Transilvania University of Braşov, Romania

Study program: Automation and Applied Informatics

Syllabus for ERASMUS + students

Faculty: Electrical Engineering and Computer Science
Study period: 4 years (bachelor)

1st Year

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Mathematical Analysis	AI0101	Romanian	5	3	2	-	-

Course description (Syllabus): Sequences and series of real numbers; Sequences and series of functions; Functions of several variables; Limits and continuity in higher dimensions; Partial derivatives; differentials; Local extreme values; extreme values with constraints; Improper integrals; Line integrals; Multiple integrals: double integrals, triple integrals, and surface integrals.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Linear Algebra, Analytical and Differential Geometry	AI0102	Romanian	5	3	2	-	-

Course description (Syllabus): Linear algebra: vector spaces; binary relations; vector subspaces; linear independence and dependence of a system of vectors; Euclidean space; orthogonality; scalar product; vector product; mixed product; double-vector product; linear transformations on vector spaces; eigenvalues; eigenvectors; diagonal form; linear, bilinear and quadratic forms. Analytic geometry: plane and line in space; distances and angles; conical shapes and properties; quadric shapes in general forms and reduced equations. Differential geometry: plane curves; curves in space; cylindrical, conical, conoid, rotational surfaces.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Computer Programming and Programming Languages I	AI0103	Romanian	5	3	-	3	-

Course description (Syllabus): Representation of information. The structure of computers. Fundamentals of language C++: C++ program structure; input/ output functions; data types; constants and variables; operators and expressions; instructions. Arrays: uni-dimensional arrays; strings; multi-dimensional arrays. Pointers: operations with pointers; arrays and pointers; dynamic variables. Functions: prototypes; function definition; transfer of parameters; returned values; recursion; function pointers; passing by references; default arguments; overloading functions. Defining your own types: enumerations, structures, bit fields, unions. Classes and objects: class type, this reference, constructors add destructors, static members, pointer of member functions; handling objects. Friend functions and classes; overloading operators. Inheritance: derived classes.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Discrete Mathematics	AI0104	Romanian	5	2	1	-	-

Course description (Syllabus): Boolean algebra and logical functions: basic definitions; axiomatic definitions of boolean algebra; basic theorems, identities, and properties of boolean algebra; logical functions; canonical and standard forms; representations of logical functions; simplification of boolean functions (Veitch-Karnaugh map, Quine-McCluskey method). Number systems and codes: binary numbers; number base conversions; octal and hexadecimal numbers;

complements; signed binary numbers; algebraic coding theory; binary codes, binary and BCD arithmetic; error detecting and error correcting codes.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Web Technologies	AI0105	Romanian	5	1	-	2	-

Course description (Syllabus): Web technologies – communication on the Internet; HyperText Markup Language (HTML); Cascading Style Sheets (CSS); Web design; Web forms; JavaScript.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Communication Skills. Ethics and academic integrity	AI0106	Romanian	2	1	1	-	-

Course description (Syllabus): Interpersonal perception; Communication process; Verbal and nonverbal communication; Transactional analysis approach on communication; Communication and conflict; Ethics and etiquette in communication; Personal development within organization; Academic ethics; Plagiarism. Identification of forms of plagiarism. Software tools to identify plagiarism.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Computer Programming and Programming Languages II	AI0207	Romanian	5	2	-	2	-

Course description (Syllabus): Java platform and Java editions; Language syntax; Data types, variables, constants, literals; Control structures; Classes and objects; Inheritance; Interfaces; Polymorphism; Streams.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Special Mathematics	AI0208	Romanian	5	3	2	-	-

Course description (Syllabus): Differential equations and Dynamic systems. Partial differential equations of first order. Complex functions of complex variables. Complex integrals, complex series, theory of residues with applications Field theory, gradient, divergence, curl, applications. Vector integrals; flux, circulation, flows; particular vector fields. Operational calculus; original functions; Laplace Transform; Fourier Transform. Applications of operational calculus in differential in partial differential equations, integral equations, dynamic systems. Variational calculus; basic equations and extensions. Isoperimetric problems, moving boundary problems.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Electrotechnics	AI0209	Romanian	5	3	2	-	-

Course description (Syllabus): The laws of the electromagnetic field; DC circuits; The transient regime; AC circuits; Three phase theory & symmetrical components; Analysis of non-sinusoidal waveforms.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Physics	AI0210	Romanian	5	3	-	1	-

Course description (Syllabus): Kinematics and dynamics of material point; Thermodynamics; Electrostatics and electrokinetics; Magnetostatic; Variable regime; Optics; Solid state physics.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Data Processing	AI0211	Romanian	4	2	-	2	-

Course description (Syllabus): Data models: hierarchical data model, network data model, relational data model, object oriented data model. Relational data model: data objects, data definition, data manipulation, data management tools. CASE tools: CASE tools for structured analysis, CASE tools for structured design, CASE tools for object oriented methods. Data transfer technology: component object model, data connectivity objects, .NET Framework.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Computer-Aided Graphics	AI0212	Romanian	3	1	-	2	-

Course description (Syllabus): Graphics theory techniques. Organizing a work session in Auto CAD 2000. General aspects of computer graphics, two-dimensional and three-dimensional modeling in AUTOCAD. Realistic representations of 2D and 3D assemblies, using geometric modeling software (CAD). Making design objects by drawing commands. Dimensional representations: interactive and generative techniques, organizing the virtual representation space, graphical objects - properties, scales of representation, virtual paper formats. Concepts of blocks, attributes. Creating three dimensional models: geometric principles and parametrical type engineering principles based on characteristics, techniques of sketching and constraining drawings, forms generation space.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
English I	LE01	Romanian	2	1	1	-	-

Course description (Syllabus): Classification of verbs; Morphology of lexical verbs; structure of the verb phrase; Tenses of the indicative mood: definition, tense, forming tenses, modality; Tenses; present: present simple, present continuous, present perfect, present perfect continuous; past: past simple, past continuous, past perfect, past perfect continuous; future: future simple, future continuous, future perfect, future perfect continuous.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
English II	LE02	Romanian	2	1	1	-	-

Course description (Syllabus): Electronic components: vacuum tubes, transistors, integrated circuits, resistors, capacitors, inductors, sensing devices and transducers. Analogue and digital electronic circuits: power-supply circuits, analogue circuits, amplifier circuits, oscillators, digital circuits, switching and timing circuits, digital logic. Telecommunications: introduction, history, telegraph, commercial growth of the telephone, emergence of broadcasting, radio-TV communications. Telecommunications operation principles: creating and receiving the signal, transmitting the signal. Communication networks: wires and cables, fibre-optic cables, radio waves, communications satellites. Digital communication networks: global positioning and navigation systems, personal computers.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Physical Training I	EF01	Romanian	1	-	1	-	-

Course description (Syllabus): Basic technical elements of the optional sport. The practice rules of the chosen sport. Practicing the chosen sport in regulatory conditions.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Physical Training II	EF02	Romanian	1	-	1	-	-

Course description (Syllabus): Basic technical elements of the optional sport. The practice rules of the chosen sport. Practicing the chosen sport in regulatory conditions.

2nd Year

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Systems Theory I	AI0301	Romanian	5	2	1	1	-

Course description (Syllabus): Signals and systems; The Laplace transform; Mathematical modeling of linear continuous systems; Transient response analyses; Steady-state error analyses of continuous systems.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Robotics	AI0302	Romanian	4	2	-	2	-

Course description (Syllabus): Representing positions and orientations; Trajectory design; Mobile robots; Navigation; Localizations; Robot arm kinematics; Manipulators Jacobian; Dynamics.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Linear Electronic Circuits	AI0303	Romanian	5	3	-	1	1

Course description (Syllabus): Introduction in linear electric circuits; Electronic devices; Rectifiers; Linear voltage regulators; Transistor amplifiers; Operational amplifiers.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Numerical Methods	AI0304	Romanian	5	2	-	2	-

Course description (Syllabus): Solving the equations systems. Solving the non-linear equations; Numerical interpolation and regression; Numerical integration; Solving the differential equations by numerical methods; The matrix exponential and state variable method; SCILAB applications.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Algorithms	AI0305	Romanian	4	2	-	1	1

Course description (Syllabus): Data types; user-defined data types; Lists; sequential representation; linked list; Trees; navigate the tree; implementation of binary tree;Graphs; modes of representation in memory; browsing Graph; Greedy heuristics; backtracking; Search algorithms; Sorting algorithms; Algorithms for minimizing paths: Dijkstra, Kruskal, Floyd, Prim; Biconnex components; 3D simulation algorithms: imaging "space object"; algorithms "image space"; depth buffer.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Measurements and Transducers	AI0306	Romanian	4	2	-	2	-

Course description (Syllabus): Fundamental questions on electrical measurements; Analog instruments; Comparison methods (d.c. potentiometer, d.c. and a.c. bridges); Cathode ray oscilloscopes; Digital instruments; General principles of electrical measurement of non-electrical quantities; Transducers (resistive, inductive, capacitive, piezoelectric, thermoelectric); Digital transducers.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Systems Theory II	AI0407	Romanian	4	2	1	1	-

Course description (Syllabus): Frequency-response analysis. Stability analysis of linear continuous systems: BIBO stability concept; algebraic criteria; stability criteria in frequency domain; relative stability. Root-locus analysis: gain and phase conditions; general rules for plotting the root locus; algorithm for plotting the root locus. Analysis of control

systems in state space: time response on linear state space models; converting state space models from/to transfer function models; controllability and observability; the stability of state space modeled systems.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Discrete Systems	AI0408	Romanian	5	2	1	1	-

Course description (Syllabus): Introduction to discrete systems; The Z transform; The modified Z transforms; System time response; Stability in the time domain; Stability in the frequency domain.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Digital Circuits I	AI0409	Romanian	5	2	1	1	1

Course description (Syllabus): General concepts of digital circuits. Combinational logic circuits: analysis techniques for combinational logic circuits; logical design of combinational networks with gates; typical MSI and LSI combinational circuits; digital design with standard MSI and LSI; dedicated combinational logic circuits; the hazard in the combinational logic circuits.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Computer Programming and Programming Languages III	AI0410	Romanian	4	2	-	2	-

Course description (Syllabus): Introduction in Microsoft .NET; The C# programming language: Visual Studio, C# program structure, data types, control structures. Object Oriented Programming in C#: classes, inheritance, polymorphism, over-definition, structures, nested classes, virtual classes; .NET and C# particular elements: object arrays, colections, strings handling; Exceptions; Delegated functions and events; Windows Forms.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Signal Processing	AI0411	Romanian	3	2	-	2	-

Course description (Syllabus): Introduction in signal processing; Analysis of continuous deterministic signals: temporal averages, correlation and covariance functions, Fourier transform, spectral analysis; Analog filters; Analog filters design: Butterworth filters, Chebyshev filters, transforms in frequency domain; Digital filters.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Digital Electronics	AI0412	Romanian	3	2	-	1	-

Course description (Syllabus): Introduction in digital signals; Switching devices; Linear elements in pulse circuits; Transistor flip-flops; Integrated digital circuits; Interface circuits; Analog-digital and digital-analog circuits.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
English III	LE03	Romanian	2	1	1	-	-

Course description (Syllabus): Articles: the indefinite article, the definite article; Nouns: number, gender; Adjectives: definition and form, comparison of adjectives, position of adjectives, order of adjectives; Pronouns: specific pronouns, indefinite pronouns; Numerals: cardinal numerals, ordinal numerals; Adverbs: classification, comparison of adverbs, position, inversion after negative adverbs.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
English IV	LE04	Romanian	2	1	1	-	-

Course description (Syllabus): Digital logic and boolean algebra: digital circuits and boolean truth tables, control and embedded systems, operators. Programming languages: machine language, assembly language, high-level languages. Semiconductors: introduction, conduction electrons and holes, doping. Hardware: input hardware, output hardware, storage hardware, hardware connections. Microprocessor: construction of microprocessors. Central processing unit: CPU operation principles, CPU function, branching instructions, clock pulses, fixed-point and floating-point numbers; CPU history and current developments. Early computers and current developments.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Physical Training III	EF03	Romanian	1	-	1	-	-

Course description (Syllabus): Basic technical elements of the optional sport; The practice rules of the chosen sport; Practicing the chosen sport in regulatory conditions.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Physical Training IV	EF04	Romanian	1	-	1	-	-

Course description (Syllabus): Basic technical elements of the optional sport; The practice rules of the chosen sport; Practicing the chosen sport in regulatory conditions.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Domain Practice Activity	AI0415	Romanian	4	3 weeks x 30 hours/week = 90 hours			

Course description (Syllabus): Practice activity. Topics focus on: IT infrastructure configurations for PCs, peripherals, computer networks; programming languages and environments used in the analysis and design of automation applications; design and management of software applications, including web applications and databases; using dedicated software packages Computer Graphics and Computer Aided Design tools; software packages dedicated to specific industrial automation used in operating facilities with practice; equipment and devices for measurement and data acquisition; study of processes subject to automation, static and dynamic characteristics and their parameters; identification of parameters, indicators and fundamentals of the theory for plant automation systems; automation equipment and deployment features; interpretation of experimental results and draw conclusions from testing automation equipment.

3rd Year

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Digital Circuits II	AI0501	Romanian	5	2	1	1	1

Course description (Syllabus): Fundamentals of sequential logic circuits; Asynchronous and synchronous sequential circuits; Analysis procedure; Sequential logic design techniques: matrix method (method algorithm - general presentation); matrix synthesis of sequential logic circuits at which the memory block is made with delay lines; matrix synthesis of sequential logic circuits at which the memory block is made with flip-flop circuits; synthesis through the sequential logic circuits chart method at which the memory block is made with flip-flop circuits; Sequential logic circuits synthesis using complex logic blocks (multiplexers, decoders, ROMs); Typical MSI and LSI sequential circuits applications.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Computers Architecture	AI0502	Romanian	5	3	-	2	-

Course description (Syllabus): Introduction in computer architecture; Central processing unit architecture; Instructions set architecture; Control units of UCP; Different architectures.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Control Engineering	AI0503	Romanian	5	3	1	2	-

Course description (Syllabus): Closed-loop control systems. PID controllers; The performances of control systems; Dominant pole, PI and PID controllers design; Tuning controllers based on quasi-optimum methods; Controllers design based on internal model method; Ziegler-Nichols PID tuning method. Smith predictive control; Complex control and related method structures (cascade control, combined reference-disturbance control); Digital control systems design (general problems, numerical PID control algorithms, design of digital PI and PID controllers by emulation based on performances, direct design by imposed response of system); State-space control systems. State controller design (pole placement methods, Ackermann formula); State observers. Luenberger observers design.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
System Identification	AI0504	Romanian	5	2	1	1	-

Course description (Syllabus): Introduction in system identification; Stochastic processes and noise; Models of the linear, time-invariant systems; Nonparametric identification methods; Parametric identification methods; Model structure selection and model validation; Practical aspects in system identification.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Control Engineering - Project	AI0605	Romanian	2	-	-	-	2

Course description (Syllabus): Complete case study involving: PID controllers in closed-loop control systems; controller design (pole-placement, quasi-optimum methods); Ziegler-Nichols PID tuning; design of control systems in state space; Luenberger observer design.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Electrical Machines and Drives	AI0606	Romanian	4	2	-	2	-

Course description (Syllabus): The electrical drives evolution and the electrical drives industrial significance; the tasks of the electrical drives designer and maintenance engineer. The electrical drives' kinematics; Direct current machines electrical drives; Induction machines electrical drives; Stepper motors and brushless DC motors electrical drives.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Microprocessor Systems	AI0607	Romanian	4	2	-	2	-

Course description (Syllabus): Introduction in microcontrollers. Microcontrollers architecture; PIC microcontrollers; AVR microcontrollers; ARM microcontrollers; DSP microcontrollers; Design principles; Using the developing tools.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Databases	AI0608	Romanian	4	2	-	2	-

Course description (Syllabus): Data models; the relational model of database; Systems management database; hardware, software and human SGBD; SGBD functions; advantages and disadvantages; Relational integrity; relational languages; relational algebra. SGBD rules set by E. F. Codd. Normalization of data; normalization purposes; normal forms; SQL language; objectives and importance; DDL and DML; Views; creating and removing views; advantages and disadvantages of using views; Data security in databases; security purposes; hazards; security controls; Transactions; definitions; properties; Control competition; control techniques; Restoring database; recovery techniques; risk analysis.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Programmable Logic Controllers	AI0609	Romanian	4	2	-	2	-

Course description (Syllabus): Information systems; Microprogramming; Hardware structure of programmable logic controllers; Program design for programmable logic controllers; Programming of human machine interfaces; Mini programmable logic controllers; Methodologies for implementing industrial solutions on PLC; Networks of programmable logic controllers.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Computer Networks	AI0610	Romanian	4	2	-	2	-

Course description (Syllabus): Overview of the computer networks; OSI and TCP/IP stack; Flow and error control techniques; Routing algorithms; Congestion control; TCP/UDP and sockets; Application layer protocols; Hubs, switches, routers, firewalls and gateways; Network security.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Operating systems	AI0511	Romanian	4	2	-	2	-

Course description (Syllabus): Classification of operating systems. Kernel. Interrupt system. Drivers; UNIX file system. Memory management; System processes. Process management and implementation. Process data exchange. Semaphores. Critical areas; Process scheduling; Execution threads.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Artificial Intelligence Techniques	AI0512	Romanian	4	2	-	2	-

Course description (Syllabus): Basics of the neural calculus; Perceptron model. Linear neural model; Training neural networks – the error back-propagation method; Fuzzy logic; Fuzzy control strategies.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Programmable Logic Circuits	AI0613	Romanian	4	2	-	1	1

Course description (Syllabus): Introduction to the theory of finite state machines; Algorithmic state machines (ASM): ASM chart; ASM block; ASM table from ASM chart; State machines – minimization of input forming logic (IFL) and output forming logic (OFL): variable entered maps (VEMs); minimization of VEMs; VEMs from state ASM table; Multiplexers for IFL and OFL: design with multiplexers; ROM-based implementation of IFL and OFL; ASM design with field programmable logic arrays (FPLA); Field programmable gate array (FPGA) synthesis of the ASM.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Specialized Practice Activity	AI0614	Romanian	4	3 weeks x 30 hours/week = 90 hours			

Course description (Syllabus): Practice activity. Topics focus on: digital computing systems and programming environments, including hardware structure and software development packages; development and implementation of algorithms and automated management structures based on microcontrollers, DSPs, programmable logic controllers; design and management of software applications, including web applications and databases; software packages dedicated to specific industrial automation used in operating facilities with practice; study of processes subject to automation, static and dynamic characteristics and parameters; algorithms used in general-purpose automated installation and performance analysis; automation equipment, implementation features and aspects of the numerical implementation; systems and algorithms for management of industrial robots and flexible manufacturing lines; study adjustable electrical drives used in industrial automation systems; case studies on specific issues in which the unity of practical work, including preparation of specifications; interpretation of experimental results and draw conclusions from testing automation equipment.

4th Year

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Microprocessor Systems - Project	AI0701	Romanian	2	-	-	-	2

Course description (Syllabus): Using microcontrollers to implement control algorithms. Microcontrollers architecture. PIC microcontrollers. AVR microcontrollers. ARM microcontrollers. DSP microcontrollers; Design principles; Using developing tools.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Robust and Adaptive Systems	AI0702	Romanian	5	2	-	2	-

Course description (Syllabus): Real time parameter estimation: ARMAX model; ARAX model; Model reference adaptive systems: the gradient method (MIT rule); the stability theory; H-inf controller design. Augmentation of the model with weighting functions. The effects of weighting functions in H-inf control; Optimal H-2 controller design. The effects of weighting functions in H-2 control.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Optimization	AI0703	Romanian	4	2	-	1	-

Course description (Syllabus): Linear optimization; Nonlinear optimization; Nonlinear optimization without constraints; Nonlinear optimization with constraints; The method of conjugate gradients; Trust region methods; Newton and quasi-Newton methods; Optimization methods without derivative calculus.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Machine Vision Systems	AI0704	Romanian	4	2	-	2	-

Course description (Syllabus): 2D-3D image acquisition and representation; Camera calibration; Image segmentation and feature extraction; Object classification and scene understanding; 3D object reconstruction; Shape tracking and analysis; Active shape models.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Fuzzy Control Systems	AI0705	Romanian	4	2	-	1	1

Course description (Syllabus): Intelligent techniques in control systems: fuzzy logic; neural networks; hybrid fuzzy neural systems. Fuzzy inference systems for control systems. Fuzzy control systems: linear fuzzy controllers; fuzzy PID controllers. Fuzzy PID controllers design methods: design guidelines; fuzzyfication of classic PID controllers; the self-learning concept and implementation. Fuzzy neural systems in control systems.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Discrete-Events Dynamic Systems	AI0706	Romanian	5	2	-	2	-

Course description (Syllabus): Dynamic systems: definitions and subclasses; Discrete event systems; The concept of finite-state automata; Supervisory control; Design control structures using Petri nets; Properties of Petri nets; High-level Petri nets.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Software Engineering	AI0807	Romanian	4	2	-	1	1

Course description (Syllabus): Elements of software engineering; phases of a software project; monitoring the development process; models of the life cycle of the software; structure of structured analysis and design. Verification; testing and maintenance; design correctness; process stability; capability and optimization; Taguchi methods; maintenance; availability and efficiency. Distributed applications; types of architectures for connecting to a server; distributed applications overview; models. Reliability issues; type mission critical applications; types of errors and their treatment; SCADA - data acquisition and system control. Software security issues; support for advanced security, data encryption, digital signatures, secure channels, key exchange, encryption key management, database security, risk analysis. Building security in Java; signature applet Java, client-server communication in secure software tools.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Control Systems for Technological Processes	AI0808	Romanian	3	2	-	1	-

Course description (Syllabus): Process automation; definition of the elements in a control loop. Concentration control: process parameters estimation; the mathematical model; controller design. Flow control: process parameters estimation; the mathematical model; controller design. Level control: process parameters estimation; the mathematical model; controller design. Pressure control: process parameters estimation; the mathematical model; controller design. Temperature control: process parameters estimation; the mathematical model; controller design. Vendor-specific equipment for industrial automation control.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Parallel and Distributed Processing	AI0809	Romanian	4	2	-	2	-

Course description (Syllabus): Fundamentals of parallel machines and inter-processor communication; Parallel algorithms and methodologies to parallelize serial algorithms; Graphical Processor Unit as parallel machine; Distributed and cloud computing.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Industrial Communication Networks	AI0810	Romanian	4	2	-	2	-

Course description (Syllabus): OSI model in the context of industrial communication protocols. Standard serial interfaces; Protocols dedicated to utilities applications; Industrial protocols (e.g. Profibus); Industrial wireless; Industrial Ethernet; SCADA and OPC.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Electrical Drives Control	AI0711	Romanian	3	2	-	1	-

Course description (Syllabus): Space phasor theory; Electrical machines reference-frame theory; Mathematical models of the classical electrical machines; Vector control of induction machine drives: the principle of field-oriented control for induction machines; vector control systems of induction machines; Direct torque control of induction machines; Sensorless vector control of induction machines.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Data Security	AI0712	Romanian	3	2	-	1	-

Course description (Syllabus): Data - the modern gold; Common threats; Attacks, detection and mitigation; protection techniques; Digital Forensics; Standards and regulations; Data protection - a continuous process.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Reliability and Diagnosis	AI0813	Romanian	3	2	-	1	-

Course description (Syllabus): The concept of reliability; Statistical reasoning; Quality-reliability rate; Failure analysis; Reliability pointer; Failure stream; The main statistical distribution of reliability indicators; Reliability benefit for automation systems.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Electrohydraulic Servo Systems	AI0814	Romanian	4	2	-	2	-

Course description (Syllabus): Basic laws used in analysis and simulation of electrohydraulic servosystems (EHSVS); Mathematical models of EHSVS components; Mathematical models and analysis of analog control EHSVS; Analysis of incremental EHSVS.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Web Application Programming	AI0815	Romanian	4	2	-	2	-

Course description (Syllabus): Web Fundamentals & Client–Server Architecture; Frontend Foundations: HTML, CSS, JavaScript; Advanced Frontend & Web Interactivity, Backend Development & Databases; APIs, Data Exchange & Security; Deployment, Versioning & Project Development.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Elaboration of the Diploma Project	AI0816	Romanian	4	120 hours			

Course description (Syllabus): The subject of the Bachelor Degree project is chosen by the student from a predefined list. The activities depend on the specific features and are coordinated by a supervising teacher.