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FIRST YEAR

I. SEMESTER

MATH113 Mathematics-I

Functions and Their Graphs, CombiJring Functions; Shifting and Scaling Graphs, Trigonometric Functions. Rates of Change and Tangents to Curves, Limit of a Function and Limit Laws, The Precise Definition of a Limit, One-Sided Limits, Continuity, Limits Involving Infinity; Asymptotes of Graphs. Tangents and the Derivative at a Point, The Derivative as a Function, Differentiation Rules, The Derivative as a Rate of Change, Derivatives of Trigonometric Functions, The Chain Rule, Implicit Differentiation, Related Rates, Linearization and Differentials. Extreme Values of Functions, The Mean Value Theorem, Monotonic Functions and the First Derivative Test, Concavity and Curve Sketching, Applied Optimization, Antiderivatives. Area and Estimating with Finite Sums, Sigma Notation and Limits of Finite Sums, The Definite Integral, The Fundamental Theorem of Calculus, Indefinite Integrals and the Substitution Method, Substitution and Area Between Curves, Volumes Using Cross-Sections, Volumes Using Cylindrical Shells, Arc Length, Areas of Surfaces of Revolution. Inverse Functions and Their Derivatives, Natural Logarithms, Exponential Functions, Indeterminate Forms and L'Hopitai's Rule, Inverse Trigonometric Functions, Hyperbolic Functions.

CHM101 Chemistry

The importance of chemistry in Electrical and Electronics Engineering, Material and Chemistry, Fundamental Laws of Chemistry, Atom and molecular weight, mole, Avogadro Number, Chemical Calculations, Symbols, Formulas and Equations, Solids, Chemical Thermodynamics, Reaction Velocity and Balance, Balance in Aqueous Solutions, Electrochemistry and Corrosion, Periodic Table and the structure of the atom, Chemical Bonds, Redox Reactions

PHYS113 Physics-I

Vectors. Kinematics. Newton’s Law of Motion. Work and energy. Conservation of energy. Linear momentum and its conservation. Rotation of rigid bodies about a fixed axis. Rotational kinetic energy

ENER101 Introduction to Energy Systems Engineering

Definition of Energy Systems Engineering, Primary Energy, Secondary Energy, Basic Thermodynamics, Energy Production, Convertion Types and Principles, Introduction of Energy Politics And Economics, Introduction of Energy Efficiency.

Foreign Language Elective

II. SEMESTER

MATH114 Mathematics-II

Integration by Parts, Trigonometric Integrals, Trigonometric Substitotions, Integration of Rational Functions by Partial Fractions, Improper Integrals. Sequences, Infinite Series, The Integral Test, Comparison Tests, The Ratio and Root Tests, Alternating Series, Absolute and Conditional Convergence, Power Series, Taylor and Maclaurin Series, Convergence of Taylor Series. Three-Dimensional Coordinate Systems, Vectors, The Dot Product, The Cross Product, Lines and Planes in Space, Cylinders and Quadric Surfaces. Functions of Several Variables, Limits and Continuity in Higher Dimensions, Partial Derivatives, The Chain Rule, Directional Derivatives and Gradient Vectors, Tangent Planes and Differentials, Extreme Values and Saddle Points, Lagrange Multipliers. Double and Iterated Integrals over Rectangles, Double Integrals over General Regions, Area by Double Integration, Double Integrals in Polar Form, Triple Integrals in Rectangular Coordinates, Triple Integrals in Cylindrical and Spherical Coordinates, Substitutions in Multiple Integrals.

PHYS114 Physics-II

Charge and matter. The electric field. Gauss' Law. Electrostatic potential. Capacitance. Current and resistance. Electromotive force and circuits. RC circuits. The magnetic field. Ampéré's law. Faraday's Law of Inductance.

ENER102 Chemistry of Fuels

Basic organic chemistry, the formation, composition and properties of the principal naturally occurring fossil hydrocarbons (coal, petroleum, natural gas), and their refining, upgrading, and conversion chemistry. The objectives of this course are to equip students with a fundamental knowledge of the chemistry for the fossil hydrocarbon resources and their energy use for transportation and stationary fuels as well as their use as chemical feed stocks.

Foreign Language Elective

University Elective

SECOND YEAR

III. SEMESTER

MATH215 Mathematics-III

Systems of linear equations; Solution sets of linear equations; Linear dependence and independence; Matrix Algebra; Inverse of a matrix and its characterization; Partitioned matrices; Determinants and their properties: Calculation of determinants; Column and row expansions; Minor and cofactors and inverse matrix; Cramer's rule; Vector spaces:Subspaces, null spaces and column spaces (Image); Basis and coordinate transformations; Linear transformations and their representations; Representation of coordinate transformation; Eigenvalues and eigenvectors :

Characteristic polynomial and Cayley-Hamilton Theorem; Diagonalization of linear transformations and matrices; Matrix polynomials; Diagonalizaton of symmetric matrices and projections; Generalized eigenvectors and eigenspaces; Inner product spaces : Orthonormal sets, Gram-Scmidt process; Singular value decomposition; Pseudo inverse; Least squares

ENER201 Energy Systems

Material balances in processes and operations. Single-phase and multiphase systems. The P-V-T characteristics of gases and vapor-gas mixtures. Energy balances in processes and operations. Simultaneous solution of material and energy balances.

ME231 Engineering Mechanics

The first half of this course is devoted to drafting by hand and the second half is devoted to using CAD(Computer Aided Design). Instrumental drawing, multiview projections, sectional views, auxiliary and oblique views, dimensioning and tolerancing, 3D sketching (include extruding, protrusions, revolving etc.).

Program Elective / Faculty Elective

EEE201 Circuit Analysis

Physical electrical circuits. Modeling and measurements of currents and voltages in physical circuits. Definitions of charge, flux, power and energy and modeling their waveforms. Kirchoff's Laws: current and voltage equations. Independent sets of current and voltage equations. Ideal 2-terminal and multi-terminal circuit elements: linear and nonlinear resistors, inductors and capacitors. Modeling of physical elements. Small signal analysis. Solution of resistive circuits: node voltage and mesh current methods. Network theorems. Solution of dynamic circuits: responses of first and second order dynamic circuits.

ENER253 Energy Laws and Regulation

Regulation of the generation and transmission of electricity and natural gas; which laws and regulations apply; how energy regulation is tied to energy technology and economics and what the main issues are that energy law practitioners currently face.

University Elective

IV. SEMESTER

MATH216 Differential Equations

Introduction and Classification of Differential Equations; First Order Differential Equations: Solution of Separable and Linear Differential Equations; Substitution Methods and Exact Differential Equations; Order reduction; Higher Order Differential. Equations:

Linear, homogeneous Equations with Constant Coefficients; Nonhomogeneous Equations and Method of Undetermined Coefficients; Method of Variation of Parameters; Laplace Transform:

Solution of initial value problems; Linear Systems of Differential Equations; Homogeneous Differential equations in R2; Solution via eigenvalues and eigenvectors; Homogeneous Differential equations in R3; Matrix exponential and Fundamental matrix solution; Solution of Nonhomogeneous Equations; Laplace transform methods; Power Series Method: Series Solution Near Ordinary Points; Regular Singular Points; Method of Frobenius

ENER202 Thermodnamics

Introduction to thermodynamics, ideal gasses, internal energy, enthalpy, energy transfer by work, heat and mass, the first and second laws of thermodynamics, refrigerators and heat pumps, Carnot cycle, entropy, reversibility.

ECO152 Economics

Definition of Economics. Basic Concepts of Economics. Introduction to Price Theory. Demand Function. Supply Function. Market Types. Conceptual descriptions about Manegerial Economics. Rationality principles in the enterprises. Establishment of businesses and establishment place selection. Establishment analyses and planning techniques in the business organizations.

MATH265 Probability & Statistics I

Set Theory, Random Variable, Sample Space, Important Theorems on Probability, Conditional Probability, Bayes' Theorem, Tree Diagrams, Permutations, Combinations, Binomial Coefficients, Stirlings Approximation,Discrete and Continuous Probability Distributions, Mathematical Expectation,Variance and Standard Deviation, Joint Distributions, Normal , Binomial, Poisson, Multinomial, Hypergeometric etc. Distributions

Program Elective / Faculty Elective

Faculty Elective

EEE224 Electromagnetic Theory

Basic axioms, electric charge, Coulomb's Law, electrostatic field in free space, electrostatic energy, surface charges and Dirac distribution, dipoles, electrostatic field in a material medium. Constitutive equations and boundary conditions, Lorentz Force and magneto static field in free space, Biot-Savart's Law, Ampere's low, magneto static field in a material medium, magnetic energy, magnetic dipoles and permanent magnets, Maxwell's equations and electromagnetic fields, Faraday's induction, self and mutual inductance, electromagnetic energy, potential functions, special theory of relativity.

Program Elective

ENER254 Energy Policy

Introduction to the geopolitics of energy, the course focuses on political, economic, strategic implications of current trends in energy markets. It will also take into account the relationship between energy and environment and alternative sources of energy in the context of the EU energy policy and the Turkish market.

THIRD YEAR

V. SEMESTER

EEE301 Electromechanical Energy Conversion

Introduction to machinery principles, The magnetic field, Faraday's law - induced voltage from a time-changing magnetic field, Production of induced force on a wire, Induced voltage on a conductor moving in a magnetic field, Transformers, Why transformers are important to modern life?, Types and construction of transformers, The ideal transformer, Theory of operation of real single-phase transformer, The equivalent circuit of a transformer, The per-unit system of measurements, Transformer voltage regulation and efficiency, Transformer taps and voltage regulation, The autotransformer, Three-phase transformers, Transformers ratings and related problems, Instrument Transformers, Introduction to three-phase induction motors, Basic induction motor concepts, The equivalent circuit of an induction motor, Power and torque in induction motor, Induction motor torque-speed characteristics, Variations in induction motor torque-speed characteristics, Determining circuit model parameters, Synchronous generator construction, The speed of rotation of a synchronous generator, The internal generated voltage of a synchronous generator, The equivalent circuit of a synchronous generator, The phasor diagram of a synchronous generator, Power and torque in synchronous generators, Measuring synchronous generator model parameters, The synchronous generator operating alone, Terminal characteristics of synchronous generators, Parallel operation of synchronous generators, Synchronous generator ratings, Introduction to synchronous motors, Synchronous motor vs. synchronous generator, Steady-state operation of motor, Starting synchronous motors, Relationships between synchronous generators and motors, The linear dc machine - a simple example, The simplest DC machine, Commutation in a simple 4-loop DC machine, Power flow and losses in DC machines, The power-flow diagram, Equivalent circuit of a DC motor, Magnetization curve of a DC machine, Motor types: Separately excited, shunt DC motors and the permanent-magnet DC motor, DC motor efficiency calculations.

EEE303 Control Systems

Elements of control systems; block-diagram representations; open-loop & closed-loop systems; principles and applications of feed-back. LTI systems : time domain and frequency domain analysis. Stability : Routh Hurwitz criterion, root-locus, Nyquist's criterion. Bode-plots, Design of lead-lag compensators; Proportional, PI, PID controllers. DC servo motor – Typical application of control system in industry.

ME307 Fluid Mechanics I

Hydrostatics, kinematics of flow, continuity equation, Euler’s and Bernoulli’s equations, viscous flow equations, head loss in ducts and piping systems, momentum theorems, dimensional analysis and similitude, potential flow, circulation and vorticity.

ME203 Engineering Materials

Classification of materials. Atomic structure and interatomic bonding. The structure of crystalline solids. Crystalline and noncrystalline materials. Imperfections in solids. Mechanical properties of materials. Phase diagrams and phase transformations. Metal alloys. Structure and properties of ceramics, polymers and composites. Electrical, magnetic, thermal and optical properties of materials. Performance of materials in service.

Program Elective

ENER351 Fundamentals of Renewable Energy

This course discusses the scientific challenges of alternative energy generation, storage, and efficient use. It will cover photovoltaic and solar power in depth, with additional coverage of fuel cells, hydrogen, energy storage, wind power, modern nuclear power, thermoelectric, geothermal, and more. Upon completion of this course, students should be able to analyze important devices and predict the power output under various conditions, compare their strengths and weaknesses, plan a sustainable power grid, and describe the technical, economic, and political challenges to making each of these alternative energies successful.

ENER353 Green Engineering & Environmental Compliance

The primary objective of this course is to introduce students to how engineering and industrial decisions affect the environment and how clean technologies can reduce environmental impact. Students will also be exposed to global mass and energy flows from an environmental perspective that relate to both industrial and natural systems. Students will be exposed to environmental concepts, principles, and evaluation techniques within the framework of green engineering, pollution prevention, and environmental sustainability. The course is for students with a general science or engineering background.

By examining mass and energy flows on the unit operation, plant-wide, local and regional scale, students will understand the interaction of anthropogenic flows with natural cycles of materials and energy. Students will understand how environmental concerns and regulations provide the motivation and incentive behind reducing pollution during the design phase rather than as an "add-on" or "end of pipe" treatment technology. Students will evaluate plant flow sheets to identify engineering means by which to reduce plant-wide environmental impact.

VI. SEMESTER

ENER302 Heat and Mass Transfer

This course will emphasize the modes of heat and mass transport in energy engineering systems. Students will know, understand, and solve heat transfer problems that involve conduction, convection, and radiation. The course will provide an integrated treatment of heat, mass and momentum transfer by convection and mass transfer by diffusion. Students will also learn and use software that will enable them to solve problems that involve exploratory, what-if, and parameter sensitivity considerations. The course will also assist students to understand the design and operation of different types of heat exchangers. This course also enables students to identify and describe the energy transformations in energy systems. The examples of the processes we would be applying energy conservation principles to include power plant, geothermal energy systems, and industrial reactors and combustors.

ENER304 Introduction of Combustion

This course provides an introductory treatment of combustion science. The objectives of the course are to develop in the students an understanding of combustion kinetics, combustion thermo- chemistry, flame dynamics, flame stability, and pollutant formation. Coverage includes laminar and turbulent flames, premixed and diffusion flames, and detonations. Emphasis is placed on the role that kinetics, heat transfer, mass transfer, and fluid dynamics have on flame structure and flame stability. The course includes some laboratory demonstrations of flat flame and diffusion flame burners, and incorporates numerical calculations of thermodynamic and kinetic combustion phenomena. The course begins with a review of transport phenomena, physical gas dynamics, and thermo chemistry. Then, the concept of the laminar flame speed is introduced in the context of a one-dimensional flame and a propagating chemical wave. Issues of premixed flame structure and stability are presented along with a discussion of flammability limits. Next, laminar diffusion flames are presented via the Burke-Schumann analysis. From laminar flames, the emphasis shifts to turbulent premixed and diffusion flames, and the concepts of flame stretch and strain. Detonations are considered, with emphasis on thermodynamic analysis of the detonation and the structure of the detonation wave. Details of chemical kinetics for the hydrogen-oxygen and hydrocarbon-air reaction systems are presented, with linkage back to earlier topics such as flame stabilization and flammability limits. After kinetic phenomena, the course then considers pollutant formation focusing on soot and NOx. The fundamental aspects of combustion are applied to analysis of the combustion process and pollutant formation in international combustion engines and catalytic combustors. The course wraps up with discussion of atmospheric chemistry, the fate of pollutants, and the formation of secondary pollutants.

ENER306 Sustainable Energy & Environment

This course examines the principles of sustainability and renewable energy conversion with emphasis on wind, water, and geothermal energy resources and the associated environmental impacts. It will complement the existing courses on fossil fuels and new courses on other forms of renewable energy resources, including solar and biomass energy. Students will actively participate in learning through team projects, semester papers, class presentations, and field trips. Energy conservation methods will be emphasized. Students will be able to understand and analyze the technical and environmental aspects of wind, hydro, and geothermal energy.

Program Elective / Faculty Elective

Program Elective / Faculty Elective

Faculty Elective

EEE312 Power Electronics & Motion Control Systems

Introduction: Power semiconductors , power electronic circuits, types and operating principles of rectifiers, inverters, DC/DC converters and AC/AC converters. Nonsinusoidal waveforms and supply and load site harmonics and their elimination. Single and three phase uncontrolled rectifiers, fully controlled rectifiers and inversion mode of operation. DC/DC Converters : Buck, Boost, Buck-Boost converters. Switched Mode Power Supplies: flyback, forward, pushpull, half bridge and full bridge DC/DC converters. Single and three phase inverters and their PWM control, space vector control, multilevel inverters. AC/AC Conversion voltage control and UPS.

Introduction, various motion control applications and drive types, dc machine drives, brushless dc Machine control, stepping motors, their supply and control, switched reluctance machines. AC machine drive systems: induction motor control systems, vector control synchronous motor control systems. Motion control examples and applications.

EEE308 Fundamentals of Power Systems

Steady-state performance of overhead transmission lines and cables; principles of active and reactive power transfer and distribution; per-unit quantities; bus admittance and impedance matrices; load flow; voltage control and power factor correction; symmetrical components, analysis of symmetrical and unsymmetrical faults. Concept of system stability: swing curves and equal area criterion. Static VAR system. Basic concepts of HVDC transmission. Computer control and Automation : Introduction to energy control centers; various states of a power system. Active power control : Speed control of generators, tie-line control, frequency control.

Program Elective

ENER352 Hydrogen and Fuel Cell Systems

The primary objective of the course is to help students understand the fundamental principles of electrochemistry, the production and storage of hydrogen from biomass and fossil fuels, and the design and operation of different types of fuel cells. Students will begin with electrochemistry and electrochemical engineering systems including fuel cells. The chemical and biochemical methods used for producing hydrogen for fuel cells applications and the current technologies available for hydrogen storage will follow next. Students are expected to be able to apply their knowledge and understanding in the analysis of fuel cell systems. Students are also expected to be able to distinguish between the design, operation, and advantages and disadvantages of the different types of fuel cells available.

ENER354 Nuclear Energy

Introduction to nuclear energy, global and national energy requirements, radioactivity, radiation protection, and fission and fusion reactor concepts. Atomic and nuclear physics discoveries that have led to the development of nuclear engineering, atomic models, relativity, x-rays, types of nuclear reactors; problem solving techniques.

FOURTH YEAR

VII. SEMESTER

ENER405 Engieering Economics and Conservation

Principles and methods for analyzing the economic feasibility of technical alternatives leading to a decision or recommendation. This general education course provides students with necessary knowledge and information on the main operating principles of devices/appliances that are in common use and information on which to make the right decision in selecting the most energy efficient and economical choice. These devices are day-to-day appliances such as refrigerators, washers and dryers, ovens, etc., and home heating or cooling and transportation choices. The course also provides necessary information on heating furnaces, insulation, doors and windows, lighting, and air conditioning principles. The objective of the course is to expose students to energy efficiency in day to day life in order to save money and energy and thereby protect the environment. This education is very important for all college students to turn them into environmentally-responsible individuals of this Global Village.

ENER407 Energy Laboratory

The role of energy in society is increasingly important with increasing environmental constraints, transitioning energy policies, supply disruption, and international pressure on climate change compliance and competition for energy. Both conventional (fossil fuels) and renewable energy sources are being explored. This course will provide hands on laboratory exposure to the techniques, tools, and analytical methods used in addressing energy science and engineering problems. Students will be exposed to probability, statistical and experimental design methods. Students will perform a variety of lab experiments, analyze the data and write reports on each experiment. Statistical analysis of the data is required where applicable. For the final lab assignment, each student will be given a "mystery" hydrocarbon-based fuel and will be required to characterize or identify the unknown fuel using the practical knowledge of the instrumentation they have learned during the semester.

ENER409 Energy Efficiency

The importance of energy and energy efficiency, energy management, energy analysis by residential and industry, electrical appliances and lighting energy efficiency, energy efficiency applications

IE 365 OCCUPATIONAL HEALTH AND SAFETY

Worker health and safety of the historical development, general information, business security concept, work-related accidents definition, causes and methods of prevention, safety studies, labor productivity in terms of importance, job security studies economic significance, the occurrence of industrial accidents and classification, hazards and dangers varieties accident research methods and solutions.

ATA111 History of Turkish Revolution-I

This course covers the analysis of the causes and the consequences of the First World War; the searches for independence of the Turkish nation in Anatolia and salvation of the Turkish lands that were occupied after the Armistice of Montrose; the development and activities of Nationalist militias and the societies against them; the evaluation of the congress administrations that were formed after 19 May,1 919 in terms of their form and content; the structure of the

Grand National Assembly and the process through which it gained legitimacy; the leadership of Turkish War of Independence; Treaty of Lausanne, and the Establishment of the Republic.

TRD111 Turkish-I

What is language? Importance of language and its place in a nation's life, language-culture relationship. Definition of grammar, function of grammar and departments of grammar. Phonetics: sounds and audio features of Turkish. Morphology; formal properties of Turkish (roots-adds). Words and word phrases. General information about composition, subject, perspective, ideas, main and ancillary ideas, paragraphs, intellectual order. Written expression, paragraph, the content and types (entrance, development and conclusion paragraphs). Expression forms, explanatory, descriptive, argumentative, narrative expression. Written expression; petition writing, quoting, footnotes and bibliography writing. Oral expression; speech and speech types (prepared speeches, panel, and discussion policies). Literary types; artistic (poetry, short stories, novels, theater and intellectual (articles, paragraphs, essays, criticism, interviews…). Reading and studying the works that about literature and idea world. Analyzing an editing text (story, novel, theater).

BUS 220 – ENTREPRENEURSHIP

Principals of entrepreneurship, Strategic management for entrepreneurship, creativity, human resources management and communication for entrepreneurs, Business Planning, Entrepreneurship in Turkey / Success stories.

VIII. SEMESTER

EEE402 Graduation Project II

This is a compulsory project that each student should take a topic on energy and conduct a research under a supervisor and then prepare a thesis about this topic. Application type of projects are encouraged.

ENER408 Electrochemical Energy Conversion

The course will cover the fundamental principles of electrochemistry, including electrochemical thermodynamics, kinetics, catalysis, and corrosion. Students will be exposed to the application of these principles in fuel cells, batteries, and photovoltaics. Students will be able to perform efficiency analysis in these systems. They will also be able to understand the differences between types of fuel cells and distinguish between electrochemical and chemical energy systems. For each of the above application areas students will learn the criteria used to determine their performance, their current state of development, and their advantages/disadvantages.

ATA112 History of Turkish Revolution-II

Lausanne Peace Treaty resulting success that is being converted to a modern state via announcement of Republic, and being gained to this state a modern, convenient to development identity, and placing Ataturk's Thought System to the memories precisely by the following revolutions of this process, so that our young people are made conscious and durable against to the threats to their personalities and to their countries.

TRD112 Turkish-II

The place of Turkish language among the world languages, alphabets that Turks are used. The historical development of Turkish language, dialects of Turkish language. Turkish's syntax features, sentence analysis studies. Etymology, Semantics I (basic meanings, connotations) and Sense Events (meaning contraction, meaning expansion, meaning shift), Words' meaning relationship. Semantics II, metaphors, transfers (name transfer, phrase transfer) words, idioms, proverbs, slogans and terms. Expression (language) mistakes and applications. Oral expression, speech and speech types (panel, discussion principles). Written expression; business letters, minutes, report and news writing techniques. Ways to improve thinking in the paragraph, identification, sampling, comparison, utilization of numerical data, producing a witness. Literary types; artistic(poetry, short stories, novels, theater) and intellectual (articles, paragraphs, anecdotes, essays, criticism, travel, biography, memoirs, letter…) Reading and studying the selected sample texts from the literature and idea world. Reviewing a scientific text.

Program Elective / Faculty Elective

Program Elective / Faculty Elective

Program Elective

ENER450 Energy Conversion Processes: Chemical and Nuclear

RF circuits, such as low-noise amplifiers, mixers, power amplifiers, oscillators. Analysis and design of RF circuits and matching networks using Smith Chart, Transmission lines such as Microstrip lines.

ENER452 Engineering Evaluation of Oil and Gas

The objective of this course is to introduce to students the application of present worth and rate-of-return analysis to problems peculiar to oil and gas evaluation. The course is divided into four sections: introduction to present worth and rate-of-return analysis; the calculation of oil and gaz reserves; the analysis of decline curves; and the application of uncertainty and risk analysis to engineering project design and evaluation.

ENER454 Materials for Energy Applications

The primary objective of this course is to introduce engineers and scientists to key principles in the design of materials relevant to energy applications. Application areas will include separations, catalysis, adsorption, semi-conductors, and photovoltaics. Students will be able to understand and apply principles in solid state chemistry/physics, material science and engineering, adsorption, surface science, and catalysis in analyzing materials for energy applications. Introductory information will be followed by case studies, state of the art review of current materials, and research needs for development. Students will be evaluated on their ability to understand and apply basic concepts in material science, solid state chemistry, and surface chemistry; report on an in depth study of one surface characterization technique; perform literature search and understand basic technical concepts in one application area. Term projects will provide an opportunity to apply concepts and skills to real world applications, and require students to report on current 'state of the art' technology and research needs. Groups of three or four students will be asked to choose from a variety of applications and then asked to present their findings.

ENER456 Air Pollutants from Combustion Sources

Generation of pollutants in combustion chambers; reduction by combustion control; pre- and post-combustion treatment of fuels and effluents.

ENER462 Energy Economics

Economics of energy demand, production, storage, and pricing; advanced energy policy issues including regulation, climate change, new energy technology.

ENER464 Physical Processes in Energy Eng.

The objective of the course is to expose students to the physical flow and separation processes that occur in energy engineering systems. Students will be exposed to gas, liquid and solid phase separation processes. The heat, mass and momentum phenomena involved will be discussed. In particular, phase equilibria and mass transfer in the behavior and performance of gas, liquid and solid fuels will be emphasized. Students will be exposed in the class to the operation and design of absorption, adsorption, fluidization, size reduction, filtration, dissolution, entrainment, and heat exchange units. Students will understand the differences between chemical processes that involve chemical reactions and transformations and physical processes that involve mainly phase changes and separation.

ENER466 Modern Thermodynamics for Energy Systems

This course will be an advanced thermodynamics class that will expose students to the thermodynamics of irreversible processes and the thermodynamic analysis of dynamic systems. Students will learn to analyze the thermodynamics of conductivity, diffusion, gravitation, electrochemical systems, stability, fluctuations and critical phenomena. Students are expected to be able to understand and apply their knowledge to analyze problems involving fuel cells, membrane potential in electrolysis systems for hydrogen production, and other energy and environmental processes.

Faculty Elective

IE 364 PROJECT MANAGEMENT

Project and project management processes, budgeting and cash flow analysis, the project team formation and building, CPM, PERT, GERT scheduling methods, resource constrained project scheduling algorithms, project progress and cost control, new product development project management.

IE 463 ENTERPRISE RESOURCE PLANNING

On the basis of business processes in SAP ERP software Sales and Distribution, Materials Management, Production Planning, Financial Accounting, Management Accounting and Human Resources Management application consists of.

IE 472 TECHNOLOGY MANAGEMENT

General concepts related to technology. Management of technology and science parks. The role of technology in managing information technology. Virtual companies and organizations cyberspace. Technology transfer.

IE 476 Operational Strategic Planning

Transferring culture of strategic thinking and strategic act. Creation the consciousness of strategic management process. Instructing the strategic planning process, and strategic planning stages. Instructing internal and external environment analysis. Defining Structure-Conduct-Performance Paradigm. Defining Industry Strategies.

Foreign Language Elective (Fall Semester)

ENG113 Academic Reading & Writing I

ENG213 Academic Listening & Speaking I

ENG215 English for Business Communication I

ENG313 Toefl IBT Course I

GER111 Basic German I

GER211 German Reading and Speaking I

GER311 Business German I

GER411 Analysis on German Texts I

RUS111 Basic Russian I

RUS211 Russian Reading and Speaking I

RUS311 Business Russian I

RUS411 Analysis on Russian Texts I

CHN111 Basic Chinese I

CHN211 Chinese Reading and Speaking I

CHN311 Business Chinese I

CHN411 Analysis on Chinese Texts I

ARB111 Basic Arabic I

ARB211 Arabic Reading & Speaking I

ARB311 Business Arabic I

ARB411 Analysis on Arabic Texts I

Foreign Language Elective (Spring Semester)

ENG114 Academic Reading & Writing II

ENG214 Academic Listening & Speaking II

ENG216 English for Business Communication II

ENG314 Toefl IBT Course II

GER112 Basic German II

GER212 German Reading and Speaking II

GER312 Business German II

GER412 Analysis on German Texts II

RUS112 Basic Russian II

RUS212 Russian Reading and Speaking II

RUS312 Business Russian II

RUS412 Analysis on Russian Texts II

CHN112 Basic Chinese II

CHN212 Chinese Reading and Speaking II

CHN312 Business Chinese II

CHN412 Analysis on Chinese Texts II

ARB112 Basic Arabic II

ARB212 Arabic Reading & Speaking II

ARB312 Business Arabic II

ARB412 Analysis on Arabic Texts II