



T.C.
SULEYMAN DEMIREL UNIVERSITY
FACULTY OF ENGINEERING
Department of Electronics and Communication Engineering

UNDERGRADUATE COURSE CATALOGUE (BOLOGNA)

SEMESTER I

FIZ125	Physics I (Compulsory)	T=2 P=0 L=1 ECTS=3
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Physical Quantities, Standards, Units. Vectors. Motion in One and Two Dimensions, Dynamics. Work, Energy, and Power. Conservation of Energy. Conservation of Linear Momentum and Collisions. Kinematics of Rotating Bodies, Momentum and Dynamics of Rotating Bodies. Equilibrium. Simple Harmonic Motion.

EHM121	Electronics and Communication Engineering Fundamentals (Compulsory)	T=2 P=0 L=1 ECTS=3
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Fundamental topics in Electronics and Communications Engineering (Basic knowledge of circuits, voltage, electronics, and communication systems).

MAT127	Mathematics I (Compulsory)	T=3 P=0 L=1 ECTS=5
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Sets and number systems, Basic functions: trigonometric, exponential, logarithmic, hyperbolic functions, Limit and continuity, Derivatives and differentiation techniques, Geometric and physical meaning of the derivative, Applications of the derivative: rate of change, maximum-minimum problems, Indeterminate shapes, Curve sketching.

EHM109	Linear Algebra (Compulsory)	T=2 P=0 L=1 ECTS=5
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Vectors, Solution of linear equations, Vector space and subspace, Orthogonal system, Determinant, Eigenvalues and eigenvectors, Linear transformations, Engineering applications.

EHM123	Electronic Technical Drawing (Compulsory)	T=0 P=0 L=2 ECTS=4
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Introduction to Technical Drawing; Technical Drawing Tools and Equipment, Line Sets, Drawing Apparatus, Standard Papers, Technical Writing (Standard Norm Writing), General Geometric Drawings, Symbols of Electrical Circuit Components, Symbols of Electronic Circuit Components, Practice Exercises for Simple Circuits, Power Supplies (Rectifier and Adapter Drawings), Clipping Circuits, Transistor Circuits.

ING111	English I (For Students Taking Preparatory Training) (YÖK)	T=2 P=0 L=0 ECTS=2
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Present Tense, Past Tense. Self-introduction, Possession, Greetings, General Conversation, Asking for Directions and Giving Directions, Directions, Information about Family and Professions, Frequency Adverbs and Routine Actions, Possessive Adjectives and Personal Pronouns, Expressing Emotions.

ENF150	Basic Information Technology Usage (YÖK)	T=4 P=0 L=0 ECTS=4
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Introduction to Information Technology, the Information Age and Information Society; Information Systems, Introduction to Computer Lab, Computer Organization, Operating Systems, Using an Operating System and its Peripherals (Printer, Scanner, Plotter, Digitizer, etc.), Computer Software,



ATA160	Principles of Atatürk and Modern Turkish History I (YÖK)	T=2 P=0 L=0 ECTS=2
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The aim and subject matter of the Atatürk Principles and Revolution History course includes: the establishment of the Ottoman State from the Armistice of Mondros, the establishment and collapse of the Ottoman State, the Eastern Question, reform movements after the Tanzimat, intellectual movements aimed at saving the Ottoman State, secret agreements and Wilson's principles, the Armistice of Mondros to the Turkish War of Independence, the Turkish War of Independence, Mustafa Kemal's life, military and political activities, the National Pact and the opening of the Grand National Assembly, the Turkish War of Independence from the Revolution to the Treaty of Lausanne, the establishment of the regular army and the Eastern, Western and Southern Fronts, the Armistice of Mudanya, the abolition of the Sultanate, the Treaty of Lausanne and its consequences.

TUR170	Turkish I (YÖK)	T=2 P=0 L=0 ECTS=2
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What is language?, The place and importance of language as a social institution in national life; The relationship between language and culture, The place of the Turkish language among world languages, The development and historical periods of the Turkish language, The current state and areas of spread of the Turkish language, The sound structure of Turkish, Spelling rules and the application of punctuation marks, General information about composition.

SEMESTER II

EHM108	Electric and Magnetism (Compulsory)	T=3 P=0 L=1 ECTS=4
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Electric charges, electric fields, Gauss's law, electrical potential, capacitors, current, resistance and DC circuits, magnetic fields, Ampere's law, Faraday's law, inductance, Maxwell's equations, alternating currents.

EHM122	Material Information (Compulsory)	T=3 P=0 L=0 ECTS=4
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Introduction to Engineering Materials, Atomic Structure and Bonds, Crystal Structures and Crystal Geometry, Crystal Defects and Diffusion, Electrical Properties of Materials, Semiconductor Devices, Microelectronics.

EHM124	Electronic Measurement Information (Compulsory)	T=1 P=0 L=1 ECTS=4
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Measurement, Measuring Instruments, Measurement Errors, Changing the Limits of Measuring Instruments, Effects of Measuring Instruments on the Measured System, Direct Current and Alternating Current Bridges, Oscilloscope, Unbalanced Wheatstone Bridge, Digital Measuring Instruments.

EHM142	Computers and Programming (Compulsory)	T=2 P=0 L=1 ECTS=4
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The Development and Types of Programming Languages. Algorithm Development and Flowcharts. Variables, Constants, Data Types and Definitions. Assignment, Loop, Decision Algorithms and Commands. Structures of Subprograms. File Types, Techniques and Commands. Graphical Programming Techniques and Program Development Methods.

MAT128	Mathematics II (Compulsory)	T=3 P=0 L=1 ECTS=5
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Indefinite integral: concepts of antiderivative and indefinite integral, examples of indefinite integrals, definite (Riemannian) integral and its properties, integration techniques, applications of definite integrals (calculation of area, arc length, volume, surface area, moment of area and center of gravity), generalized integral and its properties, applications of integrals in polar coordinates.

EHM110	Vector Analysis for Engineers (Compulsory)	T=2 P=0 L=0 ECTS=3
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Vectors, Vector Differential Operations, Coordinate Systems, Scalar and Vector Fields, Divergence, Integral Theorems, Gauss's Theorem, Stokes's Theorem, Classification of Vector Fields, Application of Vector Analysis to Field Concepts.

ING112	English I II (For Students Taking Preparatory Training) (YÖK)	T=2 P=0 L=0 ECTS=2
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The Recent Past and Future Tenses. Similarities and Differences Between These Tenses and Other Tenses, Describing Actions Requiring Skills, Use of Ordinal and Counting Numbers. Ability to Talk About History, Future Plans and Travel, Shopping Information, People's Careers, Interests and Habits, Expressing Intentions, Giving Warnings, Advice and Directives.

ATA260	Principles of Atatürk and Modern Turkish History II (YÖK)	T=2 P=0 L=0 ECTS=2
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The Treaty of Lausanne to the Republic of Turkey, the Proclamation and Significance of the Republic of Turkey, the Abolition of the Caliphate, the Constitutions that were enacted, the Reforms in the Fields of Law, Education, Economy, Health, Social and Cultural Affairs, the Turkish Army and National Defense, the Domestic and Foreign Policy of the Republic of Turkey, Atatürk's Principles, Fundamental Principles, and Complementary Principles.

TUR270	Turkish II (YÖK)	T=2 P=0 L=0 ECTS=2
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The course covers the following topics in Turkish: Types of Words in Turkish, Conjugations of Nouns and Verbs in Turkish, Sentence Structure, Types of Written Composition (Petition, Article, Anecdote, Essay, etc.), Types of Oral Composition (Symposium, Panel, Open Session, etc.), Correction of Expression and Sentence Errors, and Speaking and Writing Correctly and Beautifully Based on Selected Sample Texts from Turkish and World Literature.

SEMESTER III

EHM221	Electronic Circuits I (Compulsory)	T=3 P=0 L=1 ECTS=6
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Semiconductors, Diodes. Diode Clipping and Clamping Circuits and other diode circuit applications, Junction and Field Effect Transistors. Transistor Supply, Transistor Amplifiers. Load line generation, operating point finding, hybrid parameters, small signal equivalent circuits, frequency responses in BJT and FET, Transistor Signal Analysis and Other Amplifiers.

EHM241	Circuit Analysis I (Compulsory)	T=3 P=0 L=1 ECTS=6
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Graph Theory, Axioms of Circuit Theory, Forms of Voltage and Current Functions, Passive and Active Circuit Elements, Continuous Sinusoidal Case in Circuits, Circuit Solution Methods, Parameters of Two-Port Circuits, Derivation of State Equations, and Circuit Solutions using the Method of State Variables.

EHM243	Logic Circuits (Compulsory)	T=3 P=0 L=1 ECTS=6
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Boolean Algebra and Logic Gates, Boolean Functions, Simplifications, Karnaugh Maps, Tabular Method, Combinational Logic, Synchronous Sequential Logic, Counters, Registers and Memory Units, Introduction to Logic Circuit Design.

EHM201	Differential Equations for Engineers (Compulsory)	T=2 P=0 L=1 ECTS=5
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Differential Equations and Their Solutions. First-Order Ordinary Differential Equations. Applications of First-Order Differential Equations. Higher-Order (n-order) Linear Differential Equations. Applications of Second-Order Differential Equations with Constant Coefficients. Solution of Linear Differential Equations in Terms of Power Series. Linear Equation Systems. Boundary Value Problems and Fourier Series and Fourier Transform Pairs. Laplace Transform. Numerical Solutions of Differential Equations. Partial Differential Equations. Euler-Type Differential Equations.

EHM261	Electromagnetic Theory (Compulsory)	T=3 P=0 L=1 ECTS=7
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Electrostatic Fields, Gauss's Law, Electric Potential, Boundary Conditions, Electrostatic Energy and Forces, Solving Electrostatic Problems, Poisson-Laplace Equations, Steady Electric Currents, Magnetostatic Fields, Biot-Savart Law, Vector Magnetic Potential, Magnetic Circuits, Magnetic Materials, Boundary Conditions for Magnetostatic Fields, Magnetostatic Energy and Forces, Electromagnetic Induction, Faraday's Law, Introduction to Maxwell's Equations.

SEMESTER IV

EHM202	Complex Analysis For Engineers (Compulsory)	T=2 P=0 L=0 ECTS=5
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Vector Analysis. Coordinate Transformations. Gradient, Divergence, Rotational, and Laplacian Coordinates in Cartesian Coordinate Systems. Tensors and Cartesian Tensors. Orthogonal Coordinate Systems. Integrals; Line Integral, Surface Integral, Volume Integral, Integral Theorems, Stokes' Theorem, Divergence Theorem, Sheler-Green Theorem, Vector Green Theorem, Green's Theorem in the Plane. Theorem of Functions of Complex Variables. Complex Numbers and Functions. Derivative of Functions of Complex Variables, Analytic Functions, and Complex Series. Integrals of Functions of Complex Variables. Calculation of Real Integrals in the Complex Plane. Asymptotic Calculation of Integrals. Continuous and Discrete Transformations of Linear Systems. Distributions. Orthogonal Functions. Unit Step Functions. Fourier Series. Fourier Integral Transforms. Laplace Integral Transforms. Folding Theories of Continuous Transforms. Parseval's Theorems. Modulation. Z-Transform and Sampling Theorem. Pulse Code Modulation (PCM). Matrices of Technology. Eigenvalues of a Square Matrix. Eigenvectors of a Square Matrix. State Transition Matrix of a Square Matrix. Challey-Hamilton Theorem. Operations on Matrices.

EHM222	Electronic Circuits II (Compulsory)	T=3 P=0 L=0 ECTS=5
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Large-signal amplifiers, differential amplifiers, operational amplifiers, active filters, current and voltage regulators, low-frequency and high-frequency oscillator types, feedback circuit characteristics, types, and analysis.

EHM242	Circuit Theory I (Compulsory)	T=3 P=0 L=1 ECTS=6
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Solution of Circuits in the Continuous Sinusoidal Case, Circuit Solution Methods in the t-Domain, Solution of Circuits in the S-Domain, Routh Criterion, Block Diagram, Signal Flow Diagram and Reductions.



EHM224	Electronic Circuits Laboratory I (Compulsory)	T=0 P=0 L=2 ECTS=4
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Diodes and Basic Structural Characteristics, Diode Clipping and Clamping Circuits, Supply Voltage Regulators, BJT Amplifiers, FET Amplifiers, Low-Frequency Power Amplifiers and Output Stages, Linear Applications of Operational Amplifiers, Nonlinear Applications of Operational Amplifiers, Logic Circuits and Binary Circuits.

EHM262	Electromagnetic Waves (Compulsory)	T=3 P=0 L=1 ECTS=5
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Maxwell's Equations, Electromagnetic Energy and Power, Time-Varying Magnetic Fields, Wave Equations, Uniform Electromagnetic Waves, Reflection, Refraction and Energy Values of Electromagnetic Waves at Intersections of Different Media, Introduction to Transmission Lines.

EHM252	Signals and Systems (Elective)	T=3 P=0 L=0 ECTS=5
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Fundamentals of signals and systems, properties of systems, LTI systems, properties of LTI systems, differential and difference equations with constant coefficients, continuous-time Fourier series, continuous-time Fourier transform, sampling, Laplace transform, Z-transform.

EHM254	Signals and Systems (Elective)	T=3 P=0 L=0 ECTS=5
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Fundamentals of signals and systems, properties of systems, LTI systems, properties of LTI systems, differential and difference equations with constant coefficients, continuous-time Fourier series, continuous-time Fourier transform, sampling, Laplace transform, Z-transform.

SEMESTER V

EHM303	Probability and Random Variables (Compulsory)	T=2 P=0 L=0 ECTS=4
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Basic Concepts and Properties of Probability, Fundamental Theorems of Probability, Random Variables and Special Functions, Probability Function, Probability, Density Function, Distribution Function, Expected Value and Moments, Variance, Some Discrete Distributions, Continuous Distributions, Normal Distribution, Correlation Functions, Autocorrelation and Cross-correlation.

EHM321	Electronic Circuits Laboratory II (Compulsory)	T=0 P=0 L=3 ECTS=4
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Frequency and Pulse Response of BJT Amplifiers, Low-Frequency Oscillators, Feedback and Stability, Peak Detector.

EHM343	Microprocessors I (Compulsory)	T=3 P=0 L=0 ECTS=5
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Number Systems, Microprocessor Peripheral Components, Memory Addressing, Memory Structures, Microprocessor Internal Structure and Features Analysis, I/O Components, Interrupts in I/O Operations, Microprocessor-Based Communication, Assembler Instruction Set, Assembler Programming.

EHM381	Analog Communication (Compulsory)	T=3 P=0 L=0 ECTS=5
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Fundamental Concepts and Definitions in Communication Systems, Mathematical Foundations Used in Communication Systems, Fourier Series, Fourier Transforms, Power Spectrum, Linear Systems and Distortion, Linear Modulation, Amplitude Modulation, LP, LP and LP Modulations and Demodulations, Angle Modulation, FM and Demodulation.

EHM341	Systems Analysis (Compulsory)	T=2 P=0 L=0 ECTS=3
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Introduction: basic concepts and definitions, control systems, control types, laplace transform,



partial fraction expansion and laplace transform, mathematical models of physical systems, analogy between physical systems and electrical systems, transfer functions, block diagram representation, signal flow graphs, transient response and analysis, steady state response, steady state errors, introduction to stability concept.

EHM323	Power Electronics (Compulsory)	T=2 P=0 L=1 ECTS=5
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Phase information in power systems, Power Diodes, Thyristors, Triacs, Diacs, UJTs, Ignition Circuits, Power and Cooling Calculations, Converters and Inverters, DC Choppers, Frequency Converters, Inverter Calculations.

EHM351	Computer-Aided Design (Elective)	T=2 P=0 L=0 ECTS=4
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Design and analysis of analog and digital circuits using PSpice. DC analysis, AC analysis, time-varying analysis; examining the frequency response of circuits, Fourier series, and harmonics.

EHM325	Analog Integrated Circuit Technology (Elective)	T=2 P=0 L=0 ECTS=4
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Basic whole-circuit building blocks: Current and voltage sources, supply voltage, and temperature-independent polarity. Basic amplifier structures. Operational amplifiers: Basic structures, basic performance parameters. Whole-circuit oscillator structures. Analog multiplication circuits. Analog MOS building blocks: Current sources, amplifier structures, MOS operational amplifiers, transconductance amplifiers (OTA), current conveyors, analog multiplication circuits, oscillators, D/A and A/D converters.

EHM333	Digital Electronic Circuits (Elective)	T=2 P=0 L=0 ECTS=4
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MOS transistors, MOS inverter design, dynamic behavior of MOS inverters, combinational circuits, fundamentals of sequential circuits, semiconductor memory structures.

EHM353	Object-Oriented Programming (Elective)	T=2 P=0 L=0 ECTS=4
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Introduction to object-oriented programming, object-oriented analysis and design, Unified Modeling Language (UML), fundamentals of object-oriented programming, inheritance of type properties. Variables, Flow Control, Classes and Objects, Indices and Container Classes, Interface Structures. Classification and abstraction. Object definition and multiple types of objects. Assignment (encapsulation) and storage of object properties. Object-oriented software philosophy, object-oriented software development processes, object-oriented analysis method and representation system, object-oriented design method and representation system. Object-oriented implementation and representation system, introduction to an object-oriented programming language.

EHM301	Reading and Speaking in a Foreign Language (Elective)	T=2 P=0 L=0 ECTS=4
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Major-specific reading text, Major-specific reading text, Steps in preparing an oral presentation, Major-specific reading text, Steps in preparing an oral presentation, Submission of the topics and preliminary outlines for the presentations and feedback by the instructor, Major-specific reading texts, Students? oral presentations, Revision and assessment of oral presentations.



SEMESTER VI

EHM342	Automatic Control (Compulsory)	T=3 P=0 L=0 ECTS=4
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Introduction to control, Stability concept, Routh Hurwitz Criteria, Root Locus Plots, Stability Analysis with Root Locus, Polar plots, nyquist plots, Stability Analysis using nyquist criteria, relative stability, bode diagrams, phase lead and phase lag compensators, State space representation canonic forms, controllability observability, pole placement and observer design

EHM362	Microwave Techniques-I (Compulsory)	T=3 P=0 L=0 ECTS=4
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Analysis of Transmission Lines, Transmission Tubes, Microwave Arrangements Using S-Distribution and Parameters, Wave Propagation in Ferrite Medium and Ferrite Microwave Arrangements, Semiconductor Arrangements in Microwave Technology, Millimeter Waves.

EHM344	Microprocessors Laboratory (Compulsory)	T=0 P=0 L=3 ECTS=3
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Applications in 8 and 16-bit Microprocessors, Laboratory Experiments Related to Input/Output Circuits, Assembly Applications.

EHM382	Digital Communication (Compulsory)	T=3 P=0 L=0 ECTS=4
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Sampling Theorem, Nyquist Frequency, Pulse Modulation, PAM, TDM, PDM, DDM, Pulse Code Modulation (PCM), Delta Modulation, Baseband Digital Transmission, Coherent Filters, Intersymbol Interference, Bit Error Rates in Baseband Transmission, Bit Error Probability, Digital Modulation Systems, ASK, FSK, PSK, DPSK, and QPSK.

EHM384	High Frequency Techniques and Systems (Compulsory)	T=2 P=0 L=1 ECTS=4
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Communication systems, resonant circuits, impedance matching, filter design, high-frequency amplifiers, oscillators, PLLs, GM and FM receivers.

EHM386	Internship I (Compulsory)	T=0 P=0 L=0 ECTS=8
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EHM304	Social Optional (Elective)	T=3 P=0 L=0 ECTS=3
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EHM302	Professional Foreign Language (Elective)	T=3 P=0 L=0 ECTS=3
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Intermediate work in translating texts from English into Turkish in three stages:

- Starting with samples including the basic structures in English at sentence level,
- Moving on to short paragraphs in which these structures are found in more complex form,
- Exposing students to short essays covering variety of electronics, electrics and communications.

EHM352	Introduction to Circuit Synthesis (Elective)	T=3 P=0 L=0 ECTS=3
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Fundamentals of Circuit Synthesis. Filter Approach and Frequency Conversions. Passive Filter Synthesis. Design of Resistor-Terminated Circuits. Fundamentals of Active Filter Synthesis. Sensitivity, Active Second-Order Filters. Implementation of Active Two-Port Circuits.

EHM354	Microprocessors-II (Elective)	T=3 P=0 L=0 ECTS=3
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Microprocessor Interrupt Structures, 8, 16 and 32-bit Microprocessors, Microcomputer Structure,



Block Structures of Microcomputers, Processors, Memories, Input/Output Circuits. Interface Input/Output Elements, Input/Output Operation Techniques.

EHM356	MATLAB Applications (Elective)	T=3 P=0 L=0 ECTS=3
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Introduction to the MATLAB Software Package; General-purpose commands in MATLAB; Variables in MATLAB; Scalar, Vector, and Matrix Operations in MATLAB; 2D and 3D Graphing and Graphing Special Functions; Programming with MATLAB (m-file); Creating Custom Functions; Data Files in MATLAB; Communication Box Applications with MATLAB.

EHM358	Computer Programming Language-1 (Elective)	T=3 P=0 L=0 ECTS=3
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Introduction to Computers and Programming, Introduction to C, Selection Structures, Repetition and Loop Statements, Modular Programming, Arrays, Pointers.

SEMESTER VII

EHM403	Senior Project (Compulsory)	T=0 P=2 L=0 ECTS=2
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EHM481	Communications Laboratory (Compulsory)	T=0 P=0 L=3 ECTS=4
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Practical Applications of Amplitude and Frequency Modulation Techniques; Design of Transceiver Units, Analysis of Noise in Amplitude and Frequency Modulation, RF Applications; Noise in Digital Communication Systems, ASK Modulation/Demodulation, FSK Modulation/Demodulation, PSK Modulation/Demodulation, Generation/Reception of QPSK Signals, Generation/Reception of PAM Signals, Introduction to Digital Communication System Design.

EHM441	Digital Signal Processing (Compulsory)	T=3 P=0 L=0 ECTS=5
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Sampling of analog signals, digital filter design, digital filter structures, FFTs and software implementation of digital filters, finite word length effects, varying sampling frequency, various applications.

EHM461	Microwave Techniques-II (Compulsory)	T=3 P=0 U=0 ECTS=4
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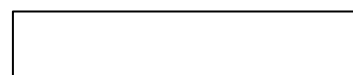
Impedance transformation and matching techniques, Microwave Resonators, Power Dividers, Directional Couplers, Microwave Filters, Active Microwave Circuits, Oscillator Design, Microwave Systems.

EHM433	Industrial Electronics (Elective)	T=3 P=0 L=0 ECTS=5
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Industrial electronic components, light-sensitive components, heat control circuits, remote control methods, timers, power converters, transducers and sensors, relays, electric motors, and semiconductor materials used in industry.

EHM455	Computer Programming Language-II (Elective)	T=3 P=0 L=0 ECTS=5
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This course, a continuation of the MATLAB APPLICATIONS course taught as Elective-II a semester ago, covers applications of important tools such as MATLAB GUIDE, Simulink, Digital Signal Processing Toolbox, Filter Design Toolbox, and RF Toolbox. It also includes software applications of courses taught over five semesters, using programming languages such as C#, Java, C++Builder, and LabView.



EHM471	Electromagnetic Compatibility (Elective)	T=3 P=0 L=0 ECTS=5
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Concepts of EMI and EMC and Problems Encountered in Practice. Use of Frequency Spectrum. EMI Sources and Modeling. EMI from Circuits and Devices. Test and Measurement Methods for Interference. Grounding, Shielding, and Bonding. EMC Standards. Frequency Allocation and Protection. Immunity to Impulse Interference. EMC Problems (Frequency, Signal Amplitude, Time, Impedance, Geometry).

EHM491	Noise in Communication Systems (Elective)	T=3 P=0 L=0 ECTS=5
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Topics covered include: Definition and Analysis of Noise in Communication Systems, AM and FM Transceiver Systems and New Technological Developments, TV Systems and the Status of New Technological Developments, New Digital Communication Systems and Coding Techniques, Overview of Radar Systems, GSM Systems and Hierarchy, Overview of Fiber Optic Communication Systems, and Overview of Satellite Communication Systems.

EHM495	Communication Theory (Elective)	T=3 P=0 L=0 ECTS=5
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Communication Systems, Communication Channels and Characteristics, Analog Modulation Techniques (AM / FM / PM), Analog-to-Digital Modulation Techniques (Pulse Code Modulation / Delta Modulation), Digital-to-Analog Modulation Techniques (ASK / FSK / PSK / QPSK / QAM), Digital Coding Techniques, Bandwidth Utilization, Multiplexing Techniques (FDM / TDM / WDM), Spread Spectrum Techniques.

EHM497	Optical Communication Systems (Elective)	T=3 P=0 L=0 ECTS=5
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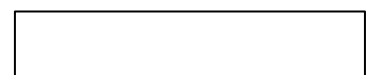
Introduction to Fiber Optics, Light Refraction, Refractive Indices, Advantages of Fiber Optics, LED Emitter & Detector, Propagation of Modes, Fiber Optics Properties, Attenuation, Macrobends, Structure of Fiber Optic Cable, Logarithm Calculations, Decibel & Wavelength in Fiber Communication, Windows, LED and Laser Sources in Fiber Optics, Scattering, Dispersion in Fiber Optics, Properties of Fiber Materials, Optical Fiber Connections and Splice Recordings, and Cabling of Optical Fibers.

EHM493	Data Communication (Elective)	T=3 P=0 L=0 ECTS=5
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The course will cover how data transmission occurs, the fundamental principles of data communication, potential data transmission disruptions, network architecture fundamentals, the OSI Model, the TCP/IP Reference Model, digital encoding techniques used in data communication, network concepts, network devices used, data communication media, and data encoding and compression techniques.

EHM431	Introduction to Medical Electronics (Elective)	T=3 P=0 L=0 ECTS=5
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Human instrumentation systems, the formation of biological signals, the explanation of membrane potential, the measurement of electroneurogram signals, the measurement of electromyogram signals, the measurement of electrocardiogram signals, the measurement of electroencephalogram and evoked potential signals, the measurement of electroretinogram and electrooculogram signals, the measurement of blood pressure in humans, the measurement of blood flow and volume, and considerations in medical electronics circuit design.



EHM451	PLC Applications (Elective)	T=3 P=0 L=0 ECTS=5
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Introduction to Programmable Logic Controllers (PLCs), Relay Logic Circuits, Ladder Diagrams, PLC Technologies, PLC Structures and Internal Circuits, PLC Programming Languages, Basic Commands, Programming Examples, Advanced Programming, Calculation Commands, Programming Examples, Connecting a PLC to a Personal Computer (IBM PC), Simulation, Error Analysis and Real-Time Monitoring, Design and Implementation of a Simple Microcontroller-Based PLC System, Serial and Parallel Communication.

EHM453	High Voltage Engineering (Elective)	T=3 P=0 L=0 ECTS=5
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Ionization and Diffraction Processes; Ionization by Electron Collision, Photoionization, Thermal Ionization. Electrical Diffraction in Gases, Corona Discharge, Diffraction in Non-Constructive Fields. Diffraction in Solid and Liquid Dielectrics. High Voltage Generation; Series Resonance Circuits in Alternating Voltages and High Voltage AC Measurements. Transient Voltages. High Voltage Measurement. Safe Insulation Testing Techniques.

EHM405	Social Optional (Elective)	T=3 P=0 L=0 ECTS=5
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EHM401	Professional Foreign Language-2 (Elective)	T=3 P=0 L=0 ECTS=5
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Advanced work in translating texts and literatures covering a wide variety of topics in electrics, electronics and communications.

SEMESTER VIII

EHM404	Final Project (Compulsory)	T=0 P=0 L=2 ECTS=2
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EHM406 – Engineering Ethics (Compulsory)	T=1 P=0 L=0 ECTS=1
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Engineering and its Definition, Engineering Education, Philosophy and Engineering, Logic and Engineering, Science and Engineering, Ethics and Engineering Ethics

EHM442	Facility Organization and Management Planning (Compulsory)	T=1 P=0 L=0 ECTS=1
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Basic concepts, what is a facility, facility design relationship, facility and its environment, facility and its contents, facility design process, opportunity analyses and feasibility studies, facility design process, location selection, optimal location selection, factors affecting location selection, location selection models and techniques, transportation technique, MODI, VAM, MACAR algorithms, quantitative criteria for facility layout, a decision-making method: ELECTRE, fundamental concepts in workplace layout, principles in workplace layout, types of workplace layout problems, systematic workplace layout planning, process diagrams, flow-action relationship diagrams, workplace layout models and techniques, model establishment and solution.

EHM462	Microwave and Antenna Laboratory (Compulsory)	T=2 P=0 L=0 ECTS=2
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Transmission Line and Coaxial Cable Test Measurement, Directional Coupler Design, Analysis and Measurements, Other Microwave Coupler Circuits, Wilkinson Power Divider Design, Analysis and Measurements. Return Loss Concept and Measurements. Dipole Antenna Design and Measurements, Microstrip Antenna Design and Measurements.



EHM464	Antennas and Propagation (Compulsory)	T=3 P=0 L=0 ECTS=3
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Introduction to Antenna Theory, Basic Antenna Parameters, Radiation Integrals and Auxiliary Potential Functions, Linear Wire Antennas, Antenna Arrays, Horn Antennas, Microstrip Antennas, Propagation of Radio Waves.

EHM466	Internship II (Compulsory)	T=0 P=0 L=0 ECTS=7
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EHM402	Foreign Language for Business (Elective)	T=3 P=0 L=0 ECTS=4
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Cv writing : Layout and the Necessary Information, Cv writing : Assessment of Curriculum Vitae (deadline) / Finding Job Ads, Cover letter writing (key points), Assessment of cover letters (deadline) / Layout of a business letter, Letter of intent - Statement of purpose letters / Letter of request, Assessment of letters / Sample business letters / Fax messages, Assessment of letters (deadline) / Sample business letters / Fax messages, Business Interviews : Frequently Asked Questions, Role-play activity on business interviews (assessment)

EHM432	Measurement and Instrumentation (Elective)	T=3 P=0 L=0 ECTS=4
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The course covers the following topics: Fundamental principles of measurement, Measurement errors and sources of error, Explanation of design terms, Calibration concepts, Measurement of circuit elements and measurement methods, Maxwell-Wien bridge, Wheatstone bridge applications, Measurement with Hay bridge, Owen bridge, Series and parallel capacitor bridges, Schering bridge, Q-meter, Analog measurements, Moving measuring instruments, Changing measurement limits, Measuring instrument sensitivity, AC measurement, Ohmmeter, Rotary coil and electronic multimeters, Counters, Digital measurement, Analog-to-digital conversion and converters, Flash converters, Single-slope ADCs, Double-slope ADCs, Voltage-frequency converters, Measurement in triggering circuits.

EHM454	Engineering Project Applications (Elective)	T=3 P=0 L=0 ECTS=4
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Basic Definitions, Distribution Transformers, Electrical Engineering Design Rules and Principles, Pricing/Tender Preparations, Implementation Principles of Electronic Projects.

EHM472	Fundamentals of Radar (Elective)	T=3 P=0 L=0 ECTS=4
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Microwave Imaging Concept; Synthetic Aperture Radar (SAR) Theory; Frequency Modulated Pulse Compression SAR; Digital Signal Processing in Systems; Signal, Image and Noise Analysis; Inverse Synthetic Aperture Radar (IAAR) and Image Processing; Three-Dimensional Imaging with Non-Coherent Single-Pulse Radar; Two-Dimensional Range for Rotating Objects, Cross-Range Imaging, Iterative Image Generation Methods; Resolution; Aperture Synthesis; Power Requirement and Fading Statistics; Phase and Motion Errors; Uncertainty Functions and Optimum Design Criteria; Multipolarization SAR; SAR Simulation, Military Radars.

EHM492	Digital Signal Processing Applications (Elective)	T=3 P=0 L=0 ECTS=4
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Discrete-Time Signals and Systems, Discrete-Time Linear Time-Invariant Systems, Z-Transforms, Inverse Z-Transforms, Applications of Z-Transforms, Spectrum Analysis of Analog Signals, Sampling and Overlap, Discrete Fourier Transform (DFD), Fast Fourier Transform (HFD), FIR and IIR Filter Design, Implementation of Digital Filters, Quantization in Digital Filters, and their applications in the MATLAB software package.



EHM494	Digital Image Processing (Elective)	T=3 P=0 L=0 ECTS=4
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Two-Dimensional Linear Time-Invariant Signals and Systems, Digital Image Concept, Analog-to-Digital Conversion, Two-Dimensional Convolution Sum, Image Files, Image Acquisition Methods, Image Filter Design, Geometric Operations and Transformations in Digital Images, Image Classification.

EHM496	Communication Networks (Elective)	T=3 P=0 L=0 ECTS=4
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Computer Communication, Local Area Network Structures, Computer Communication Structures, Network Technologies, Network Access Protocols, Telephone Communication, Wireless Communication Technologies, Network Architectures.

EHM498	Mobile Communication Systems (Elective)	T=3 P=0 L=0 ECTS=4
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The fundamental structures of mobile communication systems, 1st, 2nd, 2.5th, 3rd and 4th generation mobile communication systems, GSM, GPRS, EDGE, UMTS, HSPA, LTE, error detection and correction processes, multiple access protocols, WLAN, WMAN, WWAN technologies, satellite communication, DAB and DVB technologies, Cloud Computing.

EHM474	RF and Microwave Circuits (Elective)	T=3 P=0 L=0 ECTS=4
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Impedance Matching Circuits, Active and Passive Microwave Circuit Elements, Power and Voltage-Current Relationships, Design Procedure.

EHM456	Digital Control Systems (Elective)	T=3 P=0 L=0 ECTS=4
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Analog Signal Processing. Analog Input and Output Connections to PLCs. PID Control. Motor Control. High-Speed Counters. Industrial PLC Applications.

EHM452	Active Circuit Synthesis (Elective)	T=3 P=0 L=0 ECTS=4
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Circuit Analysis, Positive Real Functions, Synthesis of One-Port LC Circuits, Synthesis of One-Port RC and RL Circuits, Synthesis of Two-Port Circuits, Normalization, Filtering Circuits and Approximation, Sensitivity.

