KONYA TECHNICAL UNIVERSITY

FACULTY OF ENGINEERING AND NATURAL SCIENCES

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

2025-2026 ACADEMIC YEAR

UNDERGRADUATE COURSE CONTENTS

TERM 1

TECHNICAL DRAWING

Course Code:1202103

Theory Hours / Practice Hours: 2/0

ECTS: 2

Introduction, definition of technical drawing, introduction of drawing tools and equipment, scales, papers, etc. Geometric drawings, Orthographic Projection, Standard Views, Auxiliary and Sectional Views, Applications, Perspective,3D Drawings, Dimensioning, tolerances and surface treatment marks, Basic part modeling applications, Introduction to the drawing program (CAD prog.), Introduction of basic editing commands on the computer, Part modeling using basic drawing and editing commands, Creating drawings from solid model, using dimensioning commands, Drawing the detailed picture of the machine parts with sufficient appearances, Sections, Dimensions, Surface Textures and Tolerances on Solid modeled parts, Assembly Drawings.

MATHEMATICS-I

Course Code:1202104

Theory Hours / Practice Hours: 4/2

ECTS: 6

Natural, Integer, Rational, Irrational, Real, Decimal, Repeating decimal, Extended Real, and Exponential numbers, Sum and sigma notations, Root numbers, absolute values, equations and equalities, Functions, function kinds, special-defined functions, trigonometric functions and their inverse forms, hyperbolic functions and their inverse forms, Functions, function kinds, special-defined functions, function shifting and scaling, trigonometric functions and their inverse forms, hyperbolic functions and their inverse forms, Limits and continuity, limit of a function, limit theorems, formal definition of limit, one sided (left-right sided) limits, limits containing infinity, Derivative and its definition and theorems, Concept of derivative, Derivative, Extremum points-concavity-convexity-asymptotes, Function drawings, indefinite forms and L'Hopital rules, Indefinite integrals, Techniques of integration, integrals of some

fundamental functions, Riemann integral, Riemann sums, fundamental theorem of calculus, properties of Riemann integrals, equalities for integrals, mean value theorems, estimation of integrals, Applications of Riemann integrals, Area and arc length of plane regions on Cartesian coordinates, Area and volume of surfaces of revolution on Cartesian coordinates, Sequences, Convergence of sequences, monotone sequences, lower-upper limits of sequences, almost equivalent sequences, boundedness and operations of sequences, neighbour sequences, Cauchy and Fibonacci sequences.

PHYSICS-I

Course Code:1202105

Theory Hours / Practice Hours: 2/2

ECTS: 6

Vectors: Coordinate And Reference Systems, Some Properties Of Vectors, Components Of A Vector And Unit Vectors, Addition Of Vectors, Scalar Product, Vector Product, Application Problems. Motion In One Dimension: Average Velocity, Instantaneous Velocity, Acceleration, One-Dimensional Constant-Accelerated Motion, Free Falling Objects. Application Problems. Motion In Two Dimensions: Displacement, Velocity And Acceleration Vectors, Constant Acceleration Motion in Two Dimensions, Oblique Shot Motion, Uniform Circular Motion, Tangential And Radial Acceleration In A Curvilinear Trajectory, Application Problems. Laws Of Motion: Concept Of Force, Newton's I. Law And Inertial Systems, Inertial Mass, Newton's II. Law, Weight. Laws Of Movement: Newton's III. Law, Some Applications Of Newton's Laws, Application Of Newton's II. Law to Uniform Circular Motion, Irregular Circular Motion, Motion in Accelerated Systems, Application Problems. Work And Energy: Work Done By A Constant Force, Work Done By A Variable Force, Work And Kinetic Energy, Power, Application Problems. Potential Energy And Conservation Of Energy: Conservative And Conservative Forces, Potential Energy, Conservation Of Mechanical Energy, Conservative Forces And Work energy Theorem, Potential Energy Stored in A Spring, Relation Between Conservative Forces And Potential Energy, Conservation Of Energy, Application Problems. Linear Momentum And Collisions: Linear Momentum And Impulse, Conservation Of Linear Momentum in Two-Particle System, Collisions, Collisions in One Dimension, Collisions in Two Dimensions, Mass System, Motion Of Particle System.

CHEMISTRY

Course Code:1202106

Theory Hours / Practice Hours: 2/2

ECTS: 5

Basic chemical and physical properties of matter, Atom and molecule theory, historical development of chemistry. Explanation of laboratory rules, Atomic theories and the structure of the atom and the introduction of Laboratory Materials, Electron distribution in atom, periodic table and basic properties of elements, Compounds, types of compounds, nomenclature and formulas, Conservation of Matter Experiment, Basic calculations in chemistry, Chemical Equations, Stoichiometry and determination of the limiting component, Law of Constant Proportions Experiment, Reaction types and balancing reactions, Stoichiometry Experiment,

Basic properties of gases, Ideal gas equation, Determination of Relative Diffusion Rates of Gases Experiment, Real gases, kinetic theory of gases, Thermochemistry, standard formation enthalpy, endothermic and exothermic reactions, Thermochemistry Experiment, Basic properties of Liquids and Solids, Determination of Melting and Boiling Points Experiment, Solutions, concentration units, preparation of solutions, Preparation of solutions Experiment, Acids and Bases, Titration Experiment.

TURKISH LANGUAGE AND LITERATURE-I

Course Code:1202107

Theory Hours / Practice Hours: 2/0

ECTS: 2

ATATURK'S PRINCIPLES AND THE HISTORY OF REVOLUTION

Course Code:1202108

Theory Hours / Practice Hours: 2/0

ECTS: 2

FOREIGN LANGUAGE-I (ENGLISH)

Course Code:1202121

Theory Hours / Practice Hours: 3/0

ECTS: 3

Giving personal information and introducing family members, talking about school life and daily routines, Describing events in a photo and talking about current events, Talking about on spot decisions and making predictions without a visible evidence, Talking about future plans and making predictions with a visible evidence, Talking about future arrangements and timetables, Talking about future plans, on-spot decisions, arrangements and timetables, Talking about past events, Talking about events in progress for a while in the past, Talking about past habits, Talking about life experiences, Talking about events in progress for a while at present, Verifying the information known beforehand, Anne of Green Gables Chapters 1-4. Anne of Green Gables Chapter 5-8.

TURKISH LANGUAGE AND LITERATURE

Course Code:1202131

Theory Hours / Practice Hours: 4/0

ECTS: 4

INTRODUCTION TO ELECTRICAL AND ELECTRONICS ENGINEERING

Course Code:1202133

Theory Hours / Practice Hours: 4/0

ECTS: 6

Fundamental physical concepts (Physical quantities, electric charges, electric current, electric voltage, SI unit system and symbols), Conductors, semiconductors and insulators, current intensity, current density, DC current, AC current, Electrical resistance, resistor color codes, series-parallel connections, factors affecting resistance, Ohm's Law, Kirchhoff's laws, current source, voltage source and connection and conversion of sources, Solution of electrical circuits with mesh currents method. Solution of electrical circuits with node voltages method. Investigation of capacitor and inductor, Electrical work and power, Joule's law, efficiency, Single-phase alternating current (frequency, period, phase angle), effective and average values, phasor representation, Introduction to digital circuits, Introduction to electronic circuit components, Introduction to communication fundamentals, Renewable energy, Introduction to Electrical Installations, Industrial applications.

INTRODUCTION TO ELECTRICAL AND ELECTRONICS ENGINEERING

Course Code:1202134

Theory Hours / Practice Hours: 4/0

ECTS: 4

Fundamental physical concepts (Physical quantities, electric charges, electric current, electric voltage, SI unit system and symbols), Conductors, semiconductors and insulators, current intensity, current density, DC current, AC current, Electrical resistance, resistor color codes, series-parallel connections, factors affecting resistance, Ohm's Law, Kirchhoff's laws, current source, voltage source and connection and conversion of sources, Solution of electrical circuits with mesh currents method. Solution of electrical circuits with node voltages method. Investigation of capacitor and inductor, Electrical work and power, Joule's law, efficiency, Single-phase alternating current (frequency, period, phase angle), effective and average values, phasor representation, Introduction to digital circuits, Introduction to electronic circuit components, Introduction to communication fundamentals, Renewable energy, Introduction to Electrical Installations, Industrial applications.

OCCUPATIONAL SAFETY AND HEALTH-I

Course Code:1202134

Theory Hours / Practice Hours: 2/0

ECTS: 2

Development of Concepts and Rules of Occupational Health and Safety, 6331 OHS Law, Health and Safety Signs, Physical Risk Factors, Chemical Risk Factors, 4857 Labor Law, Occupational Accidents, Use and Importance of PPE.

TERM 2

ELECTRICAL ELECTRONIC MEASUREMENTS

Course Code:1202202

Theory Hours / Practice Hours: 3/0

ECTS: 6

What is measurement? Why is it necessary? What are the benefits of measuring? An Electrical-Electronic Measurement System (block diagram and description). Inevitable situations in measurement, Numbers, Digits, Trimming, Rounding and Tolerance, Evaluating errors in measurement, Absolute error and Relative error, Basic and derived units, Standards. Calibration and its importance, Metrology, Characteristics of measuring instruments, Label properties, Symbols, Comparing analog measuring instruments and digital measuring instruments, Structure of analogue measuring instruments, Rotating coil measuring instruments (Galvanometer), Designing DC Ammeter and DC Voltmeter with Galvanometers. Expansion of measuring ranges of Voltmeter and Ammeter, Resistance measurement methods: Series and parallel Ohm-meters design. Voltmeter-Ammeter method (and before/after connecting). The cross-coil gauge, Meger, Earthing resistance measurement, Wheatstone Bridge and its applications, Cable fault location, Potentiometer circuits, Calibration methods, DC Ammeter-Voltmeter applications, Signal types, Alternating current. Instantaneous value, Maximum, Average value and Effective (rms) value. Phase difference. Oscilloscope usage: Amplitude, period/frequency and phase difference measurements. Electrodynamic measuring instrument, Rotating magnet measuring instruments, Rotating plate measuring instruments, Thermal measuring instruments, Electrostatic voltmeter, Rectifying measuring instruments, Instrument transformers, Definitions of Active, Reactive and Apparent power (power triangle) and power measurements. Power measurement with Aron connection in 3-phase circuits, Energy meter, its structure, connection and energy measurement. R, L, C circuit elements, structure and measurement. Impedance definition and problems, Z=R+jX, Angle value, Current, voltage and power measurement and impedance calculation. AC bridge (Wheatstone etc) applications, Sensor and transducer types, characteristics and applications. Strain gauges, Thermal transducers,

MATHEMATICS II

Course Code:1202205

Theory Hours / Practice Hours: 4/2

ECTS: 6

Series, convergence and divergence of series, Convergence of positive series, Integral, limit and comparison tests, D'Alambert and Cauchy tests, Alternative series, functional sequences, power series, Taylor and Maclaurin series expansions of functions, Improper integrals, Gamma and Beta functions, Parametric equations and polar coordinates, Function drawings on polar coordinates, Areas and arc lengths on polar coordinates, Vector valued functions and their limit, continuity and derivative concepts, Multi-variable functions and their domains, Limits and continuity of multi-variable functions, Partial derivative, Chain rule, directional derivative and gradient vectors, Tangent planes, Taylor and Maclaurin series of multi-variable functions,

Extremum values and saddle points of multi-variable functions, Lagrange multipliers, Region transformations, Multiple integrals, Double integrals, Double integrals, Calculations of area, surface area, arc length, mass, center of a mass via double integrals, Triple integrals on Cartesian coordinates, Region transformations, Triple integrals on cylindrical and spherical coordinates.

PHYSICS-II

Course Code:1202206

Theory Hours / Practice Hours: 2/2

ECTS: 6

Electric Fields: Properties of electric charges, Coulomb's law, electric field, Electric field of continuous charge distributions, electric field lines. Gauss's Law: Electric flux, Applications of Gauss's Law. Electrical Potential: Point charges, Continuous charge distributions. Capacitance and Dielectrics: Definition of Capacitance, Calculation and Connection of Capacitors, Capacitors with dielectrics. Current and Resistance, Direct Current Circuits: Kirchhoff rules, RC circuits. Magnetic Fields: Magnetic Force, Movement in a magnetic field. Sources of Magnetic Fields: Biot-Savart law.

TURKISH LANGUAGE AND LITERATURE-II

Course Code:1202207

Theory Hours / Practice Hours: 2/0

ECTS: 2

ATATURK'S PRINCIPLES AND THE HISTORY OF REVOLUTION-II

Course Code:1202208

Theory Hours / Practice Hours: 2/0

ECTS: 2

FOREIGN LANGUAGE-II (ENGLISH)

Course Code:1202221

Theory Hours / Practice Hours: 3/0

ECTS: 3

Talking about past and present abilities, responsibilities, obligations, habits and asking for and giving advice, Talking about possible conditions and their consequences, Talking about a process, such as a recipe, setting up a product, or preparing for an event, Talking about the causes and consequences of an event or situation, Describing people and objects in detail, Describing places and time expressions in detail, Talking about imaginary conditions and their consequences, Talking about present and future imaginary wishes, Talking about past regrets,

Comparing two people, objects or groups, Comparing at least three people, objects or groups, Secret Garden Chapters 1-8.

ATATURK'S PRINCIPLES AND THE HISTORY OF REVOLUTION

Course Code:1202222

Theory Hours / Practice Hours: 4/0

ECTS: 4

COMPUTER AIDED TECHNICAL DRAWING

Course Code:1202223

Theory Hours / Practice Hours: 2/0

ECTS: 2

LINEAR ALGEBRA

Course Code:1202224

Theory Hours / Practice Hours: 2/0

ECTS: 3

COMPUTER PROGRAMMING-I

Course Code:1202225

Theory Hours / Practice Hours: 3/2

ECTS: 6

General introduction and basic concepts of programming, Algorithm design and flowcharts, Introduction to C Functions and variables, Operators, Comparison, Loops, Arrays, Matrices, Sorting, Search, Functions, Pointers, String (Word), Mathematical Functions and applications, File operations, Example applications.

OCCUPATIONAL SAFETY AND HEALTH-II

Course Code:1202226

Theory Hours / Practice Hours: 2/0

ECTS: 2

OHS Introduction, Fire, Risk Management and Assessment, The Building of the Workplace and Annexes, Flammable-Explosive environments, OHS in Working with Vehicles with Screens, Emergency Plans, Electrical Accidents, Occupational Health and Safety in Manual Lifting and Transport Works.

LINEAR ALGEBRA

Course Code:1202227

Theory Hours / Practice Hours: 2/0

ECTS: 2

COMPUTER PROGRAMMING-I

Course Code:1202228

Theory Hours / Practice Hours: 3/2

ECTS: 5

General introduction and basic concepts of programming, Algorithm design and flowcharts, Introduction to C Functions and variables, Operators, Comparison, Loops, Arrays, Matrices, Sorting, Search, Functions, Pointers, String (Word), Mathematical Functions and applications, File operations, Example applications.

TERM 3

CIRCUIT ANALYSIS-I

Course Code:1202301

Theory Hours / Practice Hours: 3/0

ECTS: 5

Signals and general characteristics of signals, unit step function and applications, Unit ramp function, exponential function, sinusoidal functions and applications, average and effective values of signals, Kirchhoff's laws, voltage divider circuits, current divider circuits, circuit analysis techniques (node voltage method, ambient current method, superposition method, some special cases), source transformation, maximum power transfer, Dependent source circuits, loop currents method and dependent sources, node voltage method and dependent sources, some special cases, Thevenin and Norton equivalent circuits in dependent source circuits, Inductors and capacitors, switching functions, initial energy in inductor and capacitor, current, voltage, power and energy calculations, Natural response of RL circuits, natural response of RC circuits, Step response of RL circuits, step response of RC circuits, General solution for cascading and natural responses, sequential switching, Natural response of parallel RLC circuits, Natural response of series RLC circuits, Step response of series RLC circuits, General solution for step and natural answers, An overview.

DIFFERANTIAL EQUATIONS

Course Code:1202303

Theory Hours / Practice Hours: 3/0

ECTS: 4

Introduction, differential equations and solutions, Classification of first-order differential equations, Applications of first-order differential equations to electrical circuits, Differential equations that can be converted to first-order differential equations, Second-order differential equations, Applications of second order linear constant coefficient differential equations to electrical circuits, Higher order differential equations, Solution of linear differential equations with variable coefficients using power series, Laplace transform and its applications, Inverse Laplace transform and its applications, Differential equation systems.

ELECTRONICS-I

Course Code:1202304

Theory Hours / Practice Hours: 3/0

ECTS: 5

Conduction in P-N semiconductors, Types of semiconductor diodes and their characteristics, Rectifiers, Trimmers and clamps, Junction transistors: current components and characteristic curves, Analysis of common-base, common-emitter and common-collector circuits as an amplifier, Analytical expressions of Hfe current gain and transistor characteristics, Transistor

bias circuits, DC analysis of transistor circuits, Structure and types of FET, FET biasing and DC analysis, BJT AC circuit models, BJT AC analysis.

ENGINEERING MECHANICS

Course Code:1202307

Theory Hours / Practice Hours: 3/0

ECTS: 4

Introduction, Newton's Laws, 2D Force Systems, Moment, Couples, Equilibrium, Structures, Distributed Loads and Centroids, Friction, General review, question and answer for the final exam.

BASIC ELECTRICITY AND MEASUREMENTS LAB.

Course Code:1202311

Theory Hours / Practice Hours: 0/2

ECTS: 2

The formation of the electrical circuit and the introduction of its elements, Measuring current and voltage, Melting of the plug fuse wire, The formation of the electrical circuit and the introduction of its elements, Measuring current and voltage, Melting of the plug fuse wire, Experimental explanation of Ohm's law, Conductor resistance; change with length, cross-section and type, Introducing resistor color codes, Introducing capacitor color codes and examining capacitors, The attraction of the electromagnet to the iron and the calculation of the pulling force, electromagnetic induction, Measurement of power, energy and power factor in single phase alternating current, Oscilloscope Introduction and Measurement of Amplitude, Frequency, Period and Phase Difference with an oscilloscope, compensatory experiment.

LOGIC CIRCUITS

Course Code:1202312

Theory Hours / Practice Hours: 3/0

ECTS: 5

ADC and DAC features, Digital number systems, Binary codes and addition/subtraction operations in these codes, Boolean algebra axioms and theorems, Simplification of logic functions with Karnaugh Method, Logic functions using NOT, AND, OR, NAND, NOR EXOR, EXNOR operations and Gates, Usage of combinational circuit elements such as adders, half adders, full adders, subtractors, half subtractors, full subtractors, Usage of combinational circuit elements such as code converters, comparators, decoder, multiplexer and demultiplexer, CMOS and TTL circuits, Flip-Flops, Counter design, Counter design by 7493, Question solutions.

COMPUTER PROGRAMMING-II

Course Code:1202313

Theory Hours / Practice Hours: 3/0

ECTS: 3

Introduction to MATLAB, Arrays, Polynomials, Matrix, Graphics 1-2, Curve Equation Finding, Integral Calculation, File Operations, Mid-Term Exam, Simulink, Introduction to Proteus, Analog Circuit Layouts, Digital Circuit Layouts, Making a Sample PCB, Sample Problem Solving.

OCCUPATIONAL SAFETY AND HEALTH-I

Course Code:1202314

Theory Hours / Practice Hours: 2/0

ECTS: 2

Development of Concepts and Rules of Occupational Health and Safety, 6331 OHS Law, Health and Safety Signs, Physical Risk Factors, Chemical Risk Factors, 4857 Labor Law, Occupational Accidents, Use and Importance of PPE.

TERM 4

CIRCUIT ANALYSIS-II

Course Code:1202401

Theory Hours / Practice Hours: 3/0

ECTS: 5

Sinusoidal source, sinusoidal response, phasor, complex numbers and complex operations, Passive circuit elements in the frequency domain, Kirchhoff's laws in the frequency domain, series, parallel and delta-star conversion, Source transformation and Thevenin-Norton equivalent circuits, node voltage method, ambient currents method, phasor diagrams, Instantaneous power, average and reactive power, effective value and power calculations, Complex power, power calculations, maximum power transfer, Balanced three-phase voltages, three-phase voltage sources, analysis of star-star, delta-star circuits, Power calculations in balanced three-phase circuits, average power measurement in three-phase circuits, Self inductance, common inductance, polarity determination in coils with common inductance, energy calculations, Linear transformer, ideal transformer, equivalent circuits in magnetically coupled coils, Resonance concept, Quality factor, bandwidth in resonant circuits, Circuit elements and circuit analysis in the s-domain, transfer function, Transfer function in piecewise functions, Circuit solutions with the Laplace method, An overview.

ELECTRONICS-II

Course Code:1202403

Theory Hours / Practice Hours: 3/0

ECTS: 5

The function of the transistor when the electronic circuit operates in AC conditions, Four-terminal operation of transistors and transistor parameters, Obtaining parameters for different transistor models, Low, mid and high-frequency equivalent circuits of transistor amplifiers, AC analysis of transistor amplifiers, AC analysis of transistor amplifiers, Low, mid and high-frequency equivalent circuits of FET amplifiers, AC analysis of FET amplifiers, Integrated circuits and operational amplifiers, Operational amplifier equivalent and analysis of operational amplifier circuits, Operational amplifier applications, 555 oscillator circuits, Voltage regulators.

ELECTROMAGNETIC FIELD THEORY-I

Course Code:1202406

Theory Hours / Practice Hours: 3/0

ECTS: 5

Introduction to Electromagnetic Fields, Electromagnetic Model, SI Units and Universal Constants, Addition and Subtraction of Vectors, Product of Vectors, Orthogonal Coordinate systems, Cartesian Coordinates, Cylindrical Coordinates, Spherical Coordinates, Gradient of a

Scalar Field, Divergence of a Vector Field, Orthogonal Coordinate systems, Cartesian Coordinates, Cylindrical Coordinates, Spherical Coordinates, Gradient of a Scalar Field, Divergence of a Vector Field, Introduction to Static Electric Fields, Basic Postulates of Electrostatics, Coulomb's Law, Electric Field Formed by Discrete and Continuous Charge Distributions, Gauss's Law and Its Applications, Electric Potential, Electric Potential Created by Charge Distribution, Material Medium in a Static Electric Field, Conductors and Dielectrics in a Steady Electric Field, Boundary Conditions for Electrostatic Fields, Dielectric Strength, Capacitance and Capacitors, Electrostatic Energy and Force, Electrostatic Energy in Field Quantities, Electrostatic Forces, Solution of Electrostatic Boundary Value Problems, Poisson and Laplace Equations, Boundary Value Problems in Cartesian, Cylindrical and Spherical Coordinates, Image Method, Introduction to Static Electric Current, Current Density and Ohm's Law, Continuity Equation and Kirchhoff's Current Law, Power Dissipation and Joule's Law, Static Current Density Equations, Resistivity Calculation, Resistivity Calculation Examples, Introduction to Stationary Magnetic Fields, Basic Postulates of Magnetostatics in Free Space, Magnetic Vector Potential, Biot-Savart Law and Applications, Magnetic Dipole, Magnetization and Equivalent Current Densities, Magnetic Field Intensity and Relative Permeability, Behavior of Magnetic Materials, Boundary Conditions for Magnetostatic Fields, Inductance and Inductors, Inductance Calculation Examples, Magnetic Energy, Magnetic Energy in Field Quantities, Magnetic Forces and Torques, Forces and Torques in Current Carrying Conductors, Direct Current Motors, Forces and Torques in Stored Magnetic Energy.

CICUIT ANALYSIS LAB.

Course Code:1202408

Theory Hours / Practice Hours: 0/2

ECTS: 2

Amplitude, Frequency and Phase Difference Measurements in Alternating Current, Calculation and Measurement of Average and Effective Values of Waveforms, Investigation of Direct Current Circuit Theorems (Ohm, 1.Kirchhoff and 2.Kirchhoff Laws), Investigation of Direct Current Circuit Theorems (Ohm, 1.Kirchhoff and 2.Kirchhoff Laws), RL Circuit Behaviors and Passive Filter Applications in AC Current, RLC Resonant circuits, Power measurement and correction of power factor in AC circuits, three-phase circuits.

ELECTRONICS LAB.

Course Code:1202409

Theory Hours / Practice Hours: 0/2

ECTS: 2

Meet, student registration, Clipper and Limiter Circuits, Rectifiers, FET-Characteristics of Electric Field Effect Transistors, Transistor Current and Voltage Amplifiers, Operational Amplifier - OPAMP Characteristics, Basic Circuits of Operational Amplifier.

PROBABILITY AND STATISTICS

Course Code:1202411

Theory Hours / Practice Hours: 2/0

ECTS: 2

FUNDAMENTAL CONCEPTS OF PROBABILITY THEORY, Probability Calculation Using Counting Methods and Conditional Probability, Independent Events, Law of Total Probability, Bayes Theorem, Sequential Experiments, Poisson Theorem, Random Variables, Probability Distribution Function, Probability Density Function, Probability Mass Function, Some Important Discrete and Continuous Distributions, One Function of One Random Variable, One Function of One Random Variable, Continuous Bivariate Random Variables, Covariance and Correlation Coefficient, One Function of Two Random Variables, Two Functions of Two Random Variables, N-Variate Random Variables, Solved Problems.

DESIGN OF LOGIC CIRCUITS

Course Code:1202412

Theory Hours / Practice Hours: 3/2

ECTS: 7

Analysis of sequential logic circuits, synchronous sequential logic circuits, synchronous sequential logic circuits, Preparation of state diagram, state table and application tables, Reducing the number of cases and design of synchronous sequential circuit, Design of different types of synchronous counter designs by synthesizing sequential circuits and design of sequence catchers, Analysis of internal register transfer, bus transfer and data transfer between registers by learning the properties of register, slider register, parallel load register, Design of an arithmetic processor that performs the given functions, Design of ALU and accumulator processor, Design of a control unit with algorithmic state machines, Design of control units using a FF, using a decoder and using PLA for each state, Fan-out calculations in a circuit with RTL, TTL or DTL features.

OCCUPATIONAL SAFETY AND HEALTH-II

Course Code:1202413

Theory Hours / Practice Hours: 2/0

ECTS: 2

OHS Introduction, Fire, Risk Management and Assessment, The Building of the Workplace and Annexes, Flammable-Explosive environments, OHS in Working with Vehicles with Screens, Emergency Plans, Electrical Accidents, Occupational Health and Safety in Manual Lifting and Transport Works.

TERM 5

ELECTRICAL MACHINERY-I

Course Code:1202501

Theory Hours / Practice Hours: 3/0

ECTS: 5

Magnetic Field Sources, Faraday's Induction Law, Stored Energy In Magnetic Circuits, Structure and types of transformers, Transformation of electrical circuit elements, Equivalent circuit of transformer, Drawing phasor diagram of transformer, Voltage regulation of transformers, Determining the maximum efficiency point in transformers, Obtaining the approximate equivalent circuit of the transformer and comparing it with the real equivalent circuit, Determination of the equivalent circuit parameters of the transformer, The open circuit and short circuit tests, Determining the polarity of transformer windings, Connecting transformers in parallel, Autotransformers, Three-phase transformers: connection types, equivalent circuit model, analyses, Three-phase transformers: connection types, equivalent circuit model, analyzes, Instrument transformers (Current transformers, Voltage Transformers), Electromechanical energy conversion, field energy, co-energy, force, moment, The concept of commutation, Armature reaction, Induction of voltage and torque in direct current machines, Structure, windings, types and working principles of DC machines, Power flow and losses in DC machines, Types of direct current motors, Equivalent circuit, Separately excited and shunt DC motors, Their characteristic curves, Magnetization, Permanent magnet DC motor, Series DC motor, Compound DC motors and their characteristics, DC motor starters, Speed control methods, Efficiency calculation, Direct current generators and their types: Separately excited DC generator, Shunt DC generator, Characteristic curves, Compound DC generators and characteristic curves.

AUTOMATIC CONTROL-I

Course Code:1202503

Theory Hours / Practice Hours: 3/0

ECTS: 5

Introduction to Control Systems, Definitions, Classifications of Control Systems, Examples of Modern Control Systems, Laplace Transforms, Transfer Functions and Block Diagrams of Linear Control Systems, Signal Flow Graphs and Masons Gains Formula, Mathematical Models and Transfer Functions of Electrical, Mechanical, Thermal and Fluid Systems, Block Diagrams, AC and DC Servomotors, Step Motors, Transient State Analysis of Feedback Control Systems, Transient Response of a first and second-order system, Time Domain Specifications and Performance Index, Steady State Analysis of feedback Control Systems and Steady State Errors, Stability of Control Systems, Routh-Hurwitz Stability Analysis, Root-Locus analysis and design, Industrial Controllers.

ELECTROMAGNETIC FIELD THEORY-II

Course Code:1202508

Theory Hours / Practice Hours: 3/0

ECTS: 5

Introduction to Time Varying Fields, Faraday's Law of Electromagnetic (EM) Induction, Displacement Current, Maxwell Equations, EM Boundary Conditions, Potential Functions, Solution of Wave Equations, Time-Harmonic Fields, Introduction to Plane Waves, Plane Waves in Lossless Medium, Transverse EM Waves, Polarization of Plane Waves, Plane Waves in Lossy Media, Plane Waves in Low Loss Dielectrics and Good Conductors, Group Velocity, EM Power Flow and Poynting Vector, Instantaneous and Average Power Densities, Perpendicular Incidence of Plane Waves to Plane Boundaries, Perpendicular Incidence on Good Conductors, Oblique Incidence of Plane Waves to Plane Boundaries, Full Reflection, Perpendicular Polarization, Parallel Polarization, No Reflection Brewster Angle, Introduction to Transmission Lines, General Transmission Line Equations, Transmission Line Parameters, Wave Properties in Infinite Transmission Lines, Wave Properties of Finite Transmission Lines, Open-Circuit and Short-Circuit Lines, Self Impedance and Propagation Constant from Input Measurements, Reflection Coefficient and Standing-Wave Ratio, Using the Smith Chart, Impedance Matching with Transmission Lines, Introduction to Waveguides, General Wave Behavior Along Uniform Guide Structures, Transverse EM Waves, Transverse Magnetic Waves, Transverse Electric Waves, Rectangular Waveguides, TM Waves in Rectangular Waveguides, TE Waves in Rectangular Waveguides, Attenuation in Rectangular Waveguides, Other Waveguide Types, Rectangular Cavity Resonators.

ELECTRICAL ENGINEERING MATHEMATICS

Course Code:1202510

Theory Hours / Practice Hours: 2/0

ECTS: 4

Complex Numbers Theory, Matrix and Determinant, Eigenvalues and Eigenvectors of the Matrix, Laplace Transform (Basic Properties), Laplace Transform (Application to Electric Circuits), Laplace Transform (Solution of Differential Equations), Laplace Transform (Solving Simultaneous Differential Equations), Fourier Series, Fourier Transform (Basic Properties), Fourier Transform (Applications), Fast Fourier Transform (Basic Properties), Fast Fourier Transform (Calculation Methods), Fast Fourier Transform (Applications).

ELECTRONICS CIRCUIT DESIGN

Course Code:1202511

Theory Hours / Practice Hours: 2/2

ECTS: 3

How are diodes and transistors used? Linear power supply design, current and voltage supply concepts, switched power supply models, buck boost, etc., switched power supply models, buck boost, etc., examination of opamp characteristics, rail to rail, slave rate, etc., circuit design with opamp, asymmetric and symmetrical supply concepts, measurement amplifier calculation and design, frequency generators and types, sine square etc. stable frequency synthesis, filter types and simple filter applications, digital filter design and application example, switching elements and comparisons, retrospective question and answer.

HIGH VOLTAGE TECHNIQUES

Course Code:1202514

Theory Hours / Practice Hours: 3/0

ECTS: 4

Importance of high voltage and basic high voltage elements, Basic equations of the static electric field, Single and multilayer planar electrode systems, Planar electrode systems, Spherical electrode systems, Spherical electrode systems, Cylindrical electrode systems, Capacitor bushings, Approximate calculation of some electrode systems and fracture at boundary surfaces, Discharge events in gases, Corona losses High Voltage Technique, Insulators.

MANAGEMENT OF ELECTRICAL ENERGY

Course Code:1202521

Theory Hours / Practice Hours: 2/0

ECTS: 3

Primary energy sources, secondary energy types and supply in the world and in Turkey. Demand developments, sectoral energy consumption and tariffs in the world and in Turkey, Energy Efficiency Law and secondary legislation Energy efficiency with energy saving, Efficient use of electrical energy in lighting (efficient luminaire, control systems etc.), Energy saving potential, energy intensity and specific energy consumption - concept, calculation, trends, Measures to increase energy efficiency in industry - technical and economic features Measures to save energy in buildings - technical and economic features, Effects on Quality, Measures to Prevent Air Pollution - Techniques, Emission Calculation Methods, Duties of energy manager (target setting, awareness raising, planning, monitoring, data collection and reporting), Economic analysis methods, Measurement techniques and equipment standards, feasibility studies Energy audit and efficiency-enhancing project preparation – I (Common knowledge), Electrical energy – concepts and quantities (ampere, voltage, power and power factor etc.)Efficiency (generation, transmission, distribution, final) and demand-side management in electrical energy, Measurement and monitoring of electrical energy (electricity, Scada systems, etc.)Types, losses and efficiencies of power transformers, Reactive power, power factor and compensation applications, harmonics and filters Types, losses, efficiencies and common uses of electric motors(fan,pump,comp), Combined heat-power systems (Cogeneration, trigeneration), types and efficiency, Efficient electrical appliances and office equipment, Automation systems (in industry and buildings).

FILTER DESIGN

Course Code:1202533

Theory Hours / Practice Hours: 2/0

ECTS: 3

Positive real functions, Extraction of the circuit transfer functions, The design of passive RC filters, The design of passive LC filters, Question solutions about passive RC and LC filters, Design of passive filter circuits terminated with 1 ohm, The design of first order active filters, Second order active filter synthesis problems using infinite gain circuits, The design of active and passive filters using Butterworth filter approaches, The design of different types of filters by making filter transformations, Question solutions.

MICROPROCESSORS

Course Code:1202535

Theory Hours / Practice Hours: 3/0

ECTS: 3

Introduction, What is a microcontroller? General structure of PIC microcontrollers, Block diagram of 16FXX and 16FXXX type microcontrollers, Special registers and their functions, Circuits using microcontrollers, Peripherals used in microcontroller circuits, Communication with microcontroller, Communication of microcontrollers with other hardware, Microcontroller board examples, Microcontroller board-simulation examples.

ELECTRICAL ELECTRONICS DESIGN-I

Course Code:1202536

Theory Hours / Practice Hours: 2/1

ECTS: 3

Appointment of advisor, Informing students about the projects to be carried out during the term and the course, Meeting with the project advisor: Conducting theoretical studies on the 1st design project determined by the department chair, Meeting with the project advisor: procurement of materials for the 1st design project, Meeting with the project advisor: Applications for the 1st design project, Presentation of the final version of the project to the advisor and report submission, Meeting with the project advisor: Conducting theoretical studies on the 2nd design project determined by the department chair, Meeting with the project advisor: procurement of materials for the 2nd design project, Meeting with the project advisor: Applications for the 2nd design project, Presentation of the final version of the project to the advisor and report submission, Meeting with the project advisor: Making theoretical studies on the 3rd design project determined by the department chair, Meeting with the project advisor: procurement of materials for the 3rd design project, Meeting with the project advisor: Applications for the 3rd design project, Presentation of the final version of the project to the advisor and report submission.

SUMMER PRACTICE-I

Course Code:1202545

Theory Hours / Practice Hours: 0/0

ECTS: 3

BIOMEDICAL INSTRUMANTATION

Course Code:1202548

Theory Hours / Practice Hours: 3/0

ECTS: 3

Definition of Biomedical Engineering, Application Areas, Biomedical Terminology, Introduction to Human Anatomy and Physiology, Human - instrumentation system and Introduction to Biomedical Measurements, Biomedical Measurements and Biostatistics, Electrodes, Sensors, Transducers and their effects, Applications of Biomedical Sensors and Transducers, Bioelectric Amplifiers and Noise reduction, Bioelectric Amplifier Design Examples, Biosignals and Action potential, Measurement of muscle activities (EMG), Heart sounds (HS), Heart potentials, ECG measurement, Introduction to ECG analysis, Brain potentials, EEG measurement, introduction to EEG analysis, New technologies, Biotelemetry, Biomechanics, Wearable Technologies, Medical Laboratory, Life support and Therapeutic devices

TERM 6

ELECTRICAL MACHINERY-II

Course Code:1202603

Theory Hours / Practice Hours: 3/0

ECTS: 6

Types of induction motors, Basic induction motor concepts, induced voltage in rotating section, The Torque induced in a current-carrying Loop, Formation of the rotating magnetic Field, Equivalent circuit of induction motors, Power flow analysis in induction motors, Speed torque characteristic of induction motors, Maximum power and torque criterion in induction motors, Determination of equivalent circuit parameters of induction motor (no load and locked-rotor test), Determination of core losses, Starting types of induction motors, Speed control methods of induction motors, Induction generators, Single phase induction motors, Synchronous generators construction, The equivalent circuits of a synchronous generators, Speed torque characteristic, Excitation types of synchronous generators, Operation of synchronous generators at load, Excitation types of synchronous generators, Operation of synchronous generators at load, Synchronous generator operating alone, Operation of synchronous generators in parallel, Motor operation principles of synchronous machine, The effect of load changes on synchronous motor, The effect of field current changes on synchronous motor, Power factor correction with synchronous motor, Starting synchronous motor.

AUTOMATIC CONTROL-II

Course Code:1202605

Theory Hours / Practice Hours: 3/2

ECTS: 6

Frequency response analysis and polar plots, Nyquist Analysis, Nyquist Stability Analysis and Examples, Bode plots and examples, Gain-phase plane and Nichols Diagrams, Relative Stability of the systems (gain and phase margin), Design in frequency domain, State-Space Analysis, Canonic forms and transformations, State-Space Representations, state-transition matrix, State-Space Representations, state-transition matrix, State feedback systems and design, State feedback systems and design, Performance Index, Optimization, Performance Index, Optimization.

POWER ELECTRONICS-I

Course Code:1202607

Theory Hours / Practice Hours: 3/0

ECTS: 3

Introduction to Power Electronics, Classification of Power Electronics Converters and Applications of Power Electronics, Basic principles of Power Electronics; Fundamental Definitions, Behavior of L and C, Fourier analysis, Basic Semiconductor Devices (Diode, Zener

Diode, Transistor) and Power Diodes, Structure, working principles and Characteristics of Transistor Type Power semiconductor devices (Power Transistor(BJT), Power MOSFET and IGBTs), Structure, working principles and Characteristics of Thyristor Type Power semiconductor devices (Thyristor(SCR), Triac, GTO and MCT) and Other Power semiconductor devices, Control techniques for Power semiconductor devices, Discrete Signal generators (Shockley diode, UJT, diac) and PWM signal generators, Triggering (Driver) Circuits and Signal Isolation of Power semiconductor devices, Protection and Snubber Circuits of Power semiconductor devices, Power Losses, Heating and Coolers in Power semiconductor devices, Uncontrolled Rectifiers, Uncontrolled Rectifiers, Effects of rectifiers on the grid (harmonics and reactive powers) and analysis of the effects of commutation on output voltage, Single-phase and three-phase AC choppers and frequency converters, General evaluation.

SIGNALS AND SYSTEMS

Course Code:1202614

Theory Hours / Practice Hours: 3/2

ECTS: 4

Signals definition and Signal examples, Examples with independent variables, continuous-time and discrete-time signal definition, Examples with independent variables, continuous-time and discrete-time signal definition, Argument conversions and examples, Periodic, Odd, Even Signals and sample solutions, Example solutions with exponential signals, sinusoidal signals and special signals, Convolution explanation, properties and example solutions, Definition of systems, linear and non-linear systems, Memory, memoryless, causal, noncausal, time-independent systems, System stability, Linear Time Invariant Systems (LTI) and Convolution, Fourier series and Discrete spectrum, Z-Transform, features and example solutions, First value, last value, Parseval's theorem z-transform examples.

INDUSTRIAL AUTOMATION

Course Code:1202616

Theory Hours / Practice Hours: 3/2

ECTS: 4

Introduction to Industrial Automation systems, Introduction to Industrial Automation systems, Introduction to Industrial Automation systems, Working Principles and Usage Areas of Relays and Contactors, Protection Elements in Industrial Automation Circuits, Industrial Automation Elements (Actuators), Industrial Automation Elements (Servo and Stepper Motors), Industrial Automation Elements (Servo Mechanisms), Automatic Control Circuits, Drawings of Automatic Control Circuits, Changing the Rotation Direction of Electric Motors Drawing Control Circuits, Methods of Starting Induction Motors and Control Circuits, Braking methods and Control Circuits in Induction Motors, Programmable Logic Controls Introduction and general structures, Programmable Logic Controls memory areas.

INTRODUCTION TO MEDICAL IMAGING

Course Code:1202618

Theory Hours / Practice Hours: 2/0

ECTS: 3

Fundamentals of X-Ray, Generation and Detection of X-Rays, The X-ray diagnostic methods, The biological effects of ionizing radiation, The basics of radionuclide imaging, Radionuclide imaging methods, Radiation dosimetry and its biological effects, The basics of acoustic propagation, the production and detection of ultrasound, The biological effects of ultrasound, Magnetic resonance imaging methods, The biological effects of magnetic field, Thermography, Presentation of homework.

SENSORS AND TRANSDUCERS

Course Code:1202619

Theory Hours / Practice Hours: 2/0

ECTS: 3

What is a sensor, what is a transducer, Investigation of sensor properties and behavior, Linearity, memory effect, etc., selection and limits of control elements such as contactor relay, Optical sensors and their behavior, Magnetic sensors and their behavior, Strain gauge and resistance based sensors, Whetstone and Maxwell bridge and their differences, Temperature sensors, Capacitive sensors and their application areas, Chemical and biological sensors, Data acquisition methods from sensors and digitalization of signals, Intelligent sensors and the conditions of the concept of mind in sensors, Special sensors for special areas, Railways, Aviation and Automotive (a real example design).

ELECTRICAL MACHINERY LAB.-I

Course Code:1202621

Theory Hours / Practice Hours: 0/2

ECTS: 2

Introduction of the course and laboratory, Single phase transformer experiments, Three phase transformer experiments, DC motor experiments, DC generator experiments, Induction motor experiments, Synchronous motor experiments, Overview of the experiments.

NUMERICAL METHODS

Course Code:1202631

Theory Hours / Practice Hours: 3/0

ECTS: 3

Introduction, Basic concepts and definitions, Errors in numerical analysis, The roots of the equations, Solution of linear equations, Optimization, Curve fitting, least squares method, curve fitting, interpolation, MATLAB applications.

ADVANCED DIGITAL SYSTEMS

Course Code:1202633

Theory Hours / Practice Hours: 3/0

ECTS: 3

Digital Systems and FPGA, Internal Structure and Features of FPGA, Introduction to VHDL, Design Sections in VHDL, Objects in VHDL, VHDL Data Types, VHDL Operators, Usage of Vivado, Testbench Formation and Design with Examples, Combinational Logic Circuits, Sequential Circuit Design, Model Implementations, Coursework (Preparation of Main Code and Testbench Code), Memory Operations, Finite State Machines.

PROFESSIONAL FOREIGN LANGUAGE

Course Code:1202635

Theory Hours / Practice Hours: 2/0

ECTS: 3

Electrons, Cells and batteries, Current, voltage and power, Alternating currents, Plugs and fuses, Sources of energy, Resistance, Capacitors, SI Units, Diodes, LDR and Transistors, Logic, Logical systems, Radio transmission, Radio reception.

ELECTRICAL ELECTRONICS DESIGN-II

Course Code:1202636

Theory Hours / Practice Hours: 2/1

ECTS: 7

Assignment of an advisor , Determination of the project topic by the student and the advisor faculty member, Resource research by the student on the determined project, meeting with the project advisor, Determining the tools and methods to be used in the project, making a resource research by the student on the determined project, meeting with the project advisor, Conducting theoretical studies about the project, meeting with the project advisor, Conducting theoretical studies about the project, meeting with the project advisor, Interim report presentation, Conducting theoretical studies about the project, meeting with the project advisor, Analyzing the test results and interpreting them with the project advisor and deciding on the corrections to be made, Elimination of the problems and deficiencies identified in the project, meeting with the project consultant, Reporting and presentation.

INTRODUCTION TO ROBOTICS

Course Code:1202840

Theory Hours / Practice Hours: 3/0

ECTS: 4

What is Robotics? Definitions and concepts, Robotic Systems, Robot Kinematics, Robot Kinematics applications, Robot Dynamics, Robot dynamics applications, Robot arms, Mobile Robot systems, Robot Control, Microcontroller and use of embedded systems in robot control, Closing the course-Delivery of projects.

TERM 7

ELECTRICAL ELECTRONICS ENGINEERING PRACTICE-I

Course Code:1202701

Theory Hours / Practice Hours: 2/1

ECTS: 7

Appointment of a faculty member as a project advisor to the student, Determination of the project topic by the student and the advisor faculty member, Resource research by the student on the determined project, meeting with the project advisor, Determining the tools and methods to be used in the project, meeting with the project advisor, Reporting the work done on the project, preparing a presentation for the interim report, Interim report presentation, Conducting theoretical studies about the project, meeting with the project advisor, Reporting the work done on the project, preparing a presentation for the final report, Reporting and final presentation.

GENERATION ELECTRIC ENERGY

Course Code:1202702

Theory Hours / Practice Hours: 3/0

ECTS: 5

Energy production and consumption balance, Plant capacity calculations, Electricity unit price calculation, Total energy cost calculation, Power plant types, Thermal power plants, Combined cycle natural gas power plant, Wind power plants, Hydroelectric power plant, Solar power plants, Power plant economics and feasibility, Power plant operation, Problem solving, Nuclear power plant.

DISTRIBUTION OF ELECTRIC ENERGY

Course Code:1202703

Theory Hours / Practice Hours: 3/0

ECTS: 3

Electrical energy distribution systems, Definition, types, connection groups and connections of power and measurement transformers, Introduction of underground cables and installation forms and introduction of overhead line conductors, Cross-section calculations for balanced and unbalanced radial networks, Cross-section calculations for Dalbudak networks Electricity, Cross-section calculations for distributed networks Electricity, Cross-section calculations for network networks, Busbars, busbar systems and maneuvers in high voltage installations, Types and functions of insulators and poles used in low voltage overhead lines, Structures, properties and calculation methods of resultant forces of iron and concrete poles and sleepers used in low voltage overhead lines, Explanation of the direct loading assumptions specified in the Electric Power Current Facilities Regulation, Example solutions for peak force calculations for the

determination of low voltage overhead line concrete and iron poles, Example solutions of overhead force calculations for the determination of concrete and iron poles in overhead lines with common poles.

ELECTRICAL MACHINERY-III

Course Code:1202705

Theory Hours / Practice Hours: 2/0

ECTS: 3

Classification of electrical machines, Structures, magnetic core and windings of three-phase transformers, Connection types, asymmetrical loadings, tertiary windings and zig-zag connections in three-phase transformers, Three-phase transformation using two Transformers, The open-delta (V-V) connection / The open-Wye-open-delta connection / The Scott-T connection / The Three- phase T connection, Induction motor winding technique, Driving dynamics, Moment of inertia, Newton's law, Driving motion in slow speed changes, Working machines, load-moment due to rotating velocity and rotation angle, evaluate of motor power, power transfer to electrical motors, Variation of electrical motors, torque characteristics, standard motors, construction and safety features, isolation types and their lifetimes, cooling types, Universal motors, D.C. and A.C. Excitation and comparison, Universal motor types, Torque generation, Equivalent circuit, Speed control methods in universal motors, Reluctance motors: Structures, types, operating principles and applications. Torque generation, Equivalent circuit, Repulsion Motors: Structures, operating principles and applications, feeding specifications, Torque generation, Equivalent circuit, Hysteresis Motors: Structures, operating principles and applications, Feeding specifications, Torque generation, Stepper Motors: Structures, types, operating principles and applications. Feeding specifications, Characteristics, Torque generation, Brushless DC Motors: Structures, operating principles and applications, Feeding specifications, Torque generation, Equivalent circuit, Permanent magnet synchronous motors: Construction types, operating principle and applications, Motor selection, Inconvenient motor selection.

ELECTRICAL MACHINERY LAB.-II

Course Code:1202706

Theory Hours / Practice Hours: 0/2

ECTS: 2

Introduction of the course and laboratory, Open Delta Connection Test in Transformers, Connection group experiments in three-phase transformers, No-load, blocked-rotor and load tests on asynchronous motors, Wound rotor asynchronous motor experiments, One-phase asynchronous motor experiments, Overview of the experiments.

DIGITAL SIGNAL PROCESSING

Course Code:1202717

Theory Hours / Practice Hours: 3/0

ECTS: 3

Defining the basic signals and systems and their characteristics, Discrete time signals and systems, Analyzing and classifying discrete time signals and systems, Analyzing and classifying discrete time signals and systems, Analyzing and classifying discrete time signals and systems, Discrete time systems described by differential equations, Discrete time systems described by differential equations, Discrete time systems described by differential equations, Analyzing linear time invariant systems in Z-Domain, Frequency analysis of the signals, Fourier series and transforms, Frequency analysis of the linear time invariant systems, Linear time invariant systems filter design, Digital filter design techniques and applications.

POWER ELECTRONICS-II

Course Code:1202720

Theory Hours / Practice Hours: 2/2

ECTS: 3

Basic Principles of DC-DC Converters, Buck and Boost Converters, Working Principles, Control Circuits and Analysis, Two and Four Quadrant Converters, DC motor operation in four Quadrant, Working Principles, Control Circuits and Analysis of Buck-Boost, CUK and SEPIC Converters, High frequency transformers and Isolated DC-DC Converters, Working Principles, Control Circuits and Analysis of Flyback and Forward Type Converters, Working Principles, Control Circuits and Analysis of Push-Pull, Half Bridge and Full Bridge Converters, DC-AC Converters (Inverters), Basic Principles, Fourier series and Performance Parameters, Basic Operation Principles, Control Circuits and Analysis of Single Phase Half Bridge and Full Bridge Voltage Source Square Wave Inverters, Control of Output Voltage in Single Phase Voltage Source Inverters; Square Wave Phase Shift Control and PWM Control Techniques, Basic Working Principles of Single Phase Voltage Source SPWM Inverters, Basic Working Principles and Analysis of Three Phase Voltage Source Square Wave and SPWM Inverters, Main Operating Principles, Control Circuits and Analysis of Voltage Source Multilevel Inverters and Current Source Inverters, Resonant Converter, Basic Working Principles, Control Circuits and Analysis of Resonant DC-DC Converters and Resonant Inverters.

MICROWAVE TECHNIQUES

Course Code:1202721

Theory Hours / Practice Hours: 3/2

ECTS: 3

Definition of microwave, transmission lines and waveguides, transmission lines and types, Characteristic impedance, Attenuation and phase, Transmission line equations and losses, Transmission line equations and losses, Circuits propagating on lossless lines, Reflections, voltage reflection coefficient and Reflection diagram, Sine waves and reflection coefficient, Non-reflective lossy lines, Actual physical voltages and currents, Reflections on lossless lines, Power flow and reflection loss in lossless lines, Standing waves and standing wave ratio, Input impedance, Insertion loss and Skin event, Impedance matching and Smith chart.

COMMUNICATION TECHNIQUE

Course Code:1202723

Theory Hours / Practice Hours: 2/2

ECTS: 5

Instruction to Information; The Basic Structure of A Communication Systems, Communication Signals, Transmission Environments, Frequencies Assignment, Modulation, The Limits on Communications, Channel Capacity, Mathematical Background; Spectra and its Demonstrating, Transfer Function, Periodic Functions and Fourier Series, Exponential Fourier Series, Mean-value and Parseval Power Theorem, Aperiodic Functions and Fourier Transforms, Properties of Fourier Transform, Convolution, Some Specific Functions used in Telecommunication, Energy and Power Spectral Densities, Correlation, System Reactions and Filters; Impulse Response and Time Domain Analysis, Transfer Function and Frequency Domain Analysis, Filters; Ideal and Real Filters, Low-Pass Filter, High-Pass Filter, Band-Pass Filter, Bant-Stop Filter, Amplitude Modulation; Double-Side-Band (DSB) - Big Carrier Modulation (Conventional Amplitude Modulation), Amplitude Modulator and Demodulator, Double-Side-Band (DSB) - Suppressed Carrier Modulation, DSB Modulator and Demodulator, Single-Side-Band (SSB) Modulation, SSB Modulator and SSB Demodulator. Vestigial-Side-Band (VSB) Modulation, Frequency Shifting and Mixing, Frequency Division Multiplexing, Angle Modulation; Phase Modulation, Frequency Modulation, Frequency Modulation Spectrum Analysis, Frequency Modulation Band Width; Narrow-Band Frequency Modulation, Wide-Band Frequency Modulation, Phase Modulation Spectrum Analysis, Narrow-Band Phase Modulation, Modulators and Demodulators for Angle Modulation; Frequency Modulators, Frequency Demodulators, Performance Analysis of Analog Modulation Methods in Noisy Channels.

RENEWABLE ENERGY SOURCES

Course Code:1202731

Theory Hours / Practice Hours: 2/0

ECTS: 3

Basic Definitions, Energy and Environment-Greenhouse Effect and Global Warming, Traditional and Renewable Energy Sources, Power Electronic Converters for Renewable Energy systems, Energy Storage Systems, Solar Energy-Solar Thermal Systems, Solar Energy-PV Systems, Solar Energy-PV Systems, MPPT Techniques, Hydrogen Energy and Fuel Cell, Wind Energy, Wind Energy systems, Wave, Tidal and Current Energy, Small Hydro and Geothermal energy, Biomass Energy, Hybrid Energy Systems.

ANALYSIS OF NOISE IN COMMUNICATION SYSTEMS

Course Code:1202735

Theory Hours / Practice Hours: 3/0

ECTS: 3

Classification and Characteristics of Signals and Systems, Fourier Series and Properties, Fourier Transform and Its Properties, Double-Sideband Suppressed Carrier Amplitude Modulation, Conventional Amplitude Modulation, Single-Sideband Amplitude Modulation and Vestigial-Sideband Amplitude Modulation, Implementation of Amplitude Modulators and Demodulators, Angle Modulation, Random Variables and Random Processes, Noise Models, Gaussian and White Processes, Effect of Noise on Amplitude Modulation, Effect of Noise on Angle Modulation, Transmission Losses and Analog Repeaters, Probability of Error for Binary Modulation, Probability of Error for M-ary Signals.

DIGITAL IMAGE PROCESSING

Course Code:1202739

Theory Hours / Practice Hours: 3/0

ECTS: 3

Introduction, Human and Computer Vision Systems, Basics of Digital Image, Image Enhancement in Spatial Domain, Image Enhancement in Frequency Domain, Image Enhancement Transforms, Image Restoration, Image Segmentation, Color Image Processing, Wavelet Transforms and Applications, Image Compression, Digital Image Processing Applications.

MICROCONTROLLER BASED SYSTEMS

Course Code:1202741

Theory Hours / Practice Hours: 3/0

ECTS: 3

Introduction to microcontroller based system design, C software methods for microcontroller based design, General tools and software methods for microcontroller based design, Simulations of microcontroller based circuits, Microcontroller based control of AC-DC converters, Microcontroller based control of AC-AC converters, Microcontroller based control of DC-DC converters, Microcontroller based control of DC-AC converters, Microcontroller based step motor control, Microcontroller based motor speed measurement, Microcontroller based DC motor speed control, Microcontroller based four quadrant DC motor control, Simulation and microcontroller based control of photovoltaic systems.

LIGHTING AND INTERIOR INSTALLATION

Course Code:1202742

Theory Hours / Practice Hours: 3/0

ECTS: 3

Introduction to Lighting, Light information and properties, Photometry, Lighting terms and types, Arc, incandescent, sodium vapor, mercury vapor, fluorescent lamps and types of lamps, Introduction of transition and architectural projects to interior installation, drawing, Introducing the materials used in the interior installation, Introducing the materials used in the interior

installation, Lighting calculation methods, Lighting calculation methods, ing table, Single-line diagram, Voltage calculation, Project Control.

SUMMER PRACTICE-II

Course Code:1202745

Theory Hours / Practice Hours: 0/0

ECTS: 3

INTRODUCTION TO NEAR FIELD COMMUNICATION

Course Code:1202746

Theory Hours / Practice Hours: 3/0

ECTS: 3

Introduction to Near Field Communication, Basics and History of Near Field Communication, Design Challenges of Near Field Communication (NFC), NFC Operating Modes, Coding, Modulation and Interference in NFC, Antenna Designs for NFC Devices and Applications, Near Field Magnetic Communication, Introduction to RFID, Fundamentals, Design Steps, Chip and Chipless RFID Structures, Smart Antenna Designs for RFID Systems, RFID Readers and Writers, Security of RFID Systems, RFID Tags, Active and Passive RFID Structures, Security and Personal Rights at NFC, Introduction to NDEF, Introduction to Arduino and NFC, NFC in Embedded Systems, Internet of Things and NFC Applications, Wireless Power Transmission, Current NFC Applications, Current NFC Applications.

DIGITAL CONTROL SYSTEMS

Course Code:1202749

Theory Hours / Practice Hours: 3/0

ECTS: 3

Introduction to digital control systems, Discrete time systems, AD/DA converters and signal reconstruction, Sampling and holding circuits, Z-transform, Inverse Z-transform, Solution of difference equations, Obtaining discrete time G(z) system from continuous time G(s) system, Block diagrams of discrete time systems and pulse transfer functions (PTF), Stability analysis of discrete time control systems, Time response analysis of discrete time control systems, The Root Locus of discrete time control systems, Frequency response analysis of discrete time control systems, State Space analysis of discrete time control systems, Stability in state space, Controllability, Observability, Design of digital controllers using Root-Locus Curves, Design of digital controllers using Frequency Response, Design of digital controllers in State Space (State feedback system design), Digital PID controllers and their design, Controller canonical implementations and real-time execution, Computer-aided application examples.

INDUSTRIAL ROBOT APPLICATIONS

Course Code:1202750

Theory Hours / Practice Hours: 3/0

ECTS: 3

The history of the industrial robot, Industrial robot types and the fields used, The future of industrial robots and new fields, Connections of robot driver and power cables, teaching of hand control tool, Industrial robot movements and axis, RT Toolbox 3 software, MELFA BASIC V programming language, MELFA BASIC V commands, Input-output connections of industrial robotic arm, Simulation of industrial robot 1, Simulation of industrial robot 2, Example 3.

TERM 8

ELECTRICAL ELECTRONICS ENGINEERING PRACTICE-II

Course Code:1202801

Theory Hours / Practice Hours: 2/1

ECTS: 8

Procurement of materials and start of implementation, meeting with the project advisor, Practical work on the project, meeting with the project advisor, Reporting the work done on the project, preparing a presentation for the interim report, Interim report presentation, Receiving the test results for the project, meeting with the project advisor, Analyzing the test results and interpreting them with the project advisor and deciding on the corrections to be made, Elimination of the problems and deficiencies identified in the project, meeting with the project advisor, Reporting the work done on the project, preparing a presentation for the final report, Reporting and final presentation.

TRANSMISSION OF ELECTRIC ENERGY

Course Code:1202803

Theory Hours / Practice Hours: 3/0

ECTS: 4

Introduction of electrical transmission systems, Basic principles related to the calculation of transmission systems and power for single and three-phase systems, Resistance and inductance in transmission lines, Inductance Electric Energy Transmission in Transmission Lines, Capacitance Electric Energy Transmission in Transmission Lines, Short transmission lines Electric Power Transmission, Medium length transmission lines Electric Power Transmission, Long transmission lines Electricity Energy Transmission, Stability and compensation in transmission lines, Design of 34.5 kV energy transmission lines.

PROTECTION ELECTRIC PLANTS

Course Code:1202804

Theory Hours / Practice Hours: 2/0

ECTS: 4

Introduction to power system protection, Network types and faults, Short circuit calculations, Faults results and impacts, Elements of protection, Surge arrester, Measure transformers, Protection methods, Motor, generator, transformer protection, High voltage distribution system protection, Load protection, Protection coordination, Power system grounding, Network protection.

POWER SYSTEM ANALYSIS

Course Code:1202805

Theory Hours / Practice Hours: 3/0

ECTS: 4

Single line and impedance diagrams, Per unit calculations, Obtaining per unit impedance diagrams of high and low voltage power systems, Per-unit impedance diagrams of three-winding transformers and removal of nodes by matrix algebra, Busbar impedance and admittance matrices, Short circuit events in energy systems, Three-phase short circuits and armature reaction in synchronous machines, Three-phase short circuits in unloaded synchronous machines, Three-phase short circuits in power systems and breaker selection, Analysis of balanced and unbalanced three-phase systems, Obtaining symmetrical components and symmetrical impedances, Examination of unbalanced faults with symmetrical components, Examination of unbalanced faults with symmetrical components Power Systems Analysis.

MOTOR DRIVING APPLICATIONS

Course Code:1202806

Theory Hours / Practice Hours: 3/0

ECTS: 4

What is Inverter? Power and motor connection of inverter, To program inverter on parameter unit, To program inverter on parameter unit, To program inverter on Mitsubishi PLC 1, To program inverter on Mitsubishi PLC 2, Inverter-PLC-HMI application example, What is servo? PLC and Motion Controller connection, JOG and position control of Mitsubishi servo motors, Synchronous control of Mitsubishi servo motors, Interpolation control of two servo motors, Mitsubishi servo motor Torque control, To control servo and inverter via potentiometer, Introduction to Robot arm, power connection, input/output, manually control by teaching box, To control the robot via software.

ANTENNAS AND PROPAGATION

Course Code:1202812

Theory Hours / Practice Hours: 3/0

ECTS: 4

Antenna Definition and Antenna Types, Radiation Generation, Current Distribution in Thin Wire Antenna, Basic Antenna Parameters, Radiation Pattern, Isotropic, Directional and Non-Directional Patterns, Radiation Power Density, Radiation Intensity, Directivity, Gain, Antenna Efficiency, Half-Power Beam Width, Beam Efficiency, Bandwidth, Polarization, Input Impedance, Radiation Resistance, Antenna Radiation Efficiency, Effective Length and Equivalent Areas, Maximum Directivity and Maximum Effective Area, Friis Transmission Equation and Radar Range Equation, Antenna Temperature, Radiation Integrals and Auxiliary Potential Functions, Vector Potentials of Electric and Magnetic Current Sources, Electric and Magnetic Fields of Electric and Magnetic Current Sources, Solution of Inhomogeneous Vector Potential Wave Equation, Far Field Radiation, Pairing and Reciprocity Theorems, Base Antennas, Infinitely Small Dipole Radiation, Power Density, Radiation Resistance, Near Field, Far Field and Midfield Regions Base Antennas, Infinitely Small Dipole Radiation, Power Density, Radiation Resistance, Near Field, Far Field and Interfield Zones, Small Dipole,

Segmentation (Far Field Region, Radiated Near Field and Reactive Near Field Regions), Finite Length Dipole, Half Wave Dipole, Vertical Antenna, Horizontal Wire in Free Space, Horizontal Wire Near Ground, Rhombic Antenna, Loop Antenna, Helical Antenna, Frequency Independent Antennas (Spiral Antenna and Log-Periodic Array), Antenna Arrays, Two Point Source, N Element Array and Radiation Pattern Drawings, Pattern Product, Typical Arrays (Yagi-Uda, Broadside, etc.), Array Scan (Phase Scan, Frequency Scan), Microwave Antennas, Horn Antennas, Parabolic Reflector, Slotted Antennas, Lenses, Electromagnetic Wave Propagation, Reflection, Refraction, Diffraction, Interference, Propagation Paths of EM Waves, Ground Waves, Space Waves, Skyl Waves.

OPTO ELECTRONIC

Course Code:1202814

Theory Hours / Practice Hours: 2/0

ECTS: 4

Light and spectrum as electromagnetic wave, Electromagnetic light Theories and propagation, Concepts of Electro-Optics, Acousto-Optics and Magneto-Optics, Optoelectronic communication systems, Optoelectronic Light sources and LEDs, Optoelectronic Light sources and Lasers, Structure and characteristics of fiber cables, Light transmission in fiber, multiple propagation, losses, Photodetectors, LDR, Photodiode and Phototransistors and their characteristics, Solar cell and its applications, Optocoupler Structure and characteristics, Optoelectronic security and alarm applications, Optoelectronic Design, Optoelectronic sensor applications.

ENGINEERING ECONOMICS

Course Code:1202816

Theory Hours / Practice Hours: 2/0

ECTS: 3

INTRODUCTION: Economic decision making in engineering, BASIC CONCEPTS: Basic concepts in engineering economics, the criterion in comparing alternatives, THE TIME VALUE OF MONEY: The cost of money and economic equivalence, DEVELOPMENT OF INTEREST FORMULAS: Simple and Compound interest rates; Instruction of the interest tables and compound-interest factors, EVALUATION OF INTEREST RATES: Nominal and Effective Interest Rates, CASH FLOW TRANSACTIONS: Equivalence Calculations in Single Cash Flow and Equal (Uniform) Series, Equivalence Calculations in Linear Gradient Series, METHODS FOR COMPARING INVESTMENT ALTERNATIVES: Present Worth Analysis, Future worth Analysis, Annual Equivalent Worth Analysis, Rate of Return Analysis, Profitability Index Method, Payback Period Analysis.

BUSINESS LAW AND ETHICS

Course Code:1202817

Theory Hours / Practice Hours: 2/0

ECTS: 4

The Notion of Labor Law-The Characteristic of Labor Law; The Resources of Labor Law, International Labor Law - Government Bodies with regard to Labor Law ; Labor Law's Sanctions - The Notion of Employee, The Notion of Employer and Sub-Contractor ,The Notion of representative of the employer - The Notion of Work Place, The Scope of Labor Law - The definition, Component and Characteristic of Labor Law - Introduction to Types of Labor Contract Continue to Types of Labor Contract, The Scope of Labor Law - The definition, Component and Characteristic of Labor Law - Introduction to Types of Labor Contract Continue to Types of Labor Contract, Introduction to Employer Obligation of Renumeration , Employer's Obligation of Renumeration, Introduction to Employer's Duty of Care to employees Employer's Duty of Care to Employee, Employer's Obligation of equal treatment to Employees and Other Obligations of Employer, The types of termination of the labor contract and Termination with notice Introduction to Job Security, Job Security (The termination procedure of Labor Contract, collective redundancy, the process of reinstatement lawsuit), the Results of Invalid Termination, anti-union dismissals, the process of Continue to Job Security (The Results of invalid Termination, Termination of Labor Contract with regard to freedom of unionization, the process of reinstatement lawsuit), The Contractual Limitation of termination with notice with regard to Employer, Introduction to Termination by rightful dismissal (Reasons of rightful dismissal by employer) Reasons for Rightful termination by employee, Rightful Termination, Introduction to Legal Consequences of Termination of Labor Contract Legal Consequences of Termination of Labor Contract, Working Hours , Rest Hours, Health and Safety at Work (Protection of Child Worker and Female Worker’s Sanctions of breach of health and safety regulations) - Employment and Agency Service, Compensations in Labor Law.

DIGITAL COMMUNICATION SYSTEMS

Course Code:1202818

Theory Hours / Practice Hours: 2/2

ECTS: 4

Introduction, Fourier analysis and probability review, sampling baseband signals, Bandpass signal sampling, pulse amplitude modulation (PAM), Pulse width modulation (PWM), pulse position modulation (PPM), Pulse code modulation (PCM), quantizing, Delta modulation (DM), adaptive DM, differential PCM, Baseband pulse transmission, matching filter, Inter-symbol interference (ISI), Nyquist criterion, Baseband M-ary PAM, equalization, Transmission through additive white Gaussian noise (AWGN) channel, Bandpass data transmission, Amplitude shift keying (ASK), frequency shift keying (FSK), Phase shift keying (PSK), differential PSK, Introduction to M-ary bandpass modulation, Introduction to multiplexing and multiple access techniques.

OUTDOOR LIGHTING

Course Code:1202826

Theory Hours / Practice Hours: 2/0

ECTS: 4

Outdoor lighting design principles, Types of armature and pole, Lamps and color temperature, Trees and plants lighting, Water lighting, Avenue and street lighting, Building surface lighting, Decorative lighting, Historical building lighting, Tunnel lighting, Automatic lighting systems, Outdoor lighting Works, Road lighting, Sample calculations, drawings.

WIRELESS COMMUNICATION SYSTEMS

Course Code:1202835

Theory Hours / Practice Hours: 3/0

ECTS: 4

Wireless Communication Systems, Basic Concepts, Mathematical Background (Probability Theory), Mathematical Background (Sampling Theorem), Information, Entropy, Data Compression, Channel Coding, Error Detection and Correction (Linear Block Codes), Performance of Digital Modulation Techniques in Noisy Channels, Channel Coding, Error Detection and Correction (Convolutional Codes), Path Loss, Shadowing, Fading and Channel Classifications, Performance of Digital Modulation Techniques in Fading Channels, MIMO Systems and Space-Time Coding, Cooperative Diversity, Multiple Access Techniques, FDMA, TDMA, CDMA, NOMA, GSM, Problem Solutions.

INTRODUCTION TO ARTIFICAL INTELLIGENCE

Course Code:1202845

Theory Hours / Practice Hours: 2/0

ECTS: 4

Artificial Intelligence history and philosophy, Basic concepts, Probabilities: Bayesian Classifiers, Similarities: Nearest-Neighbor Classifiers, Linear and Polynomial Classifiers, Artificial Neural Networks, Decision Trees, Performance Evaluation Criteria, Artificial Intelligence Applications.