# 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 | LINEAR ELECTRONIC CIRCUITS |
| 2.2 Course activity holder | Prof.univ.habil.dr.eng. Marius M. BĂLAȘ |
| 2.3 Instructor of the laboratory activity | Senior Lecturer dr.eng. Flavius Maxim PETCUȚ |
| 2.4 Year of study | 2 |
| 2.5 Semester | 1 |
| 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 laboratories | 2 |
| 3.4 Total hours in the curriculum | 56 | of which 3.5 course | 28 | 3.6 laboratories | 28 |

| Distribution of the time fund | hours |
|---|---|
| Study by textbook, course material, bibliography and notes | 25 |
| Additional documentation in the library, on specialized electronic platforms and in the field | 24 |
| Preparation of seminars/laboratories, assignments, papers, portfolios and essays | 16 |
| Tutorial | 2 |
| Examination | 2 |
| Other activities... | |
| 3.7 Total hours of individual study | 69 |
| 3.8 Total hours per semester | 125 |
| 3.9 Number of credits | 5 |

**4. Preconditions** (where applicable)

| | |
|---|---|
| 4.1 of curriculum | Electrical Engineering, Physics, Chemistry, Mathematical Analysis, Linear Algebra, Numerical Methods, Calculus Programming. |
| 4.2 of competences | Basic concepts in Electrical Engineering, Physics and Mathematics. |

**5. Conditions** (where applicable)

| | |
|---|---|
| 5.1 course | Interactive whiteboard, Microsoft Office, Matlab. |
| 5.2 laboratory | General Purpose Electronic Laboratory Equipment and various electronic circuits. Infinit Technologies stand. Software: Electronics Workbench (free). |

**6. Specific competences acquired**

| | |
|---|---|
| Professional competences | C2. Design electronic systems: Is able to identify, describe and creatively apply the operating principles of linear electronic circuits (R-L-C networks, operational amplifiers, filters, amplifiers, linear oscillators, signal sources, industrial integrated circuits, etc.) It can analyze linear electronic circuits in steady and transient modes, using mathematical methods, CAD and simulation software.<br>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, frequency analyzer, etc.) for testing and performance evaluation.<br>Methodological and organizational skills:<br>• Is able to plan and carry out experimental laboratory activities according to established procedures.<br>• Demonstrates the ability to organize and manage the human and technical resources necessary for design, testing and automated production. |
| Transversal competences | CT3. Think analytically:<br>• Think analytically.<br>• Think critically.<br>• Think creatively. |

**7. Learning Outcomes**

| | |
|---|---|
| Knowledge | • Knowledge of electronic schematics and methods of designing electronic systems.<br>• Knowledge in electronic circuit simulation programs.<br>• Use of specific laboratory equipment.<br>• Data analysis and interpretation.<br>• Think creatively and innovatively. |
| Skills | • Make electronic schematics and printed circuit boards using specialized software.<br>• Perform simulations to verify the functionality and viability of systems designed before manufacturing.<br>• Plan and execute engineering experiments using specific laboratory equipment.<br>• Analyzes and interprets experimental data to validate hypotheses or technical performance.<br>• Think analytically, critically and creatively. |

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

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

| | |
|---|---|
| 8.1 General objective of the discipline | The field of Systems Engineering encompasses all three directions of study in Automation: automated driving, hardware and software. The Linear Electronic Circuits discipline has the role of introducing students into hardware and is an essential precondition for other subjects studied further: digital electronics, power electronics, etc. |
| 8.2 Specific objectives | • Knowledge of passive and active electronic devices, with one, two or three junctions and their mathematical modeling;<br>• Knowledge of electronic amplifiers and their analysis in time (oscillograms) and frequency (frequency characteristics);<br>• Negative reaction and stability of amplifiers;<br>• Operational amplifiers and their applications;<br>• Acquisition of the competence to design elementary linear electronic circuits (amplifiers, filters, oscillators, etc.);<br>• Develop practical laboratory skills for the installation, testing and measurement of the characteristics of electronic circuits in the line;<br>• Correlation of the heuristic models with experimental results, by interpreting and analyzing the obtained data;<br>• Familiarity with the use of electronic instrumentation (oscilloscope, signal generator, frequency analyzer, etc.) and standard test procedures. |

**9. Course Content**

| **9.1 Course** | **Teaching methods** | **Observations** |
|---|---|---|
| 1. Semiconductors, p-n junctions, diodes | Interactive whiteboard display | 4 hours |
| 2. Bipolar transistors and transistors MOS, IS-MOS, D-MOS, V-MOS and IGBT | Interactive whiteboard display | 4 hours |
| 3. Electronic circuits, parameters, mathematical models | Interactive whiteboard display | 4 hours |
| 4. Frequency Circuit Analysis | Interactive whiteboard display | 4 hours |
| 5. Negative reaction amplifiers, frequency stability criterion | Interactive whiteboard display | 4 hours |
| 6. Operational Amplifiers | Interactive whiteboard display | 2 hours |
| 7. AO circuits, industrial integrated 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.<br>2. M. Bălaș. „Introducere în electronică. Circuite electronice liniare." Editura Universităţii Aurel Vlaicu din Arad, 2013.<br>3. M. Bălaș. „Linear Electronic Circuits." Course material, electronic version, 2025. |

| **9.2 Laboratory** | **Teaching methods** | **Observations** |
|---|---|---|
| 1. Labor protection in the electronics laboratory<br>2. Oscilloscope<br>3. Passive component<br>4. Semiconductor diodes – static characteristics<br>5. Bipolar transistors – static characteristics<br>6. MOS-FET transistor<br>7. The transistor as an amplifier<br>8. Analysis of periodic signals by Fourier series decomposition<br>9. Amplifier's frequency characteristics<br>10. Negative reaction in amplifiers<br>11. Operational Amplifiers<br>12. Circuits with AO<br>13. Industrial Integrated Circuits<br>14. Verification | Interactive whiteboard displays, circuit design and testing. | Each laboratory takes 2 hours |
| | **TOTAL** | **28 hours** |
| **Laboratory bibliography** | 1. M. Bălaș. „Linear Electronic Circuits." Laboratory support, electronic version, 2025.<br>2. „Advanced Power Electronics Trainer It-9500-1. Experiment Manual." Infinit Technologies. | |

**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 final grade |
|---|---|---|---|
| **11.1 Course** | Acquiring theoretical knowledge, understanding the fundamental principles (electronic components, linear, operating modes, mathematical models). The ability to solve problems and analyze the time and frequency of their electronic signals. The ability to synthesize and design simple linear circuits. | Written exam. Questions with topics taken from the course. Course activity. | 70% |
| **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. | Verification along the way. Elaboration of an application report on an electronic circuit. | 30% |

**11.3 Minimum performance standard:** In order to obtain the minimum passing grade in Linear Electronic Circuits, the student must demonstrate the fulfillment of the following minimum performance standards, in accordance with the learning outcomes declared for the discipline:

**1. Knowledge and understanding of fundamental concepts:** The student must demonstrate an understanding of the basics regarding: the general functionality of linear electronic devices (diodes, bipolar transistors and MOSFETs in linear active mode, operational amplifiers).

**2. Ability to apply standard methods of analysis:** The student must be able to correctly use the basic methods for solving linear circuits such as: the use of Kirchoff's laws in the time or complex domain, the principles of Thevenin/Norton superposition and equivalences, modeling by equivalent circuits, frequency characteristics and negative reaction.

**3. Solving some basic problems:** The student must be able to solve completely or partially problems of low difficulty, such as: determining voltages and currents in elementary linear circuits, calculating the amplification of a simple stage with a transistor, analyzing an operational amplifier in standard configurations (inverter, non-inverter, adder).

**4. Correct use of technical terminology:** The student must adequately use the terminology specific to linear electronics, including: notions of impedance, admittance, gain, input/output

impedance, operating regions of semiconductor devices, standard amplification configurations, fundamentals of linearity, saturation, polarization. Major conceptual errors or confusion between fundamental concepts are not compatible with promotion.

**5. Interpretation of the results and correlation with physical phenomenology:** The student must be able to: interpret the values obtained in the analysis of a circuit, physically argue the behavior of a simple circuit, identify probable causes of improper functioning of a simple amplifier.

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

| Date of completion | Signature of the course holder | Signature of the laboratory instructor |
|---|---|---|
| 20.09.2025 | Prof.univ.habil.Marius Mircea Bălaș | Senior lect.dr.eng.Flavius Maxim Petcuț |

| 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 Study Cycle | BACHELOR OF SCIENCE |
| 1.6 Study Programme/Qualification | AUTOMATION AND APPLIED INFORMATICS (IN ENGLISH) (AIA-E) |

**2. Course Information**

| | |
|---|---|
| 2.1 Course Title | MEASUREMENTS AND TRANSDUCERS |
| 2.2 Course activity holder | Prof.univ.habil.dr.eng. Valentina E. BĂLAȘ |
| 2.3 Laboratory activity instructor | Assistant, drd.eng. Daniel ALEXUȚĂ |
| 2.4 Year of study | 2 |
| 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 | 4 | of which 3.2 course | 2 | 3.3 Laboratory | 2 |
| 3.4 Total hours in the curriculum | 56 | of which 3.5 courses | 28 | 3.6 Laboratory | 28 |

| Distribution of the time fund | Hours |
|---|---|
| Study by textbook, course material, bibliography and notes | 20 |
| 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 | 7 |
| Examination | 3 |
| Other activities... | 4 |
| 3.7 Total hours of individual study | **44** |
| 3.8 Total hours per semester | **100** |
| 3.9 Number of credits | **4** |

**4. Preconditions** (where applicable)

| | |
|---|---|
| 4.1 of curriculum | Numerical Methods, Electrical Engineering, Physics, Linear Electronic Circuits, Programming and Use of Calculations. |
| 4.2 of competences | Basic concepts in Physics, Electrical Engineering, Electronics, and Mathematics. |

**5. Conditions** (where applicable)

| | |
|---|---|
| 5.1 Course | Interactive whiteboard, laptop and appropriate software. |

| | |
|---|---|
| 5.2 Conducting the laboratory | Laboratory room, properly equipped: computers, network, Internet connection, specialized software. |

**6. Specific competencies acquired**

| | |
|---|---|
| Professional competencies | **C7. Perform laboratory tests:** Plan and execute engineering experiments using specific laboratory equipment. Analyzes and interprets experimental data to validate hypotheses or technical performances. He is able to correctly and creatively use laboratory instrumentation (oscilloscope, signal generator, frequency analyzer, etc.) for testing and performance evaluation.<br>**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. |
| Transversal competencies | **CT3. Think analytically**:<br>• Think analytically.<br>• Think critically.<br>• Think creatively. |

**7. Learning Outcomes**

| | |
|---|---|
| Knowledge | • Knows and knows how to use specific laboratory equipment.<br>• Has knowledge of data analysis and interpretation.<br>• He knows how to mathematically model dynamical systems.<br>• Has basic knowledge of sensors and measuring equipment. |
| Skills | • Plans and executes engineering experiments using specific laboratory equipment.<br>• Analyzes and interprets experimental data to validate hypotheses or technical performances.<br>• Develop functional models for sensors and interface circuits using simulation software.<br>• Evaluate the system's response to variations in physical parameters through numerical simulation.<br>• Think creatively. |
| Responsibilities and autonomy | • Evaluates and optimizes the performance of the designed system, asuI am responsible for choosing technical solutions.<br>• Can work independently or in a team to implement and test automation solutions in a real professional environment.<br>• Has the ability to manage technical projects responsibly and on time.<br>• It has availability for continuous learning and professional adaptation in emerging fields (intelligent automation, IoT, AI in control).<br>• Approaches problems critically. |

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

| | |
|---|---|
| 8.1 General Purpose ofthe Plina Disc | The discipline aims to study the main notions of metrology, the theory of measurements and errors as well as the main measuring devices used and common types of transducers, frequently encountered in industrial processes. Notions related to data acquisition are also presented.<br>The practical work carried out within the discipline aims to acquire theoretical notions related to the theory of errors, but also practical experiments as well as the habit of working with different sensors. |
| 8.2 Specific objectives | At the end of the course, the student must be able to:<br>• Understands the fundamental principles of measurement: the concepts of physical quantity, calibration, uncertainty, measurement error, sensitivity. Describe the structure of a measurement chain.<br>• Identify and describe the main types of transducers: classifythe transducers according to the measured size, the principle of operation and the nature of the signal. Explain the principles of conversion forelectrical, electronic and mechatronic translators.<br>• Use transducers and measuring equipment correctly: apply appropriate procedures for connecting, powering and checking transducers, select the right instruments and methods for a specific measurement application.<br>• Process and interpret experimental data: apply statistical methods to evaluate measurement results and graph experimental characteristics and interpret deviations from the model.<br>• Select the right transducer for a specific application: analysethe requirements of an application (domain, precision, dynamic response) and arguethe choice of the optimal transducer.<br>• Use analysis and acquisition software: use specific programs for data retrieval and processing. |

**9. Course Contents**

| 9.1 Course | Teaching methods | Observations |
|---|---|---|
| 8. Introduction to measurement theory. Notions of metrology. Apparatus and transducers. Methodof measurement. Categories of measurements. Quality indicatorsof measurement. General characteristics of measuring devices andtransducers. Choice of transducers. | Exhibition on the interactive whiteboard, discussions to clarify concepts | 6 hours |
| 9. Theory of errors | Exhibition on the interactive whiteboard, discussions to clarify concepts | 2 hours |
| 10. General characteristics of electronic means of measurement. Behavior of the means of measurement. | Exhibition on the interactive whiteboard, discussions to clarify concepts | 4 hours |

| | | |
|---|---|---|
| 11. Electromechanical measuring devices | Exhibition on the interactive whiteboard, discussions to clarify concepts | 2 hours |
| 12. Osciloscoape catodice | Exhibition on the interactive whiteboard, discussions to clarify concepts | 2 hours |
| 13. Signal converters | Exhibition on the interactive whiteboard, discussions to clarify concepts | 2 hours |
| 14. Measuring amplifiers | Exhibition on the interactive whiteboard, discussions to clarify concepts | 2 hours |
| 15. Analog Numeric and Analog Numeric Converters | Exhibition on the interactive whiteboard, discussions to clarify concepts | 2 hours |
| 16. Sensors and transducers, presentation of the ral eyelashes. Adapters and converters. | Exhibition on the interactive whiteboard, discussions to clarify concepts | 2 hours |
| 17. Transducers for electrical, geometric, velocity, acceleration, vibration, momentum, force, pressure, level, flow, radiation,intelligent translators. Virtual tools. | Exhibition on the interactive whiteboard, discussions to clarify concepts | 4 hours |
| | **TOTAL** | **28 hours** |
| **Course bibliography** | 1. Valentina E. Balas. Measurements and transducers, course support – updated electronic version. 2025.<br>2. Valentina E. Balas. Smart Sensors with Internal Model and Fuzzy Techniques, Ed. Politehnica Timișoara, 2004. | |

| **9.2 Laboratory** | **Teaching methods** | **Observations** |
|---|---|---|
| 1. The equipment in the automation laboratory. General notions. Labor protection. | Troubleshooting | 2 hours |
| 2. Statistical processing of measurements. Theory of errors | Problem solving, data processing | 4 hours |
| 3. Oscilloscope | Specific measurements | 2 hours |
| 4. Calibration of the devices. Multimeter. Signal Converters | Performing calibration tests | 6 hours |
| 5. Proximity sensors, temperature sensors, torometers, displacement transducers | Problem solving and bad modelingand computer simulation in Workbench. Practical achievements | 10 hours |
| 6. Modeling of virtual tools. | Modeling in Labview | 2 hours |
| 7. Recovery session. Submission of reports. | Presentation of reports | 2 hours |

| | | |
|---|---|---|
| | **TOTAL** | **28 hours** |
| **Laboratory bibliography** | 3. Valentina E. Balas. Measurements and transducers, course support – updated electronic version. 2025.<br>4. Daniel Alexuta - Measurements and transducers, laboratory support – updated 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 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, 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 methods | Percentage of final grade |
|---|---|---|---|
| **11.1. Course** | Understanding the basic principles and acquiring theoretical knowledge. The ability to solvewill problems. | Written exam. In-business with topics taken from the course. Course activity. | 50% |
| **11.2 Laboratory** | Theoretical training andprior documentation, practical work in the laboratory, compliance with safety regulations, quality and accuracyof the samples, documentationand reportingof results. | Hair check, control homework, scientific activities. Evaluation of reports from laboratory work | 50% |

**11.3 Minimum Performance Standard**

In order to obtain the minimum passing grade in Measurements and Translators, the student must demonstrate the fulfillment of the following minimum performance standards, in accordance with the learning outcomes declared for the subject:
**1. Theoretical knowledge and understanding (minimum level).** The student must demonstrate that he/she can: define the fundamental concepts: measurement, error, uncertainty, sensitivity, resolution, repeatability, can schematically describe the structure of a measurement chain and the role of the main blocks, and can recognize the main types of transducers and their operating principles.
**2. Minimum practical skills.** The student must be able to perform a basic measurement with a standard instrument (voltmeter, oscilloscope, multimeter, simple sensor), correctly connect

a transducer and read the value obtained under normal laboratory conditions, and perform calibrations, using a given standard or reference.
**3. Data processing and interpretation.** The student must be able to calculate an absolute and relative error based on simple measurements, graphically represent a static feature and visually identify any major deviations.
**5. Compliance with laboratory procedures and rules.** The student must use the equipment according to the minimum safety instructions and correctly fill in a basic measurement report (data, values, simple conclusions).

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

| Date of completion | Signature of the course holder | Signature of the laboratory instructor |
|---|---|---|
| 20.09.2025 | Prof.habil.dr.eng. Valentina E. Balas | As.drd.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: | 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: | SYSTEMS THEORY |
| 2.2 Course Lecturer: | Prof.univ.habil.dr.eng. Valentina Emilia BĂLAȘ |
| 2.3 Seminar/Laboratory Instructor: | Senior Lecturer dr.eng. Corina-Anca MNERIE |
| 2.4 Year of Study: | 2 |
| 2.5 Semester | 2 |
| 2.6 Type of Assessment: | EXAMINATION |
| 2.7 Course Status: | Compulsory/DS |

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

| | | | | | |
|---|---|---|---|---|---|
| 3.1 Hours per week: | 6 | of which 3.2 lecture | 3 | 3.3 seminar/laboratory | 3 |
| 3.4 Total hours in the study plan | 84 | of which 3.5 lecture | 42 | 3.6 seminar/laboratory | 42 |

| Time allocation: | hours |
|---|---|
| Study based on course materials, bibliography | 15 |
| Additional documentation in library, specialized databases, or field work | 10 |
| Preparation for seminars/labs, essays, portfolios | 10 |
| Tutoring | 2 |
| Examinations | 3 |
| Other activities... | 1 |
| 3.7 Total hours of individual study | 41 |
| 3.8 Total hours per semester | 125 |
| 3.9 Number of credits | 5 |

## 4. Preconditions (where applicable)

| | |
|---|---|
| 4.1 of curriculum | Physics, Electrical Engineering, Mechanics, Chemistry, Mathematical Analysis, Linear Algebra, Numerical Methods, Linear Electronic Circuits. |
| 4.2 of competences | The continued practical application of the acquired knowledge enables a gradual progression through the chapters, in close connection with the topics of the previously studied subjects. |

**5. Conditions (where applicable)**

| | |
|---|---|
| 5.1 of conducting the course | Interactive whiteboard, Microsoft Office, Matlab–Simulink. |
| 5.2 of conducting the seminar and laboratory | Laboratory equipment – Quanser workstations, Matlab–Simulink. |

**6. Specific Competences Acquired**

| | |
|---|---|
| Professional Competences | - C1 – Performs analytical mathematical computations |
| Transversal Competences: | - CT3 – Thinks analytically |

**7. Learning Outcomes**

| | |
|---|---|
| Knowledge | - Understands and identifies mathematical methods (linear algebra, numerical analysis) for modelling and solving engineering problems.<br>- Is familiar with specific software tools (e.g., MATLAB) used to automate analytical computations and to validate mathematical solutions in real-world contexts.<br>- Processes information, ideas, and concepts<br>- Solves problems<br>- Thinks creatively and innovatively |
| Skills | - Apply advanced mathematical methods (linear algebra, numerical analysis) for modelling and solving engineering problems.<br>- Use specific software tools (e.g., MATLAB) to automate analytical computations and to validate mathematical solutions in real-world contexts.<br>- Thinks analytically<br>- Thinks critically |
| Responsibilities and autonomy | - Evaluates and optimizes the performance of the designed system, assuming responsibility for the selection of technical solutions.<br>- Can work independently or as part of a team in the implementation and testing of automation solutions within a real professional environment.<br>- Demonstrates the ability to manage technical projects with responsibility and adherence to deadlines.<br>- Shows openness to continuous learning and professional adaptation in emerging fields (intelligent automation, IoT, AI in control).<br>- Problems approach in a critical manner<br>- 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 Systems Theory course has the general objective of developing students' ability to analyze, model, and evaluate the behavior of dynamic systems, using mathematical tools |

| | |
|---|---|
| | and engineering methods, for the purpose of designing and optimizing automation systems. |
| 8.2 Specific objectives | **SO1 —** Understanding fundamental concepts:<br>• To explain basic notions: system, inputs, outputs, structure, causality, stability, linearity.<br>• To identify types of systems: continuous/discrete, SISO/MIMO, deterministic/stochastic.<br>**SO2 —** Modelling dynamic systems:<br>• To develop mathematical models using differential equations, transfer functions, and state-space equations.<br>• To simplify and linearize systems around operating points.<br>**SO3 —** Analyzing system properties:<br>• To determine stability, transient response, and steady-state behavior.<br>• To apply stability criteria and analysis methods in the time/frequency domain (Routh–Hurwitz, Nyquist, Bode).<br>**SO4 —** Interpreting and using graphical representations:<br>• To construct and interpret Bode diagrams, Nyquist plots, step/impulse responses, etc.<br>• To use analysis and simulation software tools (MATLAB/Simulink).<br>**SO5 —** Applying Systems Theory to industrial scenarios:<br>• To apply the studied methods to real systems: mechatronic, electrical, thermal, industrial processes, etc. |

**9. Course Content**

| 9.1 Course | Teaching methods | Observations |
|---|---|---|
| CHAPTER 1 DYNAMIC SYSTEMS (Preliminaries)<br>1.1 The concept of a system. The concept of a signal. Terminology.<br>1.2 Signal modelling.<br>1.3 System modelling.<br>1.4 System interconnections. Control systems and regulation systems.<br>1.5 Operating regimes. | Presentation using multimedia tools, debates, and discussions based on concrete examples to clarify the concepts presented. | 12 hours |
| CHAPTER 2. CHARACTERIZATION OF LINEAR SYSTEMS IN THE TIME DOMAIN AND IN THE OPERATIONAL DOMAIN<br>2.1 Linear systems. Transfer matrices and transfer functions.<br>2.2 Derivation of formulas for the impulse response and transfer function.<br>2.3 Block-diagram manipulation for fundamental interconnections.<br>2.4 Discretization issues.<br>2.5 Systems with time delay. | Presentation using multimedia tools, debates, and discussions based on concrete examples to clarify the concepts presented. | 12 hours |

| | | |
|---|---|---|
| 2.6 System realizations. State transformations. | | |
| CHAPTER 3. STEADY-STATE REGIMES<br>3.1 Constant steady-state regime.<br>3.2 Harmonic steady-state regime. | Presentation using multimedia tools, debates, and discussions based on concrete examples to clarify the concepts presented. | 3 hours |
| CHAPTER 4. STABILITY, CONTROLLABILITY, AND OBSERVABILITY OF SYSTEMS<br>4.1 System stability.<br>4.2 System controllability.<br>4.3 System observability. | Presentation using multimedia tools, debates, and discussions based on concrete examples to clarify the concepts presented. | 12 hours |
| CHAPTER 5. ELEMENTS OF NONLINEAR SYSTEM ANALYSIS | Presentation using multimedia tools, debates, and discussions based on concrete examples to clarify the concepts presented. | 3 hours |
| | TOTAL | 42 hours |

Bibliography course:


1. Valentina E. Balas, Systems Theory, Aurel Vlaicu University Publishing House, 2013.
2. Valentina E. Balas, Systems Theory, Course Support – Updated Electronic Version, 2025.
3. Ioan Dumitrache (Ed.), Automation, Romanian Academy Publishing House, Bucharest, 2009.
4. T.L. Dragomir, Elements of Systems Theory, Vol. 1, Politehnica, 2004.
5. Mihail Voicu, Introduction to Automation, Polirom, 2002.
6. L. Sebastian, Automation, Didactic and Pedagogical Publishing House, Bucharest, 1973.
7. V. Ionescu, Systems Theory, EDP, 1985.
8. T.L. Dragomir, Systems Theory – Applications 2, Politehnica Publishing House, 2006.
9. Richard C. Dorf, Robert H. Bishop, Modern Control Systems, Pearson Educational International, 2005.
10. C. Pozna, Theory of Automatic Systems, MatrixRom, Bucharest, 2004.
11. C. Ilias, Theory of Automatic Control Systems, MatrixRom, Bucharest, 2001.
12. A. Filipescu, S. Stamatescu, Systems Theory, MatrixRom, Bucharest, 2002.
13. N. E. Leonard, S. W. Levine, Using MATLAB to Analyze and Design Control Systems, Addison-Wesley Publishing Company, 1995.
14. D. Popescu, C. Voloșencu, S. Nanu, A.-M. Dan, L. Peană, T.L. Dragomir, Systems Theory. Applications 1, Politehnica Publishing House, 2005.
15. Mircea Cristea, Șerban Agachi, Elements of Systems Theory, Risoprint Publishing House, Cluj-Napoca, 2002.
16. Sorin Larionescu, Systems Theory, MatrixRom, Bucharest, 2006.
17. Ștefan Dan, Systems Theory, MatrixRom, Bucharest, 2005.
18. Dumitru Popescu et al., Industrial Automation, AGIR Publishing House, Bucharest, 2006.
19. Biswa Nath Datta, Numerical Methods for Linear Control Systems: Design and Analysis, Elsevier Academic Press, 2004.

20. Rajeeb Dey, Goshaidas Ray, Valentina E. Balas, Stability and Stabilization of Linear and Fuzzy Time-Delay Systems, Intelligent Systems Reference Library, Vol. 141, Springer, 2018.

| **9.2 Laboratory** | **Teaching methods** | **Observations** |
|---|---|---|
| 1. Occupational safety. Laboratory presentation. Introduction to the Matlab/Simulink programming environment. | Solving problems and performing computer-based modelling and simulation using the MATLAB–Simulink environment. Laboratory equipment – Quanser workstations. | 4 hours |
| 2. Analog and discrete signals. | Solving problems and performing computer-based modelling and simulation using the MATLAB–Simulink environment. Laboratory equipment – Quanser workstations. | 2 hours |
| 3. Modelling systems in continuous time and discrete time. First-order and second-order systems. MM-II, Transfer function. | Solving problems and performing computer-based modelling and simulation using the MATLAB–Simulink environment. Laboratory equipment – Quanser workstations. | 4 hours |
| 4. Modelling systems in continuous time and discrete time. First-order and second-order systems. MM-ISI, Transfer function. | Solving problems and performing computer-based modelling and simulation using the MATLAB–Simulink environment. | 4 hours |

| | | |
|---|---|---|
| | Laboratory equipment – Quanser workstations. | |
| 5. Study of interconnected systems. Study of systems in transient and steady-state regimes. | Solving problems and performing computer-based modelling and simulation using the MATLAB–Simulink environment. Laboratory equipment – Quanser workstations. | 4 hours |
| 6. Discretization of linear systems | Solving problems and performing computer-based modelling and simulation using the MATLAB–Simulink environment. Laboratory equipment – Quanser workstations. | 2 hours |
| 7. Study of linear systems in the frequency domain. | Solving problems and performing computer-based modelling and simulation using the MATLAB–Simulink environment. Laboratory equipment – Quanser workstations. | 2 hours |
| 8. Stability analysis criteria. | Solving problems and performing computer-based modelling and simulation using the MATLAB–Simulink environment. Laboratory equipment – Quanser workstations. | 2 hours |
| 9. Frequency-domain techniques for stability analysis. Make-up sessions. | Solving problems and performing computer-based modelling and simulation using the MATLAB–Simulink environment. Laboratory equipment – Quanser workstations. | 4 hours |
| | TOTAL | 28 hours |

**Laboratory bibliography:**


1. Valentina E. Balas, Systems Theory, Aurel Vlaicu University Publishing House, 2013.
2. Valentina E. Balas, Systems Theory, Course Support – Updated Electronic Version, 2025.
3. Corina Anca Mnerie, Systems Theory, Laboratory Support – Updated Electronic Version, 2025.
4. Ioan Dumitrache (Ed.), Automation, Romanian Academy Publishing House, Bucharest, 2009.
5. T.L. Dragomir, Elements of Systems Theory, Vol. 1, Politehnica, 2004.
6. Mihail Voicu, Introduction to Automation, Polirom, 2002.

7. L. Sebastian, Automation, Didactic and Pedagogical Publishing House, Bucharest, 1973.
8. V. Ionescu, Systems Theory, EDP, 1985.
9. T.L. Dragomir, Systems Theory – Applications 2, Politehnica Publishing House, 2006.
10. Richard C. Dorf, Robert H. Bishop, Modern Control Systems, Pearson Educational International, 2005.
11. C. Pozna, Theory of Automatic Systems, MatrixRom, Bucharest, 2004.
12. C. Ilias, Theory of Automatic Control Systems, MatrixRom, Bucharest, 2001.
13. A. Filipescu, S. Stamatescu, Systems Theory, MatrixRom, Bucharest, 2002.
14. N. E. Leonard, S. W. Levine, Using MATLAB to Analyze and Design Control Systems, Addison-Wesley Publishing Company, 1995.
15. D. Popescu, C. Voloșencu, S. Nanu, A.-M. Dan, L. Peană, T.L. Dragomir, Systems Theory. Applications 1, Politehnica Publishing House, 2005.
16. Mircea Cristea, Șerban Agachi, Elements of Systems Theory, Risoprint Publishing House, Cluj-Napoca, 2002.
17. Sorin Larionescu, Systems Theory, MatrixRom, Bucharest, 2006.
18. Ștefan Dan, Systems Theory, MatrixRom, Bucharest, 2005.
19. Dumitru Popescu et al., Industrial Automation, AGIR Publishing House, Bucharest, 2006
20. Biswa Nath Datta, Numerical Methods for Linear Control Systems: Design and Analysis, Elsevier Academic Press, 2004.
21. Rajeeb Dey, Goshaidas Ray, Valentina E. Balas, Stability and Stabilization of Linear and Fuzzy Time-Delay Systems, Intelligent Systems Reference Library, Vol. 141, Springer, 2018.

| **9.3 Seminar** | **Teaching methods** | **Observations** |
|---|---|---|
| 1. Analog signals and digital signals. Laplace Transform and Z Transform. | Solving problems | 2 hours |
| 2. Mathematical modelling of physical systems in continuous time and discrete time. Transfer function. | Solving problems | 2 hours |
| 3. Mathematical modelling of linear system interconnections. Study of the dynamic regimes of linear systems. | Solving problems | 2 hours |
| 4. Study of continuous-time linear systems in harmonic regime. | Solving problems | 2 hours |
| 5. System stability, application of algebraic criteria, and application of frequency-domain techniques. | Solving problems | 2 hours |
| 6. Observability, controllability. | Solving problems | 2 hours |
| 7. Make-up sessions, Test. | Solving problems | 2 hours |
| | TOTAL | 14 hours |

**Seminar bibliography:**

1. Valentina E. Balas, Systems Theory, Aurel Vlaicu University Publishing House, 2013.

2. Valentina E. Balas, Systems Theory, Course Support – Updated Electronic Version, 2025.
3. Corina Anca Mnerie, Systems Theory, Seminar Support – Updated Electronic Version, 2025.
4. Ioan Dumitrache (Ed.), Automation, Romanian Academy Publishing House, Bucharest, 2009.
5. T.L. Dragomir, Elements of Systems Theory, Vol. 1, Politehnica, 2004.
6. Mihail Voicu, Introduction to Automation, Polirom, 2002.
7. L. Sebastian, Automation, Didactic and Pedagogical Publishing House, Bucharest, 1973.
8. V. Ionescu, Systems Theory, EDP, 1985.
9. T.L. Dragomir, Systems Theory – Applications 2, Politehnica Publishing House, 2006.
10. Richard C. Dorf, Robert H. Bishop, Modern Control Systems, Pearson Educational International, 2005.
11. C. Pozna, Theory of Automatic Systems, MatrixRom, Bucharest, 2004.
12. C. Ilias, Theory of Automatic Control Systems, MatrixRom, Bucharest, 2001.
13. A. Filipescu, S. Stamatescu, Systems Theory, MatrixRom, Bucharest, 2002.
14. N. E. Leonard, S. W. Levine, Using MATLAB to Analyze and Design Control Systems, Addison-Wesley Publishing Company, 1995.
15. D. Popescu, C. Voloșencu, S. Nanu, A.-M. Dan, L. Peană, T.L. Dragomir, Systems Theory. Applications 1, Politehnica Publishing House, 2005.
16. Mircea Cristea, Șerban Agachi, Elements of Systems Theory, Risoprint Publishing House, Cluj-Napoca, 2002.
17. Sorin Larionescu, Systems Theory, MatrixRom, Bucharest, 2006.
18. Ștefan Dan, Systems Theory, MatrixRom, Bucharest, 2005.
19. Dumitru Popescu et al., Industrial Automation, AGIR Publishing House, Bucharest, 2006.
20. Biswa Nath Datta, Numerical Methods for Linear Control Systems: Design and Analysis, Elsevier Academic Press, 2004.
21. Rajeeb Dey, Goshaidas Ray, Valentina E. Balas, Stability and Stabilization of Linear and Fuzzy Time-Delay Systems, Intelligent Systems Reference Library, Vol. 141, Springer, 2018.

**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 aligned with the curricula of other university centers in the country and abroad.
To better adapt the discipline to labor market requirements, meetings were held both with representatives of the business environment and with other specialized professors from higher education institutions in Romania and abroad.
The discipline is developed based on internationally recognized textbooks in the field.
Some of the examples presented during the course, laboratory, and seminar have been discussed at national and international conferences and lectures.
The promotion to the academic rank of Professor was based on publications in the field of Systems Theory.

**11. Assessment**

<table>
<tr><th>Type of activity</th><th>Evaluation criteria</th><th>Evaluation methods</th><th>Percentage of final grade</th></tr>
<tr><td rowspan="2">11.1 Course</td><td>knowledge</td><td rowspan="2">Written exam. Questions based on topics covered in the course. Course participation.</td><td rowspan="2">60%</td></tr>
<tr><td>understanding</td></tr>
<tr><td rowspan="3">11.2 Seminar<br>11.3 Laboratory</td><td rowspan="3">- knowledge and understanding;<br>- ability to explain and interpret;<br>- complete and correct solving of the requirements.</td><td rowspan="3">- applied activities: assessments/laboratory/practical work/project, etc.;<br>- tests administered throughout the semester;<br>- assignments (control tasks);<br>- scientific activities.</td><td>Final seminar evaluation 10%</td></tr>
<tr><td>Evaluation of laboratory activities 20%</td></tr>
<tr><td>Active participation 10%</td></tr>
<tr><td colspan="4">11.4 Minimum Performance Standard</td></tr>
<tr><td colspan="4">The student knows the main concepts, recognizes them, defines them correctly, and solves a simple application.<br>The specialized terminology is simple but correctly used.<br>A minimum grade of 5 on the tests given in the seminar and laboratory.</td></tr>
</table>

Date of completion Signature of the course holder Signature of the seminar/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 TRANSPORT |
| 1.4 Field of study | AUTOMATION, APPLIED INFORMATICS AND INTELLIGENT SYSTEMS |
| 1.5 Study Cycle | BACHELOR OF SCIENCE |
| 1.6 Study Programme/Qualification | AUTOMATION AND APPLIED INFORMATICS (IN ENGLISH) (AIA-E) |

**2. Course Information**

| | |
|---|---|
| 2.1 Course Title | COMPUTER ARCHITECTURE |
| 2.2 Course Lecturer | Assoc.prof.dr.eng. Cornel BARNA |
| 2.3 Laboratory Instructor | Assoc.prof.dr.eng. Cornel BARNA |
| 2.4 Year of study | 2 |
| 2.5 Semester | 2 |
| 2.6 Type of Assessment | EXAMINATION |
| 2.7 Course Status | DS-compulsory |

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

| | | | | | |
|---|---|---|---|---|---|
| 3.1 Hours per week | 4 | of which 3.2 lecture | 2 | 3.3 Laboratory | 2 |
| 3.4 Total hours in the study plan | 56 | of which 3.5 lecture | 28 | 3.6 Laboratory | 28 |

| Time allocation | Hours |
|---|---|
| Study based on course materials, bibliography | 10 |
| Additional documentation in library, specialized databases, or field work | 18 |
| Preparation for seminars/labs, essays, portfolios | 10 |
| Tutoring | 2 |
| Examinations | 4 |
| 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. Preconditions (where applicable)**

| | |
|---|---|
| 4.1 of curriculum | Notions of electronics, Numeracy basics |
| 4.2 of competences | Computer skills |

**5. Conditions (where applicable)**

| | |
|---|---|
| 5.1 of conducting the course | Classroom, equipped with laptop, video projector (if necessary) and appropriate software. |
| 5.2 of conducting the laboratory | Classroom, equipped with laptop, video projector (if necessary) and appropriate software. |

**6. Specific Competencies Acquired**

| | |
|---|---|
| Professional competencies | C6. Establish Data Processes – Use ICT tools to apply mathematical, algorithmic, or other data manipulation processes to create information. |
| Transversal competencies | CT2. Comply with regulations. |

**7. Learning Outcomes**

| | |
|---|---|
| Knowledge | Know algorithms for data processing and analysis.<br>Knows programming languages (e.g. C++, C#).<br>Understanding algorithms and data structures, programming paradigms and languages used in the field of automation.<br>Know the principles of professional ethics and deontology. |
| Skills | Create algorithms for data processing and analysis in industrial and engineering applications.<br>Use programming languages (e.g. Python, R) and ICT tools to transform raw data into useful information.<br>Correctly apply activity-specific regulations, procedures, and instructions.<br>Propose solutions to improve compliance with rules and procedures. |
| Responsibilities and autonomy | Evaluates and optimizes the performance of the designed system, taking responsibility for choosing technical solutions.<br>Can work independently or in a team to implement and test automation solutions in a real professional environment.<br>Has the ability to manage technical projects responsibly and on time.<br>It has availability for continuous learning and professional adaptation in emerging fields (intelligent automation, IoT, AI in control).<br>Respects the principles of professional ethics in all activities carried out. |

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

| | |
|---|---|
| 8.1 General objective of the discipline | Understanding the notions of logic circuit.<br>Training of computer component design skills.<br>Knowledge of the methods of designing computing equipment.<br>Forming the skills of using the machine code. |
| 8.2 Specific objectives | Students will know how it is carried out and what are the steps of a digital subassembly design.<br>Students will know how to foresee, from the specification and design phase, the creation of cases of information processing units.<br>Students will know how to use the tools for simulating logic circuits.<br>Students will know the design cases of processing units for different sets of instructions. |

**9. Course Content**

| 9.1 Course | Teaching methods | Observations |
|---|---|---|
| 1 Introduction, Brief History | Presented theoretically, Example Oral presentations and Screenings. | 4 hours |
| 2 Serial and parallel adders | | 4 hours |
| 3 Roberson binary multiplication devices | | 2 hours |
| 4 Booth Binary Multiplication Devices | | 2 hours |
| 5 Binary Multiplication Devices by Modified Booth Method | | 2 hours |
| 6 Execution Unit Design Methods | | 2 hours |
| 7 Matrix Propagation Circuits | | 2 hours |
| 8 Binary Splitting Devices | | 2 hours |
| 9 Architecture of a minimal computer | | 2 hours |
| 10 Structure of the necessary execution units | | 2 hours |
| 11 Wired Control Unit Design | | 2 hours |
| 12 Introduction to Microprogrammed Computing Systems | | 2 hours |
| 13 Structure of a Microprogrammed Control Memory | | 2 hours |
| 14 Microprogrammed Design Optimization | | |
| | Total | 28 hours |
| **Course bibliography** | 1. C. Fox Computer Architecture Ed.No starch press 2024.<br>2. S. P. Wang, Computer Architecture and Organization, Ed.Springer 2021.<br>3. M.Murdocca, Principles of Computer Architecture, Ed.Prentice Hall, 1999.<br>4. D.Patterson,J.Hennessy: The Organization and Design of Computers, All Publishing House, 2002.<br>5. Barna Cornel, course note in electronic format, 2025. | |

| 9.2 Laboratory | Teaching methods | Observations |
|---|---|---|
| **Laboratory exemplification** | Exemplification on the computer. Simulation of logic circuits | 28 hours |
| | Total | 28 hours |

| | |
|---|---|
| **Laboratory bibliography** | 1. C. Fox Computer Architecture Ed.No starch press 2024.<br>2. S. P. Wang, Computer Architecture and Organization, Ed.Springer 2021.<br>3. M.Murdocca, Principles of Computer Architecture, Ed.Prentice Hall, 1999.<br>4. D.Patterson,J.Hennessy: The Organization and Design of Computers, All Publishing House, 2002.<br>5. Barna Cornel, laboratory note 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**

| | |
|---|---|
| | |

**11. Assessment**

| Type of activity | Evaluation criteria | Evaluation methods | Percentage of final grade |
|---|---|---|---|
| **11.1 Course** | Course knowledge. Understanding the notions and principles that define the architecture of computing systems. | Written Paper | 60% |
| **11.2 Laboratory** | Knowledge and understanding. Ability to explain and interpret. Complete and correct resolution of requirements. | Evaluation of laboratory activity. Active presence at class and laboratory. | 40% |
| **11.3 Minimum Performance Standard** | | | |

Date of completion 20.09.2026

Signature of the course holder
Assoc.prof.dr.eng. Cornel Barna

Signature of the laboratory instructor
Assoc.prof.dr.eng. Cornel Barna

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 TRANSPORT |
| 1.4 Field of study | AUTOMATION, APPLIED INFORMATICS AND INTELLIGENT SYSTEMS |
| 1.5 Study Cycle | BACHELOR OF SCIENCE |
| 1.6 Study Programme/Qualification | AUTOMATION AND APPLIED INFORMATICS (IN ENGLISH) (AIA-E) |

## 2. Course Information

| | |
|---|---|
| 2.1 Course Title | ANALYSIS AND SYNTHESIS OF NUMERICAL DEVICES |
| 2.2 Course Lecturer | Assoc.prof.dr.eng. Cornel BARNA |
| 2.3 Laboratory Instructor | Assoc.prof.dr.eng. Cornel BARNA |
| 2.4 Year of study | 2 |
| 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 | 4 | 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 | 15 |
| Additional documentation in library, specialized databases, or field work | 20 |
| Preparation for seminars/labs, essays, portfolios | 15 |
| Tutoring | 4 |
| Examinations | 4 |
| Other activities... | 0 |
| 3.7 Total hours of individual study | 58 |
| 3.8 Total hours per semester | 100 |
| 3.9 Number of credits | 4 |

## 4. Preconditions (where applicable)

| | |
|---|---|
| 4.1 of curriculum | Notions of electronics, Numeracy basics |
| 4.2 of competences | Computer skills |

## 5. Conditions (where applicable)

| | |
|---|---|
| 5.1 of conducting the course | Classroom, equipped with laptop, video projector (if necessary) and appropriate software. |
| 5.2 of conducting the laboratory | Classroom, equipped with laptop, video projector (if necessary) and appropriate software. |

**6. Specific competencies acquired**

| | |
|---|---|
| Professional competencies | C2. Design electronic systems - Sketch and design electronic systems, products and components, using computer aided design (CAD) software and equipment. Perform a simulation so that an assessment of the viability of the product can be carried out and that the physical parameters can be examined before the actual construction of the product. |
| Transversal competencies | |

**7. Learning Outcomes**

| | |
|---|---|
| Knowledge | He has knowledge of electronic schematics and methods of designing electronic systems.<br>He has knowledge in simulation programs. |
| Skills | Make electronic schematics and printed circuit boards using specialized software.<br>Perform simulations to verify the functionalityand viability of systems designed prior to manufacturing. |
| Responsibilities and autonomy | Evaluates and optimizes the performance of the designed system, taking responsibility for choosing technical solutions.<br>Can work independently or in a team to implement and test automation solutions in a real professional environment.<br>Has the ability to manage technical projects responsibly and on time.<br>It has availability for continuous learning and professional adaptation in emerging fields (intelligent automation, IoT, AI in control).<br>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 | Understanding the notions of logic circuit<br>Training of computer component design skills.<br>Knowledge of the methods of designing computing equipment.<br>Forming the skills of using the machine code. |
| 8.2 Specific objectives | Students will know how it is carried out and what are the steps of a digital subassembly design.<br>Students will know how to foresee, from the specification and design phase, the creation of cases of information processing units.<br>Students will know how to use the tools for simulating logic circuits.<br>Students will know the design cases of processing units for different sets of instructions. |

**9. Curs Content**

| 9.1 Course | Teaching methods | Observations |
|---|---|---|
| **Introduction**<br><br>Presentation of the field and scope of applicability, main notions, connection with other disciplines, brief history. | Presented theoretically, exemplification,<br>Oral presentations and screenings. | 4 hours |
| **Mathematical principles**<br><br>Numbering bases, conversion from one base to another for integers and fractionals,<br><br>Practical examples. Operations of addition, subtraction, multiplication and division with numbers represented in various bases. Binary, octal and hexadecimal base. Fast conversions between them. Particularities of elementary operations in these numbering bases. | | 4 hours |
| Binary number representation formats. Boolean algebra, axioms, and logical functions. Truth tables, canonical disjunctive and conjunctive analytic expressions. Simplification of functions, through analytical, graphical and algorithmic methods. | | 4 hours |
| **Combinational circuits**<br><br>Description of logical portions. Realization of digital circuits based on logic functions using logic gates and PLA circuits. | | 4 hours |
| Description of multiplexers, demultiplexers, encoders and decoders. Examples of design with these circuits. ROM memories. The use of these logic circuits to perform logic functions. | | 4 hours |
| **Sequential circuits**<br><br>The notion of sequential circuit, differences from combinational circuits. Presentation of bistable types, making circuits using bistable | | 4 hours |
| **Vending machine design**<br><br>The notion of sequential automaton, the stages of designing and realizing a sequential automatic circuit. Reducing the number of states of an automaton. State encoding. | | 4 hours |

| | | |
|---|---|---|
| | Total | 28 hours |
| **Course bibliography** | 1. Gh. Stefan, Digital Integrated Circuits, Ed. Didactica 1983.<br>2. M.Sampalean Circuite ptr. Data Conversion, Ed. Tehnica 1980.<br>3. R Oberman Electronic Counts, Technical Publishing House, 1978.<br>4. M. Murdocca, Principles of Computer Architecture Ed. Prentice Hall 1999.<br>5. Barna Cornel, course note on online platform, 2025. | |

| **9.2 Laboratory** | **Teaching methods** | **Observations** |
|---|---|---|
| **Laboratory exemplification** | Exemplification on the computer. Simulation of logic circuits | 14 hours |
| | Total | 14 hours |
| **Laboratory bibliography** | 1. Gh. Stefan, Digital Integrated Circuits, Ed. Didactica 1983.<br>2. M.Sampalean Circuite ptr. Data Conversion, Ed. Tehnica 1980.<br>3. R Oberman Electronic Counts, Technical Publishing House, 1978.<br>4. M. Murdocca, Principles of Computer Architecture, Ed. Prentice Hall 1999.<br>5. Barna Cornel, laboratory note on online 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.**

| |
|---|
| |

**11. Assessment**

| **Type of activity** | **Evaluation criteria** | **Evaluation methods** | **Percentage of final grade** |
|---|---|---|---|
| **11.1 Course** | Course knowledge. Understanding the notions and principles that define the architecture of computing systems | Written Paper | 60% |

| | | | |
|---|---|---|---|
| **11.2 Laboratory** | Knowledge and understanding ; Ability to explain and interpret; Complete and correct resolution of requirements. | Evaluation of laboratory activity<br>Active presence at class and laboratory | 40% |
| **11.3 Minimum Performance Standard** | | | |

| Date of completion | Signature of the course holder | Signature of the laboratory instructor |
|---|---|---|
| 20.09.2025 | Assoc.prof.dr.eng. Cornel Barna | Assoc.prof.dr.eng. Cornel Barna |

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 | AUTOMATION, INDUSTRIAL ENGINEERING, TEXTILES and TRANSPORT |
| 1.4. Field of study | AUTOMATION, APPLIED INFORMATICS AND INTELLIGENT SYSTEMS |
| 1.5. Cycle of studies | LICENSE |
| 1.6. Study Programme/Qualification | AUTOMATION AND APPLIED INFORMATICS (IN ENGLISH) (AIA-E) |

## 2. Course Information

| | |
|---|---|
| 2.1. Course Title | APPLIED INFORMATICS II |
| 2.2. Course Lecturer | Senior Lecturer .dr.eng. Daniel DRAGU |
| 2.3. Laboratory and Project Instructor | Assistant drd. Bogdana Tania GAVRILĂ |
| 2.4.Year of study | 2 |
| 2.5.Semester | 1 |
| 2.6.Type of Assessment | VERIFICATION |
| 2.7. Course Status | DF-compulsory |

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

| | | | | | |
|---|---|---|---|---|---|
| 3.1. Hours per week | 5 | of which 3.2 lecture | 1 | 3.3 Laboratory+Project | 2+2 |
| 3.4. Total hours in the study plan | 70 | of which 3.5 lecture | 14 | 3.6 Laboratory+Project | 56 |

| 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 | 14 |
| 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 |

## 4. Preconditions (where applicable)

| | |
|---|---|
| 4.1. of curriculum | - Introductory notions of computer science and programming languages. |
| 4.2. of competences | - Use a development environment for creating simple programs |

## 5. Conditions (where applicable)

| | |
|---|---|
| 5.1. of conducting the course | Classroom, equipped with laptop, smart board and appropriate software, local/online |

| | |
|---|---|
| 5.2 of conducting the laboratory and project | Properly equipped laboratory room: computers, network, Internet connection, specialized / online software |

## 6. Specific Competencies Acquired

| | |
|---|---|
| Professional competencies | • C6 – Establish data processes<br>• C9 – Develop Open Source Software |
| Transversal competencies | • CT3 – Think Analytically |

## 7. Learning Outcomes

| | |
|---|---|
| Knowledge | • Understanding algorithms and data structures, programming paradigms and languages used in the field of automation<br>• Identify open-source platforms and libraries for the development of technical software applications |
| Skills | • Use programming languages and ICT tools to transform raw data into useful information.<br>• It uses open-source platforms and libraries for the development of technical software applications. |
| Responsibilities and autonomy | • Evaluates and optimizes the performance of the designed system, taking responsibility for choosing technical solutions.<br>• 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 | To develop the fundamental knowledge and practical skills necessary to<br>• understanding and applying numerical bases and methods of representing numbers in computing systems<br>• designing and developing software applications, both for desktop and mobile environments, in the context of engineering in Automation and Applied Informatics. |
| 8.2.Specific objectives | The student will be able to:<br>• Explain and apply the basic concepts of numeral systems<br>• Use methods of representing signed integers<br>• Apply the principles of representing real numbers in floating-point<br>• Develop basic desktop and mobile software applications<br>• Work efficiently, both individually and in a team<br>• Apply good programming practices and ethical norms in software development |

## 9. Course content

| **9.1 Course** | **Teaching methods** | Observations |
|---|---|---|
| 1. Numeracy basics | | 2 hours |

| | | |
|---|---|---|
| 2. Representation of signed integers | Exposition, description, explanations, examples, dialogue, interaction | 2 hours |
| 3. Floating Point Numbers Representation | | 2 hours |
| 4. Desktop Apps | | 4 hours |
| 5. Mobile Apps | | 4 hours |
| | TOTAL | 14 hours |

**Course Bibliography**


1. Daniel Dragu, Applied Informatics II – course and laboratory notes, electronic version, 2025.
2. Frans Kaashoek, Operating System Engineering, Massachusetts Institute of Technology, MIT Open CourseWare, 2012.
3. C# Programming Guide, https://learn.microsoft.com/en-us/dotnet/csharp/programming-guide/.


| **9.2 Laboratory** | **Teaching methods** | Observations |
|---|---|---|
| 1. Numeracy basics. Conversions between number bases | Computer exemplification | 4 hours |
| 2. Console apps | | 4 hours |
| 3. Desktop Apps | | 8 hours |
| 4. Port communication | | 4 hours |
| 5. Mobile Apps | | 8 hours |
| | TOTAL | 28 hours |

Laboratory Bibliography


1. Daniel Dragu, Applied Informatics II – course and laboratory notes, electronic version, 2025.
2. C# Programming Guide, https://learn.microsoft.com/en-us/dotnet/csharp/programming-guide/.
3. P. Nastase, B. Ionescu, F. Berbec, The Basics of Information and Communication Technology, Infomega Publishing House, Bucharest, 2010.


| **9.3 Project** | **Teaching methods** | Observations |
|---|---|---|
| 1. Desktop Apps | Design, implementation, testing | 28 hours |
| 2. Microcontroller Applications | | |
| 3. Mobile Apps | | |
| | TOTAL | 28 hours |

Project Bibliography
1. Daniel Dragu, Applied Informatics II – course and laboratory notes, electronic version, 2025.
2. C# Programming Guide, https://learn.microsoft.com/en-us/dotnet/csharp/programming-guide/.
3. P. Nastase, B. Ionescu, F. Berbec, The Basics of Information and Communication Technology, Infomega Publishing House, Bucharest, 2010.

## 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 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.

## 11. Assessment

| Type of activity | Evaluation criteria | Evaluation methods | Percentage in the 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<br>• Active participation | Applicative activities / practical works | 20% + 10% |
| 11.3 Project | • Correct and effective application of concepts in problem solving | Presentation, support | 20% |
| 11.3 Minimum Performance Standard<br>1. The student knows the main concepts, defines them correctly and builds a simple application;<br>2. The specialized language is simple, but correctly used;<br>3. Minimum grade of 5 in the laboratory;<br>4. To solve a minimum of topics well – questions and applications. | | | |

| Date of completion | Signature of the course holder | Signature of the laboratory instructor |
|---|---|---|
| 20.09.2025 | Senior lecturer.dr.eng. Daniel Dragu | Assist.drd. Bogdana Tania Gavrilă |

| | |
|---|---|
| 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<br>29.09.2026 | Approval from the Dean<br>Senior lecturer.dr.eng. Corina-Anca Mnerie |

# SYLLABUS

**12. 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 Programme/Qualification | AUTOMATION AND APPLIED INFORMATICS (IN ENGLISH) (AIA-E) |

**13. Course Information**

| | |
|---|---|
| 2.1. Course Title | ALGORITHM DESIGN |
| 2.2. Course Lecturer | Senior Lecturer dr.eng. Daniel DRAGU |
| 2.3. Laboratory Instructor | Senior Lecturer dr.eng. Daniel DRAGU |
| 2.4. Year of study | 2 |
| 2.5. Semester | 1 |
| 2.6. Type of assessment | VERIFICATION |
| 2.7. Course Status | DS-compulsory |

**14. 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 | 15 |
| Additional documentation in library, specialized databases, or field work | 12 |
| Preparation for seminars/labs, essays, portfolios | 20 |
| Tutoring | 5 |
| Examinations | 3 |
| Other activities | 3 |
| 3.7 Total hours of individual study | 58 |
| 3.8 Total hours per semester | 100 |
| 3.9 Number of credits | 4 |

**15. Preconditions** (where applicable)

| | |
|---|---|
| 4.1. of curriculum | - |
| 4.2. of competences | - |

**16. Conditions** (where applicable)

| | |
|---|---|
| 5.1. of conducting the course | Classroom equipped with laptop, smart board and appropriate software, local/online |

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

**17. Specific competencies acquired**

| | |
|---|---|
| Professional competencies | • C9 – Develop Open Source Software |
| Transversal competencies | • CT3 – Think Analytically |

**18. Learning Outcomes**

| | |
|---|---|
| Knowledge | Student/graduate:<br>• Identify open-source platforms and libraries for the development of technical software applications<br>• Think creatively and innovatively |
| Skills | Student/graduate:<br>• It uses open-source platforms and libraries for the development of technical software applications.<br>• Think critically |
| Responsibilities and autonomy | Student/graduate:<br>• Has the ability to manage technical projects responsibly and on time.<br>• Approach issues critically<br>• Analyze experimental laboratory data<br>• Develop new installations |

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

| | |
|---|---|
| 8.1.General objective of the discipline | Forming students' skills to design and implement the main algorithm models, as well as developing students' analytical capacity and their abilities to correctly apply the accumulated knowledge. |
| 8.2.Specific objectives | Students are able to<br>• Explain and apply the fundamental paradigms of algorithm design;<br>• Develop algorithms that use recursive calls and evaluate when this technique is effective;<br>• Build and implement algorithmic solutions using fundamental data structures;<br>• Analyze the complexity of the proposed algorithms and optimize solutions according to available resources;<br>• Apply algorithmic notions in concrete contexts and in practical projects;<br>• Document and clearly communicate the proposed algorithmic solutions, justifying the choices made. |

**20. Course Content**

| **9.1 Course** | **Teaching methods** | Observations |
|---|---|---|
| 1. Introduction to PA. Algorithm, properties of algorithms | | 2 hours |

| | | |
|---|---|---|
| 2. Algorithm Design Paradigms | Exposition, description, explanations, examples, dialogue, interaction | 2 hours |
| 3. Recursion. | | 4 hours |
| 4. Divide and rule | | 4 hours |
| 5. Backtracking | | 6 hours |
| 6. Data Structures | | 6 hours |
| 7. Lists, Stacks | | 4 hours |
| | TOTAL | 28 hours |
| Course Bibliography<br>4. Daniel Dragu, Algorithm Design – Lecture and Laboratory Notes, electronic version, 2025.<br>5. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, Introduction to Algorithms", MIT Press, 2009. | | |

| **9.2 Laboratory work** | **Teaching methods** | Observations |
|---|---|---|
| 1-7. Practical aspects based on the topics discussed in the course | Exemplification on the computer. Functionality testing. | 14 hours |
| | TOTAL | 14 hours |
| Laboratory Bibliography<br>4. Daniel Dragu, Algorithm Design – Lab Notes, 2025.<br>5. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, Introduction to Algorithms", Third Edition, MIT Press, 2009. | | |

**21. 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.

**22. 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<br>Active participation | Applicative activities / practical works | 40% + 10% |
| 11.3 Minimum Performance Standard<br>1. The student knows the main concepts, defines them correctly and builds a simple application;<br>2. The specialized language is simple, but correctly used;<br>3. Minimum grade of 5 in the laboratory;<br>4. To solve a minimum of topics well – questions and applications. | | | |

| Date of completion | Signature of the course holder | Signature of the 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 TRANSPORT |
| 1.4 Field of Study | AUTOMATION, APPLIED INFORMATICS AND INTELLIGENT SYSTEMS |
| 1.5 Study Cycle | BACHELOR OF SCIENCE |
| 1.6 Study Programme/Qualification | AUTOMATION AND APPLIED INFORMATICS (IN ENGLISH) (AIA-E) |

**2. Course Information**

| | |
|---|---|
| 2.1 Course Title | SPECIAL MATHEMATICS |
| 2.2 Course Lecturer | Assoc. Prof. Dr. Păstorel GAŞPAR |
| 2.3 Seminar Instructor | Assistant. Drd. Sorin HOARĂ |
| 2.4 Year of study | 2 |
| 2.5 Semester | 1 |
| 2.6 Type of Assessment | EXAMINATION |
| 2.7 Course Status | DF-compulsory |

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

| | | | | | |
|---|---|---|---|---|---|
| 3.1 Hours per week | 4 | of which 3.2 lecture | 2 | 3.3 Seminar | 2 |
| 3.4 Total hours in the study plan | 56 | of which 3.5 lecture | 28 | 3.6 Seminar | 28 |

| 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 | |
| Examinations | 4 |
| Other activities... | |
| 3.7 Total hours of individual study | 44 |
| 3.8 Total hours per semester | 100 |
| 3.9 Number of credits | 4 |

**4. Preconditions** (where applicable)

| | |
|---|---|
| 4.1 of curriculum | Mathematical analysis on R and R^2, Linear algebra |
| 4.2 of competences | - |

**5. Conditions** (where applicable)

| | |
|---|---|
| 5.1 of conducting the course | Classroom equipped with blackboard (optional video projector) |
| 5.2 of conducting the seminar | Seminar room equipped with blackboard (optional video projector) |

**6. Specific Competencies Acquired**

| | |
|---|---|
| Professional competencies | C1. Perform analytical mathematical calculations |
| Transversal competencies | - |

**7. Learning Outcomes**

| | |
|---|---|
| Knowledge | Graduate:<br>• Knows and identifies mathematical methods (linear algebra, numerical analysis) for modeling and solving engineering problems.<br>•Uses specific software tools (e.g. MATLAB) to automate analytical calculations and verify mathematical solutions in real contexts. |
| Skills | Graduate:<br>•Apply advanced mathematical methods (linear algebra, numerical analysis) for modeling and solving engineering problems.<br>•Uses specific software tools (e.g. MAT¬LAB) to automate analytical calculations and verify mathematical solutions in real contexts. |
| Responsibilities and autonomy | Graduate:<br>• Evaluates and optimizes the performance of the designed system, assuming responsibility for choosing technical solutions.<br>•Can work independently or in a team to implement and test automation solutions in a real professional environment.<br>•Has the ability to manage technical projects responsibly and on time.<br>•Has availability for continuous learning and professional adaptation in emerging fields (intelligent automation, IoT, AI in control).<br>• 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 | Use of the theoretical foundations of mathematics and formal models. |
| 8.2 Specific objectives | 1. Assimilation of knowledge of Fourier analysis;<br>2. Acquiring the habit of working with Fourier series and coefficients;<br>3. Knowledge of the fundamental concepts regarding the Laplace transform;<br>4. Application of Laplace transform and Fourier analysis in solving some<br>differential equations and signal modeling. |

**9. Course Content**

| **9.1 Course** | **Teaching methods** | **Observations** |
|---|---|---|

| | | |
|---|---|---|
| 1. Laplace transform: definition, examples, properties Elementary<br>2. Properties of the Laplace transform: derivation of the transform Laplace, Heaviside's function, inverse Laplace transform, limit theorems, impulse function, periodic functions<br>3. The product of convolution and applications to differential equations<br>4. Higher-order differential equations with constant coefficients.<br>5. Fourier series: Fourier coefficients, particular forms for odd and even functions<br>6. Vibrating string problem.<br>7. The Heat Problem | Exposure to the board and/or with overhead projector; Exemplification of the notions introduced | Average 4 hours/theme<br>4 hours<br>4 hours<br>4 hours<br>4 hours<br>4 hours<br>4 hours |
| Total | | 28 hours |
| **Course bibliography** | | |
| 1. P.: An Introduction to Laplace Transformsand Fourier Series, 2nd Edition, Springer, New York, 2014.<br>2. U. Graf: Applied Laplace Transforms and z-Transforms for Scientists and Engineers, Springer, Basel, 2004.<br>3. E. Stade: Fourier Analysis, John Wiley & Sons, New Jersey, 2005. | | |

| **9.2 Seminar** | **Teaching methods** | **Observations** |
|---|---|---|
| 1. Laplace transform: definition, examples, properties Elementary<br>2. Properties of the Laplace transform: derivation of the transform Laplace, Heaviside's function, inverse Laplace transform, limit theorems, impulse function, periodic functions<br>3. The product of convolution and applications to differential equations<br>4. Higher-order differential equations with constant coefficients.<br>5. Fourier series: Fourier coefficients, particular forms for odd and even functions<br>6. Vibrating string problem.<br>7. The Heat Problem | Exposure to the board and/or with overhead projector; Exemplification of the notions introduced | Average 4 hours/theme<br>4 hours<br>4 hours<br>4 hours<br>4 hours<br>4 hours<br>4 hours |
| Total | | 28 hours |

| **Seminar bibliography** | |
|---|---|
| 1. P.: An Introduction to Laplace Transformsand Fourier Series, 2nd Edition, Springer, New York, 2014.<br>2. U. Graf: Applied Laplace Transforms and z-Transforms for Scientists and Engineers, Springer, Basel, 2004.<br>3. E. Stade: Fourier Analysis, John Wiley & Sons, New Jersey, 2005. | |

**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 course is in line with what is done in other university centers in the country and abroad. For a better<br>To adapt the content of the discipline to the requirements of the labor market, meetings were held with representatives of the Arad industrial environment. |

**11. Assessment**

| Type of activity | Evaluation criteria | Evaluation methods | Percentage of final grade |
|---|---|---|---|
| **11.1 Course** | - correctness and completeness of knowledge;<br>- logical coherence;<br>- the degree of assimilation of the specialized language; | Final written evaluation (in the (Examination) | 40% |
| **11.2 Seminar** | - the ability to operate with the assimilated knowledge;<br>- the ability to apply in practice; | Final written evaluation (in the (Examination) | 60% |
| **11.3 Minimum Performance Standard**<br>knowledge of the fundamental elements of theory, solving a simple application. | | | |

Date of completion 20.09.2025

Signature of the course holder
Assoc. Prof. dr. Pastor Gașpar

Signature of the seminar instructor
Assist.drd. Sorin Hoara

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 TRANSPORT |
| 1.4 Field of Study | AUTOMATION, APPLIED INFORMATICS AND INTELLIGENT SYSTEMS |
| 1.5 Study Cycle | BACHELOR OF SCIENCE |
| 1.6 Study Programme/Qualification | AUTOMATION AND APPLIED INFORMATICS (IN ENGLISH) (AIA-E) |

**2. Course Information**

| | |
|---|---|
| 2.1 Course Title | PHYSICAL EDUCATION AND SPORT 3 |
| 2.2 Course Lecture | |
| 2.3 Seminar Instructor | Assistant drd. Vlad Adrian GEANTĂ |
| 2.4 Year of study | 2 |
| 2.5 Semester | 1 |
| 2.6 Type of assessment | VERIFICATION |
| 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 | 0 | 3.3 Seminar | 2 |
| 3.4 Total hours in the study plan | 28 | of which 3.5 lecture | 0 | 3.6 Seminar | 28 |

| Time allocation | Hours |
|---|---|
| Study based on course materials, bibliography | 9 |
| Additional documentation in library, specialized databases, or field work | |
| Preparation for seminars/labs, essays, portfolios | 8 |
| Tutoring | 2 |
| Examinations | 2 |
| Other activities... | 1 |
| 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 of conducting the course | |
| 5.2 of conducting the seminar | Gym, Sports Field |

**6. Specific competencies acquired**

| | |
|---|---|
| Professional competencies | |

| | |
|---|---|
| Transversal competencies | CT1. Work in teams - Work confidently within a group, each doing his or her part in serving the whole.<br>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 | Know the principles and stages of teamwork.<br>Know ways to communicate and collaborate effectively.<br>Know the principles of professional ethics and deontology.<br>He is familiar with the applicable procedures and quality standards. |
| Skills | Actively participates in team activities, contributing to the achievement of common goals.<br>Demonstrates the ability to negotiate and resolve conflicts constructively.<br>Correctly apply activity-specific regulations, procedures, and instructions.<br>Propose solutions to improve compliance with rules and procedures. |
| Responsibilities and autonomy | They take on their own tasks and respect the deadlines set in the team.<br>Contribute to a positive and productive team climate.<br>Respects the principles of professional ethics in all activities carried out<br>It contributes to the promotion of an organizational culture based on compliance and integrity.<br>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 | Development of generic theoretical and practical skills in engineering sciences.<br>Providing the engineering knowledge fund specific to the field of systems engineering.<br>Development of competences and abilities for the research, development, design and implementation of specific processes, products and services.<br>Development of the knowledge necessary for technical-economic analyses.<br>Development of strategic partnerships with the business environment to facilitate the access and insertion of graduates on the local, national and European labor market. |
| 8.2 Specific objectives | Fundamental engineering training. |

| | |
|---|---|
| | Ensure knowledge of computer graphics and computer-aided graphic design skills.<br>Provide general technical knowledge in the field of systems engineering.<br>Ability to conceive, promote and carry out group projects.<br>Acquire the skills to integrate technical knowledge specific to all categories of processes and products.<br>Acquiring the ability to direct the quality of products from the design stage, to control and verify the final quality of products and processes. |

**9. Course content**

| **9.1 Course** | **Teaching methods** | **Observations** |
|---|---|---|
| | | |
| Course bibliography | | |

| **9.2 Seminar** | **Teaching methods** | **Observations** |
|---|---|---|
| Athletics: elements from the school of running and jumping. | Presentations, Demonstrations, Intuitive Demonstrations, Explanations with Demonstrations | 8 hours |
| Fitness/Jogging | Presentations, Demonstrations, Intuitive Demonstrations, Explanations with Demonstrations | 8 hours |
| Elements of gymnastics: front exercises and formations | Presentations, Demonstrations, Intuitive Demonstrations, Explanations with Demonstrations | 3 hours |
| Table tennis | Presentations, Demonstrations, Intuitive Demonstrations, Explanations with Demonstrations | 3 hours |
| Sports games: basketball, volleyball, football | Presentations, Demonstrations, Intuitive Demonstrations, Explanations with Demonstrations | 3 hours |
| Combat/Self-defense | Presentations, Demonstrations, Intuitive Demonstrations, Explanations with Demonstrations | 3 hours |
| | Total | 28 hours |
| **Seminar bibliography:** | 1. Bushman, B., 2011, Complete guide to fitness and health, Human Kinetics, Champaign, IL;<br>2. CORBIN, B. C., RUTH, L., 2007, Fitness for life, Human Kinetics, Champaign, IL. | |

| | |
|---|---|
| | 3. DRAGNEA, A., BOTA, A., 1999, Theory of Motor Activities, Didactic and Pedagogical Publishing House, Bucharest.<br>4. IONESCU, A., MAZILU, V., 1971, Physical Exercise in the Service of Health, Stadion Publishing House, Bucharest.<br>5. SCARLAT, E., SCARLAT, M. B., 2011, Treatise on Physical Education, Didactic and Pedagogical Publishing House, Bucharest.<br>6. ULMEANU, I., 1966, Notions of Physiology with Applications to Physical Exercises, UCFS Publishing House, Bucharest.<br>7. Vlad bag – electronic laboratory on the SUMS 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**

Through its contents, the discipline has a pronounced pragmatic character, contributing to the training of specialists in the field of specialization through the following: harmonious development of the body; optimizing health; optimizing health; preventing the onset of global and segmental physical deficiencies, forming and maintaining correct body attitudes; stimulating students' interest in the systematic and independent practice of physical exercise individually and collectively on a daily or weekly basis; creating the habit of observing the rules of sports hygiene and accident prevention; developing the capacity for self-defense and self-improvement.

**11. Assessment**

| Type of activity | Evaluation criteria | Evaluation methods | Percentage of final grade |
|---|---|---|---|
| **11.1 Course** | | | |
| **11.2 Seminar** | Active participation in classes<br>Disposition to physical and intellectual effort<br>Suitable equipment<br>Appropriate attitude for teamwork | Execution of exercises as number and correctness;<br>Continuous evaluation during the activity;<br>Tests during the semester and their grading;<br>Reports for those exempted | 70%<br>10%<br>10%<br>10% |
| **11.3 Minimum Performance Standard**<br>Minimum 5 attendances at Physical Education and Sports classes<br>Control Tests:<br>Speed Running 20m<br>Squats: 20 reps<br>Long jump from the spot without momentum | | | |

Date of completion 20.09.2025 | Signature of the course holder | Signature of the seminar instructor Assist.drd. Vlad Andrei Geantă

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
29.09.2026

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

# SYLLABUS

**23. 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) |

**24. Course Information**

| | |
|---|---|
| 2.1. Course Title | AUTOMATION AND MICROPROGRAMMING |
| 2.2. Course Lecturer | Senior Lecturer dr.eng. Corina Anca MNERIE |
| 2.3. Laboratory Instructor | Senior Lecturer dr.eng. Corina Anca MNERIE |
| 2.4. Year of Study | 2 |
| 2.5. Semester | 2 |
| 2.6. Type of Assessment | EXAMINATION |
| 2.7. Course Status: | DS-compulsory |

**25. 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 3.2 lecture | 28 | laboratory | 28 |

| Time allocation | Hours |
|---|---|
| Study based on course materials, bibliography | 15 |
| Additional documentation in library, specialized databases, or field work | 10 |
| Preparation for seminars/labs, essays, portfolios | 10 |
| Tutoring | 3 |
| Examinations | 4 |
| Other activities… | 2 |
| **3.7.Total hours of individual study** | 44 |
| **3.9.Total hours per semester** | 100 |
| **3.10.Number of credits** | 4 |

**26. Preconditions** (where applicable)

| | |
|---|---|
| 4.1. of curriculum | Physics, Electrical Engineering, Linear Electronic Circuits. |
| 4.2. of competences | The continuity of the applicative capitalization of the acquired knowledge allows a gradual passage of the chapters, in close relation with the theme of the previously studied subjects. |

**27. Conditions** (where applicable)

| | |
|---|---|
| 5.1. of conducting the course | Classroom, equipped with laptop, video projector (if necessary) and appropriate software. |
| 5.2. of conducting the laboratory | Properly equipped laboratory room: computers, network, Internet connection, specialized software, programmable controllers, specific stands with PLC and appropriate software |

**28. Specific skills acquired**

| | |
|---|---|
| **Professional Competencies** | C5. Design control systems |
| **Transversal Competencies** | CT3. Think analytically |

**29. 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.<br>2. Know the structure, operation and interaction of hardware and software components in an industrial control system – in particular a PLC<br>3. Identify the languages, functions, algorithms used in PLC programming.<br>4. Solve problems. |
| Skills | 1. Integrate and configure hardware and software components into a functional system with PLC and simulation.<br>2. Plan and execute engineering experiments using specific laboratory equipment.<br>3. Analyzes and interprets experimental data to validate hypotheses or technical performances.<br>4. Think analytically and creatively. |
| Responsibilities and autonomy | 1. Evaluates and optimizes the performance of the projected system, assuming responsibility for choosing technical solutions.<br>2. Has the ability to manage technical projects responsibly and on time.<br>3. Can work independently or in a team to implement and test automation solutions in a real professional environment.<br>4. It analyzes experimental data, develops new projects. |

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

| | |
|---|---|
| 8.1. General objective of the discipline | The main objective of the "Automata and Microprogramming" course, provided in the specialized training plan, is to familiarize the students of the Automation and Applied Informatics specialization in the field of programmable logic automata as well as with their programming languages defined in the standards. |
| 8.2.Specific objectives | • Knowledge of the hardware construction of programmable vending machines and understanding their operation<br>• knowledge and understanding of the ways of preloading programmable machines<br>• Ability to interpret and explain automation diagrams<br>• Ability to create simple programs for programmable controllers used in practice |

**31. Course Content**

| **9.1 Course** | **Teaching methods** | Observations |
|---|---|---|
| 1. General. | Oral presentations. Powerpoint projections and computer simulations using the video projector or in the network | 2 hours |
| 2. Description of an automation | | 4 hours |
| 3. Vector Vending Machines. Structure. Features | | 2 hours |
| 4. AP Input Modules | | 2 hours |
| 5. AP Output Modules | | 2 hours |
| 6. Making automation graphs | | 6 hours |
| 7. Programming Programmable Vending Machines | | 6 hours |
| 8. Concrete automation solutions with AP | | 4 hours |
| TOTAL | | 28 hours |

**Course bibliography:**


- ✓ [1] Mnerie Corina, Automata and mycoprogramming, course and laboratory notes, electronic format, 2025.
- ✓ [2] Mărgineanu Ioan, Programmable Automata. Hardware peculiarities and programming languages http://www.infopam.net/
- ✓ [3] Ivănescu Andrei Nick, Automata și microprogramare, Ed. Politehnica Press.
- ✓ [4] Th. Borangiu, A.-N. Ivanescu and S. Brotac, Programmable Automata. Theory and Solved Problems, Princeech Publishing House, Bucharest 2002.
- ✓ [5] Frank D. Petruzella – Activities Manual for Programmable Logic Controllers-McGraw-Hill Education (2016)
- ✓ [6] Frank D. Petruzella – Programmable Logic Controllers-McGraw-Hill Education (2016)
- ✓ [7] https://www.mitsubishielectric.com/fa/assist/e-learning/eng.html


| **9.2 Laboratory**<br>Solving automation problems using PLCs programmed with the Ladder diagram. Basic programming. | **Teaching methods** | Observations |
|---|---|---|
| 1. Occupational protection measures in the microsystems laboratory. Behavior and action in emergency situations | | 2 hours |

| | | |
|---|---|---|
| Examples of Simple Representative Automations | PCs with the right software<br>AP Mitsubishi FX3u-16M<br>AP Mitsubishi FX3-30MT<br><br>Mitsubishi – FX Trainer – simulation software | |
| 2. Presentation of the AP equipment from the Microsystems laboratory. Identification of the component parts of different types of APs (different manufacturers, monobloc or modular). Presentation of industrial automation problems with AP. Posing the problem. | | 4 hours |
| 3. Presentation of the MELSEC FX Trainer Mitsubishi simulation software. | | 2 hours |
| 4. Using the basic objects of the LADDER language and implementing simple combinational logic functions. Lab AP Programming | | 4 hours |
| 5. Using timers in apps. The traffic light | | 4 hours |
| 6. Using Counters in Apps | | 4 hours |
| 7. Conveyor and loading/unloading control solutions using Programmable Vending Machines | | 4 hours |
| 8. Making automation graphs. Case studies | | 2 hours |
| 9. Completion of works. | | 2 hours |
| TOTAL | | 28 hours |

**Laboratory bibliography:**

[1] Mnerie Corina, Automata and mycoprogramming, course and laboratory notes, electronic format, 2025.

[2] Mărgineanu Ioan, Programmable Automata. Hardware peculiarities and programming languages http://www.infopam.net/

[3] Ivănescu Andrei Nick, Automata şi microprogramare, Ed. Politehnica Press.

[4] Th. Borangiu, A.-N. Ivanescu and S. Brotac, Programmable Automata. Theory and Solved Problems, Princeech Publishing House, Bucharest 2002.

[5] Frank D. Petruzella – Activities Manual for Programmable Logic Controllers-McGraw-Hill Education (2016)

[6 ] https://www.mitsubishielectric.com/fa/assist/e-learning/eng.html

## 32. 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 both with representatives of the business environment and with other specialized professors from other higher education centers in the country or abroad.

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

Some of the examples presented in the laboratory applications course originate from communications, lectures, project topics and other similar materials.

**33. Assessment**

| Type of activity | Evaluation criteria | Evaluation methods | Percentage of final grade |
|---|---|---|---|
| 11.1 Course | Knowledge, understanding and ability to apply the notions and concepts presented in the course. | Written paper or grid test | 50% |
| | Solving homework within the imposed deadline | Evaluation along the way | 25% |
| 11.2 Laboratory | Participation, involvement and resolution of the problems proposed in the laboratory. | Evaluation along the way and final | 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.<br>2. Specialized language is simple, but correctly used.<br>3. To solve well a minimum of theoretical topics and applications.<br>4. Performing laboratory work. | | | |

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

20.09.2025 Senior lecturer.dr.eng. Corina Anca Mnerie 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. Dan Valentin Muller

Date of approval in the faculty council Approval from the Dean

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

# SYLLABUS

**34. 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) |

**35. Course Information**

| | |
|---|---|
| 2.1. Course Title | ELECTRIC MACHINES AND DRIVES 2 |
| 2.2. Course Lecturer | Assoc. Prof. Dr. eng. Valentin Dan MULLER |
| 2.3. Project activity Instructor | Assoc. Prof. Dr. eng. Valentin Dan MULLER |
| 2.4. Year of Study | 2 |
| 2.5. Semester | 2 |
| 2.6. Type of Assessment | VERIFICATION |
| 2.7. Course Status | DS-compulsory |

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

| | | | | | |
|---|---|---|---|---|---|
| 3.1. Hours per week | 3 | of which 3.2 lecture | 2 | 3.3 Project | 2 |
| 3.4. Total hours in the study plan | 56 | of which 3.5 lecture | 28 | 3.6 Project | 28 |

| Time allocation: | Hours |
|---|---|
| Study based on course materials, bibliography | 10 |
| Additional documentation in library, specialized databases, or field work | 10 |
| Preparation for seminars/labs, essays, portfolios | 10 |
| Tutoring | 4 |
| Examinations | 6 |
| Other activities | 4 |
| **3.7.Total hours of individual study** | 44 |
| **3.9.Total hours per semester** | 100 |
| **3.10.Number of appropriations** | 4 |

**37. 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 electric drives. |

**38. Conditions (where applicable)**

| | |
|---|---|
| 5.1. of conducting the course | Classroom or classroom equipped with IT systems (video projector, etc.). |
| 5.2. of conducting the seminar and laboratory | Classroom or laboratory |

**39. Specific Competencies Acquired**

| | |
|---|---|
| **Professional Competencies** | C3. Include new products in the production process – Help integrate new systems, products, methods, and components into the production line. It ensures that production workers are properly trained and comply with new requirements. |
| **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:<br>• He has knowledge of the operation of some methods, algorithms, equipment.<br>• Identify how certain products can be included in production<br>• Define performance indicators.<br>• Propose and validate optimization solutions to reduce costs and increase efficiency.<br>• It processes information, ideas and concepts.<br>• Solve problems.<br>• Think creatively and innovatively. |
| Skills | Graduate:<br>• Document and implement procedures for introducing a new product into the manufacturing flow.<br>• It ensures the training of operators and the adaptation of equipment to the requirements of the new product.<br>• Identify losses and non-conformities in the production process based on performance indicators.<br>• Propose and validate optimization solutions to reduce costs and increase efficiency.<br>• Think analytically.<br>• Think critically.<br>• Think creatively. |
| Responsibilities and autonomy | Graduate:<br>• 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.<br>• Has the ability to manage technical projects responsibly and on time.<br>• It has availability for continuous learning and professional adaptation in emerging fields (intelligent automation, IoT, AI in control).<br>• Manifestation of ethical behavior and a professional attitude in the engineering activity.<br>• It analyzes experimental laboratory data.<br>• Develop new installations. |

**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.<br>• During this course, control schemes with electric machines are presented, with the technical-constructive and functional characteristics of these systems. |
| 8.2.Specific objectives | • Knowledge and appropriate use of the notions specific to the discipline.<br>• Knowledge and deepening of some fundamental notions of electric drives.<br>• Assimilation of theoretical knowledge regarding electric drive systems with direct current and alternating current machines. |

**9. Course Content**

| **9.1 Course** | **Teaching methods** | **Observations** |
|---|---|---|
| **1.Shipping: Drive System Architecture** | Oral presentation | 2 hours |
| **2. Kinematics and dynamics of electric drives** . Kinematics of electric drives. Dynamics of electric drives The equation of motion. Reporting the main sizes to the shaft of the electric car | Oral presentation, completed with the presentation of images (video projector, etc.) | 4 hours |
| **3. Characteristics of electric drive motors of work machines and transmission elements.** General notions. Mechanical characteristics of engines and working machines. Electromechanical couplings. | Oral presentation, completed with the presentation of images (video projector, etc.) | 4 hours |
| 4. **Electric drive systems (mover-electric motor-work machine).** Drive systems with DC motors and converters. Drive systems with asynchronous and synchronous AC motors. | Oral presentation, completed with the presentation of images (video projector, etc.) | 8 hours |
| **5. Automatic control and regulation systems for electric drives.** General notions. Speed control systems Mcc. Impulse asynchronous car | Oral presentation, completed with the presentation of | 6 hours |

| | | |
|---|---|---|
| speed regulation systems. Speed adjustment of asynchronous machines with cascading schemes. | images (video projector, etc.) | |
| **6. Choice of electric drive systems**<br>Energy for electric shareholders. Criteria for choosing drive machines | Oral presentation, completed with the presentation of images (video projector, etc.) | 4 hours |
| | Total | 28 hours |

**Course bibliography:**


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

[2]. Dordea, T. Electric Machines. ASAB Publishing House, Bucharest, 2002.

[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]. Tunsoiu, Gh; Seracin, E; Saal, C. Electric Shareholders. Didactic and Pedagogical Publishing House, Bucharest 1982.

[6]. Saal, C; Tope, I; Fransua Al; Micu, E. Electric Drives and Automation. Didactic and Pedagogical Publishing House, Bucharest, 1980.


| **9.2 Project** | | |
|---|---|---|
| Project theme: Electric drive of a working machine with asynchronous electric motors with winding rotor. | EN | 4 hours |
| Quantities required for determining the mechanical characteristics for the asynchronous machine | EN | 4 hours |
| Plotting Mechanical Characteristics | EN | 4 hours |
| Determination of Starting Rheostat Steps for Three-Phase Asynchronous Machine with Winded Rotor | EN | 4 hours |
| Checking the electric drive motor | EN | 4 hours |
| Automatic control scheme of the electric drive | EN | 4 hours |
| Delivering the project | EN | 4 hours |
| | Total | 28 hours |

**Project bibliography:**


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

[2]. Müller, V. Electric cars. Teme experimentale, Editura Politehnica Timişoara, 2005.

[3]. Tunsoiu, Gh; Seracin, E; Saal, C. Electric Shareholders. Didactic and Pedagogical Publishing House, Bucharest 1982.


**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.<br>• 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 Project | Students' ability to form and develop practical skills. | Oral method (at the end of the semester) | 15% |
| | Active participation of students in the project. | Oral + practical method (during the semester) | 10% |
| 11.3 Minimum Performance Standard | | | |
| • The components of an electric drive system.<br>• Ordering schemes | | | |

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

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

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

**40. 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 Program/Qualification | AUTOMATION AND APPLIED INFORMATICS (IN ENGLISH) (AIA-E) |

**41. Course Information**

| | |
|---|---|
| 2.1 Course Title | ELECTRIC CARS AND DRIVES 1 |
| 2.2 Course Lecturer | Assoc. Prof. Dr. eng. Valentin Dan MULLER |
| 2.3 Laboratory Instructor | Assoc. Prof. Dr. eng. Valentin Dan MULLER |
| 2.4 Year of Study | 2 |
| 2.5 Semester | 1 |
| 2.6 Type of Assessment | EXAMINATION |
| 2.7 Course Status | DS-compulsory |

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

| | | | | | |
|---|---|---|---|---|---|
| 3.1. Hours per week | 4 | of which 3.2 lecture | 2 | 3.3 Laboratory | 2 |
| 3.4. Total hours in the study plan | 56 | of which 3.5 lecture | 28 | 3.6 Laboratory | 28 |

| 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 | 12 |
| Tutoring | 2 |
| 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 |

**43. Preconditions** (where applicable)

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

**44. Conditions** (where applicable)

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

**45. Specific Competencies Acquired**

| | |
|---|---|
| **Professional Competencie** | C3. Include new products in the production process – Help integrate new systems, products, methods, and components into the production line. It ensures that production workers are properly trained and comply with new requirements. |
| **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:<br>• He has knowledge of the operation of some methods, algorithms, equipment.<br>• Identify how certain products can be included in production<br>• Define performance indicators.<br>• Propose and validate optimization solutions to reduce costs and increase efficiency.<br>• It processes information, ideas and concepts.<br>• Solve problems.<br>• Think creatively and innovatively. |
| Skills | Graduate:<br>• Document and implement procedures for introducing a new product into the manufacturing flow.<br>• It ensures the training of operators and the adaptation of equipment to the requirements of the new product.<br>• Identify losses and non-conformities in the production process based on performance indicators.<br>• Propose and validate optimization solutions to reduce costs and increase efficiency.<br>• Think analytically.<br>• Think critically.<br>• Think creatively. |
| Responsibilities and autonomy | Graduate:<br>• Evaluates and optimizes the performance of the designed system, taking responsibility for choosing technical solutions.<br>• Can work independently or in a team to implement and test automation solutions in a real professional environment.<br>• 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).<br>• Manifestation of ethical behavior and a professional attitude in the engineering activity.<br>• It analyzes experimental laboratory data.<br>• Develop new installations. |

## 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 electric cars<br>• This course presents all types of electric cars, with the technical-constructive and functional characteristics of these systems. |
| 8.2. Specific objectives | • Knowledge and appropriate use of the notions specific to the discipline.<br>• Knowledge and deepening of some fundamental notions of machines<br>• Assimilation of theoretical knowledge regarding electric drive systems with direct current and alternating current machines. |

## 9. Course Content

| 9.1 Course | Teaching methods | Observations |
|---|---|---|
| **1. The electrical transformer.** Construction – Principle of operation – Classification – Nominal sizes. The single-phase transformer. The operating regimes of the electrical transformer. The three-phase transformer. Parallel operation of transformers. Special transformers. The transient regime of the electrical transformer. | Oral presentation, completed with the presentation of images (video projector, etc.) | 8 hours |
| **2. Induction machine.** Construction – Classification – Principle of operation. Equations of the asynchronous machine. Operating characteristics of induction machines. Starting the asynchronous machine. Changing the speed of the asynchronous car Braking the asynchronous car. | Oral presentation, completed with the presentation of images (video projector, etc.) | 8 hours |
| **3. Synchronous machine.** Construction – Classification – Principle of operation. The reaction of the induced. Equations of the synchronous machine. The power and electromagnetic torque of the synchronous machine. Synchronous generator. Operating characteristics. Non-symmetrical regimes of the synchronous machine | Oral presentation, completed with the presentation of images (video projector, etc.) | 8 hours |

| | | |
|---|---|---|
| **4. DC machine.** Construction – Classification – Principle of operation. The reaction of the induced and the resulting magnetic field. Equations and electromagnetic torque. DC motor. DC generator. Brake the DC machine. | Oral presentation, completed with the presentation of images (video projector, etc.) | 4 hours |
| | Total | 28 hours |

**Course bibliography:**


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

[2]. Dordea, T. Electric Machines. ASAB Publishing House, Bucharest, 2002.

[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]. Tunsoiu, Gh; Seracin, E; Saal, C. Electric Shareholders. Didactic and Pedagogical Publishing House, Bucharest 1982..

[6]. Saal, C; Tope, I; Fransua Al; Micu, E. Electric Drives and Automation. Didactic and Pedagogical Publishing House, Bucharest, 1980.


| **9.2 Laboratory** | **Teaching methods** | **Observations** |
|---|---|---|
| Labor protection, presentation of the types of electric machines in the laboratory. | Classic + Presentation | 2 hours |
| No-load test of electrical transformer | classic + assembly | 2 hours |
| Electrical Transformer Short Circuit Test | classic + assembly | 2 hours |
| Load Characteristics of Electrical Transformer | classic + assembly | 2 hours |
| Trying to operate the asynchronous machine in a no-load operation | classic + assembly | 2 hours |
| Short-circuit operation test of asynchronous machine | classic + assembly | 2 hours |
| Adjusting the speed of the asynchronous motor | Mixed (classic + IT-assisted) | 2 hours |
| Modeling and simulation of the three-phase asynchronous machine in transient mode | IT-assisted | 2 hours |
| Starting the DC motor | classic + assembly | 2 hours |
| Adjusting the DC motor speed | classic + assembly | 2 hours |
| Transient mode in DC machine | IT-assisted | 2 hours |
| Modeling and simulation of the synchronous machine in transient mode | IT-assisted | 2 hours |
| Rebounds | | 4 hours |
| | Total | 28 hours |

**Laboratory bibliography:**


[1]. Müller, V. Electric cars. Teme experimentale, Editura Politehnica Timişoara, 2005.

[2]. Tunsoiu, Gh; Seracin, E; Saal, C. Electric Shareholders. Didactic and Pedagogical Publishing House, Bucharest 1982.

[3]. Müller, V. Laboratory 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**

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 in 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 | | | |
| In order to pass the exam, the student must obtain at least a grade of 5<br>• Knowing how electric cars work<br>• Speed adjustment | | | |

Date of completion 20.09.2025

Signature of the course holder Assoc.Prof. dr.eng. Valentin Dan Muller

Signature of the laboratory instructor Assoc.Prof. dr.eng. Valentin Dan Muller

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: | DATABASE |
| 2.2 Course Lecturer: | Prof.univ. dr.eng. Mariana NAGY |
| 2.3 Laboratory Instructor: | Assist, drd Tania-Bogdana GAVRILĂ |
| 2.4 Year of Study: | 2 |
| 2.5 Semester | 1 |
| 2.6 Type of Assessment: | VERIFICATION |
| 2.7 Course Status: | DS -ompulsory |

## 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 | 10 |
| Preparation for seminars/labs, essays, portfolios | 10 |
| Tutoring | 0 |
| Examinations | 3 |
| 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. 4. Preconditions (where applicable)

| | |
|---|---|
| 4.1 of curriculum | |
| 4.2 of competences | Knowledge of office automation |

**5. Conditions (where applicable)**

| | |
|---|---|
| 5.1 of conducting the course | Course room, equipped with laptop, video projector / smart board and appropriate software – Power Point, Word, database software |
| 5.2 of conducting the laboratory | Laboratory room, appropriately equipped: computers, network, Internet connection, Power Point, Word, database software |

**6. Specific Competencies Acquired**

| | |
|---|---|
| Professional Competencies | **C6. Establishes data processes** - Uses ICT tools to apply mathematical, algorithmic or other data manipulation processes to create information. |
| Transversal Competencies: | **CT2. Comply with regulations** - Comply with the rules, regulations and guidelines relating to a particular field or sector and apply them in their daily work.<br>**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 | The graduate:<br>• Knows algorithms for data processing and analysis.<br>• Knows programming languages (e.g. C++,C#)<br>• Understanding algorithms and data structures, programming paradigms and languages used in the field of automation |
| Skills | The graduate:<br>• Creates algorithms for processing and analyzing data in industrial and engineering applications.<br>• Uses programming languages and ICT tools to transform raw data into useful information. |
| Responsibilities and autonomy | The graduate:<br>• Evaluates and optimizes the performance of the designed system, assuming responsibility for choosing technical solutions.<br>• Can work independently or in a team to implement and test automation solutions in a real professional environment.<br>• Has the ability to manage technical projects with responsibility and respect for deadlines.<br>Has availability for continuous learning and professional 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 discipline | • Students acquire the essential concepts for the efficient manipulation of a large volume of data using a computer.<br>• Improving the quality of cooperation between specialists from various fields and the computer science specialist through an interdisciplinary approach to the subjects. |

| | |
|---|---|
| 8.2 Specific objectives | • Mastering the concepts of data organization. Data analysis and database model creation.<br>• Creating and using relational databases.<br>• Familiarizing with the main methods of automatic data processing, efficient database querying.<br>• Programming in a DBMS using VBA<br>• Creating a database to solve a practical problem: analysis, design, implementation, use. |

**9. Course Content**

| 9.1 Course | Teaching methods | Observations |
|---|---|---|
| **Fundamental concepts**<br>- Basic concepts: data, information, databases – evolution, characteristics, examples.<br>- Advantages of using BD. Data independence. Architecture of a BD. DBMS. DB administration. - -<br>Database models. Database normalization. | - interactive presentation<br>- heuristic conversation<br>- demonstration | 4 hours |
| **MS-Access, relational DBMS**<br>- MS-Access, relational DBMS - component of the MS-Office package. Interface, important windows.<br>- Entities used. Presentation, role. Creating, Editing, Vizualising. Utilities: search wizard, expression wizard, DB compress and repair. | - interactive presentation<br>- web search<br>- exemplification | 2 hours |
| **Tables and relationships**<br>- Table structure, data types, field properties, data validation.<br>- Relationships: presentation, role, classification, creation, deletion, properties. Examples | - interactive presentation<br>- problem solving<br>- modeling | 2 hours |
| **User Interface**<br>- Forms: data entry/viewing. Properties. Forms: simple menus.<br>- Reports: design, creation, properties. Interpretation of information. Examples. | - interactive presentation<br>- problem solving<br>- modeling | 2 hours |
| **Database querying**<br>- Select queries: presentation, roles, visualization. Sorting, filtering, parameters, aggregate functions, calculated fields.<br>- Action queries: presentation, role, classification, examples Action queries: applications.<br>- Macros. Examples<br>- SQL elements | - interactive presentation<br>- problem solving<br>- debate<br>- programing | 6 hours |

| | | |
|---|---|---|
| **Elements of object-oriented programming in VBA**<br>- Events. Definition, examples, order of events related to the use of a form.<br>- VBA modules. Role, classification. Commands. Examples of CBF modules.<br>- Objects. Properties and methods. Classes and instances. Container. | - interactive presentation<br>- problem solving<br>- web search<br>- exemplification | 8 hours |
| **Creating an application**<br>- Presentation of the stages of creating complex functional applications.<br>- Creating a simple relational DBMS for parts management in a high-end warehouse | - interactive presentation<br>- problem solving<br>- modeling<br>- web search | 4 hours |
| | **TOTAL** | **28 hours** |

**Course bibliography:**


1. Nagy M., Lecture notes, SUMS, 2025.
2. Churcher C, Beginning Database Design: From Novice to Professional, A Press, 2012.
3. Garais E.G., Proiectarea bazelor de date relationale cu Microsoft Access, Ed. Pro Universitaria, 2024.
4. MacDonald M., Access 2013- the missing manual, O'Reilly Media, 2013.
5. Preppernau J., Lambert S., Lambert D., Microsoft Office Access 2007 Step-by-step, Microsoft Press,U.S, 2000.
6. Sfetcu N., Working with databases, Ed. Multimedia, 2021.
7. Ulrich L.A., Cook K., Access 2019 For Dummies, Ed. Wiley, 2019.
8. https://support.office.com/.
9. https://sourcedaddy.com/ms-access/event-sequence.html.


| **9.2 Laboratory** | **Teaching methods** | **Observations** |
|---|---|---|
| Fundamental concepts - Basic concepts: data, information, databases – evolution, characteristics, examples. - Advantages of using DB. Data independence. Architecture of a DB. DBMS. DB administration. - Database models. Database normalization. | - exercise<br>- debate<br>- web search | 2 hours |
| MS-Access, relational DBMS - MS-Access, relational DBMS - component of the MS-Office package. Interface, important windows. - Entities used. Presentation, role. Creating. Viewing. Utilities: search wizard, expression wizard, database compress and repair. | - exercise<br>- debate<br>- web search | 1 hours |
| Tables and relationships: - Table structure, data types, field properties, data validation. - Relationships: presentation, role, classification, | - application<br>- modeling<br>- organized group work | 1 hour |

| | | |
|---|---|---|
| creation, deletion, properties. Examples | | |
| User interface: - Forms: data entry/viewing. Properties. Forms: simple menus. - Reports: design, creation, properties. Interpretation of information. Examples. | - exercise-<br>- application<br>- modeling<br>- project | 1 hour |
| Database querying: - Selection queries: presentation, role, visualization. Sorting, filtering, parameters, aggregate functions, calculated fields. - Action queries: presentation, role, classification, examples. Action queries: applications. - Macros. Examples - SQL elements | - application<br>- modeling<br>- project<br>- organized group work | 2 hours |
| Object-oriented programming elements in VBA - Events. Definition, examples, order of events related to the use of a form. - VBA modules. Role, classification. Commands. Examples of CBF modules. - Objects. Properties and methods. Classes and instances. Container. | - application<br>- modeling<br>- project<br>- web search<br>- organized group work | 2 hours |
| Creating an application - Presentation of the stages of creating complex functional applications. - Creating a simple relational DBMS for parts management in a high-end warehouse | - application<br>- modeling<br>- project<br>- web search<br>- organized group work | 5 hours |
| | **TOTAL** | **14 hours** |

**Laboratory bibliography:**


1. Nagy M., Lecture notes, SUMS, 2025.
2. Gavrilă Bogdana Tania, laboratory notes electronics, 2025.
2. Diamond S. B., Brilliant VBA for Microsoft Access 2007 VBA, Prentice-Hall, 2008.
3. Garais E.G., Proiectarea bazelor de date relationale cu Microsoft Access, Ed. Pro Universitaria, 2024.
4. MacDonald M., Access 2013- the missing manual, O'Reilly Media, 2013.
5. Preppernau J., Lambert S., Lambert D., Microsoft Office Access 2007 Step-by-step, Microsoft Press,U.S, 2000.
6. Sfetcu N., Lucrul cu baze de date, Ed. Multimedia, 2021.
7. Ulrich L.A., Cook K., Access 2019 For Dummies, Ed. Wiley, 2019.
8. https://support.office.com/.
9. https://sourcedaddy.com/ms-access/event-sequence.html .

**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 consistent with the content of similar disciplines in other university centers in the country and abroad. For a better adaptation of the content of the discipline to the requirements of the labor market, meetings were held with both employers - representatives of the business environment and with professors involved in cooperation programs at the European level. |

**11. Assessment**

| Type of activity | Evaluation criteria | Evaluation methods | Percentage of final grade |
|---|---|---|---|
| 11.1 Course | □ correctness and completeness of knowledge □ logical coherence □ degree of assimilation of specialty language<br><br>□ conscientiousness, interest in study | Oral assessment:<br>□ Presentation of a final project<br>□ Free student presentation<br>□ Evaluation conversation<br>□ Oral questionnaire.<br><br>Active participation in classes. | 30%<br><br>10% |
| 11.2 Laboratory | □ ability to operate with the acquired knowledge; □ ability to apply in practice<br><br>□ conscientiousness, interest in study | Oral assessment:<br>□ Project completion and presentation,<br>□Themes, projects completed along the way<br><br>Active participation in laboratory applications | 30%<br><br>10%<br><br>20% |
| 11.3 Minimum performance standard | | | |
| Mastering fundamental concepts, using specialized language, creating a basic application. | | | |

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

20.09.2025 Prof.univ.dr.ing. Mariana Nagy Asistent drd. Bogdana-Tania Gavrilă

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 Programme/Qualification | AUTOMATION AND APPLIED INFORMATICS (IN ENGLISH) (AIA-E) |

## 2. Course Information

| | |
|---|---|
| 2.1 Course Title: | ENGLISH LANGUAGE |
| 2.2 Course Lecturer: | |
| 2.3 Seminar/Laboratory Instructor: | Senior Lecture dr. Manuela Odeta ȘOPȚ-BELEI |
| 2.4 Year of Study: | 2 |
| 2.5 Semester | 1 |
| 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 which3.2. lecture | - | 3.3. Seminar | 1 |
| 3.4. Total hours in the study plan | 14 | of which3.5. lecture | - | 3.6. Seminar | 14 |
| Time allocation: | | | | | **Hours** |

| | |
|---|---|
| Study based on course materials, bibliography | |
| Additional documentation in library, specialized databases, or field work | 10 |
| Preparation for seminars/labs, essays, portfolios | 14 |
| Tutoring | 4 |
| Examinations | 4 |
| Other activities... | 4 |
| 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 | Previous knowledge of English |
| 4.2. of competences | Fluent communication ability B2 |

**5. Conditions (where applicable)**

| | |
|---|---|
| 5.1. Course Course | |
| 5.2. Seminar | Seminar room |

**6. Specific Competencies Acquired**

| | |
|---|---|
| Professional Competencies | |
| Transversal Competencies | CT1. Work in teams - Work confidently within a group, each doing their part in the service of the whole.<br>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.<br>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 | Know the principles and stages of teamwork.<br>Know ways to communicate and collaborate effectively.<br>Know the principles of professional ethics and deontology.<br>He is familiar with the applicable procedures and quality standards.<br>It processes information, ideas and concepts.<br>Think creatively and innovatively. |
| Skills | Actively participates in team activities, contributing to the achievement of common goals.<br>Demonstrates the ability to negotiate and resolve conflicts constructively.<br>Correctly apply activity-specific regulations, procedures, and instructions.<br>Propose solutions to improve compliance with rules and procedures.<br>Think analytically and creatively. |
| Responsibilities and autonomy | They take on their own tasks and respect the deadlines set in the team.<br>Contribute to a positive and productive team climate.<br>Respects the principles of professional ethics in all activities carried out.<br>It contributes to the promotion of an organizational culture based on compliance and integrity.<br>Approach problems critically. |

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

| | |
|---|---|
| 8.1. General objective of the discipline | - offering and requesting various information within a conversation<br>- extracting essential information from a text and using it in various activities<br>- the correct use of as many grammatical and language structures as possible<br>- Acquiring the basic specialized language and using it in writing various materials or in various conversational situations |
| 8.2. Specific objectives | - Acquiring the basic specialized language and using it in writing various materials or in various conversational situations |

**9. Contents**

| 9.1. Course | Teaching methods | Observations |
|---|---|---|

| 9.2. Seminar | Seminar methods | Observations |
|---|---|---|
| Computer types | -Lecture;<br>- Interactive dialogue; | 1 hours |
| Input devices | -Lecture;<br>- Interactive dialogue; | 2 hours |
| Output devices | -Lecture;<br>- Interactive dialogue; | 2 hours |
| Storage devices | -Lecture;<br>- Interactive dialogue; | 2 hours |
| Motoring, cars | -Lecture;<br>- Interactive dialogue; | 2 hours |
| Computer architecture | -Lecture;<br>- Interactive dialogue; | 2 hours |
| Software and programming languages | -Lecture;<br>- Interactive dialogue; | 2 hours |
| Oral Examination | -Dialogue; | 1 hours |
| | All | 14 hours |

**Seminar bibliography:**

**[1].** BANTAŞ, ANDREI, Porteanu Rodica, English Language for Science and Technology, Niculescu Publishing House, Bucharest, 1999.

**[2].** CHITORAN, DUMITRU, Panoref Irina, Poenaru Ioana, English Grammar Exercices, Ed.Teora, Bucharest, 1999.

**[3].** E.ADAM, English for Science and Technology, Cavallioti Publishing House, The British Council, Bucharest, 1999.

**[4].** GLENDING, H.ERIC, English in Mechanical Engineering, Teacher's Edition, Oxford University Press, 1990.

**[5].** HAPGOOD, MICHAEL, English Lesson One, Heinemann, Educational Books.

**[6].** IDEM, English Lesson Three, Heinemann, Educational Books.

**[7].** JONSON D and CN, General Engineering, Prentice Hall International, Great Britain, 1993.

**[8].** MILLS, MARTIN, Nexus, English for Advanced Learners, Macmillan, UK, 2004.

**[9].** PADIOŞ, CONSTANTIN, English Grammar, Therory and Practice, Ed. Polirom, Bucharest, 2001.

**[10].** Vince, MICHAEL, Advanced Language Practice, English Grammar and Vocabulary, Macmillan, UK, 2004.

Dictionaries

**[11].** NICULESCU, GABRIELA; CINCU, CORNELIU, Romanian-English Technical Dictionary, Bucharest Technical Publishing House, 2001.

**[12].** WEBBER, MARTIN, Elementary Technical English, Thomas Nelson, 1983.

**[13].** *Seminar in electronic format, uploaded to the SUMS 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 contents of the discipline were developed in accordance with the expectations of employers, with a national program and with the consultation of members of the same specialty within the department and from similar departments from other universities

**11. Assessment**

| Type of activity | Evaluation criteria | Evaluation methods | Percentage of final grade |
|---|---|---|---|
| 11.1. Course | | | |
| 11.2. Seminar | - Correct use of specialized language;<br>- Ability to solve the proposed exercises that lead to the recapitulation of various grammar problems and various language structures;<br>- Translations and retroversions in which the learned specialty terms appear | - Periodic testing during the semester (Partial exam)<br>- Answers to the exam / colloquium (final evaluation);<br>- Preparation of reports;<br>- Preparation of portfolios. | - Responses to the final evaluation – 70%;<br>- Testing during the semester – 30%; |
| 11.3. Minimum performance standard | | | |
| Writing a written document at B2 level to argue a point of view on a certain topic, coherent and linguistically correct, adapted to the context and field of interest; fluent oral argumentation, correctly articulated, at minimum level B2. | | | |

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

20.09.2025 Senior lecturer.dr. Manuela Odeta Șopț Belei

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 Programme/Qualification | AUTOMATION AND APPLIED INFORMATICS (IN ENGLISH) (AIA-E) |

## 2. Course Information

| | |
|---|---|
| 2.1 Course Title: | ENGLISH LANGUAGE |
| 2.2 Course Lecturer: | |
| 2.3 Seminar/Laboratory Instructor: | Senior Lecture dr. Manuela Odeta ȘOPȚ-BELEI |
| 2.4 Year of Study: | 2 |
| 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 which3.2. lecture | - | 3.3. Seminar | 1 |
| 3.4. Total hours in the study plan | 14 | of which3.5. lecture | - | 3.6. Seminar | 14 |
| Time allocation: | | | | | **Hours** |

| | |
|---|---|
| Study based on course materials, bibliography | |
| Additional documentation in library, specialized databases, or field work | 10 |
| Preparation for seminars/labs, essays, portfolios | 14 |
| Tutoring | 4 |
| Examinations | 4 |
| Other activities... | 4 |
| 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 | Previous knowledge of English |
| 4.2. of competences | Fluent communication ability B2 |

**5. Conditions (where applicable)**

| | |
|---|---|
| 5.1. Course Course | |
| 5.2. Seminar | Seminar room |

**6. Specific Competencies Acquired**

| | |
|---|---|
| Professional Competencies | |
| Transversal Competencies | CT1. Work in teams - Work confidently within a group, each doing their part in the service of the whole.<br>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.<br>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 | Know the principles and stages of teamwork.<br>Know ways to communicate and collaborate effectively.<br>Know the principles of professional ethics and deontology.<br>He is familiar with the applicable procedures and quality standards.<br>It processes information, ideas and concepts.<br>Think creatively and innovatively. |
| Skills | Actively participates in team activities, contributing to the achievement of common goals.<br>Demonstrates the ability to negotiate and resolve conflicts constructively.<br>Correctly apply activity-specific regulations, procedures, and instructions.<br>Propose solutions to improve compliance with rules and procedures.<br>Think analytically and creatively. |
| Responsibilities and autonomy | They take on their own tasks and respect the deadlines set in the team.<br>Contribute to a positive and productive team climate.<br>Respects the principles of professional ethics in all activities carried out.<br>It contributes to the promotion of an organizational culture based on compliance and integrity.<br>Approach problems critically. |

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

| | |
|---|---|
| 8.1. General objective of the discipline | - offering and requesting various information within a conversation<br>- extracting essential information from a text and using it in various activities<br>- the correct use of as many grammatical and language structures as possible<br>- Acquiring the basic specialized language and using it in writing various materials or in various conversational situations |
| 8.2. Specific objectives | - Acquiring the basic specialized language and using it in writing various materials or in various conversational situations |

**9. Contents**

| 9.1. Course | Teaching methods | Observations |
|---|---|---|

| 9.2. Seminar | Seminar methods | Observations |
|---|---|---|
| Computer types | -Lecture;<br>- Interactive dialogue; | 1 hours |
| Input devices | -Lecture;<br>- Interactive dialogue; | 2 hours |
| Output devices | -Lecture;<br>- Interactive dialogue; | 2 hours |
| Storage devices | -Lecture;<br>- Interactive dialogue; | 2 hours |
| Motoring, cars | -Lecture;<br>- Interactive dialogue; | 2 hours |
| Computer architecture | -Lecture;<br>- Interactive dialogue; | 2 hours |
| Software and programming languages | -Lecture;<br>- Interactive dialogue; | 2 hours |
| Oral Examination | -Dialogue; | 1 hours |
| | All | 14 hours |

**Seminar bibliography:**

**[1].** BANTAŞ, ANDREI, Porteanu Rodica, English Language for Science and Technology, Niculescu Publishing House, Bucharest, 1999.

**[2].** CHITORAN, DUMITRU, Panoref Irina, Poenaru Ioana, English Grammar Exercices, Ed.Teora, Bucharest, 1999.

**[3].** E.ADAM, English for Science and Technology, Cavallioti Publishing House, The British Council, Bucharest, 1999.

**[4].** GLENDING, H.ERIC, English in Mechanical Engineering, Teacher's Edition, Oxford University Press, 1990.

**[5].** HAPGOOD, MICHAEL, English Lesson One, Heinemann, Educational Books.

**[6].** IDEM, English Lesson Three, Heinemann, Educational Books.

**[7].** JONSON D and CN, General Engineering, Prentice Hall International, Great Britain, 1993.

**[8].** MILLS, MARTIN, Nexus, English for Advanced Learners, Macmillan, UK, 2004.

**[9].** PADIOŞ, CONSTANTIN, English Grammar, Therory and Practice, Ed. Polirom, Bucharest, 2001.

**[10].** Vince, MICHAEL, Advanced Language Practice, English Grammar and Vocabulary, Macmillan, UK, 2004.

Dictionaries

**[11].** NICULESCU, GABRIELA; CINCU, CORNELIU, Romanian-English Technical Dictionary, Bucharest Technical Publishing House, 2001.

**[12].** WEBBER, MARTIN, Elementary Technical English, Thomas Nelson, 1983.

**[13].** *Seminar in electronic format, uploaded to the SUMS 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 contents of the discipline were developed in accordance with the expectations of employers, with a national program and with the consultation of members of the same specialty within the department and from similar departments from other universities

**11. Assessment**

| Type of activity | Evaluation criteria | Evaluation methods | Percentage of final grade |
|---|---|---|---|
| 11.1. Course | | | |
| 11.2. Seminar | - Correct use of specialized language;<br>- Ability to solve the proposed exercises that lead to the recapitulation of various grammar problems and various language structures;<br>- Translations and retroversions in which the learned specialty terms appear | - Periodic testing during the semester (Partial exam)<br>- Answers to the exam / colloquium (final evaluation);<br>- Preparation of reports;<br>- Preparation of portfolios. | - Responses to the final evaluation – 70%;<br>- Testing during the semester – 30%; |
| 11.3. Minimum performance standard | | | |
| Writing a written document at B2 level to argue a point of view on a certain topic, coherent and linguistically correct, adapted to the context and field of interest; fluent oral argumentation, correctly articulated, at minimum level B2. | | | |

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

20.09.2025 Senior lecturer.dr. Manuela Belei Odeta

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

**46. 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) |

**47. Course Information**

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

**48. 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** |

**49. Preconditions** (where applicable)

| | |
|---|---|
| 4.1.de curriculum | Quality standards.<br>User manuals. |
| 4.2.de competences | Labor protection rules. |

**50. Conditions** (where applicable)

| | |
|---|---|
| 5.1.de course | - |

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

**6. Specific skills acquired**

| | |
|---|---|
| Professional skills | C1 – performs analytical mathematical calculations.<br>C2 – designs electronic systems. |
| Transversal competences | CT1 – works in teams.<br>CT2 – complies with regulations. |

**7. Learning Outcomes**

| | |
|---|---|
| Knowledge | Graduate:<br><br>- Knows and identifies mathematical methods (linear algebra, numerical analysis) for modeling and solving engineering problems.<br>-Use specific software tools (e.g. MATLAB) to automate analytical calculations and verify mathematical solutions in real contexts.<br>Graduate:<br>-Has knowledge of electronic schematics and methods of designing electronic systems.<br>-Has knowledge in simulation programs<br>Graduate:<br>-Knows the principles and stages of teamwork<br>-Know ways to communicate and collaborate effectively<br>-Knows the principles of professional ethics and deontology<br>-Is familiar with applicable procedures and quality standards |
| Skills | -Applies advanced mathematical methods (linear algebra, numerical analysis) for modeling and solving engineering problems.<br>-Use specific software tools (e.g. MATLAB) to automate analytical calculations and verify mathematical solutions in real contexts.<br>-Makes electronic schematics and printed circuit boards using specialized software.<br>-Performs simulations to verify the functionality and viability of systems designed before manufacturing |
| Responsibilities and autonomy | Graduate:<br>-Evaluates and optimizes the performance of the designed system, assuming responsibility for choosing technical solutions.<br>-Can work independently or in a team to implement and test automation solutions in a real professional environment.<br>-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<br>- Contributes to a positive and productive team climate |

**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.<br>- Practical application of theoretical knowledge, by getting involved in real activities, projects and tasks, specific to the field of study.<br>- Developing technical and operational skills, through the use of industry-specific equipment, tools, technologies and software.<br>- Training the ability to work in a team, collaborate effectively with professionals in the field and communicate clearly and professionally.<br>- Acquiring the work procedures, quality, safety and professional ethics rules specific to the sector of activity.<br>- Development of analysis and problem-solving skills, by participating in the identification, diagnosis and optimization of processes.<br>- Observing and understanding workflows, technological processes, and how different system components are integrated.<br>- Exercising professional responsibility and autonomy, by assuming concrete tasks and complying with deadlines and work standards.<br>- Improving time management skills and organizing activities in a real professional context.<br>- Preparation of a well-structured practice report, in which the activities carried out, the experiences acquired and the skills developed are analyzed. |

**9. 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 | Check | Practice Notebook<br>Discussions | 80%<br>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