responsibilities and autonomy	Graduate: Evaluates and optimizes the performance of the designed system, taking responsibility for choosing technical solutions. Can work independently or in a team to implement and test automation solutions in a real professional environment. Has the ability to manage technical projects responsibly and on time. It has availability for continuous learning and professional adaptation in emerging fields (intelligent automation, IoT, AI in control). Manifestation of ethical behavior and a professional attitude in the engineering activity.Can work independently or in a team to implement and test automation solutions in a real professional environment. Has the ability to manage technical projects responsibly and on time.

	It has availability for continuous learning and professional adaptation in emerging fields (intelligent automation, IoT, AI in control). Manifestation of ethical behavior and a professional attitude in the engineering activity.

8. **Objectives of the discipline** (resulting from the grid of specific competences accumulated)

8.1.General objective of the discipline	• The main objective of the discipline is the knowledge of special electric machines and electric drive systems. • This course presents the types of electric machines and control schemes with these special electric machines, with their technical-constructive and functional characteristics.
8.2.Specific objectives	• Knowledge and appropriate use of the notions specific to the discipline. • Knowledge and deepening of some fundamental notions of special electric cars. • Assimilation of theoretical knowledge regarding drive systems with special electric machines.

9. **Content**

9.1 Course	**Teaching methods**	Observations
1. Electric amplifier machines. The external characteristic U=f(I_l) of the MEAT. Amplidina Cross Field Welding Generator. Transformer with adjustable magnetic shunt.	Oral presentation, completed with the presentation of images (video projector, etc.)	2 hours
2. Electric transducer micromachines. Tachogenerators. Synchronous tachogenerators. Asynchronous tachogenerators. Direct current tachogenerators.	Oral presentation, completed with the presentation of images (video projector, etc.)	2 hours
3. DC servo motors. Generalities. Servo motors with disc rotor**.** Servo motors with cup rotor. Mechanical characteristics of DC actuators controlled on the induct. Control of DC actuators	Oral presentation, completed with the presentation of images (video projector, etc.)	2 hours
4. Single-phase asynchronous motor. The principle of operation. The equations of the two-phase asynchronous machine in the hypothesis of a circular rotating magnetic field. Asynchronous servo motors. Mechanical Characteristics of Servo Motor	Oral presentation, completed with the presentation of images (video projector, etc.)	4 hours
5. Special synchronous motors. Synchronous motors with permanent magnets. Synchronous motors with variable reluctance. Self-Reducing Motors	Oral presentation	2 hours

6. Stepper synchronous motors . Construction and control of stepper motors. Angular characteristics of mpp with MP	Oral presentation, completed with the presentation of images (video projector, etc.)	2 hours
	Total	14 hours

Bibliography:

[1]. Müller, V. Course Support in Electronic Format, 2025.

[2]. Dordea, T. Electric Machines. Second Edition, Didactic and Pedagogical Publishing House, Bucharest, 1970.

[3]. Viorel, I.A.; Ciorba, R.C. Electric machines in drive systems. U.T. Pres Publishing House, Cluj-Napoca, 2002.

[4]. Müller, V. Electric Machines, Politehnica Publishing House, Timişoara, 2005.

[5]. Müller, V The single-phase asynchronous motor with auxiliary phase, Politehnica Publishing House, Timişoara, 2002.

[6]. Müller, V Single-phase asynchronous machine with auxiliary phase in automatic control systems 2004.

9.2 Laboratory:	**Teaching methods**	Observations
1. Labor protection, presentation of the types of special electric machines in the laboratory.	Classic + Presentation	2 hours
2. Adjusting the speed of the two-phase servo motor by the method of varying the amplitude of the control voltage	classic + assembly	2 hours
3. Adjusting the speed of the two-phase servo motor by the method of variation of the phase shift of the control voltage versus the excitation voltage	classic + assembly	2 hours
4. Mixed speed adjustment of the two-phase asynchronous servo motor**.**	classic + assembly	2 hours
5. The mechanical characteristics of the two-phase asynchronous servo motor**.**	classic + assembly	2 hours
6. Recovery	EN	4 hours
	Total	14 hours

Bibliography:

[1]. Electronic Laboratory Support, 2025.

[2]. Müller, V. The single-phase asynchronous motor with the auxiliary phase, Editura Politehnica Timişoara 2002.

[3]. Müller, V Single-phase asynchronous machine with auxiliary phase in automatic control systems 2004.

10. Corroboration/validation of the course content with the expectations of representatives of the epistemic community, professional associations, and representative employers in the field related to the program

First of all, the university curricula for a study program must be structured based on the proposals of the social partners of the higher education institution, so that the graduate of the respective study program is easy to enter the labor market, immediately after completing the first cycle of studies (bachelor's degree), thus being stimulated to participate in master's and doctoral courses, organised in collaboration with the social partners.

In the case of the study programme: Both the EU policy in the field and the standards in this field must be taken into account with immediate applicability, thus ensuring a compatibility of the curricula with the European ones as well as a better mobility of

students through the European programmes (SOCRATES/ERASMUS, Leonardo da Vinci, Tempus II, etc.).

11. Assessment

Type of activity	Evaluation criteria	Evaluation methods	Percentage of the final grade
11.1 Course	Students' ability to acquire a minimum level of knowledge.	Written method - Exam, at the end of the semester	65%
	Active participation of students in the course.	Oral method (during the semester)	10%
11.2 Laboratory	Students' ability to form and develop practical skills.	Oral method (at the end of the semester)	15%
	Active participation of students in laboratory work.	Oral + practical method (during the semester)	10%
11.3 Minimum Performance Standard			
• Classification of special electric cars • Operating principle and speed regulation of two-phase asynchronous servo motors			

Date of completion Signature of the course holder Signature of the laboratory instructor

20.09.2025 Assoc.Prof. dr.eng. Valentin Dan Muller Assoc.Prof. dr.eng. Valentin Dan Muller

Date of approval in the department Signature of the department director

26.09.2025 Assoc.Prof. dr.eng. Valentin Dan Muller

Date of approval in the faculty council Approval from the Dean

29.09.2026 Senior lecturer.dr.eng. Corina-Anca Mnerie

SYLLABUS

53. Program Information

1.1. Higher education institution	AUREL VLAICU UNIVERSITY OF ARAD
1.2. Faculty	FACULTY OF ENGINEERING
1.3. Department	AUTOMATION, INDUSTRIAL ENGINEERING, TEXTILES AND TRANSPORTS
1.4. Field of study	AUTOMATION, APPLIED INFORMATICS AND INTELLIGENT SYSTEMS
1.5. Study Cycle	BACHELOR OF SCIENCE
1.6. Study Program/Qualification	AUTOMATION AND APPLIED INFORMATICS (IN ENGLISH) (AIA-E)

54. Course Information

2.1. Name of the discipline	ELECTRIC DRIVE CONTROL AND REGULATION SYSTEMS
2.2. Course activity holder	Assoc.prof.dr.eng. Valentin Dan MULLER
2.3. Owner of the laboratory activity	Assoc.prof.dr.eng. Valentin Dan MULLER
2.4. Year of study	3
2.5. Semester	2
2.6. Type of assessment	VERIFICATION
2.7. Discipline regime	DS-optional

55. Total estimated time

3.1. Hours per week	2	of which 3.2 lecture	1	3.3 Laboratory	1
3.4. Total hours in the study plan	28	of which 3.5 lecture	14	3.6 Laboratory	14

Time allocation:	Hours
Study based on course materials, bibliography	8
Additional documentation in library, specialized databases, or field work	5
Preparation for seminars/labs, essays, portfolios	2
Tutoring	2
Examinations	5
Other activities...	-
3.7 Total hours of individual study	22
3.8 Total hours per semester	50
3.9 Number of credits	2

56. Preconditions (where applicable)

4.1. of curriculum	Mathematical Analysis, Linear Algebra, Physics, Electrical Engineering, Electrical Machinery
4.2. of competences	Knowledge and appropriate use of the notions specific to the discipline; Knowledge and deepening of some notions regarding the control of electric cars

57. Conditions (where applicable)

5.1. of conducting the course	Classroom equipped with IT systems (video projector, etc.).
5.2. of conducting the seminar and laboratory	Specialized laboratories within the institution or within partner companies.

58. Specific competences acquired

Professional Competencies	C5. Designcontrol systems - Develops devices that command and manage the behavior of other devices and systems, using the principles of engineering and electronics.
Transversal competencies	CT2. comply with regulations - Comply with rules, regulations and guidelines relating to a specific field or sector and apply them in their daily activity

7. Learning Outcomes

Knowledge	Graduate: • Understand the basic and advanced principles of automatic control (feedback, stability, tuning) and their application in the design of automated systems. • Know the structure, operation and interaction of hardware and software components in an industrial control system (sensors, actuators, controllers, interfaces)
Skills	Graduate: • Design automatic control structures for industrial processes using mathematical models and performance criteria. • Integrates and configures hardware components (PLCs, microcontrollers, industrial communication networks) and software into a functional automatic control/control system.
Responsibilities and autonomy	Graduate: • Evaluates and optimizes the performance of the designed system, taking responsibility for choosing technical solutions. • Can work independently or in a team to implement and test automation solutions in a real professional environment. • Has the ability to manage technical projects responsibly and on time. • It has availability for continuous learning and professional adaptation in emerging fields (intelligent automation, IoT, AI in control). • Manifestation of ethical behavior and a professional attitude in the engineering activity.Can work independently or in a team to implement and test automation solutions in a real professional environment. • Has the ability to manage technical projects responsibly and on time. • It has availability for continuous learning and professional adaptation in emerging fields (intelligent automation, IoT, AI in control).

	• Manifestation of ethical behavior and a professional attitude in the engineering activity.

8. Objectives of the discipline (resulting from the grid of specific competences accumulated)

8.1. General objective of the discipline	• The main objective of the discipline is to know the electrical drive systems. • This course presents the types of electric cars and control schemes with these electric cars, with their technical-constructive and functional characteristics.
8.2. Specific objectives	• Knowledge and appropriate use of the notions specific to the discipline. • Knowledge and deepening of some fundamental notions of electric cars. • Assimilation of theoretical knowledge regarding drive systems with electric cars.

9. Content

9.1 Course	**Teaching methods**	**Observations**
1. Structure of a high-performance electric drive system	Oral presentation, completed with the presentation of images (video projector, etc.)	2 hours
2. Methods of adjusting the speed of DC machines	Oral presentation, completed with the presentation of images (video projector, etc.)	2 hours
3. Driving DC motors powered by direct voltage inverters (VTC); control characteristics	Oral presentation, completed with the presentation of images (video projector, etc.)	2 hours
4. Equations of alternating current machines from the point of view of speed regulation; phasing equations, equations of state, transfer functions	Oral presentation, completed with the presentation of images (video projector, etc.)	2 hours
5. Adjustable electric drives with AC machines powered by static frequency converters;	Oral presentation	2 hours
6. The principles of vector regulation of the induction machine. The analogy between the DC machine and the field-oriented asynchronous machine. . The principle of direct torque control in AC machines; Stator	Oral presentation, completed with the presentation of images (video projector, etc.)	4 hours

torque and flow regulation scheme in an asynchronous machine		
	Total	14 hours

Bibliography

[1]. Müller, V. Course Support in Electronic Format, 2025.

[2]. Dordea, T. Electric Machines. Second Edition, Didactic and Pedagogical Publishing House, Bucharest, 1970.

[3]. Viorel, I.A.; Ciorba, R.C. Electric machines in drive systems. U.T. Pres Publishing House, Cluj-Napoca, 2002.

[4]. Müller, V. Electric Machines, Politehnica Publishing House, Timişoara, 2005.

[5]. Müller, V The single-phase asynchronous motor with auxiliary phase, Politehnica Publishing House, Timişoara, 2002.

[6]. Müller, V Single-phase asynchronous machine with auxiliary phase in automatic control systems 2004.

9.2 Laboratory:	Teaching methods	Observations
1. Labor protection, presentation of the types of special electric machines in the laboratory.	Classic + Presentation	2 hours
2. Control structure for regulating the speed of the two-phase servo motor by the method of variation of the amplitude of the control voltage	classic + assembly	2 hours
3. Control structure for adjusting the speed of the two-phase servo motor by the method of variation of the phase shift of the control voltage from the excitation voltage	classic + assembly	2 hours
4. Mixed speed adjustment of the two-phase asynchronous servo motor.	classic + assembly	2 hours
5. The mechanical characteristics of the two-phase asynchronous servo motor.	classic + assembly	2 hours
6. Recovery	EN	4 hours
	Total	14 hours

Laboratory bibliography:

[1]. Electronic Laboratory Support, 2025.

[2]. Müller, V. The single-phase asynchronous motor with the auxiliary phase, Editura Politehnica Timişoara 2002.

[3]. Müller, V Single-phase asynchronous machine with auxiliary phase in automatic control systems 2004.

10. Corroboration of the contents of the discipline with the expectations of the representatives of the epistemic community, professional associations and employers representative in the field related to the program

- First of all, the university curricula for a study program must be structured based on the proposals of the social partners of the higher education institution, so that the graduate of the respective study program is easy to enter the labor market, immediately after completing the first cycle of studies (bachelor's degree), thus being stimulated to participate in master's and doctoral courses, organised in collaboration with the social partners.
- In the case of the study programme: Both the EU policy in the field and the standards in this field with immediate applicability must be taken into account,

thus ensuring a compatibility of the curricula with the European ones as well as a better mobility of students through the European programmes (SOCRATES/ERASMUS, Leonardo da Vinci, Tempus II, etc.).

11. Assessment

Type of activity	Evaluation criteria	Evaluation methods	Percentage of final grade
11.1 Course	Students' ability to acquire a minimum level of knowledge.	Written Method - Exam, at the end of the semester	65%
	Active participation of students in the course.	Oral method (during the semester)	10%
11.2 Laboratory	Students' ability to form and develop practical skills.	Oral method (at the end of the semester)	15%
	Active participation of students in laboratory work.	Oral + practical method (during the semester)	10%
11.3 Minimum Performance Standard			
• Methods of adjusting the speed of DC and AC machines			

Date of completion Signature of the course holder Signature of the laboratory instructor

20.09.2025 Assoc.Prof. dr.eng. Valentin Dan Muller Assoc.Prof. dr.eng. Valentin Dan Muller

Date of approval in the department Signature of the department director

26.09.2025 Assoc.Prof. dr.eng. Valentin Dan Muller

Date of approval in the faculty council Approval from the Dean

29.09.2026 Senior lecturer.dr.eng. Corina-Anca Mnerie

Date of approval in the faculty council Approval from the Dean

29.09.2026 Senior lecturer.dr.eng. Corina-Anca Mnerie

SYLLABUS

1. Program Information

1.1 Higher education institution	AUREL VLAICU UNIVERSITY OF ARAD
1.2 Faculty	FACULTY OF ENGINEERING
1.3 Department	AUTOMATION, INDUSTRIAL ENGINEERING, TEXTILES AND TRANSPORTS
1.4 Field of study	AUTOMATION, APPLIED INFORMATICS AND INTELLIGENT SYSTEMS
1.5 Study Cycle	BACHELOR OF SCIENCE
1.6 Study Program/Qualification	AUTOMATION AND APPLIED INFORMATICS (IN ENGLISH) (AIA-E)

2. Data about the discipline

2.1 Name of the discipline	AUTOMATED SAMPLING SYSTEMS
2.2 Course activity holder	Senior Lecturer dr.eng. Flavius-Maxim PETCUȚ
2.3 Seminar/laboratory activity holder	Senior Lecturer dr.eng. Flavius-Maxim PETCUȚ
2.4 Year of study	3
2.5 Semester	2
2.6 Type of assessment	VERIFICATION
2.7 Discipline regime	DS-compulsory

3. Total estimated time (hours per semester of teaching activities)

3.1 Hours per week	2	of which 3.2 lecture	1	3.3 Laboratory	1
3.4 Total hours in the study plan	28	of which 3.5 lecture	14	3.6 Laboratory	14
Time allocation:					Hours
Study based on course materials, bibliography					5
Additional documentation in library, specialized databases, or field work					5
Preparation for seminars/labs, essays, portfolios					5
Tutoring					5
Examinations					2
Other activities...					
3.7 Total hours of individual study					22
3.8 Total hours per semester					50
3.9 Number of credits					2

4. Preconditions (where applicable)

4.1 of curriculum	Systems Theory, Automation Systems Engineering, Digital Electronics.
4.2 of competences	Knowledge of physics and mathematics, electronics

5. Conditions (where applicable)

5.1 of conducting the course	Room with projector
5.2 of conducting the laboratory	Laboratory room (computers with Matlab/Simulink) Equipment for verifying theoretical knowledge

6. Specific Competencies Acquired

Professional competencies	C5. Design control systems - Develop devices that command and manage the behavior of other devices and systems, using the principles of engineering and electronics.
Transversal competencies	CT3. Think analytically – Think using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions, or approaches to problems.

7. Learning Outcomes

Knowledge	Graduate: Understand the basic and advanced principles of automatic control (feedback, stability, tuning) and their application in the design of automated systems. Know the structure, operation and interaction of hardware and software components in an industrial control system (sensors, actuators, controllers, interfaces). It processes information, ideas and concepts. Solve problems. Think creatively and innovatively.
Skills	Graduate: Design automatic control structures for industrial processes using mathematical models and performance criteria. Integrates and configures hardware components (PLCs, microcontrollers, industrial communication networks) and software into a functional automatic control/control system. Think analytically. Think critically. Think creatively.
Responsibilities and autonomy	Graduate: Evaluates and optimizes the performance of the designed system, taking responsibility for choosing technical solutions. Can work independently or in a team to implement and test automation solutions in a real professional environment. Has the ability to manage technical projects responsibly and on time. It has availability for continuous learning and professional adaptation in emerging fields (intelligent automation, IoT, AI in control). Approach problems critically.

8. Objectives of the discipline (resulting from the grid of specific competences accumulated)

8.1 General objective of the discipline	Training the skills necessary for the analysis, design and implementation of automated sampling systems, with a

	focus on the use of methods and tools specific to digital control.
8.2 Specific objectives	Understanding the principles of sampling, reconstruction, and modeling of discrete dynamical systems. Analyzing the operation of automated sampling systems used in industry. Use of numerical simulation methods for the study of the response of discrete systems (Matlab/Simulink). Development of digital regulator design skills and evaluation of their performance. Practical application of theoretical notions through laboratory activities and case studies. To train the skills of integrating hardware and software components into an automated system with digital control.

9. Contents

9.1 Course	Teaching methods	Observations
Ch. 1. Introduction to discrete-time systems 1.1. Discrete signals 1.2. Laplace and z transformations 1.3. Properties of the z-transformation 1.4. Fourier spectral analysis	Oral presentations. Projecting Powerpoint slides using video-projector	4 hours
Chapter 2. Sampling theorem (shannon) 2.1. Sampling theorem (Shannon) 2.2. Consequences of the misapplication of the sampling theorem. 2.3. The phenomenon of Aliasing 2.4. Effect of switching regulators 3.4. Resampling discrete models 3.5. Modeling discrete signals in Simulink 3.6. Discrete Block Library 3.7. Simulink Model Discretizer	Oral presentations. Projecting Powerpoint slides using video-projector	4 hours
Chapter 3. Modeling discrete signals in matlab 3.1. Discrete transfer functions 3.2. Conversions between continuous and discrete time representations 3.3. Conversion methods -	Oral presentations. Projecting Powerpoint slides using video-projector	4 hours
Chapter 4. Discrete System Applications in Discrete Time 4.1. Digital regulators	Oral presentations. Projecting Powerpoint slides using video-projector	2 hours

4.2. Numeric Filters 4.3. Applications		
	Total	14 hours
Course bibliography	1. P. Marwedel: "Embedded Systems Foundations of Cyber-Physical Systems", second edition, "Embed-ded Systems Design" Series, Springer, 2011. 2. I. Dumitrache and others: "Automatica" vol. 1. Romanian Academy Publishing House, 2010. 3. I. Dumitrache and others: "Electronic Automation", Didactic and Pedagogical Publishing House, Bucharest, 1993. 4. D. Popescu, s.a.: "Automatica Industriala", AGIR Publishing House, Bucharest, 2006. 5. D. Popescu, C. Voloşencu, S. Nanu, A.M. Dan, L. Peană, T.L. Dragomir: "The Theory of Systems. Applications 1", Ed. Politehnica, 2005. 6. R.C. Dorf, R.H. Bishop, "Modern Control Systems," Pearson Educational International, 2005. 7. C. Pozna: "The Theory of Automatic Systems", MatrixRom, Bucharest, 2004. 8. Petcuț Flavius Maxim: "Sampling systems" course support, electronic version, 2025.	

9.2 Laboratory	**Teaching methods**	**Observations**
1. Discrete transfer functions. Conversions between representations in continuous and discrete time. 2. ZOH zero-order restraint elements. 3. Elements of retention of order one FOH and Tus-tin approximation. 4. Modeling discrete systems in Simulink. 5. Simulink Model Discretizer. 6. Digital PID Controllers 7. Designing a temperature controller7. Design of a temperature regulator	Realization and testing of assemblies	14 hours
	Total	14 hours
Laboratory bibliography: 1. I. Dumitrache and others: "Automatica" vol. 1. Romanian Academy Publishing House, 2010. 2. I. Dumitrache and others: "Electronic Automations", Didactic and Pedagogical Publishing House, Bucharest, 1993. 3. D. Popescu, s.a.: "Automatica Industriala", AGIR Publishing House, Bucharest, 2006.		

4. D. Popescu, C. Voloşencu, S. Nanu, A.M. Dan, L. Peană, T.L. Dragomir: "The Theory of Systems. Applications 1", Politehnica Publishing House, 2005.
5. S. Preitl, R.E. Precup: "Introduction to the Engineering of Automatic Regulation", vol. 1, Politehnica Publishing House, Timişoara, 2001.
6. N.E. Leonard, S.W. Levine, "Using MATLAB to Analyze and Design Control Systems," Addison-Wesley Publishing Company, 1995.
7. Petcuț Flavius Maxim: "Sampling systems" laboratory support, electronic version, 2025.

10. Corroboration/validation of the contents of the discipline with the expectations of the representatives of the epistemic community, professional associations and employers representative in the field related to the program

The content of the discipline is in accordance with what is done in other university centers in the country and abroad.
In order to better adapt the content of the discipline to the requirements of the labor market, meetings were held both with representatives of the business environment and with other specialized professors from other higher education centers in the country or abroad.
The discipline is developed on the basis of internationally recognized field textbooks.
Some of the examples presented during the course and seminar were discussed at national and international conferences and lectures;

11. Assessment

Type of activity	Evaluation criteria	Evaluation methods	Percentage of final grade
11.1 Course	Material uploaded to the platform	Written exam	67%
11.2 Laboratory	Applications in laboratory work	Mathematical average of grades	33%
11.3 Minimum Performance Standard			

Date of completion Signature of the course holder Signature of the laboratory instructor
20.09.2025 Senior Lecturer dr.eng. Flavius M. Petcu Senior Lecturer dr.eng. Flavius M. Petcuț

Date of approval in the department Signature of the department director

26.09.2025 Assoc.prof.dr.ing. Valentin Dan Muller

Date of approval in the faculty council Approval from the Dean

29.09.2026 Senior lecturer.dr.eng. Corina-Anca Mnerie

SYLLABUS

59. Program Information

1.1. Higher education institution	AUREL VLAICU UNIVERSITY OF ARAD
1.2. Faculty	ENGINEERING
1.3. Department	AUTOMATION, INDUSTRIAL ENGINEERING, TEXTILES AND TRANSPORT
1.4. Field of study	AUTOMATION, APPLIED INFORMATICS AND INTELLIGENT SYSTEMS
1.5. Cycle of studies	BACHELOR OF SCIENCE
1.6. Study Programme/Qualification	AUTOMATION AND APPLIED INFORMATICS (IN ENGLISH) (AIA-E)

60. Course Information

2.1. Name of the discipline	SPECIALIZED PRACTICE
2.2. Course activity holder	
2.3. Seminar/laboratory activity holder	
2.4. Year of study	3
2.5. Semester	2
2.6. Type of assessment	VERIFICATION
2.7. Discipline regime	DS-compulsory

61. Total estimated time

3.1.Number of hours per week		of which 3.2 course		3.3 Seminar/laboratory/internship	
3.4.Total hours in the curriculum	90	of which 3.5 courses		3.6 Seminar/laboratory/practice	90
Time Pool Distribution					Hours
Study by textbook, course material, bibliography and notes					
Additional documentation in the library, on specialized electronic platforms and in the field					10
Preparation of seminars/laboratories, assignments, papers, portfolios and essays					
Tutorials					
Examination					
Other activities					
3.7.Total hours of individual study					
3.9.Total hours per semester					**100**
3.10.Number of appropriations					**4**

62. Preconditions (where applicable)

4.1.de curriculum	Quality standards; User Manuals
4.2.de competences	Labor protection rules

63. Conditions (where applicable)

5.1.de course	-

5.2.de seminar/laboratory	Attendance at practical activities is mandatory.

6. Specific competencies acquired

Professional competencies	C1 – Perform analytical mathematical calculations. C2 – Design electronic systems. C4 - Analyzes production processes for improvement.
Transversal competencies	CT1 – Work in teams. CT2 – Comply with regulations.

7. Learning Outcomes

Knowledge	Graduate: - Knows and identifies mathematical methods (linear algebra, numerical analysis) for modeling and solving engineering problems. -Use specific software tools (e.g. MATLAB) to automate analytical calculations and verify mathematical solutions in real contexts. Graduate: -Has knowledge of electronic schematics and methods of designing electronic systems. -Has knowledge in simulation programs -Define performance indicators. -Proposes and validates optimization solutions to reduce costs and increase efficiency. Graduate: -Knows the principles and stages of teamwork -Know ways to communicate and collaborate effectively -Knows the principles of professional ethics and deontology -Is familiar with applicable procedures and quality standards
Skills	-Applies advanced mathematical methods (linear algebra, numerical analysis) for modeling and solving engineering problems. -Use specific software tools (e.g. MATLAB) to automate analytical calculations and verify mathematical solutions in real contexts. -Identifies losses and non-conformities in the production process based on performance indicators. Propose and validate optimization solutions to reduce costs and increase efficiency. -Makes electronic schematics and printed circuit boards using specialized software. -Performs simulations to verifythe functionality and reliability of systems designed before manufacturing.
Responsibilities and autonomy	Graduate:

	-Evaluates and optimizes the performance of the designed system, assuming responsibility for choosing technical solutions. -Can work independently or in a team to implement and test automation solutions in a real professional environment. -Evaluates and optimizes the performance of the designed system, assuming responsibility for choosing technical solutions. -Can work independently or in a team to implement and test automation solutions in a real professional environment. -Has the ability to manage technical projects responsibly and on time. -Has availability for continuous learning and professional adaptation in emerging fields (intelligent automation, IoT, AI in control). -Assumes his/her own tasks and respects the deadlines set in the team. - Contributes to a positive and productive climate in the team.

8. Objectives of the discipline (resulting from the grid of specific competences acquired)

8.1 General objective of the discipline	The main objective of the discipline is to integrate students into real professional activities in their field of specialization, through the practical application of the acquired theoretical knowledge, the development of technical skills and the formation of the skills necessary to adapt to the requirements of the work environment.
8.2 Specific objectives	- Familiarizing students with the professional environment, the organizational structure and the way of functioning of an institution or company in the field of their specialization. - Practical application of theoretical knowledge, by getting involved in real activities, projects and tasks, specific to the field of study. - Developing technical and operational skills, through the use of industry-specific equipment, tools, technologies and software. - Training the ability to work in a team, collaborate effectively with professionals in the field and communicate clearly and professionally. - Acquiring the work procedures, quality, safety and professional ethics rules specific to the sector of activity. - Development of analysis and problem-solving skills, by participating in the identification, diagnosis and optimization of processes. - Observing and understanding workflows, technological processes, and how different system components are integrated.

	- Exercising professional responsibility and autonomy, by assuming concrete tasks and complying with deadlines and work standards. - Improving time management skills and organizing activities in a real professional context. - Preparation of a well-structured practice report, in which the activities carried out, the experiences acquired and the skills developed are analyzed.

10. Content

9.1 Course	Teaching methods	Observations
9.2 Laboratory	Teaching methods	Observations

10. Corroboration of the contents of the discipline with the expectations of the representatives of the epistemic community, professional associations and employers representative in the field related to the program

Operating with up-to-date concepts from computer science, information and communication technology.

11. Assessment

Type of activity	Evaluation criteria	Evaluation methods	Percentage of final grade
11.1 Course			
11.2 Laboratory			
11.3 Field practice	Colloquium	Practice Notebook Discussion	80% 20%
11.4 Minimum Performance Standard			
Fulfillment of the evaluation criterion in a proportion of at least 50%.			

Date of completion
20.09.2025

Signature of the department director
Assoc.prof.dr.eng. Valentin Dan Muller

Date of approval in the department

26.09.2025

Dean's signature

Senior lecture dr.eng. Corina-Anca Mnerie

Date of approval in the faculty council

29.09.2026

Approval from the Dean

Senior lecturer.dr.eng. Corina-Anca Mnerie

Endorsed by Project Manager,
Nicoleta Dumitrașcu

SYLLABUS

MODULE 1

INTRODUCTION TO ENTREPRENEURSHIP

General Objective of the Discipline

The course aims to facilitate the understanding of the concepts of entrepreneurship, entrepreneur, enterprise, and the entrepreneurial process. Theoretical notions are intended to become operational for the practical purpose of starting a business as a career development opportunity and an alternative to being an employee. It also provides a guide to orient the entrepreneur in decisions regarding the initiation and development of a business through the creation of a business plan.

Professional Competencies

CP1: Operationalizing main theories, concepts, and explanatory models of the entrepreneurial process applicable to private initiatives.

CP2: Explaining legislative, financial, and legal principles and mechanisms specific to private entrepreneurial initiatives.

CP6: Diagnosing dysfunctions and possible risks in implementing an entrepreneurial initiative in specific fields of activity.

Transversal Competencies

CT1: Applying principles, norms, and values of professional ethics within one's own rigorous and responsible work strategy.

CT2: Formulating and implementing communication techniques to optimize team cooperation in an entrepreneurial context.

Topics:

Topic: INTRODUCTORY NOTIONS OF ENTREPRENEURSHIP

1. Fundamental notions in the field of entrepreneurship: short history of entrepreneurship and defining the concepts of entrepreneurship and entrepreneur.
2. Characteristics of the entrepreneurial process.
3. The entrepreneurial process: the entrepreneur's goals by reporting to his potential. How to build a successful business. SWOT analysis in a business.

Specific objective:

At the end of the training, the students will be capable of:

- defining the notions of entrepreneurship and entrepreneur;
- identifying the fundamental elements of an independent activity.

Distribution of the time fund, reported to the content of the activities and the resources for the course for

<u>topic 1 course</u>: Fundamental notions in the field of entrepreneurship

Number of hours allocated to course + seminar **Topic 1. Fundamental notions in the field of entrepreneurship**			
Total	**Course (C)**	**Seminar (S)**	**Evaluation(Ev)**
4	2	2	Participatory observation and attendance sheet

Fundamental notions in the field of entrepreneurship: short history of entrepreneurship and defining the concepts of entrepreneurship and entrepreneur

Budget Time	Duration	Course content	Activities	Methods used in teaching	Material resources
1 hour	20’	Fundamental notions in the field of entrepreneurship: short history of entrepreneurship at the international level	Schematic presentation of materials	Discussion, Debate	Video projector, Laptop, Internet access
	30’	Fundamental notions in the field of entrepreneurship: short history of entrepreneurship in	Schematic presentation of materials	Discussion, Debate	Video projector, Laptop, Internet access

		Romania			
	10’	Practical applications for checking the understanding of concepts	Exemplifications, Success stories	Exemplifications, Practical applications from previous experience in the field of entrepreneurship	Internet access, Film
1 hour	30’	Fundamental notions in the field of entrepreneurship: defining the concepts of entrepreneurship.	Defining the theoretical concepts of the entrepreneurial process.	Exposure, Exemplification, Brainstorming type debate, Filming	Colored markers, Flipchart sheets, Flipchart; Internet access, Video projector, Film
	30’	Fundamental notions in the field of entrepreneurship: defining the concepts of entrepreneur.	Defining the theoretical concepts of the entrepreneur's function.	Exposure, Exemplification, Filming, Brainstorming type debate	Colored markers, Flipchart sheets, Flipchart; Internet access, Video projector, Film
Total: 2 hours					

Summary of the topic:

The theoretical training session of the course lasts 2 hours. During the session, topics about a short history of entrepreneurship will be debated and the concepts of entrepreneurship and entrepreneur will be defined, in the form of two learning units centered on: a short history of entrepreneurship at the international level and in Romania and on defining the concepts of entrepreneurship and entrepreneur. The students will identify practical situations in the entrepreneurial environment, they will practice using the understanding of specialized terms, through exemplification from practical experience and through theoretical debates. They will analyze, following a viewing, a film on the theme of entrepreneurship and success stories. To engage the students in the training session, an exercise of interrelation, discussion, and brainstorming-type debate will be proposed, with the exemplification of some successful businesses.

Training strategies used

During the topic, the trainers will use the following training and learning strategies and methods:

- Exposure
- Exemplification
- Discussion
- Brainstorming type debate
- Analysis of a filmed material with educational role

Material and technical resources in supporting the course:

Video projector, Laptop, Internet access, Flip-chart, colored markers, pencils, flipchart sheets, flipchart, thematic film with educational role in the field of entrepreneurship, success stories.

Strategy for ongoing evaluation within topic 1. The evaluation during this topic will be realized based on the observation of the participation and activity of the trainees, during the time destined for face-to-face organization. For this purpose, there will be dialogue with the trainees, questions will be addressed, and trainees will be requested to present their own experience, in the form of practical exemplifications from real life and previous entrepreneurial experiences. The attendance sheet signed at each course is taken into consideration.

Bibliography

1. **Boaghe, D.** *Factori determinanți ai comportamentului antreprenorial în cazul tinerilor* [Determinant factors of entrepreneurial behavior in youth], https://irek.ase.md/xmlui/bitstream/handle/1234567890/891/Boaghe_D_SIMPOZION_19-20_iunie_2020.pdf?sequence=1&isAllowed=y, 2020;
2. **Burlacu, F.** *Importanța și rolul finanțării tinerilor antreprenori* [The importance and role of financing for young entrepreneurs], https://irek.ase.md/xmlui/bitstream/handle/123456789/1555/BURLACU%20Felicia_Simp ozion_16-17%20aprilie%202021%20Vol.3.pdf?sequence=1, 2021;
3. **Farrell, L.C.** *Cum să devii antreprenor* [How to become an entrepreneur], Curtea Veche Publishing, Bucharest, 2008;
4. **Gordon, M.E.** *Antreprenoriatul* [Entrepreneurship], Curtea Veche Publishing, Bucharest, 2012;
5. **Iacob, M.I.** *Antreprenoriatul – Forța motrice a oricărei întreprinderi* [Entrepreneurship – The driving force of any enterprise], "Aurel Vlaicu" University Press, Arad, 2008;
6. **Mariotti, S., Glackin, C.** *Antreprenoriat. Lansarea și administrarea unei afaceri* [Entrepreneurship: Launching and managing a business], Bizzkit Publishing, 2012.

Online resources:

https://dictionary.cambridge.org/dictionary/english/entrepreneurship

Seminar topics:

Seminar topic INTRODUCTORY NOTIONS OF ENTREPRENEURSHIP seminar:

1. Are you born an entrepreneur or do you learn to become one? Qualities versus competencies.
2. Who is the entrepreneur.
3. Common personal traits and skills of the successful entrepreneur.
4. Successful businesses - practical examples.

Specific objective of the seminar: At the end of the training, the students will be capable of:

- describing the most important competencies, characteristics, attributes, lifestyle, skills, and traits specific to an entrepreneur.

Topic 1 seminar: Are you born an entrepreneur or do you learn to become one? Qualities versus competencies.

Budget Time	Content of the course	Activities	Methods used in teaching	Material resources
1 hour	Are you born an entrepreneur or learn to become one?	Students will identify practical situations in the entrepreneurial environment, practice understanding specialized terms. An interrelation exercise and case study will be proposed.	Debate, Cooperative learning, Discovery learning, Working in teams, Brainstorming	Video projector, laptop, internet access
1 hour	Qualities versus competencies	Case studies from the local entrepreneurial community will be analyzed and they will identify their temperamental profile as an entrepreneur and the practical skills they possess in the sphere of intrinsic motivation for starting a business, by answering a questionnaire.	Case study, Exercise	Flipchart, Colored markers, Flipchart sheets, Worksheets
Total 2 hours				

Summary of the topic:

The practical training session within the seminar lasts 2 hours. The time budget will be broken down into two practical learning units. During the first learning session, practical topics will be presented and debated within the seminar, regarding the practical learning capacity of the trainees in becoming a successful entrepreneur. In the second learning unit, aspects regarding the concepts of competencies and/or qualities necessary for a successful entrepreneur will be analyzed. An individual temperamental profile and entrepreneurial aptitudes profile will be created to become a successful entrepreneur.

Training strategies used

During the topic, the trainers will use the following training and learning strategies and methods:

- Debate
- Conversation
- Discovery learning
- Case study
- Cooperative learning
- Brainstorming

Material and technical resources in supporting the course:

Video projector, laptop, internet access, flipchart, flipchart sheets, colored markers, pencils. Questionnaire for evaluating the temperamental profile - worksheets.

Strategy for ongoing evaluation within topic 1

The evaluation during this module will be realized based on the observation of the participation and activity of the trainees, during the time destined for face-to-face organization. For this purpose, there will be dialogue with the trainees, questions will be addressed to them, and they will be requested to present their own experience.

Bibliography

1. **Barrow, C., Barrow, P., & Brown, R.** *Ghidul întocmirii planului de afaceri* [The Business Plan Workbook], Casa Cărții de Știință, Cluj-Napoca, 2002.
2. **Crețu, D., & Daniliuc, F. S.** *Ghid practic pentru antreprenori* [Practical Guide for Entrepreneurs], Evrika Publishing, Bucharest, 2021.
3. **Farrell, L. C.** *Cum să devii antreprenor* [How to Become an Entrepreneur], Curtea Veche Publishing, Bucharest, 2008.
4. **Ghenea, M.** *Antreprenoriat: drumul de la idei către oportunități și succes în afaceri* [Entrepreneurship: The Road from Ideas to Opportunity and Business Success], Evrika Publishing, Bucharest, 2021.
5. ***Propriul meu plan de afaceri*** [My Own Business Plan], available at www.rs.ro
6. **Gavrilă-Ardelean, M. F., Gavrilă-Ardelean, V. L., & Grivu, O. N.** (2008). *Dezvoltarea comunitară* [Community Development]. "Aurel Vlaicu" University Press, p. 24.

On-line resources:

https://cursuri-antreprenori.eu/wp-content/uploads/2020/05/Curs-complementar-Competenteantreprenoriale.pdf

https://dictionary.cambridge.org/dictionary/english/entrepreneurship

Topic 2 course: CHARACTERISTICS OF THE ENTREPRENEURIAL PROCESS
Specific objectives At the end of the course, students will be capable of:

- defining the notions of entrepreneurship and entrepreneur;
- identifying the characteristics of the entrepreneurial process;
- identifying the fundamental elements of an independent activity.

Number of hours allocated to course + seminar Topic 2. Characteristics of the entrepreneurial process			
Total	Course (C)	Seminar (S)	Evaluation(Ev)
8	6	2	Participatory observation and attendance sheet

Topic 2. Characteristics of the entrepreneurial process

Budget Time	Content of the course	Activities	Methods used in teaching	Material resources
2 hours	Characteristics of the entrepreneurial process: identifying regional market opportunities and obtaining capital necessary for establishing an enterprise	Schematic presentation of materials; A debate will be initiated regarding regional entrepreneurial opportunities.	Exposure, Discussion, Debate	Video projector, laptop, internet access
2 hours	Characteristics of the entrepreneurial process: building the Business Plan, establishing the company, consultation/knowledge of current national legislation; legal consultancy;	Students will identify practical situations, practice using terms through practical exemplification and theoretical debates. They will watch a film.	Case studies, Exercise, Problematization, Cooperative learning	Video projector, Laptop, internet access
Total 6 hours				

Summary of the topic:

Characteristics of the entrepreneurial process.

The theoretical training session of the course lasts 6 hours. During the session, topics about describing the stages of the entrepreneurial process will be debated and specific concepts will be defined.

The 6 hours are divided into three learning units of 2 hours each:

- 2 hours - identifying regional market opportunities and obtaining capital;
- 2 hours - building the Business Plan, establishing the company, legislation, and legal consultancy;
- 2 hours - business management.

Training strategies used

- Exposure,
- Exercise,
- Problematization,
- Debate,
- Case studies.

Material and technical resource

Video projector, laptop, internet access, flip-chart, markers, successful business cases.

Strategy for ongoing evaluation within topic 2.

Evaluation throughout this topic will be carried out based on the observation of the participation and activity of the trainees, during the time destined for face-to-face organization. For this purpose, there will be dialogue with the trainees, questions will be addressed, and trainees will be requested to present their own experience, in the form of practical exemplifications from real life and previous entrepreneurial experiences, [as well as] the staged evaluation of the Business Plan.

Bibliography

1. Barrow C., Barrow P., Brown R., Guide to preparing a business plan, 2002.
2. Creţu Daniel, Daniliuc Felix Silviu, Practical guide for entrepreneurs, 2021.
3. Farrell, L.C., How to become an entrepreneur, 2008.
4. Ghenea Marius, Entrepreneurship: the road from ideas to opportunities and success in business, 2021.
5. My own business plan, available on www.rs.ro
6. Gavrilă-Ardelean, M. F., et al. Community development, 2008.

Online resources:

https://cursuri-antreprenori.eu/wp-content/uploads/2020/05/Curs-complementar-Competenteantreprenoriale.pdf
https://dictionary.cambridge.org/dictionary/english/entrepreneurship

Topic 2 seminar: Who is the entrepreneur? Are you born an entrepreneur or do you learn to become one? Qualities versus competencies.

1. Who is the entrepreneur
2. Common personal traits and skills of the successful entrepreneur
3. Successful businesses – practical examples

Specific objective of the seminar:

Trainees will be capable of:

- identifying traits of successful entrepreneurs;
- describing the most important competencies and traits

Budget Time	Content of the course	Activities	Methods used in teaching	Material resources
1 hour	Who is the entrepreneur	Practical applications analyzing local case studies and identifying individual temperamental profile and intrinsic motivation via questionnaire.	Case study, Discovery learning, Cooperative learning	Video projector, laptop, internet access
1 hour	Who is the entrepreneur: Personal qualities of the successful entrepreneur	Participants will engage in practical applications where they will analyze case studies from the local entrepreneurial community. They will also identify their temperamental profiles as entrepreneurs and the practical skills they possess in the area of intrinsic motivation for starting a business by completing a questionnaire.	Case study, Discovery learning, Cooperative learning	Flipchart, Colored markers, Flipchart sheets
Total 2 hours				

Summary of the topic: Who is the entrepreneur.

The practical training session within the seminar lasts 2 hours. The time budget will be broken down into two practical learning units, each with a duration of 60 minutes.

During the first session, the seminar's practical themes will be presented and debated, focusing on enhancing the trainees' practical capacity to become successful entrepreneurs.

In the second 60-minute learning unit, aspects regarding the concepts, competencies, and/or qualities required of a successful entrepreneur will be analyzed. Participants will identify practical situations within the entrepreneurial environment and practice the use and understanding of specialized terminology.

Training strategies used:

Throughout the topic, trainers will utilize the following training and learning strategies and methods:

- Brainstorming,
- Discovery learning,
- Cooperative learning,
- Working in teams,
- Debate.

Material and technical resources:

Video projector, laptop, internet access, flipchart, flipchart paper, and colored markers.

Ongoing Evaluation Strategy for Seminar Topic 2

Evaluation during this module will be based on the observation of the trainees' participation and activity during the face-to-face sessions. To this end, trainers will engage in dialogue with the trainees, ask questions, and request that they present their own experiences.

Bibliography

1. Cordoş, R.C., Sărmăşan, R., & Oprea, S.G. *Analiza oportunităților tinerilor antreprenori români pentru deschiderea primei afaceri* [Analysis of Romanian Young Entrepreneurs' Opportunities for Opening a First Business]. Review of Management & Economic Engineering, 13(2), 2014.
2. Crețu, Daniel; Daniliuc, Felix Silviu. *Ghid practic pentru antreprenori* [Practical Guide for Entrepreneurs], Evrika Publishing, Bucharest, 2021.
3. Dinu, M. *Economia României – Întreprinderile mici și mijlocii* [Romania's Economy – Small and Medium-Sized Enterprises], Economică Publishing, Bucharest, 2002.
4. Drucker, P. *Inovația și sistemul antreprenorial* [Innovation and Entrepreneurship], Enciclopedică Publishing, Bucharest, 1993.

5. Farrell, L.C. *Cum să devii antreprenor* [How to Become an Entrepreneur], Curtea Veche Publishing, Bucharest, 2008.
6. Gavrilă-Ardelean, M. F., Gavrilă-Ardelean, V. L., & Grivu, O. N. (2008). *Dezvoltarea comunitară* [Community Development]. "Aurel Vlaicu" University Press, p. 24.
7. Timmons, J. A. (1989). *The Entrepreneurial Mind*. Brick House Publishing Co., 3 Main St., PO Box 512, Andover, MA (clothbound: ISBN-0-931790-84-0; paperback: ISBN-0-931790-85-9, $18.95).

Online resources:

https://www.econlib.org/library/Enc/Entrepreneurship.html
https://region-aura.latribune.fr/debats/opinion/2018-09-25/petite-histoire-du-verbeentreprendre-791111.html
https://region-aura.latribune.fr/debats/opinion/2018-09-25/petite-histoire-du-verbeentreprendre-791111.html
https://www.merriam-webster.com/dictionary/entrepreneur

Topic 3 course: THE ENTREPRENEURIAL PROCESS: the entrepreneur's goals by reporting to his potential

3.1. How to build a successful business

3.2. SWOT/ SWOTT analysis in a business

Specific objective:

- identify characteristics of the entrepreneurial process;
- analyze the entrepreneur's goals by reporting to own potential.

Number of hours allocated to course + seminar Topic 2. Characteristics of the entrepreneurial process			
Total	Course (C)	Seminar (S)	Evaluation(Ev)
12	6	6	Participatory observation and attendance sheet

Time allocation based on activity content and course resources for **Course Topic 3: The Entrepreneurial Process: Entrepreneurial Goals in Relation to Individual Potential.**

Budget Time		Content of the course	Activities	Methods used in teaching	Material resources
3 hours	1 hour	Entrepreneur's goals	Film analysis	Presentation Discussion Debate	Internet access, movie
	1 hour	Entrepreneur's goals relative to potential	Success story analysis	Presentation Discussion Debate	Internet access, movie
	1 hour	How to build a successful business	Success story analysis	Presentation Discussion Debate	Flipchart, Colored markers, Flipchart sheets, Worksheets
3 hours	1 hour	The entrepreneurial process: the entrepreneur's goals in relation to his potential: SWOT analysis in a business - definitions, uses	Conducting a SWOT analysis in a business	Discussion Debate Brainstorming	Flipchart, Colored markers, Flipchart sheets, Worksheets
	1 hour	SWOT: Internal analysis of the organization: strengths and weaknesses in the company. SWOT: External analysis of the organization: opportunities and threats for the company.	Internal SWOT analysis External SWOT analysis	Discussion Debate Brainstorming	Flipchart, Colored markers, Flipchart sheets, Worksheets
	1 hour	SWOTT: Analysis of current trends of new technologies for success in the company	SWOT analysis of the influence trends of new technologies	Discussion Debate Applications	Internet, promoting software
	Total 6 hours				

Summary of the topic:

In order for a person to be an entrepreneur, he needs a battery of skills, which are configured in a psychological profile of the entrepreneur. For this, he must possess: vision, desire for change and creativity, entrepreneurial spirit, energy, dedication and passion to implement his ideas on the market.

The students will identify practical situations in the entrepreneurial environment, will practice using their understanding of business opportunities in the local market, by exemplifying from practical experience and through theoretical debates, based on the entrepreneurial skills that will be acquired in this course. They will analyze a film on the topic of entrepreneurship and successful businesses and will carry out a SWOT/SWOTT analysis of the business.

Training strategies used

During the theme, the trainers will use the following training and learning strategies and methods:

- Presentation,
- Discussion,
- Analysis,
- Brainstorming,
- Debate of the thematic film,
- Use of new digital software trends for the success of a company.

Material and technical resources in supporting the course:

Video projector, Laptop, Internet access, Flip chart, colored markers, pencils, flipchart sheets, flipchart, thematic film with an educational role in the field of entrepreneurship, examples of successful businesses.

Strategy for on-going evaluation within theme 3

The evaluation during this theme will be carried out based on observing the participation and activity of the trainees, and the implementation of the Business Plan. During the time allocated for face-to-face organization, the trainees will be interviewed, questions will be asked and the trainees will be asked to present their own experience, in the form of practical examples from real life and previous entrepreneurial experiences. Presentation of the Stage Business Plan.

Bibliography

1. Boaghe, D. *Factori determinanți ai comportamentului antreprenorial în cazul tinerilor* [Determinant Factors of Entrepreneurial Behavior among Youth], [URL], 2020;
2. Burlacu, F. *Importanța și rolul finanțării tinerilor antreprenori* [The Importance and Role of Financing for Young Entrepreneurs], [URL], 2021;
3. Iacob, M.I. *Antreprenoriatul – Forța motrice a oricărei întreprinderi* [Entrepreneurship – The Driving Force of Any Enterprise], "Aurel Vlaicu" University Press, Arad, 2008;
4. Mariotti, S., Glackin, C. *Antreprenoriat. Lansarea și administrarea unei afaceri* [Entrepreneurship: Owning Your Future / Launching and Managing a Business], Bizzkit Publishing, 2012.

Online resources: https://dictionary.cambridge.org/dictionary/english/entrepreneurship

Seminar

Topic 3 – Successful business. Practical examples

Topic 4 – Forms of organization and necessary documentation

Specific objective of the seminar:

At the end of the training, students will be able to:

- identify the characteristics of the entrepreneurial process;

- identify the fundamental elements of an independent activity.

Distribution of time, in relation to the content of the activities and the resources for seminar, **topic 3 seminar: Successful business – practical examples**

Budget Time		Content of the course	Activities	Methods used in teaching	Material resources
30 mins	1 hour	Introductory exercise –the ideal business	Students will analyze in groups of 5 possible businesses, identifying the advantages and disadvantages of starting each business. At the end, they will present a business idea to the entire group.	Debate, Exercise	Paper, pens
	1 hour	General characteristics of a business plan	Presentation of the general characteristics of a Business Plan. Using practical examples to solidify and understand concepts.	Cooperative Learning Exercise Problematization	Video projector, laptop, internet access
	1 hour	Identifying and analyzing a successful business	In groups of 2, students will analyze a successful business and outline the business plan that was behind it.	Cooperative Learning Exercise Problematization	Internet access Worksheets
3 hours	1 hour	Specific documentation for establishing a company depending on the form of	For the businesses identified, the documents necessary for establishing the company will be identified and analyzed. The	Simulation Case Study Exercise Explanation	Internet access Worksheets

		organization	students will document themselves and be guided by the trainer.		
	1 hour	Institutions involved in establishing a company	The trainer will present and analyze together with the trainees the institutions and their requirements regarding the establishment of a company.	Explanation Exampling	Websites of public or private institutions
	1 hour	Entrepreneurship as a personal opportunity	Each student will briefly present their own perspective on the entrepreneurial alternative, mentioning advantages, disadvantages, personal possibilities and limitations, options and future professional goals.	Gallery tour	-
	Total 6 hours				

<u>Summary of the topics 3</u> Successful businesses – practical examples and 4. Forms of organization and necessary documentation

The practical training session within the seminar lasts 6 hours. During the

learning session, the practical topics within the seminar will be presented and debated, regarding

the practical learning capacity of the trainees in becoming a successful entrepreneur, through

the analysis of Business Plans.

The trainees will identify practical situations in the entrepreneurial environment and will identify

the specific documents necessary for entrepreneurial development. Learning through

discovery and cooperation will be used, alternately with the presentations and analyses carried out by the trainer.

The institutions involved in the preparation of the documentation for establishing a company will be briefly presented.

At the end, each trainee will briefly present his or her own perspective on a future professional alternative in the entrepreneurial field.

Training strategies used

During the theme, the trainers will use the following training and learning strategies and methods:

- Discovery learning,
- Cooperative learning,
- Team work,
- Debate,
- Gallery tour,
- Case studies.

Material and technical resources to support the course:

Video projector, laptop, internet access, flipchart, flipchart sheets, colored pencils and markers.

On-going evaluation strategy within theme 2 seminar

Evaluation during this module will be based on observing the participation and

activity of the trainees, during the time allocated for face-to-face organization. To this end, the trainees will be interviewed, asked questions and asked to present their own experience.

Bibliografie

1. Olărean, A. *Manualul femeii de succes*, Ed. Lidana, București, 2018.
2. Burlacu, N., Golovco, V., & Goremîchina, O. „Antreprenoriatul în sfera serviciilor ca factor al creșterii economice în condiții de piață", în *Studia Universitatis Moldaviae* (Seria Ştiinţe Exacte şi Economice), 107(7), pp. 78-82, 2017.
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6. Levente, K. *Finanțarea întreprinderilor mici și mijlocii*, Ed. Expert, București, 2004.
7. Hill, N. *Calea spre succes*, Ed. Curtea Veche, București, 2019.
8. ***Propriul meu plan de afaceri***, disponibil online la www.rs.ro.
9. Gavrilă-Ardelean, M. F., Gavrilă-Ardelean, V. L., & Grivu, O. N. *Dezvoltarea comunitară*, Editura Universităţii „Aurel Vlaicu", Arad, 2008, p. 24.

Online resources:

Signature