

**KARADENİZ TECHNICAL UNIVERSITY, OF TECHNOLOGY OF FACULTY
ENERGY SYSTEMS ENGINEERING
CONTENTS OF THE COURSE**

1st year, fall semester

ESM 1003 MATHEMATICS-I (T:4, P:0, L:0, ECTS:5)

Contents of the Course: Functions, inverse functions, plotting the graphs of basic curves, transformation of graphs. Trigonometric functions, inverse trigonometric functions, logarithmic and exponential functions. Limit, rules of limit, continuity. Derivative of function, geometric meaning of derivative, rules of derivative, derivative of trigonometric functions, inverse trigonometric functions, logarithmic and exponential functions. Higher order derivative, chain rules, derivative of implicit functions, applications of derivative, concept of derivation. L' hospital rule, limit at infinity, Rolle Theorem and Mean Value Theorem, extrema of functions. Asymptotes, plotting graphs by observation of changes in functions. Indefinite integrals. Methods of integration, change of variable, integration by parts, integration of polynomials, algebraic and trigonometric (rational) functions. Riemann sums, definite integration and properties, fundamental theorem of analysis. Applications of definite integrals: areas of regions, length of curves, volumes of rotating objects, surface arease, calculation of mass, moment, gravitational center and work. Change of variables for definite integrals. Generalization of integration. Sequences, series, alternating series, power series, series expansion of functions (Taylor and Maclaurin series)

YDB 1001 ENGLISH-I (T:3, P:0, L:0, ECTS:3)

Contents of the Course: Reading passages and drills, listening practices and exercises, translation studies, writing an article about a subject and discussion on a specific subject.

AITB 1001 HISTORY OF REVOLUTION AND ATATURK'S PRINCIPLES-I (T:2, P:0, L:0, ECTS:2)

Contents of the Course: historical concepts, descriptions, descriptions of resources and methods, French Revolution and Industrial Revolution, Collapse of the Ottoman Empire, Tanzimat and Islahat Firman (order), I. and II. Constitutional Monarchy, Tripoli and Balkan Wars, I. World War, Mondros Truce, Wilson principles, Paris Conference, Atatürk, Samsun and Anatolia, Amasya Notice, National Congress, Opening the Mebusan Assembly, Foundation of Turkish National Assembly (TBMM), Internal rebellions, 1921 Organic Law, Foundation of the Army, I. İnönü, Sakarya, Kütahya, Eskişehir Wars and the Last Attack, Pacts during the Turkish War of Independence, Lozan Pact, Abrogate of Saltanate. Concepts, descriptions, descriptions of resources and methods in the History of Revolutions, French Revolution and Industrial Revolution, Collapse of Ottoman Empire, Tanzimat and Islahat Firman (order), I. and II. constitutional Monarchy, Tripoli and Balkan Wars, I. World War, the Armistice of Moudros Truce, Wilson Principles, Paris Conference, Atatürk, Samsun and Anatolia, Amasya Notice, National Congress, Opening of the Mebusan Assembly, Foundation of Turkish National Assembly (TBMM), Internal Rebellions, 1921 Organic Law, Foundation of the Army, I. İnönü, Sakarya, Kütahya, Eskişehir Wars and the Last Attack, Pacts during the Turkish War of Independence, Lozan Pact, Abolishment of Sultanate

TDB 1001 TURKISH LANGUAGE-I (T:2, P:0, L:0, ECTS:2)

Contents of the Course: Language and languages; (Language-Nation Relations, Language-Culture) Languages in the world and the place of Turkish language among other languages; (Language families in terms of their sources) Historical Development of Turkish written language: (Old Turkish- Middle Turkish-Divanü Lügati't-Türk, Atabet'ül Hakayık, Harezmi Turkish). Old Turkey Turkish (Old Anatolian Turkish); The era new Turkish, Modern Turkish era, West (West eastern Turkish) Turkey's Turkish, East (North-eastern Turkish) Karatay Turkish Phonetics; (Sound and the formation of sound the harmony of vowel sounds), Fundamental sound Features in Turkish; (Feature's sound of Turkish, Spelling structure of Turkish, Sentence Emphasis). Morphology; (Words in terms of form, prefixes, suffixes, roots). Enumeration and words in respect to their functions; (Noun, pronouns, and adjectives) Verbs; (Shape and Tense supplements). Prepositions-Gerunds; (Derived from nouns-verbs). Meaning Science: Meaning in word, the frame of word meaning. Sentence Knowledge: (Kinds of Sentences). The analysis of sentences.

ESM 1005 PHYSICS-I (T:3, P:0, L:1, ECTS:5)

Contents of the Course: Vectors Motion in one dimension Motion in two-dimension Laws of Motion Circular Motion and Applications of Newton's Laws Work and Energy Potential Energy and Conservation of Energy Rotation of Rigid Bodies about a Fixed Axis Rolling Motion, Angular Momentum and Torque.



ESM 1007 BASIC CHEMISTRY (T:3, P:0, L:1, ECTS:5)

Contents of the Course: Substance: Elements, Compounds, Mixtures, renaming of the compounds, some basic reactions of some metals. Measurements and the Mole concept: units conversion, measure of uncertainty, accuracy and precision, chemical quantities, Determination of chemical formulas, solutions, acids and bases. Structure of the atom, the characteristic features of the light, atomic spectra, energy levels, atomic models, writing electron-configurations of many-electron atoms and ions, public properties of periodic table, chemical reactions, writing chemical reactions, balancing reactions, collapse, neutralization and redox reactions. stoichiometry of the reaction, mole-mole estimated, the estimated mass-to-mass, determining the volume of solution for reaction, limiting reagent and the yield of the reactions the theoretical and experimental, chemical bondings: Ionic Bonds, Covalent Bonds, Gases: Physical state, character of molecular gases, the laws of gases, gas mixtures, real gases.

ESM 1001 ENGINEERING DRAWING (T:2, P:2, L:0, ECTS:5)

Contents of the Course: The introduction of tools and equipments used in engineering drawing, standard paper folding, and line types. Geometric drawings and applications used in engineering drawing. Views of objects. Views and basic standard views. Types of views and views. Dimensioning of drawing. Sections and sectional views. Cross sections and surface finish. Tolerances. Dimensional tolerances and geometric tolerances. Perspective drawings. Drawings of screws and nuts and bolts. Drawings of the main mechanical and electrical components.

ESM 1009 INTRODUCTION TO ENERGY SYSTEM ENGINEERING (T:2, P:0, L:0, ECTS:3)

Contents of the Course: Orientation to the Department, University Policy, Definition of Engineering, Definition of Energy and Forms of Energy, Historical Development of Energy Technologies, Conservation of Energy, Energy Transformations, Energy Resources, Usage of Energy Resources in Turkey and in the World, Usage Areas of Energy Resources, Power Plants, Renewable and Non-renewable energy Resources, Electrical Delivery Technologies, Energy and Environment, Energy and Economy, Current Situation of Energy Technologies in Turkey and in the World.

1st year, spring semester**ESM 1000 MATHEMATICS II (T:4, P:0, L:0, ECTS:5)**

Contents of the Course: Matrices, determinants, eigenvalues and eigenvectors, inverse matrix. Systems of linear equations and solutions by reduction to echelon form and Crammer rule. Conic sections and quadratic equations, polar coordinates and plotting graphs, parameterization of curves on plane. Three dimensional space and Cartesian coordinates. Vectors on the plane and space. Dot, cross and scalar triple product. Lines and planes on three dimensional space. Cylinders, conics and sphere. Cylindrical and spherical coordinates. Vector valued functions, and curves on the space, curvature, torsion and TNB frame. Multi variable functions, limit, continuity and partial derivative. Chain rule, directional derivative, gradient, divergence, rotational and tangent planes. Ekstremum values and saddle points, Lagrange multipliers, Taylor and Maclaurin series. Double integration, areas, moment and gravitational center. Double integrals in polar coordinates. Triple integrals in cartesian coordinates. Mass, moment and gravitational center in three dimensional space. Triple integrals in cylindrical and spherical coordinates. Change of variables in multiple integrals. Line integrals, vector fields, work, flux. Green's theorem on plane. Areas of surface and surface integrals. Stokes theorem, divergence theorem and applications.

YDB 1004 ENGLISH-II (T:2, P:0, L:0, ECTS:2)

Contents of the Course: Reading texts related to the department; grammar activities; related vocabulary and translation between two languages; listening activities; discussions over the related current topics in the field.

AITB 1000 HISTORY OF REVOLUTION AND ATATURK'S PRINCIPLES- II (T:2, P:0, L:0, ECTS:2)

Contents of the Course: Concepts, descriptions, descriptions of resources and methods in the History of Revolutions, French Revolution and Industrial Revolution, Collapse of Ottoman Empire, Tanzimat and Islahat Firman (order) , I. and II. constitutional Monarchy, Tripoli and Balkan Wars, I. World War, the Armistice of Moudros Truce, Wilson Principles, Paris Conference, Atatürk, Samsun and Anatolia, Amasya Notice, National Congress, Opening of the Mebusan Assembly, Foundation of Turkish National Assembly (TBMM) , Internal Rebellions, 1921 Organic Law, Foundation of the Army, I. İnönü, Sakarya, Kütahya, Eskişehir Wars and the Last Attack, Pacts during the Turkish War of Independence, Lozan Pact, Abolishment of Sultanate



TDB 1000 TURKISH LANGUAGE- II (T:2, P:0, L:0, ECTS:2)

Contents of the Course: Punctuation and Composition (Punctuation Marks, Other Marks) marks of abbreviations, Spelling Rules (The spelling of capital letters, The writing of quotations, numbers, The Composition (the purpose of composition, method in) composition writing, planning, introduction, development and result in composition the features of telling (purity in telling, simplicity in telling, clarity and sincerity in telling, mistakes in telling (the use of synonymous words in the sentence) The use of synonymous words in the sentence, The misuse of phrases, Explanation, story, description, criticism, portrait, speaking, provingThe kinds of verbal telling, (daily and unprepared speaking- prepared speaking, debate, panel) The kinds of written telling (letters, telegraphs, celebrations, invitations, literary lettersJob letters, formal letters, petitions, reports, decisions, announcements, advertisementsTalkings, criticisms, memoires, travels, writings, interviews, surveys, Autobiographies, biographiesNovel- story-fabl- Theatre-tragedy -drama- secenery, poetry and its kinds

ESM 1004 PHYSICS-II (T:3, P:0, L:1, ECTS:5)

Contents of the Course: Electric Fields, Gauss's Law, Electric Potential, Capacitance and Dielectrics, Current and Resistance, Direct Current Circuits, Magnetic Fields, Sources of Magnetic Field, Farady's Law, Inductance, Alternating Current Circuits, Electromagnetic Waves.

ESM 1006 COMPUTER AIDED DRAWING (T:2, P:2, L:0, ECTS:5)

Contents of the Course: 1- To select CAD software running options via display and draw commands 2- To modify display and drawing adjustment and exit form CAD 3-To draw drawing by using basic drawing commands and to use coordinate systems 4-To draw technical drawing by using drawing coomands and to add text to drawings 5-To be able to use modify commands 6-To change drawing objects 7-To multiply drawing objects 8-To modify dimensioning format 9-To use dimensioning commands 10-To change dimensions, to add finish symbol and tolerance 11-To be able to do data transfer between 2D CAD softwares 12-To use file extensions for 2D data transfer processing 13-To select plotter, paper size using for printing

ESM 1002 MEASUREMENT TECHNIQUES (T:1, P:0, L:1, ECTS:4)

Contents of the Course: Mechanical and electrical measuring instruments

ESM 1008 COMPUTER PROGRAMMING (T:2, P:2, L:0, ECTS:5)

Contents of the Course: The origin of Python and the basic form of a Python program, variables, constant operators and expressions, program control statements, functions, arrays, pointers, data structures, input output with files

2st year, fall semester**ESM 2007 MECHANIC (T:4, P:0, L:0, ECTS:5)**

Contents of the Course: General Principles, Force Vectors, Equilibrium of a Particle, Force System Resultants, Equilibrium of a Rigid Body, Structural Analysis, Friction, Center of Gravity and Centroid, Moment of Inertia, Virtual Work

ESM 2017 DIFFERENTIAL EQUATIONS (T:4, P:0, L:0, ECTS:5)

Contents of the Course: Differential equations and basic concepts. Differential equations as mathematical model (Ordinary differential equations, order and degree of differential equations. Derivation of differential equations.) General, particular and singular solutions of the differential equations. Existence and uniqueness theorems. Separable, homogenous, exact differential equations and transforming to exact differential equation by using integrating factor. Linear differential equations, Bernoulli differential equation and applications of the first order differential equations (Population model, temperature problems, electrical circuit problems, chemical problems). General solution of nth order linear differential equations (linearly independent solutions, super position principle for the homogeneous equations, particular and general solutions). General solution of nth order constant coefficient homogenous differential equations. Solutions of the constant coefficient non-homogenous equations. (Undetermined coefficients, change of parameters). Initial Value Problems (IVP) and Boundary Value Problems (BVP) (Eigenvalues and eigenfunctions for boundary value problems. Physical applications, mechanical vibrations, electrical circuits). Variable coefficient homogenous and non-homogenous differential equations (Cauchy-Euler, Legendre differential equations). Power series solutions of differential equations around ordinary points. Laplace and inverse Laplace transformations. System of differential equations. Application of the Laplace transformation to system of differential equations.



ESM 2011 FUNDAMENTALS OF ELECTRICAL ENGINEERING (T:2, P:1, L:0, ECTS:4)

Contents of the Course: Circuit Concepts: Voltage-current relations. Circuit diagrams. Circuit Laws: Kirchoff's voltage law. Kirchoff's current Law. Energy and Electrical Power. Active circuits, passive circuits ve ideal circuits. Analysis methods: The branch current method. The mesh current method. The node method. State variable analysis. Energy storage elements: The capacitors and inductors. Thevenin ve Norton networks. Analysis methods in AC circuits: Average and effective values. Phasors. Impedance and Admittance. Phasor diagrams and resonance. Power in the time domain. Power in sinusoidal steady state. Average or real power. Reactive power. Complex power. Maximum power transfer. Three phase circuits.

ESM 2009 MATERIAL SCIENCE (T:2, P:1, L:0, ECTS:5)

Contents of the Course: Classification of materials. Calcium based binders: Gypsum, Lime, and Cement. Manufacture of Portland cement and its composition. Hydration of Portland cement and hydration products. Blended cements. Aggregates for concrete. Classification of aggregates and their physical and mechanical properties. Gradation of aggregates. Mixing water. Chemical admixtures. Mineral additives. Properties of fresh concrete. Tests carried out on fresh concrete. Properties of hardened concrete. Strength of concrete and factors affecting the strength of concrete. Deformation of concrete under axial loading. Creep and shrinkage of concrete. Durability of hardened concrete. Concrete mix proportioning and mix design trials.

YDI 2001 READING AND WRITING IN ENGLISH (T:2, P:0, L:0, ECTS:3)

Contents of the Course: 1.Target group of students to become much better readers and writers in the English language specific strategies and lesson plans to prepare a way to acquire skills and be able to present 2. The target student lesson plans while taking into consideration the needs of the masses to improve their English reading and writing skills to apply the best available techniques 3. prepared and / or served as a lesson plan, the teacher of the course and / or to develop on the feedback given by classmates 4. Various articles, lesson plans and make assessments orally and in writing on micro teaching and learning and to share the gains 5. Students will be able to give feedback to both his teaching and writing in order to advance the work and other students 6. Students need to prepare material considering and adapting skills to win

ESM 2013 ELECTRONIC-I (T:2, P:0, L:0, ECTS:4)

Contents of the Course: Semiconductor: p-type semiconductor, n-type semiconductor, the p-n junction. Diodes: The open-circuited p-n junction, the Volt-Ampere characteristic, the temperature dependence of the V/ I characteristic, diode resistance, diode capacitance, breakdown diodes, the load-line concept, linear diode model, diode switching times, a breakdown-diode voltage regulator, clipping circuits, rectifiers, other diode circuits, capacitor filters, small-signal analysis. BJT : The junction transistor, transistor construction , the Common-Base (CB), the Common-Emitter (CE), the Common-Collector (CC) configurations, on, cutoff, saturation regions, transistor ratings , transistor switching times , the operating point of a BJT, bias stability, self-bias or emitter bias, stabilization against variations in I_{CO} , V_{BE} , and β . JFET : The junction field-effect transistor, the Volt-Ampere characteristic , the enhancement MOSFET, the depletion MOSFET, MOSFET inverter, MOSFET logic gates, complementary MOSFET, the operating point of a JFET.

ESM 2001 ELECTRICAL AND ELECTRONICS CIRCUIT DESIGN (T:2, P:0, L:0, ECTS:4)

Contents of the Course: The general concept of using computer programs for forming and designing electronic circuits. Installation of the program. Moving, connecting and appointing a value to electronic elements. Basic elements, independent and dependent sources, coils, magnetic core, switches, diodes and transistors. The properties of simulated model for each electronic device and their cascade usage. Forming half wave and full wave rectifiers. Analyzing a circuit via the CAD program. The properties of the measurement devices that are supplied by the CAD program. Measurement of current and voltage in series or parallel branches with ammeter and voltmeter. Usage of the oscilloscope and its properties. Design an electronic circuit with requested properties. Printing the designed circuit to paper via printer.

ESM 2023 THERMOCHEMISTRY (T:2, P:0, L:0, ECTS:4)

Contents of the Course: The first law of thermodynamics, Enthalpy, entropy change with temperature, Work and heat, the reaction in the heat exchange business expansion, the enthalpy and internal energy relationship

ESM 2029 FOLK DANCES (T:2, P:0, L:0, AKTS:4)

Contents of the Course: To learn about Turkish folk dances, Recognition and learning, of the Karadeniz folk dance repertoire, application and development of staging projects

ESM 2021 BASIC INFORMATION TECHNOLOGIES (T:2, P:0, L:0, ACTS:4)

Contents of the Course: Basic elements of the computer system, Operating system management, Word processing software, Spreadsheet software and drawing graphics, Presentation software, Using internet services and internet security.

2st year, spring semester

ESM 2020 ENGINEERING THERMODYNAMICS (T:3, P:1, L:0, ECTS:5)

Contents of the Course: Basic concepts and definitions. Pure substance and property of a pure substance. Ideal gas and state equation for an ideal gas. The first law of thermodynamics. First law of Thermodynamics: Closed systems. First law of Thermodynamics: Open systems. The second law of thermodynamics.

ESM 2018 ENGINEERING MATHEMATICS (T:3, P:0, L:0, ECTS:5)

Contents of the Course: Fourier series and convergence of general Fourier series. Fourier sinus and cosinus series, solution of differential equations with Fourier series. Introduction to first and second order partial differential equations. Solutions of heat and wave equation using separation of variables and Laplace transformation. Sturm-Liouville problems and eigenfunction expansions. Introduction to complex numbers and properties. Concept of complex functions. Conformal mapping. Limit, continuity and derivative in complex functions. Integration of complex functions. Cauchy integration theorems and applications. Cauchy derivative theorems and applications. Taylor and Laurent series. Residue Theorem and application to calculation of real integrals.

ESM 2028 CIRCUIT ANALYSIS-I (T:2, P:1, L:0, ECTS:5)

Contents of the Course: Classification of the circuits. Circuit analysis in t-domain: The branch current method. The mesh current method. The node method. Amplifiers and Operational amplifier circuits: Amplifier model. Feedback in Amplifier circuits. Operational amplifier. Analysis of circuits containing ideal op-amps. Inverting circuit. Summing circuit. Noninverting circuit. Integrator and differentiator circuits. State variable analysis: Introduction to state variables. Circuit state equations for linear and time invariant systems. Circuit state equations for nonlinear, linear and time variant systems. The Solutions of State Equations in s domain and t domain. Natural response. Forced response. Complete response. The state-transition matrix. Transfer-function matrix. Analysis of the stability.

ESM 2006 NUMERICAL METHODS IN ENGINEERING (T:2, P:1, L:0, ECTS:4)

Contents of the Course: Mathematical modeling concept, approximations and errors. Roots of equations. Systems of algebraic equations. Curve fitting. Numerical differentiation and numerical integration. Solution of ODE's. Boundary-value problems. Introduction to MATLAB programming. Application of the numerical methods using MATLAB programming language.

ESM 2000 GENERAL AND TECHNICAL COMMUNICATIONS (T:2, P:0, L:0, ECTS:4)

Contents of the Course: 1 Self-confidence increases 2 distinguishes communication techniques 3 Reporting and presentation techniques from selects the most appropriate 4 Have knowledge about organizational communication

ESM 2026 EFFECTIVE PRESENTATION TECHNIQUES (T:2, P:0, L:0, ECTS:4)

Contents of the Course: The importance of presentation, presentation planning, presentation excitement, presentation process, nice and effectual speaking, answering the questions, the use of visual material, the use of support materials

ESM 2004 PERSONAL DEVELOPMENT AND ITS CONTROL (T:2, P:0, L:0, ACTS:4)

Contents of the Course: Class content, objective, expectations, aim of education, duty of the teacher, definition of learning, behaviors of self limiting people, behaviors of normal and no limit people, effective communication rules, energy levels of our behaviors (low/high), goal setting (planning the future), time management, setting priorities (20/80 rule), Differentiating yourself, nose difference, being valuable/important, leader/manager, love, trust, responsible, discipline, smart engineer, intellectual person, Ethics, Scientific thinking, rationalism, Importance of love and health, content/ enlightened person, Student presentations Self help topics.

ESM 2014 ENTREPRENEURSHIP (T:2, P:0, L:0, ECTS:4)

Contents of the Course: Entrepreneurship and entrepreneur concepts * Historical development of entrepreneurship * Entrepreneurship and economic development * Entrepreneurship criterion * Entrepreneurship, conditions and principles of starting a business * Features and abilities of an entrepreneur * Creativity and innovation in



entrepreneurship * The process and steps of decision-making in entrepreneurship * Financial institution and sources in entrepreneurship * Advantages and disadvantages of entrepreneurship * Factors affecting entrepreneurship * Entrepreneurship, legal procedure and incentives in Turkey * Agricultural entrepreneurship practises in the world * Opportunities and areas for agricultural entrepreneurship in Turkey

ESM 2002 RESEARCH METHODS AND TECHNIQUES (T:2, P:0, L:0, ECTS:4)

Contents of the Course: Science and Scientific Knowledge Aims and Types of Scientific Research Planning of the research research methods Experimental Research Methods Field Investigations Introductory Investigations. Statistical Investigations Data Types and Data Collection Methods. Preparation of Survey Forms. Organizing and Analyzing the Data WRITING REPORT Parts of the Study Source and Footnote Rules Text Transfers Table Shapes and Graphics Effective Writing and Writing Rules Punctuation Adjunct Writing Required

YDI 2004 PROFESSIONAL ENGLISH (T:2, P:0, L:0, ECTS:4)

Contents of the Course: 1 Establishing fast communication in the English language, to establish high-level dialogue 2 professional writing in the English language to write, to read, to examine 3 to examine academic articles in English 4 Engineers and case studies to be dominated by between companies 5 Project filing system to keep track of the English language in the international arena

YDI 2008 ENGLISH SPEAKING (T:2, P:0, L:0, ECTS:4)

Contents of the Course: 1 Learn to communicate in a foreign language in a professional manner. 2 Self developed to express a foreign language. 3 Conversation start and learn to maintain. 4 Learns to discuss mutual ideas within the group. 5 Passes on the information that they know a foreign language at the theoretical level applications.

YDI 2006 WRITING INTENT LETTER AND CV IN ENGLISH (T:2, P:0, L:0, ACTS:4)

Contents of the Course: 1.English structural properties used in business 2 Grammar information 3 foreign literature related to professional area 4 version of the CV form 5 Letter of Intent to express in their own words

ESM2030 RD AND TECHNOLOGY MANAGEMENT (T:2, P:0, L:0, ECTS:4)

Contents of the Course: The knowledge and skills that engineers will need to design, develop and manage products and processes in advanced technology-based organizations and R & D centers.

3st year, fall semester

ESM 3025 FLUID MECHANICS (T:3, P:0, L:0, ECTS:4)

Contents of the Course: The concept of a fluid, thermodynamic properties of fluids. Pressure distribution in a fluid. Integral relations for a control volume. Differential relations for a fluid particle. Dimensional analysis and similarity. Viscous flow in ducts.

ESM 3015 HEAT AND MASS TRANSFER (T:2, P:1, L:0, ECTS:4)

Contents of the Course: Conduction principles and computational conduction. Convection. External and internal convection applications. Heat exchangers. Condensation and evaporation. Foundations of radiation. Enclosure radiation.

ESM 3017 INTERNAL COMBUSTION ENGINES (T:2, P:1, L:0, ECTS:4)

Contents of the Course: General information about the engines. Engine dynamics. General characteristics and comparison of thermal machines. Fundamental concepts in internal combustion engines. The structure and main elements of the internal combustion engine. Operation of engines and indicator diagrams. Engine thermodynamics.

ESM 3011 RENEWABLE ENERGY SOURCES (T:2, P:1, L:0, ECTS:4)

Contents of the Course: Classification of conventional energy sources and renewable energy sources. General comparison of conventional energy sources with renewable energy sources. General knowledge about solar energy and solar power systems. Knowledge about wind energy and wind energy conversion systems (wind turbines) and theoretical determination of performance of wind turbines, applying momentum theory. Hydraulic energy and power generation systems for hydraulic sources. Knowledge about the formation of geothermal energy or geothermal cells and power generation from these sources. Prediction methods of the amount of heat obtainable from any geothermal source. Wave energy and wave energy conversion systems



ESM 3013 ELECTRIC MACHINES-I (T:2, P:1, L:0, ECTS:4)

Contents of the Course: Introduction. Basic concepts and definitions. Induction Machines.

ESM 3003 STATISTICAL METHODS IN ENGINEERING (T:2, P:1, L:0, ECTS:4)

Contents of the Course: Introduction. Frequency Analysis. Probability. Important Probability Distributions. Sampling Distributions. Statistical Hypothesis Tests. Regression Analysis.

ESM 3027 ENVIRONMENT AND ENERGY (T:2, P:0, L:0, ECTS:4)

Contents of the Course: Orientation to the Department, University Policy, Definition of Engineering, Definition of Energy and Forms of Energy, Historical Development of Energy Technologies, Conservation of Energy, Energy Transformations, Energy Resources, Usage of Energy Resources in Turkey and in the World, Usage Areas of Energy Resources, Power Plants, Renewable and Non-renewable energy Resources, Electrical Delivery Technologies, Energy and Environment, Energy and Economy, Current Situation of Energy Technologies in Turkey and in the World.

ESM 3029 ENVIRONMENTAL PROBLEMS (T:2, P:0, L:0, ECTS:4)

Contents of the Course: Conceptual framework: Urban, urbanization and urbanization policies Urbanization and urbanization in history Urban, Urbanization and Urban Planning in Different Systems Urbanization Process and Urbanization Policies in Turkey Urban Planning Urban Theories Regional Development and Regional Planning Housing and Housing Policy in Turkey Gecekondu, Gecekondu Problem and Policy in Turkey The Importance of Urban Land and Urban Planning Environment, Environmental Problems and Policy Environmental Policies in Turkey

ESM 3031 PROGRAMMABLE LOGIC CONTROLLER (T:2, P:0, L:0, ECTS:4)

Contents of the Course: Introduction to programmable logic controllers, basic units of PLCs, logical operations, ladder diagram commands and programming with ladder diagram, set-reset commands, timers-counters in PLCs, comparison commands, design automation systems using PLC.

ESM 3039 ELECTRICAL AND ELECTRONICS CIRCUIT DESIGN (T:2, P:0, L:0, ECTS:4)

Contents of the Course: The general concept of using computer programs for forming and designing electronic circuits. Installation of the program. Moving, connecting and appointing a value to electronic elements. Basic elements, independent and dependent sources, coils, magnetic core, switches, diodes and transistors. The properties of simulated model for each electronic device and their cascade usage. Forming half wave and full wave rectifiers. Analyzing a circuit via the CAD program. The properties of the measurement devices that are supplied by the CAD program. Measurement of current and voltage in series or parallel branches with ammeter and voltmeter. Usage of the oscilloscope and its properties. Design a electronic circuit with requested properties. Printing the designed circuit to paper via printer.

3st year, spring semester**ESM 3004 SYNCHRONOUS MACHINE (T:2, P:1, L:0, ECTS:4)**

Contents of the Course: Introduction to Synchronous Machine (SM), Construction of SM, Armature Reaction on SM, Equivalent circuit of SM, Vector Diagram of SM, Moment in SM, Characteristics in Synchronous Generator, Parallel Connections of Synchronous Generators, Power Setting in Synchronous Generators, Starting Synchronous Motor, Power Balance in Synchronous Machine and Experiments.

ESM 3018 ENERGY TRANSMISSION LINES (T:2, P:1, L:0, ECTS:4)

Contents of the Course: Production, transmission and distribution facilities. Conductors and isolators. Poles and choice. Separators, cutters. Bar and bara systems. Power Transformer and Distribution Transformers.

ESM 3032 HYDROELECTRIC POWER PLANT (T:2, P:1, L:0, ECTS:5)

Contents of the Course: Water intake structure, transmission channel, penstock, forebay, turbine, switchyard, energy.

ESM 3026 CONTROL SYSTEMS-I (T:3, P:0, L:0, ECTS:4)

Contents of the Course: Fundamentals of the control systems, Types of control systems (Open and closed loop systems), Systems modelling and transfer functions, Mechanical, Electromechanic and electrical systems modelling Modelling systems with block diagrams and signal flow graphs Control systems analysis in time-domain Control systems analysis in frequency-domain Various type controller design process.

ESM 3028 FUELS and COMBUSTION (T:3, P:0, L:0, ECTS:4)

Contents of the Course: Basic concepts of fuels and combustion. Physical and chemical properties of commonly used solid, liquid and gaseous fuels. Combustion stoichiometry and thermodynamics.

ESM 3034 POWER ELECTRONICS CIRCUITS (T:3, P:0, L:0, ECTS:4)

Contents of the Course: Definition of power electronics, history of power electronics, power semiconductor switches, Diodes, Thyristors, Transistors, Half and full wave diode rectifiers and applications, Half and full wave controlled rectifiers and applications, Three phase controlled rectifiers. DC-DC converters. Inverters and their applications.

ESM 3038 HEATING, VENTILATING AND AIR CONDITIONING (T:3, P:0, L:0, ECTS:4)

Contents of the Course: Thermal comfort, classification, fundamentals of the heating system design. Heat and humid air transfer in building elements. Thermal insulation rules for buildings, Turkish Standard 825, control of condensation. Heating load calculations in buildings, Turkish Standard 2164. Heaters, pipe heaters, convectors, radiators, radiation heaters. Pipe diameter calculation for hot water heating systems, diameter calculation in natural circulation and pumping heating systems. Selection of boiler and other equipments. Ventilation. Psychrometric processes.

ESM 3044 NUCLEAR ENERGY (T:3, P:0, L:0, ECTS:4)

Contents of the Course: Basic concepts and atomic properties. Nuclear disruption and radioactivity: Radioactive decay, alpha decay, beta decay, gamma decay. Nuclear reactions: Neutron physics, Nuclear fusion, nuclear fusion. Particle accelerators. Flight reactors. Fusion reactors and basic elements. Design principles of reactors. Neutron-matter interaction and effect-section effects, Neutron flux distribution, Transport and diffusion theories. The comparative and validity areas of transport and diffusion theory.

4st year, fall semester

ESM 4001 BUSINESS PLACE APPLICATION (T:1, P:4, L:0, ECTS:20)

Contents of the Course: Practice-oriented studies in enterprises suitable for Energy Systems Engineering. Detailed daily reporting of the applications made.

ESM 4003 PROFESSIONAL TRAINING- II (T:0, P:2, L:0, ECTS:3)

Contents of the Course: The practical placement gives the student the opportunity to transform the theoretical knowledge obtained during the educational programme into the work environment and hence includes all kinds of work-related activities. Students are required to spend in any field related to the area of interest where they can practise their profession. The work carried out is compiled in a detailed manner on daily basis in the form of a report which is then approved by the chief staff in the place of work and then submitted to the academic staff responsible for the evaluation and grading of the internship reports.

ESM 4005 DESIGN PROJECT (T:0, P:3, L:0, ECTS:4)

Contents of the Course: Designing a project Application of Project.

ESM 4007 PROFESSIONAL EXPERIENCE- I (T:0, P:2, L:0, ECTS:3)

Contents of the Course: The practical placement gives the student the opportunity to transform the theoretical knowledge obtained during the educational programme into the work environment and hence includes all kinds of work-related activities. Students are required to spend in any field related to the area of interest where they can practise their profession. The work carried out is compiled in a detailed manner on daily basis in the form of a report which is then approved by the chief staff in the place of work and then submitted to the academic staff responsible for the evaluation and grading of the internship reports.

4st year, spring semester

ESM 4000 FINAL PROJECT (T:0, P:2, L:0, ECTS:6)

Contents of the Course: To teach students, who are about to graduate, how to conduct an individual research in their professional field and to gain a useful experience. Students must fulfill the requirements of this course by performing either an applied, experimental, or solely a literature survey-based research, about a subject proposed by his/her assigned adviser, and by reporting the results accordingly. Thus, students will learn how to perform an individual research and to present its results both written and orally.



ESM 4034 ENERGY LABORATORY (T:1, P:0, L:1, ECTS:2)

Contents of the Course: Energy experiments.

ESM 4036 ENERGY LEGISLATION (T:1, P:0, L:1, ECTS:2)

Contents of the Course: Legal rules regulating the energy sector, Energy Market Regulatory Authority (Turkish called EPDK) regulations, legislation on energy law, regulatory and supervisory activities in the field of energy, EPDK's duties and powers, sanctions, competition in the energy sector, Electricity Market Law, Natural Gas Market Law, the Petroleum Market Law, LPG Market Law, Renewable Energy Sources Law, Secondary legislation created by EPDK.

ESM 4024 NURAL GAS STATIONS (T:2, P:0, L:0, ECTS:4)

Contents of the Course: Basic for Natural gas, Gas installation systems, Projects and Calculations.

ESM 4010 COMBINED HEAT AND POWER PLANTS (T:2, P:0, L:0, ECTS:4)

Contents of the Course: Simple power cycles, Otto, Diesel, mixed Carnot, Sterling, Ericson, Brayton and Rankine cycles, methods to increase efficiency in power cycles, combined power cycle types and working principles, the introduction of energy and exergy efficiency expressions in combined power cycles.

ESM 4044 WIND AND SOLAR ENERGY SYSTEMS (T:2, P:0, L:0, ECTS:4)

Contents of the Course: A basic introduction to renewable energy systems, Introducing solar and wind energy sources, Solar energy systems: modeling, operational characteristics, production process, grid-on and grid-off photovoltaic systems, condensing photovoltaic systems. Wind energy systems: wind energy basics, wind farms, wind energy projects, grid-connected wind energy systems.

ESM 4052 FOSSIL ENERGY RESOURCES AND BIOFUELS (T:2, P:0, L:0, ECTS:4)

Contents of the Course: Input of fossil energy sources, petroleum and natural gas properties and methods of it's obtaining formation, ways to use oil and its derivatives, Coal, lignite, specifications, production techniques, and applications, herbal and other biological sources of energy, methane, methanol and ethanol production, conventional and non-conventional sources of fuel, alternative fuels, natural gas, liquid fuels.

ESM 4054 NATURAL GAS INSTALLATION (T:2, P:0, L:0, ECTS:4)

Contents of the Course: General features of natural gas, natural gas project information, natural gas line grounding rules, tranche dimensions, cathodic protection techniques, valves used in natural gas installation, boiler gas supply line, natural gas burners, indoor natural gas installation and outdoor natural gas installation, natural gas girth / consumption line, natural gas meters and natural gas safety rules, natural gas installation test rules, tools used in leak test.

ESM 4046 ENERGY EFFICIENCY AND MANAGEMENT (T:2, P:0, L:0, ECTS:4)

Contents of the Course: Energy sources, energy conversion and usage in Turkey, energy politics. Energy management and audit, monitoring and having a purpose, energy audit. Measurement apparatus and measuring techniques. Energy and mass balance, Sankey diagrams, calculation of energy and mass balance, sample of application. Heat transfer and insulation. Optimum thickness of thermal insulation, thickness calculation regarding heat transfer, thickness calculation regarding cost. Heat recovery. Economic analysis methods, general definitions, project evaluation methods, sample problems.

ESM 4058 POWER SYSTEM ANALYSIS (T:3, P:0, L:0, ECTS:4)

Contents of the Course: Introduction to electric power system and basic elements, Three phase systems and the structure of interconnection networks, Current-voltage-power-energy relations in power systems, Per-unit system Iterative problem solving techniques Introducing the package program Power flow analysis.

ESM 4014 OCCUPATIONAL HEALTH AND SAFETY (T:2, P:0, L:0, ECTS:4)

Contents of the Course: Principles of occupational health and safety practice, Risk prevention culture in the workplace, Importance of safety culture and place in daily life, Establishment and continuation of security culture, The purpose, structure of JHSU (joint health and safety unit) The qualifications, assignments, authorizations and responsibilities of occupational safety specialists and workplace physicians are taught.



Prof. Dr. İsmail POLAT
Head of Department

