Ders İçerikleri (Course contents)

EEE101 Introduction to Electrical and Electronics Engineering (3-0)3 ECTS:5

Fundamentals of electricity. Representation of current, voltage, power, resistance, inductance, capacitance, Ohm's law. Electrical measurements – meters. DC and AC circuits. Magnetism. Transformers. Semiconductor devices: diodes, transistors, integrated circuits. Linear electronics circuits: power supplies, amplifiers, oscillators. Digital electronic circuits: basic logic gates, microcomputer basics, printed circuit board fabrication.

EEE146 Programing-I (3-2)4 ECTS:5

Basic elements of computer programs. Problem solving on a computer. Algorithms and flowcharts. Variables, constants, and data types. Arithmetic operations. Control structures: Selection and Loops. Functions. Arrays. Strings. File processing.

EEE 186 Applied Linear Algebra (3-0)3 ECTS:5

Linear Equations and Matrices. Solving Linear Systems. Determinants. Real Vector Spaces. Inner Product Spaces. Linear Transformations and Matrices. Eigenvalues and Eigenvectors.

EEE 201 Circuit Theory-I (4-2)5 ECTS:7

Fundamentals of electric circuits, variables and lumped circuit elements. Kirchhoff's laws. Resistive circuits. Methods of circuit analysis. Operational amplifiers (opamps). Energy storage elements. Analysis of first and second order circuits. Steady-steady alternating current analysis.

EEE241 Digital Design (3-2)4 ECTS:6

Review of number systems and Boolean algebra. Simplification of Boolean functions. Analysis and design using logic gates. Description of basic logic MSI components and analysis and design using these components. Representation of digital systems using a hardware description language. Analysis and design of combinational and sequential logic circuits.

EEE247 Programming-II (3-2)4 ECTS: 6

Introduction to MATLAB. Vectors and Matrices. Introduction to MATLAB Programming. Selection Statements. Loop Statements & Vectorizing Code. MATLAB Programs. Text Manipulation. Data Structures: Cell Arrays and Structures, Sorting. Data Transfer. Advanced Functions. Introduction to Object-Oriented Programming and Graphics. Advanced Plotting Techniques. Advanced Mathematics. GUI. Simulink.

EEE283 Probability and Random Variables (3-0)3 ECTS:4

Axiomatic definition of probability spaces. Random variables; distribution and density functions; conditional probability. Product spaces. Multivariate distribution; conditional distributions and densities; independent random variables. Functions of random variables; expected value, moments and characteristic functions.

EEE285 Applied Differential Equations (3-0)3 ECTS:5

Basic Definitions. First Order Differential Equations. Mathematical Models. Numerical Methods. Linear Equations of Higher Order. Systems of Differential Equations. Boundary Value Problems. Laplace Transform Method. Series Solution Method.

EEE202 Circuit Theory-II (4-2)5 ECTS:7

Sinusoidal alternating current and phasors. Series and parallel ac circuits. Methods of ac circuit analysis; mesh and nodal analysis. Power in ac circuits. Circuit impulse response and transfer functions. Resonance. Mutual inductance and transformers. Non sinusoidal circuits and Fourier series.

EEE210 Semiconductor Devices (3-0)3 ECTS:5

Free carrier density in semiconductors. Energy and density of states. Carrier transport and recombination. Electrostatic field and potentials. pn-junction. The depletion approximation. Breakdown in pn-junction. DC current-voltage characteristics of pn-junction. Small signal AC analysis of pn-junction. Bipolar Junction Transistor (BJT). Physical operation of BJT. Current gains. Small signal AC equivalent circuit of BJT. Field Effect Transistor (FET)-JFET/MOSFET transistors. Physical operation of FET. Small signal AC equivalent circuit of FET.

EEE204 Introduction to Embedded Systems (3-2)4 ECTS:6

Introduction to Embedded Systems. Number Systems and Data Formats. Microcomputer Organization. Assembly Language Programming on embedded processor. Embedded Programming using C. Timers. Counters. Peripherals.

EEE264 Electromagnetic Theory (4-0)4 ECTS:6

Review of vector analysis. Electrostatic fields in vacuum and material bodies. Dielectric properties of materials. Electrostatic energy and forces. Steady electric current and conductors. Static magnetic fields in vacuum and in materials. Magnetic energy and forces. Quasistatic fields and electromagnetic induction.

EEE270 Introduction to Electrical Energy Systems (3-0)3 ECTS:4

Introduction to power systems. Sinusoidal steady state analysis. Sinusoidal steady state power calculations. Balanced three phase systems. Transformers and per-unit calculations. Single line diagrams. Voltage drop and power loss calculations. Reactive power compensation. Power and wiring cables.

EEE301 Signal and Systems (3-0)3 ECTS:5

Representation of signals and systems. Classification of signals and systems. Linear time-invariant systems: Impulse response, convolution. Applications of Laplace transform to system analysis. Discrete-time systems and Z-transform. Fourier analysis of continuous-time signals and systems. Fourier analysis of discrete-time signals and systems. Sampling theory. Introduction to filtering

EEE311 Electronics-I (3-2)4 ECTS:6

Diode; ideal diode. Zener diode. Applications of diode. Clipping circuits. Clamping circuits. Voltage doubler. Rectifier circuits (half-wave, full-wave). Half-wave/full-wave RC filter circuits. Zener diode regulator. Bipolar Junction Transistor (BJT). DC biasing of BJT. Temperature effect on BJT. Field Effect Transistor (FET)- MOSFET/JFET. DC biasing of FET. Small signal analysis of FET (Common source, Common drain, Common gate).

EEE321 Electromechanical Energy Conversion-I (3-2)4 ECTS:6

Electromagnetic circuits. Hysteresis and eddy currents. Single-phase and three-phase transformers. Per unit system. Special types of transformers. Stored energy and mechanical energy in singly and doubly fed electromechanical systems. D.C. machine windings, D.C. generators, D.C. motors. D.C. motor starters. Speed control of D.C. motors.

EEE331 Communication Systems Fundamentals (3-0)3 ECTS:5

Introduction to communication systems. Signals and Systems. Fourier transform. Amplitude Modulation Fundamentals. Fundamentals of Frequency Modulation. Analog-to Digital Conversion: Sampling process, pulse-amplitude modulation, quantization process. Digital Communications: Basis of digital transmission. Noise and its effects on communication systems, multiplexing and demultiplexing, basic s of transmission lines, antennas. Microwave communication, satellite communication, optical communication, cell phone technologies, wireless technologies: bluetooth, ZIGBEE, WIMAX, IoT, RFID

EEE361 Electromagnetics Waves (4-0)4 ECTS:5

Maxwell`s equations in time and frequency domains. Electromagnetic energy and power. Wave equation. Uniform plane electromagnetic waves; reflection and refraction. Introduction to transmission lines, waveguides, antennas and radiation.

EEE312 Electronics-II (3-2)4 ECTS:6

Small signal analysis of BJT. BJT and FET at high frequencies. Frequency response of amplifiers. Multistage amplifiers (cascade, cascade, Darlington/ complementary configurations. Differential amplifiers. Linear and nonlinear applications OPAMP. Power amplifiers: (Audio amplifiers-Class A, class B, class AB). Linear power supply regulator.

EEE322 Electromechanical Energy Conversion-II (3-2)4 ECTS:6

MMF waveforms of distributed windings. Polyphase windings and rotating fields Winding factors, harmonic voltages. Synchronous machines: Cylindrical and salient-pole types. Synchronization. Induction motors. Circle diagram. Speed control of induction motors. Single-phase induction motors.

EEE352 Autamatic Control Systems (3-2)4 ECTS:6

Review of the mathematical system modelling. The concept of feedback; block diagrams, flow graphs. System performance specifications. Stability of linear feedback control systems by using Routh criterion, root-locus method and Nyquist criterion. Nichols chart. Design of compensators. Sensitivity.

EEE 401 Discrete Time Systems (3-0)3 ECTS:5

The fundamental aspects of discrete time systems. Sampling and reconstruction methods. State space techniques, modified z transform. Stability considerations using root locus, Nyquist and Lyapunov methods. Compensation and digital controllers, applications of computer controlled systems. Introduction to nonlinear sampled data systems, pulse width modulation and pulse frequency modulation. Introduction to optimal control systems and dynamic programming.

EEE 403 Digital Filters (2-2)3 ECTS:5

Introduction to digital filters. Classical applications. Mathematical fundamentals. Phase Filters. Approximation methods. Transformations. Recursive Filters. Equalizers. Nonrecursive filters, design and smoothing. Window functions. Decimator and Interpolators. Signal processing applications.

EEE 404 Digital Systems and Signal Processing (3-0)3 ECTS:5

Review of linear systems. Overview of analog and digital signal processing. A/D converters. Discrete time signals and Z-transform. Digital systems. Discrete and Fast Fourier transform. Processor integrated circuits. D/A converters.

EEE 406 Analog Filter Design (3-0)3 ECTS:5

Network functions, Properties of network functions, Types of filters, Frequency and Impedance denormalization, Magnitude approximations , Transformation of the complex frequency, Phase approximation, Sensitivity, Synthesis of LC driving point functions, Poles of transfer functions, Other properties of transfer functions, Synthesis of transfer functions using lossless ladders, Single amplifier filters, Infinite gain single amplifier filters, The state variable (KHN) Filters, Other multiple amplifier filters, Operational transconductance amplifiers, Switched capacitor filters, FDNR and negative impedances.

EEE407 Microprocessors and Microcontrollers (2-2)3 ECTS:5

Using microcontroller, Assembly and C language programming, it is aimed that the students have the ability of embedded systems design.

EEE409 Introduction to Artificial Intelligence (3-0)3 ECTS:5

Basic concepts and terminology of AI. Problem solving in AI: Basic search strategies, Supervised and unsupervised learning. Introduction to neural networks. Introduction to machine learning. Introduction to deep learning. Applications and examples of AI.

EEE 410 Electrical and Electronics Measurement and Instrumentation (3-0)3 ECTS:5

System of units and standards of measurement. Dimensions. Calibration. Static and dynamic characteristics of measuring devices. Errors of measurements and their treatment. Curve fitting methods. Correlation coefficient. Loading effects. Voltage, current, power, impedance measurements.AC DC bridges. Digital recording systems. Noises. Transducers: resistive, capacitive, inductive, thermoelectric, piezoelectric, photovoltaic, mechanical. Magnetic measurements. LVDT. Measurements of force, pressure, temperature, flow, level quantities.

EEE411 Digital Electronics (2-2)3 ECTS:5

Basic wave shapes. Fundamentals of digital electronics. BJT Digital Circuits. Operation of BJT inverters and gate circuits. FET Digital Circuits. Operation of MOS inverters and gate circuits (NMOS, CMOS). Regenerative circuits. Astable, Monostable, and Bistable multivibrators. Schmitt triggers. Semiconductor memories.

EEE 417 Introduction to Lasers (3-0)3 ECTS:5

Laser fundamentals. Operation of practical lasers. Properties of Laser radiation. Meteorological and scientific applications. Industrial, medical and military applications. Holography. Applications in optical information systems.

EEE 421 Power Electronics-I (2-2)3 ECTS:5

Principles of operation of basic types of AC/DC, AC/AC: DC/AC and DC/DC converters. Operating characteristics and techniques for utilization thyristors and triacs. Performance characteristics of rectifier circuits. Operation of simple forced-commutated inverters and choppers. Gate firing circuits and pulse transformers. Methods of delay angle and sequence control.

EEE 422 Power Electronics-II (2-2)3 ECTS:5

Power devices; BJTs, MOSFETs, SITs and IGBTs. Operation of DC Choppers. Switching mode regulators; Buck, Boost. Buck-Boost and Cuk regulators. Pulse width modulation techniques. Pulse width modulated inverters. Resonant pulse converters. Power supplies. DC drives. AC drives. Protection of devices and circuits.

EEE431 Analog Communication (3-0)3 ECTS:5

Amplitude modulation (AM) and other linear carrier wave (CW) modulation techniques. Frequency/phase modulation (FM/PM). Superheterodyne receivers and applications. Noise in CW modulated systems. Sampling and quantization, Pulse Code Modulation (PCM).

EEE432 Introduction to Data Communications (3-0)3 ECTS:5

Fundamentals of data and computer communications. Information sharing between computing devices. Basics of sending signals across links. Concepts such as bandwidth, data rate, signal encoding, modulation and error control. Multiple links to form networks by using switching, routing and internet working. Present day technologies, such as WiFi, video streaming, Ethernet, ADSL and web browsing. Broad coverage of data communications, finishing with an introduction to the Internet.

EEE433 Optical Fiber Communications (3-0)3 ECTS:5

Introduction to geometric optics; ray theory and electromagnetic wave theory of optical propagation in fibers. Optical fibers and their transmission characteristics. Fiber materials and their fabrication. Cables, connectors and couplers. Introduction to optical sources and detectors. Principles of optical communication systems, performance analysis and design.

EEE434 Cellular Communication Systems (3-0)3 ECTS:5

GSM, GPRS, EDGE, UMTS, HSPA, LTE and LTE-Advanced Pro, 5G and beyond. Signaling, coding, radio networks, core networks, switching, handover in the cellular systems. IoT, bluetooth, Wireless Local Area Network.

EEE436 Digital Communication (3-0)3 ECTS: 5

Digital modulation: ASK, PSK, FSK, MSK, M-ary digital modulation. Spectrum of digital modulation schemes. Transmission in band-limited channels. Synchronization. Wireless channel models. Multi-carrier modulation .Multi-antenna communication. Introduction to information theory. Introduction to coding theory.

EEE437 Fundamentals of Antennas (3-0)3 ECTS:5

Fundamental parameters of antennas; radiation pattern and intensity, directivity and gain, efficiency, bandwidth, polarization, impedance, effective aperture and antenna temperature. Friis transmission and radar range equations. Reciprocity theorem and images. Radiation integrals. Wire and loop antennas. Linear, planar and circular arrays. Linear array synthesis.

EEE438 Antennas (3-0)3 ECTS:5

Equivalence principle. Huygen's principle. Aperture antennas; rectangular and circular apertures. Horn antennas. Reflector and lens antennas. Traveling wave and broadband antennas. Frequency independent antennas. Microstrip antennas.

EEE439 Introduction to Remote Sensing (3-0)3 ECTS:5

Overview of remote sensing systems. Application areas of remote sensing. Electromagnetic radiation, multispectral and hyperspectral scanning systems. Remote sensing in microwave region. Radar imaging and SAR systems. Remote sensing satellites. Data acquisition and processing. Classification and data fusion.

EEE441 Digital Design-II (2-2)3 ECTS:5

Synchronous sequential logic. Registers, counters, and the memory unit. Algorithmic state machines. Asynchronous sequential logic.

EEE442 Programmable Logic Controllers (2-2)3 ECTS:5

Practical applications of PLCs in machine and equipment control. Basic elements of control. Designing and configuring logic circuits. Physical parts and operation of PLCs. Selecting a PLC for a specific application.PLC programming techniques.

EEE445 Introduction to Computer Vision (3-0)3 ECTS: 5

Illumination, sensors and cameras. Image acquisition and representation. Fundamentals of digital image processing. Linear filters, edge detection, segmentation. Representation and description. Object recognition.

EEE448 Microprocessor Applications (3-0)3 ECTS:5

Direct memory access, interrupt and bus arbitration techniques, magnetic recording techniques, disk interfaces, CRT controllers, software development techniques, survey of 8 and 16 bit microprocessors and their applications.

EEE452 Introduction to Nonlinear Control Systems (3-0)3 ECTS: 5

Controllability, observability. State feedback. Design of dual observes. State-space analysis methods, phase-plane construction: the isocline method, classification of singularities. Stability definitions. Lyapunov's second method, Lure's stability criterion, Aizerman's conjecture. Popov's function. Dual-input describing function. Use of high frequency bias signal.

EEE453 Process Control (3-0)3 ECTS: 5

Control of industrial process. Development of models of fundamental processes. Characteristics of transducers. Controllers, final control elements and their use in control loop. Cascade and feed-forward control. Static and dynamic characteristics of flow, pressure and liquid level control loops. Heat and mass transfer processes.

EEE454 Process Instrumentation and Control (3-0)3 ECTS: 5

Measurement and Instrumentation for control of industrial processes: A short review of elements of process control loop. Simple identification techniques, correlation methods. Temperature, flow, pressure measuring methods and instruments. Instrumentation of flow, pressure and liquid level control loops. Method of gas analysis to give control output. Chemical reaction measuring elements; PH, Redo; conductivity measurements.

EEE456 Introduction to Digital Control Systems (3-0)3 ECTS: 5

Review of discrete and analog system representations, z-transform sampling and reconstruction. Open loop and closed loop discrete time control systems. System time-response characteristics. Stability. Digital controller design.

EEE461 Microwave Engineering-I (3-0)3 ECTS: 5

Introduction to Maxwell's equations and some theorems related to electromagnetism, transmission lines and some waveguiding structures, impedance matching and tuning, microwave network analysis, and microwave resonators.

EEE462 Microwave Engineering-II (2-2)3 ECTS: 5

Transformers. Theory of small reflections. Transformer designs. Tapered transmission lines. Lumped resonant circuits and resonators. Microwave cavities. Coupling by apertures. Directional couplers and directional coupler design. Power dividers and hybrid junctions. Microwave filters and filter design. Ferrite devices.

EEE468 Fundamentals of Electromagnetic Compatibility (3-0)3 ECTS:5

Introduction to EMI and EMC concept. EU Directives, Standards and Bodies. Electromagnetic Waves and Antennas. Noise and Frequency Analysis. Fluctuation and Flicker Effects. EMC Standards and EMC Test Setups. The Numerical Modelling of EMC Problems. Shielding Design Consideration. Cables and Connectors – Grounding. Implementation for EMC in CST- EMC Studio (Electromagnetic simulator). EMC simulation examples in CST- EMC Studio (Electromagnetic simulator).

EEE471 Power System Analysis-I (3-0)3 ECTS: 5

Basic structure of electrical power systems. Representation of Power systems. Symmetrical components. Electrical characteristics of generators, transformers, transmission lines and cables. Use of per-unit system in power network calculations. Current and voltage relations in short, medium and long transmission lines. Symmetrical and asymmetrical fault calculations. Limitation of fault level.

EEE472 Power System Analysis-II (3-0)3 ECTS: 5

Matrix analysis of power networks; methods of solution. Load flow studies. Economic operation of power systems; economic load dispatching. Power system stability; steady state and transient stabilities.

EEE474 Distribution Systems (3-0)3 ECTS: 5

Basic considerations. Distribution networks. Feeders. Distribution substations Subtransmission, primary and secondary distribution. Choice of voltage levels. Operational characteristics of cables, overhead lines and transformers. choice of conductor cross-section. Analysis of tie bar and ring systems. Fusegear and switchgear components; current and voltage transformers. Differential protection of transformers and feeders. Overcurrent protection. Earthing methods. Economics of distribution systems.

EEE475 High Voltage Techniques-I (3-0)3 ECTS: 5

Numerical computational techniques in field analysis and its applications. Ionization processes in gases. Electrical breakdown in gases, vacuum, solids and liquids. Breakdown in composite materials and their electrical properties; dielectric gases, insulating liquids and solid dielectrics, and applications in electrical apparatus.

EEE476 High Voltage Techniques-II (3-0)3 ECTS: 5

Generation of high DC, AC and impulse voltages and currents for testing purposes. Measurement of high voltages and currents. Non-destructive testing of insulating materials and apparatus. High voltage testing of electrical apparatus.

EEE484 Computational Methods (3-0)3 ECTS: 5

Numerical errors and their estimation, approximation and interpolation. Roots of equations. Solution of linear and non-linear simultaneous equations. Numerical differentiation and integration. Solution of ordinary and partial differential equations. Introduction to statistical methods.

EEE498 Engineering Design-I (2-2)3 ECTS:3

Understanding engineering problems. Fundamentals of engineering design. Engineering design in electrical and electronics engineering. Fundamentals of project management,risk management and change management. Design tools. Ethics and safety in engineering design projects. Written and oral communication in engineering design projects. Design experience through team project.

EEE499 Engineering Design-II (2-2)3 ECTS:5

Project management. Project planning. Economic issues in projects. Reliability of engineering products. Team work and collaboration in engineering projects. Practical issues in engineering design. Written and oral presentation skills. Project exhibitions and poster presentations.

ENG499 Multi Disciplinary Project (1-2)2 ECTS:2

It is a project course based on teamwork carried out by students from different education programs on a determined common topic, covering two or more academic disciplines. With collaborative studies, research in which the knowledge, methods and tools of different disciplines are used together; it will include integrated studies that increase interdisciplinary interaction.