Transilvania University of Braşov, Romania
Study program: Electrotechnics

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	ET101	Romanian	5	3	2		

Course description (Syllabus): Strings, substrings. The convergence criterion of Cauchy. Elements of real topology. Continuity, differentiability. Polynomial and Taylor's Formula. Riemann integrability. Improper integrals; convergence criteria. Sequences and series of functions; Simple and uniform convergence. Power series: radius of convergence; Derivation and integration. Taylor series. n R space; Scalar product; Norm; Euclidean metric; Topology. Partial derivatives and; Jacobian Matrix. Functions differentiability. Class $C1$. Diffeomorphism. Higher order partial derivatives; Schwarz's Theorem; Hessian Matrix. Taylor's Formula. Integrals. Euler Functions. Double and triple integrals; Variable changes. Integral formula.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Linear Algebra, Differential Geometry	ET102	Romanian	5	3	2		

Course description (Syllabus): Free vectors in plane and in space. Free vector products and applications. Line and plan in space, angles and distances. Coordinate transformations in plane and in space. Tapered. Quadra. Vector spaces, subspaces. Numeration bases. Elements of coding theory. Linear binary codes. Boole algebra. Boolean functions. Elements of graph theory.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Computer Programming and Programming Languages I	ET103	Romania n	5	2		2	

Course description (Syllabus): Introduction. Computing systems. The structure of a computer system: hardware - software. Programming languages. How to run a computer program. Programming bases in the C programming language. The structure of a program in the C programming language. Variables, constants; types of data, type declarations, type modifiers. Operators and expressions. Designing programs. Conditional instructions and repetitive structures. Functions. Data files. Pointers.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Physics I	ET104	Romanian	5	2	2		

Course description (Syllabus): Mechanics: cinematic, dynamic, mechanical oscillations. Thermodynamics fundamentals. Electrical field and electrostatic interactions. Continuous electrical current. The magnetic field. . Electromagnetic induction. Electromagnetic waves. Wave characteristic phenomena. Geometric optics fundamentals. The corpuscular nature of the light. Atomic physics fundamentals.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Technological Methods and Procedures	ET105	Romanian	4	2		1	

Course description (Syllabus): General elements of electrical systems technology. The structure of matter and models used to study electrical product. Conductive materials. Superconducting materials. Semiconductor materials. Dielectric materials. Magnetic materials.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Technical Drawing	ET106	Romanian	3	1		2	

Course description (Syllabus): The general objective of the subject is developing students' ability to understand, create and correctly interpret technical graphic representations, by mastering the norms and conventions of technical drawing, necessary for professional communication in engineering and preparation for the subsequent use of computer-aided design programs. The specific objectives are: mastering the norms and conventions of technical drawing used in the representation of technical objects and assemblies (line types, formats, technical writing); developing the ability to represent simple parts and constructive elements in orthogonal projections; developing the ability to interpret technical drawings and to correctly read them; learning methods of dimensioning and the correct application of dimensioning rules for technical parts; developing practical drawing skills by using traditional drawing tools and computer-aided methods (initiation); cultivating attention to detail and precision in the execution and verification of graphic representations; developing graphic communication skills necessary for collaboration in the engineering field.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Foreign Languages I	ET107	Romanian	2	1	1		

Course description (Syllabus): Introduction. Objectives . Classification of verbs. Definitions . Morphology of lexical verbs. Structure of the verb phrase. Tenses of the indicative mood. Definitions. 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
Sport Activities I	ET108	Romanian	1		1		

Course description (Syllabus): Walking on the flat and when climbing the slope and turns; Methodical sequence of direct and oblique descent learning; Ski braking - techniques; Ways and means for improving learning and detours; Succession methodical learning bypassing the plug; Succession methodical learning plug detour in half; Cornering methodical sequence learning by rotation.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Special Mathematics	ET209	Romanian	5	3	2		

Course description (Syllabus): Mathematical methods which lead to differential equations. Equations of the first order and degree. Cauchy Problem. Existence and uniqueness Theorem. Separation variables. The homogeneous type. Linear equations. Bernoulli equations. Exact equations. Integrating factors. Linear equations of higher degree, (with variable coefficients and with constant coefficients). Differential systems**:** Linear systems with constant coefficients. Prime integral. Symmetric systems. Stability Theory. Basic concept. Stability of linear and non-linear systems. Complex Functions: Complex number. Complex plane. Sequences. Series. Elementary functions. Continuity, derivability, Cauchy-Riemann conditions. Complex Integral. Cauchy's Integral Formulas. Taylor and Laurent series. Residues. Applications. Laplace Transform: Definition, properties and theorems. Inverse of the Laplace Transform. Applications in solving differential and integral equations. Fourier series: Basic results on Fourier series. Fourier Transform. Applications. Z – Transform: Basic results ans applications.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Computer Programming and Programming Languages II	ET210	Romanian	5	2		2	

Course description (Syllabus): The presentation of the programming language C ++. Functions with / without parameters, overloading the functions, inline functions, recursion. Pictures: initialization, scanning, dimensional arrays, arrays as parameters. Characters- using sequences of characters, character arrays. Pointers- operators, variables and pointers, pointers to pointers, pointers to functions. dynamic memory, data structures, and other types of data. Classes, objects, constructors / destructors, overloading builders / operators, static members. Functions / classes friendship, inheritances between CALS, multiple inheritance. Polimorfism- pointers to base class members virtual abstract base class.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Physics II	ET211	Romanian	5	2	1	1	

Course description (Syllabus): Physical quantities, measurement units, international system of units, dimensional analysis, calculation of errors. Elements of classical mechanics. Kinematics. Dynamics. Theory of Relativity. Mechanical Oscillations and Waves (analogy with electromagnetic systems). Elements of thermodynamics and statistical physics. Thermodynamic transformations. Principles of thermodynamics. The ideal gas. Maxwell and Boltzmann distributions. Electromagnetism. (Static, stationary and variable regimes)Macroscopic electromagnetic theory of light. Geometrical optics principles. Interference, diffraction and polarization of light. Elements of quantum mechanics and atomic physics. Photoelectric and Compton effects. Thermal radiation. Heisenberg's uncertainty relations. Wave functions. Elements of solid state physics. Crystals. Semiconductors. Semiconductor Devices.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Electrical Circuit Theory 1	ET212	Romanian	5	2	3	1	

Course description (Syllabus): Faraday's law of induction. Magnetic circuit law. Capacitor. Coil. Inductances. Magnetic couplings. Energy in the electromagnetic field. Resistors, sources, t.e.m. and current sources. Methods for solving DC circuits. Single-phase circuits in sinusoidal permanent regime.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Chemistry	ET214	Romanian	4	2		1	

Course description (Syllabus): Chemical compound. Oxides, acid, base and salt. The laws of chemistry (law of mass conservation of matter, chemical equivalents law). The relationship between structure and properties of substances. Chemical bonds (ionic, covalent, coordinative-covalent, metallic, hydrogen bonds, van der Waals forces). Water. Molecular and colloidal disperse systems (ebulioscopie, freezing electrolytic dissociation, pH, hydrolysis, buffer systems. Water hardness. Water softening and demineralisation. Electrolysis of melts and solutions. Metals. Preparation. Properties. Corrosion. Methods and techniques for corrosion protection. The electrochemical conversion of energy. Cells used in the automotive industry. Macromolecular compounds. Composite materials. Glass.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Ethics and Academic Integrity	ET214	Romanian	3	1	1		

Introduction to academic ethics and integrity. Specific aspects that have shaped the field. The importance of academic ethics and integrity for future electrical engineering specialists. Definition of concepts: ethics, morality, integrity. Essential values in academia: honesty, responsibility, respect. Fundamental values: honesty, fairness, respect, responsibility ; Regulation and principles: University codes of ethics and national regulations (e.g., Education Act). Norms and standards in academic writing and research. Institutional and individual responsibility ;Forms of deviation from academic integrity: Plagiarism, self-plagiarism, incorrect paraphrasing. Falsification of data, fabrication of results.

Exam fraud, contracting work, use of AI without acknowledgment ; Ethics of academic writing. Creativity and intellectual property: Correct citation of sources Originality vs. influence – the fine line ; Ethics in scientific research and publication: Ethical conduct in research: data collection, interpretation, and reporting. Ethics of collaboration and co-authorship. Conflict of interest, copyright, multiple publication ; Academic integrity in the age of digital technology and artificial intelligence: Current challenges in maintaining academic integrity: access to online resources, copy-paste, commercial writing services. Responsible use of digital tools: AI platforms (e.g., ChatGPT, Grammarly, Quillbot, etc.). Acceptable limits of technology use in writing, research, and assessment. Risks and best practices in the digital educational environment.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Foreign Languages II	ET215	Romanian	2	1	1		

Course description (Syllabus): Electronic components: Introduction. 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. Telecommunications operation principles: Introduction. Creating and receiving the signal. Transmitting the signal. Communication network.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Sport Activities II	ET216	Romanian	1		1		

Course description (Syllabus): Walking on the flat and when climbing the slope and turns; Conversation, explanation, exercise, demonstration, individual experiment, educational games, the comprehensive and fragmented. Succession methodically direct and oblique descent learning; Apply the brakes Ski - techniques; Methods and means for learning and improvement detours; Succession methodical learning bypassing the plug; Succession methodical learning plug detour in half; Methodical sequence learning rotating cornering.

2nd Year

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Electrical Circuit Theory 2	ET301	Romanian	5	2	2		

Course description (Syllabus) Three-phase electrical circuits for no-load and shortcircuit cases. Electrical circuits in disturbant regimes. Electrical circuits in dynamic states. Special methods for electrical circuits solving: transfiguration method, superposition method, equivalent voltage generator method, equivalent current generator method.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Computer Programming and Programming Languages III	ET302	Romanian	3	1		2	

Course description (Syllabus): Introduction in MATLAB. Programs structures. Matrices, vectors and scalars. Logical and relational operators. Loops. Vector operations. Numerical operations in MATLAB. Common mathematical functions. Data interpolation and curve fitting. Graphics in MATLAB: 2D and 3D. Simulink – part I (introduction); Simulink – part II (modeling and simulation of electrical circuits) Symbolic MATLAB operations.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Electromagnetic Field Theory	ET303	Romanian	6	2	3		

Course description (Syllabus): Electrostatic. Introducing the concepts of electrical charge densities of electric charge, electric field, electric moment, the electric polarization. Laws and theorems characteristic electrostatic regime.

Capacitors. Determination of the electrostatic field methods: electric flow method, images, magnetic field lines approximation, analytical equations to integration field. Electrodynamics. Introduction of the concept of magnetic field. Laws of the magnetic filed. Magnetic circuits, magnetic circuits solving. Inductance. Energy magnetic field. Force in the magnetic field. Magneto statics. Electrical circuits in transient regime. Quadripole and electric filters. Quadripole parameters. Determining the parameters analytically or by testing. Quadripole connections. Filters. The calculation of the filters.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Electrotechnics Materials	ET304	Romanian	4	2		2	

Course description (Syllabus): Materials laws and electromagnetism theory. Electrical conductibility of materials. Study of conductive materials. Study of dielectrics. Study of magnetic materials.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Analog Electronics	ET305	Romanian	4	2	1	1	

Course description (Syllabus): Introduction. Fundamentals on electrical circuits; The modeling principles, circuit elements; Fundamental circuit configurations and equivalent circuits. Semiconductor diode. Diode simplified models; Diodes applications: half-wave and bridge rectifier, capacitive filter, diode limiting circuits. Bipolar junction transistors (BJT). BJT operation, large signal models, BJT inverter; DC analysis, transistor bias, computing of quiescent point, command circuits with BJT; AC analysis of BJT, the small-signal equivalent circuits of BJT; The voltage amplifier model, single-stage transistor amplifiers. The field-effect transistors (FET). N-channel enhancement metal oxide semiconductor (MOS) FET: structure, physical operation, equivalent circuits, static characteristics; Bias circuits and the small-signal operation and models of FET; Amplifiers. Classification of amplifiers; Low-frequency power amplifier. Ideal operational amplifier (OpAmp), the basic function and applications: inverting and non-inverting configurations, current-voltage and voltage current converters; Real operational amplifier: DC and AC limitations and parameters, single supply operation. Voltage regulators. Zenner diode and parametrical voltage regulator; Voltage regulators with feedback, integrated voltage regulators. Pulse Waveform Circuits. Linear and non-linear shaping circuits, RC and OpAmp integrator and differentiator; Voltage comparators, comparators with hysteresis; Rectangular and triangular signal generators.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Digital Electronics	ET306	Romanian	4	2		1	

Course description (Syllabus): General description of logical systems. Combinational logic circuits – analysis and synthesis. Logical functions minimizations. Karnaugh diagram and Quine McCluskey method. Logical functions implementation with electromagnetic relays. Logical functions implementation with SSI circuits. Logical functions implementation with MSI circuits. Logical functions implementation with LSI circuits. Combinational specialized logic circuits.Hazard in logic circuits.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Elements of Mechanical Engineering	ET307	Romanian	2	1		1	

Course description (Syllabus): Elements of basic dynamics. Fundamental theorems of dynamics. Rigid body dynamics.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Foreign Languages III	ET308	Romanian	2	1	1		

Course description (Syllabus): Computer Users; Computer Architecture; Computer Applications; Peripherals; Interview:Former Student; Operating Systems; Graphical User Interfaces.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Sport Activities III	ET309	Romanian	1		1		

Course description (Syllabus): Getting to the ball - movement games handball specific discipline; Conversation, explanation, exercise, demonstration, individual experiment, teaching games; Movement in the ground for attack and defense; Procedures for keeping, catching and bird balls; Driving the ball; Disposing gate in place and running; Disposing jump gate; Disposing wearing diving save; Remove the ball from the opponent; blocking shot on goal, blocking the opponent with the body; Applications on technical and tactical training content in the game of handball.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Microprocessors Systems	ET410	Romanian	3	2		1	

Course description (Syllabus): Computers fundaments. Structural and operational representation of computational systems. Computer structure. Buses. Microprocessors types. Performance computers assesment. Structural and operational fundaments of Centrel Processor Unit (CPU). Processor structure: data bus, control unit, elementary CPU architecture, condition and control flags, interfaces, interrupts and exception, stack memory, pipeline type structures. Operation: addressing mechanism, main memory selection, external bus type signals. Instructions: set of instructions, CISC/RIST processors type, addressing methods. Memory organization. Destination. Main features. Hierarchical structure. Static and dynamic RAM. Cache memory. Memory administration technics. Virtual memory implementation. Inputs/Outputs system structure. Interfaces. Synchronous and asynchronous serial communications. I/O interchange ways. Some standard type of interfaces: ISA, PCI, EIA232, USB.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Energy Sources	ET411	Romanian	3	2		1	

Course description (Syllabus): Introduction. Conventional energy sources. Fundamentals of thermodynamics. Steam power plants. Rankine cycle. Gas turbines. Nuclear power plants. Renewable energy sources. Hydropower plants. Microhydropower generation. Solar energy. Solar thermal generation. Photovoltaic power generation. Wind power. Geothermal and biomass power. Energy storage.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Electrical and Electronic Measurements	ET412	Romanian	4	2		2	

Course description (Syllabus): 1. General aspects. The measurement as experimental operation. Electrical quantities. Measuring instruments and systems. Types of measurement errors, expressions, calculation. Deflectional measuring instruments. Moving coil instruments, ammeters, voltmeters, multimeters. Moving iron instruments. Electro-dynamic instruments, the wattmeter. Induction instruments, the single-phase electricity meter. Instrument transformers. The rectifier instrument. Applications. . Bridges and potentiometers. Balanced and unbalanced DC bridges. The Wheatstone bridge. The Thomson bridge. AC bridges, balance conditions. Inductance bridges, the Maxwell-Wien bridge. Capacitance bridges, the Wien bridge. DC potentiometers. Applications. 4. Analogue electronic instruments. DC and AC millivoltmeters and voltmeters, voltage measurement (peak, r.m.s., average). Selective voltmeters. Electronic ammeters and ohmmeters. Electronic frequency and phase meters. Hall and magneto-resistive ammeters. The oscilloscope. Constructional and functional characteristics of the analogue dual channel oscilloscope. The cathode ray tube (CRT), other types of displays. Structure and operation of the time base. The trigger circuit. Measurement methods. Impedance measurement. DC and AC voltage and current measurement. Power, energy and power factor measurement. Frequency, period, time interval and phase difference measurement.Impedance measurement. DC and AC voltage and current measurement.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Electromagnetic Converters I	ET413	Romanian	4	2		2	

Course description (Syllabus): The electric transformer. The single phase transformer. Principle of working. The equivalent circuit. The equivalent circuit. Diagram of the phasors. The losses in the transformer. No-load operation. Short-circuit test. Load operation. The three-phase transformer. Constructive features. Theory of the three-phase transformer. The connections of the transformer. No-load operation. Operation under unbalanced load. Utilisation of different types of connections. Parallel operation. The autotransformer. Main issues of the general theory of AC electrical machines. The induced e.m.f. for one turn and one phase. The A.C. windings. The characteristic of the e.m. f. produced by the winding. The curve of the magnetic induction in the air gap. 3.The asynchronous machine and the asynchronous machine drives Construction and principle of operation. The equations of the voltages. Electrical parameters. The equivalent circuit. Diagram of the phasors. The torque. The losses and efficiency. The diagram of the current. Determination of the parameters from the results of no-load and locked-rotor tests. The operating characteristics. The parasite torques. Starting of the asynchronous motors: with wound rotor and with squirrel-cage rotor. Speed-control of the asynchronous motors, possibilities of speed-control. Speed control by modification of the rotor circuit's resistance; speed control by variation of the supply voltage at constant frequency; speed control by means of frequency inverter. Braking methods for the asynchronous motor: braking as recovering generator, braking with counter-current, dynamic braking, braking in unbalanced conditions. The transitory duties of the asynchronous machines. Connection of the asynchronous motor. Disconnecting of the asynchronous motor. The sudden shortcircuit of the asynchronous machine.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Swithgears	ET414	Romanian	6	3		3	

Course description (Syllabus): Introduction, generalities, functions of electrical equipment, contents of the lecture. . Fundamentals of electrical apparatus. Commutation of electrical circuits (without electric arc). Electric switching arc and his suppression. Voltage recovery, interaction between the circuit breaker and the grid. Electrical contacts. Thermal, electro dynamic and electric stability of electrical equipment. High voltage electrical equipment. Isolating switches. Circuit interrupters and earthing switches. HV Circuit breakers. Current-limiting reactors and arresters. Instrument transformers (current transformers, voltage transformers). Low voltage electrical equipment. Switches. Fuses. Air circuit breakers. Relays.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
System Theory and Control	ET415	Romanian	4	2	1	1	

Course description (Syllabus): Dynamic systems. Structures. Systems classification. Dynamic models. Signals used in systems theory. Direct and inverse Laplace transform. Transfer functions. Block diagrams. Analysis and simulation of time response. Stability. Analysis of frequency response. Bode diagrams. Nyquist stability. Nyquist stability criterion. Discrete systems.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Foreign Languages IV	ET416	Romanian	2	1	1		

Course description (Syllabus): The Internet . The World Wide Web. Websites. Interview: Webpage Creator .Communication Systems. Computing Support. Data Security. Interview:ex hacker. Software Engineeering. People in computing. .Recent Developments in IT. .The Future of IT. Interview:Electronic Publishing

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Sport Activities IV	ET417	Romanian	1		1		

Course description (Syllabus): Getting to the ball - movement games handball specific discipline; Conversation, explanation, exercise, demonstration, individual experiment, teaching games. Movement in the ground for attack and defense; Procedures for keeping, catching and bird balls; Driving the ball; Disposing gate in place and running; Disposing jump gate; Disposing wearing diving save; Remove the ball from the opponent; blocking shot on goal, blocking the opponent with the body; Applications on technical and tactical training content in the game of handball.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Practice I (90 hours/year)	ET418	Romanian	4				

Course description (Syllabus): Solving the problems in electrical engineering by computer programs. Understanding the operating principles of transformers, electrical machines, static converters, electrical equipment, installations producing electrical energy. Mathematical modeling of electromagnetic field problems and circuits with applications in electrical engineering. Assessment of the quality and performance of functional electrical systems by specific methods

3rd Year

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Microcontroller Programming	ET501	Romanian	5	2		2	

Course description (Syllabus): General description; Bloc-schematics; Internal architecture; Central Processing Unit; Peripheral devices description; Microcontroller families; Different microcontrollers description; Design principles.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Sensors, interfaces and data aquisitions I	ET502	Romanian	3	2		1	

Course description (Syllabus): Introduction. Classification, general requirements. Types of measurement errors. Static and dynamic characteristics. Sensors parameters. Optoelectronic sensors, such as: photovoltaic diodes, photoconductors, photodiodes, phototransistors, positron-sensitive photo detectors, photodiode arrays, charge-coupled devices, light-emitting diodes, injection lasers and liquid-crystal displays. Mechanical sensors, such as: metallic, thin-film and semiconductor strain gauges, diffused silicon pressure sensors, silicon accelerometers, solid-state displacement transducers, piezoelectric field-effect transducers, tunnel-diode strain sensors, surface acoustic wave devices, silicon micromechanical switches. Thermal sensors, such as: platinum resistors, thermistors, diode temperature sensors, silicon transistor thermometers, integrated temperature transducers, PTAT circuits, thermocouples, thermopiles, piezoelectric thermometers, quartz thermometers, power transistors and thick-film thermal print heads. Pressure transducers. Sensors and transducers based on elastic deformation of the bodies. Level sensors. Hydrostatic sensors and transducers. Electrical and radioactive radiation transducers. Ultrasonic transducers. Flow sensor. Solid-state flow meters and electronic flow controllers. Magnetic sensors. Electromagnetic sensors and transducers. Hall-effect devices, integrated Hall devices. Sensors and displacement transducers. Speed sensors and transducers. Density and viscosity transducers.
Smart sensors.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Electromagnetic Converters II	ET503	Romanian	5	2		2	1

Course description (Syllabus): THE DC-MACHINE: Construction. Principle of operation as generator and as motor. Principle of realisation of DC windings. The induced e.m.f. The reaction of the armature. Comutation. Means for improving the commutation. The electromagnetic torque. The losses and efficiency of the DC-machine. The DC-generator. The generator with separate excitation. The generator with shunt excitation. The generator with series excitation. The generator with compound excitation. Working in parallel of the DC-generators. The DC-motor. The equation of the voltages. The equation of the torques. Starting of the DC-motors. The DC-motor with shunt excitation.

The DC-motor with series excitation. THE SYNCHRONOUS MACHINE: Operation parts. Principle of operation of the synchronous generator. The equation of the voltages of the synchronous generator with non salient poles in sinusoidal duty. The equation of the voltage of the synchronous generator with salient poles. The reaction of the armature of the synchronous generator with salient poles. The phasors diagram of the voltages and current for the synchronous generator with salient poles.The losses and efficiency of the synchronous generator. Parallel connection of the synchronous generators. The oscillations of the synchronous generators operating in parallel. Summation of powers and electronagnetic torques. The V-shape curves of the synchronous generator. Principle of working of the synchronous motor. The equation of the voltages for the synchronous motor. The phasors diagrames for the voltages and currents of the synchronous motor. Operation of the synchronous motor when connected to infinite power mains. The V-shape curves. The synchronous compensator. The working characteristics of the synchronous motor. Starting of the synchronous motor. Starting method by means of an auxiliary motor. Starting method in asynchronous duty.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Static Converters	ET504	Romanian	4	2		2	

Course description (Syllabus): Introduction. Base theory of converters. Power electronics systems structure and applications. Processors and power converters. Classification of power converters. Power semiconductor devices (diode, thyristor, BJT, IGBT, MOSFET). Loss in power semiconductor devices. Series and parallel connection of power devices. Protections. AC-DC power conversion. Rectifiers. Rectifier and inverter operating modes. Rectifier parameters. Natural commutation rectifiers. Forced commutation rectifiers. DC-AC power conversion. Base principles of DC-AC power conversion. Types of Inverters. Voltage single phase inverters. Current single phase inverters. Bases of PWM control. Single phase PWM inverters. Three phase PWM inverters. AC-AC power conversion. Base principles of AC-AC power conversion. Control of frequency and voltage. Direct control: cycle-converters, matrix converters. Indirect control: frequency converters with dc intermediary circuit. Power electronics industrial applications.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Project-Static Converters	ET505	Romanian					1

Course description (Syllabus): Using the basics of power semiconductor components. Theoretical and practical knowledge of the basic notions regarding the electronic circuits of power static converters. Design of relatively simple circuits with static converters.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Production, Transmission and Distribution of Electric Energy	ET506	Romanian	4	2		1	

Course description (Syllabus): Power plants: Main types. General characterization. National power system load curve covering. Electric energy transport and distribution systems. Electric networks classification. Electric networks operating regimes. Power system parameters. Power lines parameters. Transformers parameters. Distribution substations and transformers. Typical Bus Configurations. Transformer substations equipment. Electrical networks design. Allowable voltage drops in steady-state regime. Calculation hypotheses for radial bus networks. Power losses calculation for radial bus networks. Energy losses calculation for transformers and radial bus networks. Power systems faults. Definition, classification. Faults calculation hypotheses and methods. Neutral grounding. General considerations. Comparison of main grounding methods. Power systems stability. Stability criteria and operating states. Primary and secondary frequency regulation. National electro-energetic system. General characterisation; major faults.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Accounting Fundamentals	ET607	Romanian	3	1	2		

Course description (Syllabus): Understanding the role and importance of accounting within the entity's information system.Knowledge of the assets and liabilities of the balance sheet, of the structures of income and expenses, as well as of the accounting procedures for their instrumentation, evaluation, monitoring and control; Knowing the information users and the qualitative characteristics of the financial information with the new general financial reporting principles; The correct use of the specific accounting tools for recording the economic processes and the results of the activity.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Programmable Logic Controllers	ET608	Romanian	3	2		2	

Course description (Syllabus): Overview of the Process Control. PLC System. Processor and memory organization. Program scan. PLC Programming languages and programming environments. IEE 61131 Standard. Statement list (STL). Structured text (ST). Ladder diagram (LAD). Function block diagram (FBD). Sequential function chart (SFC). Methods of structured design of programs for PLC. Examples. ASi (Actuator Sensor interface) networks. Communication processor. Use of ASi network for process control with SIEMENS PLC. PROFIBUS networks. Use of PROFIBUS network for process control with SIEMENS PLC. CAN open network. Use of PROFIBUS network for process control with EATON (MOELLER) PLC.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Traductoare, interfete si achizitii de date II	ET609	Romanian	4	2		1	1

Course description (Syllabus): General aspects. Introduction to DAQ systems. Recent trends. Technologies, platforms and standards. Developing DAQ systems using specific hardware. Description of the architecture of DAQ systems. Sensors and actuators. Signal conditioning elements. Acquisition boards. DAQ system design. Designing and modelling the architecture of DAQC systems. Main architectures and platforms for acquisition and control. The OSI model. Software for DAQ applications. Introduction to Virtual Instrumentation and Graphical (G) Programming. Main LabVIEW elements used for developing DAQ systems. Configuration of DAQ systems with dedicated communication buses and interfaces. The serial interface: RS family. The parallel interface: GPIB bus. Modular instrumentation: VXI, PXI. Dedicated interfaces: USB, Ethernet, CAN. Configuration of Wireless Acquisition Systems. Smart sensors and MEMS. Description of Wireless Sensor Networks. Interfaces, standards and network topologies.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Frequency Converters	ET610	Romanian	4	2		2	

Course description (Syllabus): Introduction. General description of the system and components role; Structure of VS Frequency Converters; Modern PE switches; PAM and Multilevel Inverters. PWM inverters. Induction Machine models. Clasical models, adecvated for V/f converters. Dynamic IM models. Vectorial model. Bi-phase models. IM Models applications. FOC. Sensorless drives. Starting voltage and frequency. Starting torques evolution (dynamics). VS Frequency Converters Control circuits for IM . Synchronous Machine Models. Electromagnetic excitation salient SM model. PM SM model. VS Frequency Converters structure and Control circuits. Brushless DC Models. Machine model. Converter structure and operation modes.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Electrical Drives I	ET611	Romanian	4	2		2	

Course description (Syllabus): Mechanic elements in electrical drive; Mechanic characteristics for electrical machines and load machines; Integration to functional equation; The state functionality of electrical machines; Static converters; The control of the speed to direct current machines; Brushless direct current machines.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Practice II (90 hours/year)	ET612	Romanian	4				

Course description (Syllabus): Electrical system design using computer-aided design software. The design of electrical installations that include measurement and numerical data acquisition systems. The design of automatic control systems of electric drives using dedicated software. The design of control systems with dedicated microprocessors or PLCs using specific programming environments and technologies. The design of low voltage electrical installations at the load level. The design of the power supply of industrial loads.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Intelligent electrical systems	ET514	Romanian	4	2		1	

Course description (Syllabus): The course describes the principles of using Internet of Things (IoT) for specifical electrical engineering applications by using the modern IT technologies combined with digital and analog sensors. The students will be able to build from scratch a simple IoT application in the electrical engineering field. Course main issues: Configuration of a Raspberry Pi system. The installation of a new Raspberry Pi system is presented; The control of digital IO pins. The control of GPIO (General Purpose Input Output) pins can be obtained by using Python scripts; Analogical signals.The analogical small signals obtained from the sensors can be converted into digital signals and used with Raspberry Pi;. Control of relays blocks. The Raspberry Pi can be used to control one or many relays blocks for power circuits; Building of an application by integrating sensors with Database and Web technologies
All the components are assembled together into an IoT application.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Modeling and simulation of the electrical systems	ET515	Romanian	3	2		1	

Course description (Syllabus): Studying the modeling and simulation of electrical circuits of energy storage systems, focusing on the areas of application in electrical engineering, their advantages and disadvantages, cost and future development prospects. Modeling and simulation of the component elements of the electrical circuits of the studied electrical energy storage systems, using specialized software programs. Applications of electrical energy storage system circuits in renewable energy systems (case studies).

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Sound Synthesis and Audio Files	ET617	Romanian	4	2		2	

Course description (Syllabus): Sampled signals. Sampling ideal. Reconstruction of a signal from its samples. Sampling frequency domain. Sample files. Tones (tones). Characterization of tones: high (pitch), timbre and strength (loudness), attack (onset) and duration. ADSR amplitude envelope (attack-decay-sustain-release).Discrete-time signals. Elementary discrete signals. Fourier analysis of discrete-time non-periodic signals. Fourier transform of discrete-time signals. Generalization of Fourier transform for discrete-time non-periodic signals. Discrete Fourier transform. Meshing frequency. Fast Fourier transformation. Modulated signals. Amplitude modulation with sinusoidal carrier. If sinusoidal signal modulator. If the modulating signal as the sum of sinusoidal oscillations. If a non-periodic signal modulator. Or phase modulated signals in frequency with sinusoidal carrier. Representing signals in time-frequency fields. Introduction to wavelet analysis functions. Short-term Fourier transform discrete-time signals. Discrete wavelet transform. Audio file types. Coding samples (linear dither, dither logarithmic representation sample values as signed or unsigned). Data format (header, saving bytes in order "little-endian" or "big-endian"). Restrictions on sample rate, bit depth, number of channels.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
CAD for Electrical Installations (Autocad, Cadelec)	ET620	Romanian	4	2		1	1

Course description (Syllabus): Introduction. The object of the course. Electrical technical documentation. Classification of technical documentation. Structure of technical documentation. Content of written documents. Items that must be entered in the electrical installations projects. Making highlighting the field and drawing scale. Methods of measurement and estimation of size. Representation of existing installations. Measurement scale used to represent the plans. List of electrical equipment that is used frequently and their symbols in drawings. Symbols used in wiring diagrams for different types of devices (lights, sockets, etc). Symbolizing complex aggregates (lathes, mills, crane, etc.). Niches and paintings, single line diagram. Components of cubicles and panels (bar systems, fuses, measurement systems). Realization of single line diagrams according to electrical wiring diagram in plan. Types of cables and their symbolization drawings. Recognize the main types of cables commonly used in electrical. Symbols in the drawings for cables. Facilities provided by the programming environment Caddy Electric. Program Overview. Facilities offered by the program. Existing databases symbols. Establishing measurement scale. Creating connection points. Connecting cable. Editing drawings of Electric Caddy. Fixing the types of cables used. Generating reports using programming environment Caddy Electric **.**

4th Year

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Industrial Control using Computers	ET701	Romanian	5	2		2	

Course description (Syllabus): Connection to process: signal conversion, signal filtering, galvanic isolation. Input/output process with computer modules: scheduled transfer, transfer to interruptions, DMA transfer. Industrial series network: the serial port, adapting serial port for connection multipointcontrol of the circulation of information, types of serial networks, the role of the data link, MODBUS protocol, CAN and CAN open networks, BACnet networks, Industrial computer modules: analoginputs/outputs modules, binary inputs/outputs modules, pulse input/output modules. Real time operating systems: the role of operating systems in the computer system resource management, multitasking operating systems and multithreading.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Fundamentals of Modeling, Designing & Testing Electrical Systems	ET702	Romanian	5	2		3	1

Course description (Syllabus): Overview of Real time systems: Definition, evolution, typology, structure and applications. Temporal Modeling and specification of real time systems: State diagram, finite automata model, Petri-net, state chart and mode chart, Q-model, formal methods. Real-time simulation systems. Case studies. Qualitative Modeling. Automatic Generation Control: Load frequency control of Single and multi-area power systems, real time implementation of economic dispatch through load frequency control system. Megavar voltage control, fundamental characteristics: typical excitation systems, automatic voltage regulator (AVR) for generator excitation control. Reactive power dispatch and its coordination with active power dispatch. Energy control center: Computer configuration in energy control centers, data acquisition and transmission, man-machine interfaces, functions performed in energy control centers. State estimation: introduction to the problem of state estimation, maximum likelihood estimation and weighted least-estimation, bad data identification, concept of power system monitoring, the line power flow state estimator. State variable Modeling: Continuous Dynamic Systems. Solution methods for Nonlinear Differential equations. Bond Graph Techniques. Simulation Software.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Electrical Drives II	ET703	Romanian	5	2		1	

Course description (Syllabus): Spatial fasor theory; Induction motor model; Field oriented control principle of induction motor; Field oriented contol systems for induction motor; Direct torque control of induction motor; Sensorless control of the speed and position for induction motor.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Electrical Installations	ET704	Romanian	5	2		2	1

Course description (Syllabus): General rules for design of electrical installations. Types of loads. The power required by electrical installation. Electric switchgear and electrical protection for consumers Power supply low voltage consumers Calculation of low voltage electrical installations for consumers Protection equipment. Earthing equipment. Electric shock protection. Protection against overvoltage. Indoor and outdoor lighting installations. Power factor improvement. Detection and harmonic filtering in electrical installations. Energy efficiency in electrical installations. Legislation in electricity. Recap and discussion on topics.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Electromagnetic Compatibility	ET705	Romanian	5	3		2	

Course description (Syllabus): Introduction in Electromagnetic Compatibility (EMC). Sources of Electromagnetic interference and disturbances. Interference coupling mechanisms. EMC requirements. Electromagnetic radiation and health.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Fundamentals of Electrical Systems Optimization	ET806	Romanian	4	2		3	

Course description (Syllabus): Electrical systems modeling. Characteristic quantities and parameters. I/O quantities. Ordinary differential equations and algebraic correlations between characteristic quantities. Dynamic modeling. State-space models synthesis. Ways of selecting the state variables based on algebraic correlations between the characteristic quantities of the system. Functions of the energy management systems. One dimensional optimization methods. Multidimensional optimization without constrains. Powell algorithm. Gradient descent optimization. Constrained multidimensional optimization. Penalty methods. Barrier methods. Intelligent control system design. Neural network control systems. Learning in neural networks. Genetic algorithms. Evolutionary design techniques.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Internat and data bases	ET807	Romanian	4	2		2	

Course description (Syllabus): The course describes the principles of byilding a dynamic Web application by using database technology applied in the electrical engineering field. The students will be able to build from scratch a simple Web application with a database behind. **Course main issues:**

1. The HTML (Hyper Text Markup Language) protocol and CSS (Cascade Style Sheet). The basics of HTML and CSS are presented;

2. The PHP (Hypertext PreProcessor). The integration of PHP as a server script for Hyper Text protocol is presented

3. The SQL (Structured Query Language); The MySQL language is presented for building a database

4. Building of an application by integrating Database and Web technologies. All the components are assembled together into an dynamic Web application

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Statistics and Reliability	ET808	Romanian	3	2		2	

Course description (Syllabus): Probability theory. Random variables. Probability density function. Probability distribution. Basic theory of technical statistics. Determination of the parameters of a probability distribution. Reliability indices. Relaibility of systems. Calculation of short circuit currents.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Management	ET809	Romanian	2	2	1		

Course description (Syllabus): Entrepreneurship and business. Concepts, characteristics. The approach of business. Business planning and strategic business decision. Entrepreneurship and innovation. Creativity. The sources of entrepreneurial innovation. Entrepreneurial strategies. Employ all available resources. Strike the open market. Use the gaps in the market. Change the values and the characteristic. Building the entrepreneurial organizations.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Diploma project elaborating (6 hours x 10 weeks=60 hours)	ET810	Romanian	4				

Course description (Syllabus): Validation of the proposed mathematical model and elaborating the theoretical part of the project (the current state of the subject and the theoretical bases). Deepening modeling and simulation for the proposed model: Simulation of electrical and electronic circuits. The choice of components and calculations based on data catalog. Writing the diploma project.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Practice III (for elaborating the diploma project 60 hours/year)	ET811	Romanian	6				

Course description (Syllabus): Practical implementation of the proposed model and experimental measurements. Implementation of a program dedicated to a specific application in electrical engineering, eg .: industrial automation, measuring device and data acquisition. Installation projects for medium and low voltage circuits. Experimental measurements (where applicable).

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Electrosecurity	ET713	Romanian	5	2		2	

Course description (Syllabus): Characteristic phenomena of electric current flow through the human body. Characteristic phenomena of electric current flow through the earth. Generator structures of accidental voltages. Protection systems against accidental voltages in low voltage electrical installations. Permanent control of insulation resistance. Automatic protection disconnection use in the event of a isolation fault, means of protection against accidental voltages. Measuring methods for determining the grounding resistance.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Automotive Electrical Equipment	ET814	Romanian	4	2		2	

Course description (Syllabus): The role of the vehicle electrical and electronic equipment; General operating conditions. Power supply system, storage battery, alternator. Automatic voltage regulator. Parallel operation of the storage battery, alternator and loads. Ignition system. electronic ignition. Electric start system. The lighting system of the vehicle. The braking system ABS. The control system; gauges, transducers. Hybrid car, electric car.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Power Supply of Industrial Consumers	ET817	Romanian	3	2		2	1

Course description (Syllabus): Installations for generation, transmission and distribution of electric power. Consumers and power consumption. Study of neutral within power networks. The optimization of reactive power flow within power networks. Compensation of power factor. Calculation of short circuit currents.