Transilvania University of Braşov, Romania

Study program Electrical Engineering and Computers

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

1st YEAR

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Mathematical Analysis	MAT1	5	3	2	0	0

Course description (Syllabus): This is a basic course in Mathematical Analysis, meant to give the student the understanding of the fundamental notions of Mathematical Analysis (sets, sequences, series, limits, continuity, differentiability and integrability) and the necessary skills when operating with them.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Linear Algebra, Diff. Geometry	MAT2	5	2	2	-	-

Course description (Syllabus): Basic notions of linear algebra – 4 hours:vector spaces and subspaces, examples; basis and dimension of a vector space, changes of bases; linear transformations on finite dimensional spaces. 2) Analytic geometry in plane and in space – 16 hours: operations with Euclidean vectors and their applications; coordinate systems and coordinate transformations in plane and in space; linear geometry (study of planes and lines) in space; quadratic geometry in plane and in space; generation of surfaces. 3) Elements of differential geometry – 8 hours: plane curves: element of arc length, length of a regluar arc of a curve; tangent and normal line to a curve at a regular point, osculating circle and curvature. spatial curves: length of a regular arc; Frenet-Serret (TNB) frame; curvature and torsion. surfaces in Euclidean 3-dimensional space: tangent plane and normal line at a regular point; first fundamental form (metric) of a surface and its applications.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Discrete mathematics	EEC103	4	1	1	-	-

Course description (Syllabus): The aim of the course „Discrete Mathematics" is to outline the importance of using graphs theory in modeling many electrical systems. This course contains several basic graphs problems: 1) graph searches (generic search, depth first search and breadth first search) and their applications (topological sort and determining the connected components), 2) minimum spanning tree problem and 3) the problem of determining Eulerian and Hamiltonian tours. The students are taught how to identify practical problems that can be modeled as graphs problems.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Physics I	FIZ1	4	2	-	2	-

Course description (Syllabus): Kinematics and dynamics of the material point (basic concepts, conservation laws). Dynamics of rigid bodies; basic relations, the principal axes of inertia, calculation examples; The Gyroscope; The total kinetic energy of a rigid body; practical applications; the flywheel. Mechanical oscillations; Harmonic oscillations; General expressions, movement equations, the energy of an oscillator. Free damped and forced oscillations; The resonance phenomena; Composition of harmonic oscillations; Practical applications. Thermodynamics, thermodynamic processes, laws of thermodynamics, applications, thermal engines; Basic Aspects on Electric Phenomena; Electrostatics, laws, electric field and potential; Electrokinetics, electrical conduction, mechanism of conduction; Dielectrics, conductors, semiconductors; applications; Biot-Savart law, Ampere's circuital law. Substances in magnetic field. Technical applications; Laws of electromagnetic induction; Electromagnetic waves; Optics. Elements of photometry. Thermal radiation. Propagation of light. Reflection and refraction of light. Interference and diffraction of light. Technical applications; optical devices.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
History of Technology	EEC21	3	2	1	-	-

Course description (Syllabus): Communication as process: Model of communication, communication forms, axioms of communication, active listening, assertive communication, written communication. Career concept; concept of professional career; management and the career development; career planning tools; career integrated in the concept of sustainable development. Engineering and engineers - Electrical engineering case study: Methodology in engineering; regulations; engineering branches; electrical engineering – evolution, tools, branches. Cultures and civilization at the beginning of the 21st century: About values, cultures, civilization, techniques, technologies, artifacts. Examples. Role of science and its connection with technology: About science; scientific thinking, methods and principles used in history of technology; the role of history of technology in the professional development; connections with conventional and non-conventional technologies. Development of knowledge about electricity until 19th century: Possible context of the science development;

Experiments and theories of electricity. Artifacts of the electricity: Electrostatic generators; electrical capacitors; measurement instruments; personalities. Knowledge development on the magnetism: Magnetism and the ancient world; magnetism in the 12^{th} -17^{th} centuries; terrestrial magnetism; compass evolutions; classical theories of magnetism and specific technologies; personalities. Electricity and magnetism in 19^{th} – 20^{th} centuries: Development of electromagnetism theories – experimental basis; electronics and radio-electronics; development of Electromechanics and mechatronics; energy obtaining. Electrification in Romania (1882-1992): Development of the systems for energy generation, transport, distribution and use; performances; personalities. Complexity of technical and technological systems: Lighting; Transport; Communication systems; Computers; Artificial intelligence; Biotechnologies.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Mathematical fundamentals of computers	EEC211	6	3	2	-	-

Course description (Syllabus): The aims of the course „Mathematical fundamentals of computers" are to show the reasons for the binary, octal and hexadecimal number systems' association with computers, to prove the importance of finding an optimal combinatorial circuit for a given logic function and to outline the importance of using graphs theory in modeling many electrical systems. This course contains 4 chapters. The first one, „Numbers systems" deals with binary, decimal, octal, hexadecimal number systems, conversions among bases and base *b* arithmetic. In the second chapter representations of integer numbers (Sign and magnitude, One's complement, Two's complement) and real numbers (The IEEE 754 Floating Point Standard) are presented. The chapter „Basics Logic Design" is dedicated to Boolean functions, their normal forms, their minimization using Veitch-Karnaugh maps or Quine McCluskey's method and designing the corresponding optimal combinatorial circuits. The Reed-Müller expansions and the generalized Reed-Müller expansions are also presented. The last chapter contains two basic graphs problems: the shortest paths problem and the maximum flow problem. The students are taught how to identify practical problems that can be written using Boolean functions or modeled as graphs problems.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Energy Sources	EEC 213	7	2	1	1	1

Course description (Syllabus): Introduction; Conventional Energy Sources; Fossil Power Plants The operational concept and major components; Hydroelectric Power Plants The operational concept and major components; Nuclear power plants The operational concept and major components; Geothermal Power Plants The operational concept and major components; Generators and Transformers; Power Supply Networks : Conventional and Distributed Generation; Ecology, Pollution and Sustainable development; Renewable Energy Sources; Small and Micro Hydro Plants; Wind Generators; PV and Solar Thermal Panels; Biomass and Waste Treatment; Energy Saving; Power Electronics and Energy Conversion Conditioning Technologies.

2^{nd} YEAR

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Special Mathematics	EEC301	5	2	2	0	0

Course description (Syllabus): Scalar field, gradient; Vector field, divergence, rotor, Hamilton operator; Integral vector, integration formulas; Particular fields: conservative, solenoid, harmonic; Complex functions of real variable; Complex functions of complex variable; holomorphic functions; Complex integrals, Cauchy formulas. Complex series: Taylor and Laurent;Residues, the residue theorem, applications; Directly integrable equations. Linear equations and equations reducible to linear equations. Higher order equations; applications. Linear partial differential equations; applications. quasilinear equations; nonlinear equations; Laplace transform: Original functions. Laplace transform for derivative and for convolution product of functions; applications of Laplace transform.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Programming	EEC302	6	2	-	2	1

Course description (Syllabus): The course aims to ensure the students with the knowledge about general principles of object oriented programming.After completing successfully the course, the students will be able to: Name, explain and apply the core concepts and constructs used in object-oriented programming (Java exemplify). Develop small programs or modify existing ones, to solve clearly defined programming problems. Given a clearly described component, develop a test set and test code for the component. Run and analyze a given program, describe how well it or identify ways in which it fails.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Materials for Electrical Engineering	EEC303	6	2	-	2	-

Course description (Syllabus): Introduction in Electrical Material Science and Engineering: Tendencies in advanced material development; Discipline objectives; Atoms and bonding forces; Material properties and parameters; Classifications. Electromagnetic Theory and Material Laws: Material Laws; Electrical conduction law; Polarization law; Magnetization law. Electroconductive Materials: Electrical conduction in metals; Classical theory of conduction; Factors which influence the electric conduction in metals, Applications. Quantic theory of electrical conduction; Mathiessen law; Applications. Superconductivity**:** Historical view; Barden-Schrieffer-Cooper theory; Applications Semiconductive

Materials**:** General characteristics; Intrinsic electric conduction; Extrinsic electric conduction; Temperature and light effects; n-p junction, Applications. Dielectrics: Particularities of electrical conduction in dielectrics; Classifications; Polarization in constant and harmonic fields; Losses and equivalent schema. Dielectric breakdown, Lifetime of electroinsulating materials; Applications. Magnetic Materials: Atomic theory of magnetism; Classifications, Diamagnetism and paramagnetism of materials. Materials with magnetic order; Theory of soft and hard ferromagnetic materials. Magnetic losses; Applications. Nanomaterials: Magnetorezistive materials and ferroelectrics; Applications.

Course title	**Code**	**No. of credits**	**Number of hours per week**			
			course	**seminar**	**laboratory**	**project**
System Theory	EEC304	5	3	2	-	-

Course description (Syllabus): General system concepts. The Bilateral Laplace Transform; Mathematical modeling of dynamic systems; Transient response analysis and steady-state error analysis; Frequency response analysis; Root-locus analysis; Design and compensation techniques; The state-space analysis of control systems; Introduction in the discrete-time systems analysis. The z-transform.

Course title	**Code**	**No. of credits**	**Number of hours per week**			
			course	**seminar**	**laboratory**	**project**
Electromagnetism	EEC305	6	3	3	-	-

Course description (Syllabus): General aspects on the theory of the electromagnetic field and on the structure of substances; Introductions of the state quantities of the electromagnetic field in vacuum; The laws of the electromagnetic field; The energy of the electromagnetic field; Electrostatics; Electrokinetics; Electrodynamics; Magnetic phenomena.

Course title	**Code**	**No. of credits**	**Number of hours per week**			
			course	**seminar**	**laboratory**	**project**
Electronic Devices and Circuits	EEC408	5	3	2	1	-

Course description (Syllabus): Lectures presents: the principles of circuit analysis and design, the basic concepts and characteristics of the electronic devices and circuits. **Tutorials** complete the lectures and develop the ability of analyzing actual electronic circuits that implements the basic circuits presented at the lectures. **Laboratory** work has been developed to give the student practice in the experimental setup, measurement, and analysis of basic electronic devices and circuits. **The course as a whole** outlines some ways of thinking about analog circuits that will help to develop intuition. By the end of this subject, students should have acquired reasonable proficiency in the analysis and design of basic electronic circuits.

Course title	**Code**	**No. of credits**	**Number of hours per week**			
			course	**seminar**	**laboratory**	**project**
Electrical Circuits Theory	EEC410	5	3	3		

Course description (Syllabus): DC circuits; AC circuits; Three phase theory & symmetrical components; Two-port networks; Analysis of non-sinusoidal waveforms.

Course title	**Code**	**No. of credits**	**Number of hours per week**			
			course	**seminar**	**laboratory**	**project**
Electrical Equipments	EEC411	5	3	-	2	-

Course description (Syllabus): Generalities: Evolution and presentation of Switching Electrical Apparatus (SEA). General structure and characteristics of SEA. Classification Chap.1. Electrical Contacts: Physical processes in the conduction state and in the switching of electric contacts; thermal problems; designing of electric contacts. Chap.2. Electromagnets, clasifications; calculus of attraction fortce; characterstics. Chap. 3. Thermal calculus of electrical apparatus Chap. 4. Electric arc. Chap. 5. Switching of electrical circuits – Connection and disconnection of D.C. and A.C. circuits. Quenching condition of D.C. electric arc; Disconnection of A.C. electric arc: condition of A.C. quenching arc; determination of reestablish voltage. Chap.6. Quenching of electric arc: quenching methods and quenching chambers. Chap.7. Low Voltage Apparatus. SEA: Circuit breakers, industrial plugs and sockets; electric relay, electromagnetic contactors, automatic interrupters. Static SEA. Chap.8. High Voltage Switching Apparatus. Circuit breakers: constructive types (oil, compresed air, vacuum, SF6). Isolators: characteristics and parameters; constructive types. Chap.9. Protection Apparatus. Protection relays. Electrical fuses: fusible burning theory; characteristics; constructive types. Arresters.

3rd YEAR

Course title	**Code**	**No. of credits**	**Number of hours per week**			
			course	**seminar**	**laboratory**	**project**
Electrical Measurements	EEC501	4	2		2	

Course description (Syllabus): The course presents the main instruments and methods/techniques used in Electrical Measurements. The course contents: 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. 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. Operation modes, alternate, chopped. Special oscilloscopes, multi-channel, double time base. The digital storage oscilloscope, structure, operation, block diagram. 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. Power, energy and power factor measurement. Frequency, period, time interval and phase difference measurement.

Course title	**Code**	**No. of credits**	**Number of hours per week**			
			course	**seminar**	**laboratory**	**project**
Static converters	EEC502	5	2		2	

Course description (Syllabus): Static Converters is the main chapter of Power Electronics and represents the technology for conversion and processing of electrical power and its applications. It provides the basis for new electrical circuit architecture that provides substantial improvements in performance, flexibility, and productivity. It has verity of applications in different industries such as home appliances, automotive systems, telecommunication, aerospace, industrial automation, flexible AC transmission lines (FACT), and high voltage DC transmission (HVDC). The following chapters are included: Power electronics: enabling technologies. Power electronic switches; Advanced power static converters; Switch-mode load-side converter; Design of switching power-poles; Switch-mode dc-dc converters: switching analysis, topology selection and design; Designing feedback controllers in switch-mode dc power supplies; Soft-switching in dc-dc converters and converters for induction heating and compact fluorescent lamps; Rectification of utility input using diode rectifiers; Power-factor-correction (pfc) circuits and designing the feedback controller; Switch-mode dc power supplies; Design of high - frequency inductors and transformers.

Course title	**Code**	**No. of credits**	**Number of hours per week**			
			course	**seminar**	**laboratory**	**project**
Electromechanic Converters	EEC503	6	2		2	1

Course description (Syllabus): Aims: To introduce the students for fundamental concepts and principles of operation of various types of electromechanic converters To equip the students with basic experimental and modeling skills for handling problems associated with electromechanic converters To give the students an appreciation of design and operational problems in the electromechanic converters. Principles of Electromechanical Energy Conversion; Magnetic MEMS and Micropower Systems;Transformers; Direct-Current Generators; Direct-Current Motors; Synchronous Generators; Synchronous Motors;Polyphase Induction Motors; Single-Phase Motors; Dynamics of Electric Machines; Special-Purpose Electric Machines.

Course title	**Code**	**No. of credits**	**Number of hours per week**			
			course	**seminar**	**laboratory**	**project**
Analog Integrated Circuits	EEC504	5	2	-	2	-

Course description (Syllabus): This course is intended to provide the next level of understanding of analog circuits (after Electronic devices and circuits – EEC408).EEC504 provided an understanding of: General amplifier concepts, including frequency analisys; The ideal operational amplifiers and theirs linear applications; The non-idelaities of operational amplifier, dc and ac effects and limitations; The non-linear circuits, voltage comparators and applications; Function generators and oscillators; Signal processing circuits, including active filters; Voltage regulators, linear and switching types; Spice simulator used for analog circuits. The main goal of the course is to develop the ability to understand, model, simulate and test low complexity electronic modules.

Course title	**Code**	**No. of credits**	**Number of hours per week**			
			course	**seminar**	**laboratory**	**project**
Database	EEC505	4	1		2	

Course description (Syllabus): This course helps students understand database concepts with the right blend of breadth and depth of information. Data is one of the most valuable assets an organisation has. Relational and hierarchical databases have been used in the industry for decades. This course teaches students the fundamentals of databases, including relational database theory, logical and physical database design, and the SQL language. Advanced topics include using functions, stored procedures and XML.

Course title	**Code**	**No. of credits**	**Number of hours per week**			
			course	**seminar**	**laboratory**	**project**
Digital Signal Processing	EEC606	4	2		2	

Course description (Syllabus): The course presents the main principles and methods used by Digital Signal Processing in order to design filters. The course contents: General aspects**.** Introduction to discrete-time sequences and LTI systems. Periodic sampling. Aliasing. Sampling low-pass signals. Sampling band pass signals. Fourier transform for digital signals Discrete Fourier Transform (DFT). Inverse DFT. DFT Leakages. DFT of rectangular functions. Fast Fourier Transform (FFT). The radix-2 algorithm. Finite Impulse Response (FIR) and Infinite Impulse Response (IIR) filters. Averaging. FIR filter structures. Convolution. Low pass FIR filter design. The Laplace transform. The Z transform. IIR filter structures. Specialized Low pass FIR filter. Frequency Sampling Filters (FSF). Interpolated FIR filters (IFIR). Filters with decimation. Sample Rate conversion. Quadrature signals The j operator. Complex phasors. Frequency domain representation. Complex down-conversion.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Data Acquisition	EEC607	4	2		1	1

Course description (Syllabus): The course presents the main principles and components of Data Acquisition systems and also introduces the platforms and interfaces dedicated to building Data Acquisition (DAQ) Systems. The course contents: General aspects: Introduction to DAQ systems. Recent trends. Technologies, platforms and standards. 2. Developing DAQ systems using specific hardware; Description of the architecture of DAQ systems. Sensors and actuators. Signal conditioning elements. Acquisition boards. DAQC 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 DAQC 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. The ZigBee standard.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Microprocessors and microcontrollers	EEC608	4	2	0	2	0

Course description (Syllabus): The course is an introduction in microprocessors' and microcontrollers' architecture in terms of instruction set architecture, processor arithmetic and data path structure, control path, pipelining, processor interfacing signals, interrupting system. The course also provides classification and exemplification of modern microprocessors architectures. Specific competencies acquired by the students: exploitation and get up different control systems based on microprocessors and microcontrollers, sustenance and design of different interfaces, gaining skills in programming and developing microprocessors systems

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Power Plants and Transport of Electrical Energy	EEC609	4	2	-	2	-

Course description (Syllabus): The teaching course presents the main issues on operating principles regarding the *Power Plants* and *Transport of Electrical Energy*. The main chapters of the course are: Introduction; Conventional steam-electric power plants: steam generating plant (different fuel types, thermo-hydrodinamics, Rankine cycle analysis, steam turbine plant); Gas turbine plants (open cycle plant, closed cycle plant, combined cycle plant, cogeneration plant); Conventional hydroelectric plants (hydroelectric facilities, hydroelectric equipment, environmental impacts); Pumped hydroelectric energy storage (system description and operation, advantages and disadvantages, current state and future developments, case studies); Nuclear power plants (system description and operation, nuclear reactions, reactor with pressurized water, nuclear waste); Alternative energy sources (marine energy, biomass and synthetic fuels, earth and geothermal energy); Renewable energy sources (fuel cell plants, small scale hydro plants, solar plants, wind power plants); System structure and three phse transmission (structural features and sample diagrams, stations and substations, three phasetransmission); Loading and voltage control (thermal limits, stability limits, voltage control); Protection coordination (protection and protective devices, protection zones and coordination); Systems performances (reliability, security, stability, power quality); New technologies (energy storage, distributed generation, automation, FACTS); The main goal of the course is to develop the ability to understand and to design (dimensioning and choosing) of some power systems.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Waveguides, Antennae and Wireless Communications	EEC513	3	2	0	1	0

Course description (Syllabus): Waveguide Theory and Application**:** Waveguide Theory; Waveguide Devices. 2. Antennas: Principles of Antenna Radiation; Antenna Characteristics; Basic Antennas; Array Antennas; Special; Antennas. 3. Wireless Communications: Wireless Communications Basics; Applications of wireless technology; Categories of wireless implementations, devices and standards

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Computer Architecture	EEC616	3	2	0	1	0

Course description (Syllabus): The course is an introduction in computers' architecture and organization. The course focus on the organisation of computer system buses, memory system, computer performance evaluation, I/O system and specific architectures for parallel processing. Specific competencies acquired by the students: use, debug, interface and design computer controlled systems.

4th YEAR

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Electrical Drives	EEC701	5	2	-	2	-

Course description (Syllabus): Basic principles for electric machine analysis. The reference-frame theory; The Direct-Current machines drives; Solid-state converters for DC drive systems; Synchronous machines. Analysis of the steady-state operation in reference-frame theory; Theory of brushless de machines. Brushless DC motor drives; Induction motor drives. The field oriented control; Fully controlled 3-Phase bridge converters; Stepper motor drives.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Electrical Installations	EEC703	5	2	-	1	1

Course description (Syllabus): Generalities; Producing, transport and distribution of electric energy; High, medium and low voltage electric networks; Low voltage electric networks at the consumer; Designing of low voltage electric networks; Lighting and socket installations; Increasing quality of electric energy; Electrosecurity in electrical installations; Electric equipment.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Economics for engineers & Project manag.	EEC705	4	2			1

Course description (Syllabus): The purpose of this course is to introduce students to the study of management principles. Introduction to General Management; Business History; Entrepreneurship; Financial Management; General Marketing; Leveraging the Power of Marketing; Setting Competitive and Corporate Strategy; Organizational Management; Technology Management; Environmental and Economic Development; Developing Leaders.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Data transmissions and protocols	EEC808	4	2		2	

Course description (Syllabus): Among the course's main topics are the following: data communications models and the evolution from service-centered telecommunications networks to service independent, all-over IP data networks; the main elements of a protocol and key concepts regarding the design of protocols**;** the TCP/IP protocol stack and the OSI reference models**;** the application layer: client - server and peer-to-peer architectures, the HTTP and DNS protocols**;** the transport layer: general rules for designing a reliable data transfer protocol, UDP vs TCP protocol analysis, developing networked applications using socket programming**;** the network layer: datagram protocols vs virtual circuit protocols, IPv4 and IPv6, designing and configuring an IPv4 network (subnetting), routing**;** the data link layer: link layer services, main types of MAC protocols, Ethernet and link layer addressing, switching**;** wireless communication technologies and protocols: WiFi, WiMAX, Bluetooth, ZigBee**;** industrial communication technologies and protocols: Fieldbus industrial networks vs Ethernet-based industrial networks

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Electromagnetic compatibility	EEC809	4	2	0	2	0

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	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Electronic Circuit Simulation	ECS	5	2		2	1

Course description (Syllabus): Electronic Circuits**;** CLC (logical gates, adders, MUX, DMUX, CDC, DCD, comparators)**;** CLS (D flip-flop, T flip-flop, SR flip-flop, parallel & serial registers, counters, edge detectors, shift registers, FSM)**;** Electronic Circuits design in Verilog**;** Verilog language syntax: module, data types, instances, execution statements; Integrated circuits description using Verilog; Electronic Circuits simulation in ModelSim.