Undergraduate Courses of IZTECH Chemical Engineering Department

CHE 101 Introduction to Chemical Engineering (Credits= (2-0)2, AKTS=8)
Basic concepts, history, definition of chemical engineering. Its role and future in the modern world along with the challanges that lie ahead. Selected technical trips to chemical process plants. Assignment of a project in groups, its literature search, report writing and presentation

CHEM 121 General Chemistry I (Credits= (3-0)3, AKTS=5)
Atoms and Atomic theory, chemical compounds, Chemical reactions, gasses, thermochemistry, aqueous solutions, solution chemistry, electronic structures and chemical bonding

CHEM 122 General Chemistry II (Credits= (3-0)3, AKTS=5)
This course is designed to teach student basic concepts in chemistry

ENG 101 Development of Reading and Writing I (Credits= (3-0)3, AKTS=3)
This is a course that aims to develop skills to analyze paragraphs and essays, reading skills and written and spoken communication skills

ENG 102 Development of Reading and Writing II (Credits= (3-0)3, AKTS=3)
This is a course which aims to equip students with the skills to anaylze essays and articles, to write an organized essay and article, to make presentations, to take notes while listening and reading skills, which wll help them in their academic studies.

PHYS 121 General Physics I (Credits= (3-2)4, AKTS=7)
Mechanics forms the basic content of General Physics I Course. Newton's laws and vectorial motion, rotation, collision etc. Subtitles includes applications and explanations of concepts based on calculus are introduced.

PHYS 122 General Physics II (Credits= (3-2)4, AKTS=8)
Electromagnetism chapter of classical mechanics forms the content ofthe course General Physics II. Dynamics of charged particles, electric and magnetic fields and differentiation are taut with calculus.

MATH 141 Basic Calculus I (Credits= (3-2)4, AKTS=5)
Functions. Limits and continuity. Derivatives. Applications. The definite integral. The indefinite integral. Logarithmic, exponential, inverse trigonometric functions. Integral and its applications.

MATH 142 Basic Calculus II (Credits= (3-2)4, AKTS=6)
Integration techniques. Sequences and Infinite series. Multivariable functions and their derivatives. Multiple integral and its applications.

CHE 102 Computer Tools in Engineering (Credits= (3-2)4, AKTS=6)
Programming methods and algorithm; computer aided drawing application software

CHE 201 Material and Energy Balances in Engineering (Credits= (3-0)3, AKTS=5)
Fundamentals of material and energy balances in engineering systems involving chemical, physical and biological processes. Applications of these fundamentals on industrial processes.

CHE 210 Numerical Methods in Engineering (Credits= (3-2)4, AKTS=6)
Solution to Simultaneous Linear Equations. Interpolation. Numerical Differentiation and Integration. Solution to Nonlinear Equations. Solution to Ordinary Differential Equations. The Finite Difference Method.

CHE 211 Introduction to Polymer Science (Credits= (3-0)3, AKTS=3)
Teaching topics related to polymer science and engineering concepts such as the structure of polymers, types, properties and applicationsial polymers- introduction to polymer science, history of polymers and industrial polymers, polymer synthesis methods, copolymerization, microstructure, melting and glass transition temperatures- property relationship, mechanical and rheological properties and polymer processing methods.

CHE 213 Microbiology (Credits= (3-0)3, AKTS=3)
Gaining knowledge on these topics: Introduction to microbiology, history and evolutionary of microbiology, classification and nomenclature of microorganisms, cell biology, microbial growth, metabolism of microorganisms and microbial control. Learning the principles of different microscopes and imaging cells using different types of microcopes.

CHE 219 Environmental Chemistry (Credits= (3-0)3, AKTS=3)
An introductry course to give objectives about environment. Environment is composed of four elements. These four elements can be classified as air, water, soil and biological environment. After the definition of environmental terms introduced, the fundamentals of geochemistry, atmospheric chemistry, environmental microbiology, water chemistry and treatment chemistry are defined in the view of clean and polluted environment.

CHE 220 Thermodynamics I (Credits= (3-0)3, AKTS=6)
Fundamental concepts of Thermodynamics; Properties of Pure Substance; Energy Transfre by heat, work and mass; First Law of Thermodynamics; Analysis of First Law for open and closes systems; Second Law of Thermodynamics; Entropy analysis in Engineering systems; Cycles (Carnot and Rankine).

CHE 222 Fluid Mechanics (Credits= (4-0)4, AKTS=6)
Introduction to Fluid Mechanics (Dimensions and Units). Fluid Statics (Pressure at a Point , Hydrostatic Pressure). Incompressible and compressible fluids. Buoyancy, Flotation and Stability. Fluid Dynamics: Conservation of Mass, Conservation of Momentum, and Conservation of Energy. Friction Loss. Bernoulli Equation. Inviscid Flow, Viscous Flow. The Navier-Stokes equations. Mixing and Agitation. Dimensional analysis.

CHE 226 Introduction to Enviromental Engineering (Credits= (3-0)3, AKTS=3)
An engineering introductry course designed to teach air and water quality and control. The characteristic properties of the cesses on the water and air quality is elaborated. The information and fundamentals of water and wastewater treatment technology are introduced. Fundamentals of air pollution and control included.

CHE 228 Structure and Properties of Polymers (Credits= (3-0)3, AKTS=3)
Step Growth Polymerization, Free radical addition polymerization, Copolymerization, Polymer Solutions, Measurement of molecular weight and size, Morphology and Order in Crystalline Polymers, Polymer rheology and mechanical properties, structure property relationships in polymers.

CHE 232 Chemical Processing of Petroleum (Credits= (3-0)3, AKTS=3)
Introduction to industrial chemicals. Raw materials and processes used in industrial chemicals production. Reactions involved in oil refinery process. Bulk chemicals production process and its characteristics. Fine chemicals production. Biotransformation. Green Chemistry. The role of heteregenous reactions in production of industrial chemicals. Illustrative examples of some industrially important reactions.

CHE 234 Polymer Chemistry (Credits= (3-0)3, AKTS=3)
Introduction to chemical properties of polymers, step- and chain-growth polymerization mechanisms and kinetics, examples of living polymerization mechanisms and kinetics (iyonik ve RAFT polymerizations), emulsion and suspension polymerization mechanisms, polymer bioconjugation strategies.

CHEM 221 Organic Chemistry (Credits= (4-0)4, AKTS=5)
To understand the relationship between chemical structure and reactivity of organic compounds.

ECON 205 Principles of Economics (Credits= (3-0)3, AKTS=4)
The course offers students the knowledge on the definition of economics, macro and micro economics and monetary policy and fiscal policy.

HIST 201 Principles of Ataturk I (Credits= (2-0)Creditssiz, AKTS=2)
The modernisation of the Ottoman Empire during the nineteenth and early twentieth century's, the spread of nationalism among its subject peoples, the revolutionary changes in Ottoman institutions and society that led to the Empire's demise and the transitional period from the Empire to the national state and the foundation of the Turkish Republic, transformation of society.

HIST 202 Principles of Ataturk II (Credits= (2-0)Creditssiz, AKTS=2)
In the period from the foundation of Turkish Republic to 1990's, political, social, economic and cultural changes and the major events that have taken place in Turkey and in the world.

MATH 255 Differential Equations (Credits= (4-0)4, AKTS=6)
First order linear differential equations and various applications. Second order linear differential equations. Higher order linear differential equations. Power series solutions (Ordinary and regular singular points). The Laplace Transform: solution of initial value problems. System of linear differential equations. Solution by operator method and by Laplace transform. Fourier series and boundary value problems.

MBG 101 Biology I (Credits= (3-0)3, AKTS=5)
Structre, composition, molecular diversity and chemical mechanisms of life.

TURK 201 Turkish Language I (Credits= (2-0)Creditssiz, AKTS=2)
Definition of the language and the place and importance of language as a social institution in life, place among the world languages of Turkish, exchange of words between languages, vocabulary, basic grammatical features and evaluated the current status of present state.

TURK 202 Turkish Language II (Credits= (2-0)Creditssiz, AKTS=2)
Turkish writing expression, identification, discussion and practical training for oral and written expression.

CHE 300 Summer practice(Creditssiz, AKTS=7)
A practical training for a period of 20 works-days in an organization where chemical engineering is extensively practiced. A formal report is required to reflect the work carried out.

CHE 302 Chemical Kinetics and Reactor Design (Credits= (4-0)4, AKTS=7)
Reaction rate laws and stoichiometry, homogeneous and heterogeneous reaction kinetics and their mechanisms, analyses of reaction kinetic data, multiple reactions, heat effects on reactors, study of biochemical reactions and bioreactor types and also the fundamentals, covered in the course, will be applied to a design project by forming a team of 2-3 students.

CHE 310 Chemical Engineering Lab I (Credits= (0-4)2, AKTS=5)
Laboratory studies demonstrating the principles of physical chemistry, fluid mechanics and heat transfer and to verify theoretical concepts and learn laboratory techniques. Methods for analyzing and presenting data. Report preparation and presentation of an oral technical report.

CHE 311 Heat and Mas Transfer (Credits= (3-2)4, AKTS=5)
Introduction to heat transfer modes: Conduction, Convection and Radiation. Steady and unsteady state heat transfer. Analogy between heat and mass transfer: Boundary layers, heat exchangers. Diffusion and mass transfer.

CHE 312 Separation Processes (Credits= (3-2)4, AKTS=5)
Principles of Mass Transfer, Introduction to seperation processes, Staged and countercurrent seperation processes, Absorption and stripping, simple distillation methods, Staged distillation with reflux and McCabe Thiele Method, Efficiencies of plate and packed towers, Distillation of multicomponent mixtures, Liquid-liquid extraction.

CHE 321 Thermodynamics 2 (Credits= (3-0)3, AKTS=5)
Thermodynamic properties of ideal and nonideal substances, Equilibrium and Stability Criteria in Single and Multicomponent Systems.

CHE 330 Mathematical Modeling in Engineering (Credits= (3-0)3, AKTS=7)
Introduction to mathematical modeling. Review of heat, mass, momentum transfer, kinetic, equilibrium and other transport equations. Review and application of unsteady state macroscopic balances. Review and application of steady state microscopic balances.

CHE 334 Kompozit Malzemelerin İşlenmesi (Credits= (3-0)3, AKTS=3)
The course includes the types of composite materials, production methods, properties and application areas of composites to different fields. Students will gain information about İntroduction to composites, composite materials, interface modification, production methods, mechanical properties and different application cases.

CHE 336 Environmental Chemistry (Credits= (3-0)3, AKTS=3)
It is an course to introduce how the pollution can be prevented on the source before the pollution created by teaching fate of pollutants, regulations, tretment and source reduction economics, tecniques, etc...
The pollution problems in the chemical engineering and the responsibilities, Developed countries environmental reguletions and applications and the paralelism between science and technology, Selection criterias among P2 alternatives, Fundamentals of P2, Economic analysis, Source conservation and efficiency.

CHE 338 Photovoltaics (Credits= (3-0)3, AKTS=3)
Materials, devices and systems related to solar electric generation including how solar cells convert light into electricity, fundamental device physics, device designs, manufacturing and testing of solar cells. Technologies that are currently on the market, and how to evaluate the risk and potential of existing and emerging solar cell technologies including the potential & drawbacks of first, second and third generation devices (Amorphous, single- and multicrystalline silicon, CdTe, CIGS, CPV, organic solar cells etc.).

CHE 344 Inorganik Polimerler (Credits= (3-0)3, AKTS=3)
Definition of inorgac polymers and their characterization methods, phosphazenes, siloxanes, silanes, polymers having germanium, tin and boron elements and their applications

CHE 366 Industrial Microbiology (Credits= (3-0)3, AKTS=3)
Introduction of industrial microbiology topics by taking the cell as the fundamental source. Demonstrating the importance of the subject of the courses by relating it to the current daily life and introducing the different fermentation techniques together with downstream processing used in the production of value added biotechnological products.

CHE 424 Biomass Conversion to Chemicals And Fuels (Credits= (3-0)3, AKTS=3)
This course introduces various processes used in converting biomass into biofuels and chemicals. The course will deal with the following topics: Bioresource availability, chemistry of biomass and its pretretment technologies, energy crops; enzymatic conversion; catalytic conversion, fermentation, and biorafinary. Both current and emerging technologies will be considered.

CHE 461 Catalytic Materials (Credits= (3-0)3, AKTS=3)
The course covers the preparation and characterization of catalytic materials, and the relationships between the surface and electronic properties and pore structure of the materials and their catalytic activity and selectivity. The course includes the following materials: zeolites and molecular sieves; metals and alloys; metal sulfides and other catalytic applications. The course is suitable for a broad spectrum of students in material science and engineering, fuel science, chemical engineering, chemistry, solid state science and environmental engineering.

CHE 301 Technical Writing for Chemical Engineers (Credits= (3-0)3, AKTS=3)
With an holostic approach, and regarding of the interest of student in chemical engineering area, in the context of writting a rewiev paper, the parts included are as follows: Introduction: principles of oral, visual, and written communication; Types of written communication in Chemical Engineering: reports (laboratory report, design report, progress report), thesis, research/project proposal, research article, review article; Organization/sections (title, abstract, introduction, materials and methods, results, discussion, conclusions, references); Content and organization of each section; Citation and references; Visual expression of results (graphics and tables); Databases and searching strategies for literature review; Preparation of an outline and a draft for a research report; Writing of the sections of the research report; Principles of oral presentation; Visual aids; Presentation of the research report; Poster presentation principles.

CHEM 321 Physical Chemistry (Credits= (3-0)3, AKTS=4)
The properties of gasses, The kinetic theory of gasses, Molecules in motion in gases, The motion of molecules and ions in liquids, Diffusion, The rates of chemical reactions, The kinetics of complex reactions, Molecular

reaction dynamics, The properties of surfaces, The properties of liquid surfaces, Surfactants, Colloidal systems, Pyhsical transformations of pure substances, Phase diagrams, The properties of simple mixtures, Dynamic Electrochemistry.

CHE 400 Summer practice (Creditssiz, AKTS=7)
A practical training for a period of 20 works-days in an organization where chemical engineering is extensively practiced. A formal report is required to reflect the work carried out.

CHE 402 Process Dynamics (Credits= (3-0)3, AKTS=4)
This course is designed to develop an understanding of the fundamentals of dynamic modeling, design and analysis of classical feedback control of chemical processes.

CHE 410 Chemical Enginerring Lab II (Credits= (0-4)2, AKTS=6)
It is aimed at studying mass and heat transfer, batch distillation, chemical reactor, bioreactor and absorption topics using open ended problem approach and considering safety and environmental concerns.

CHE 411 Chemical Enginerring Lab III (Credits= (0-4)2, AKTS=7)
This couse covers an experimental or theoretical project under supervision of a faculty member and the students are expected to research, conduct, report and present of the given research subject.

CHE 420 Engineering Economics and Design (Credits= (2-4)4, AKTS=8)
Introduction to process synthesis and analysis; estimation of capital and operational costs; total capital and operational costs; Measurement of plant profitability; optimum design strategy; synthesis of reaction and separation-heat exchanger processes; analysis of process alternatives with respect to safety, environmental and economic factors.

CHE 421 Engineering Design (Credits= (2-4)4, AKTS=11)
Process design and adaptation of engineering systems to contemporary chemical systems. Cost analysis and project assessment. Unit design and operation. Equipment used in Chemical Industry. Momentum, mass and heat transfer application in Chemical Engineering. Optimization of constant and variable cost analysis. And control mechanisms.

CHE 423 Petrochemical Process (Credits= (3-0)3, AKTS=3)
Introduction to Petrochemicals. Raw materials and processes used in petrochemicals production. Reactions involved in petrochemical processing. Fine chemicals production. Green Chemistry. The role of heteregenous reactions in production of petrochemicals. Illustrative examples of some industrially important reactions.

CHE 425 Biochemical Engineering (Credits= (3-0)3, AKTS=3)
Applications of chemical engineering principles to biological processes. Topics include enzyme mechanisms and kinetics, bioreactor design, cellular growth and metabolism, fermentation, and bioseparations.

CHE 427 Flames (Credits= (3-0)3, AKTS=3)
Analysis of flames and combustion systems using fundamental principles of chemical engineering (i.e., transport processes, reaction engineering, and thermodynamics.

CHE 431 Sustainable Energy (Credits= (3-0)3, AKTS=3)
The content of the course includes sustainable energy generation/conversion systems, energy sources, renewable and traditional energy conversion systems, systems that enable the use of fossil fuels under the concept of sustainable energy generation/conversion, Developments on energy in Turkey and the world, catalytic materials and new generation energy generation/conversion processes.

CHE 435 Fundamentals of Air Pollution and Control (Credits= (3-0)3, AKTS=3)
Criteria and toxic air pollutants, effects of air pollutants on human health and environment, sources, ambient and source sampling, representative sample, isokinetic sampling, atmosphere, air pollution meteorology, atmospheric dispersion, pollution prevention, particle size ditributions, particle control methods, gas control methods, regional and global air pollution problems (global climate change, ozone depletion, long range transport, etc.)

CHE 439 Biomaterials (Credits= (3-0)3, AKTS=3)
The multidisciplinary subject of biomedical application of materials obtained from natural and synthetic sources. Solid properties, various materials used in biomaterials, tissue-material interactions, in situ, in vitro and in vivo application methods and sterilization are discussed. Important soft and hard tissue applications involving tissue engineering, and drug delivery are discussed with special emphasis on biodegradable and non degradable synthetic polymers

CHE 450 Gas Purification Technology (Credits= (3-0)3, AKTS=3)
Industrial Gases, Principle of separation processes and application, Absorption, Adsorption

CHE459 Special Topics in Biotechnology (Credits= (3-0)3, AKTS=3)
Brief introduction to molecular aspects of biotechnology with a special focus on medical biotechnology, classification of biopharmaceuticals, techniques used for production, isolation and characterization of biopharmaceuticals, delivery systems for biopharmaceuticals, discussions on popular biotechnology topics

CHE 464 Separation and Purification of Bichemical Products (Credits= (3-0)3, AKTS=3)
To teach the students the methods of the separation and purification processes of the biochemical products.

CHE 470 Introduction to Soft Matter (Credits= (3-0)3, AKTS=3)
Structures and properties of soft materials, polymers, colloids, liquid crystalline materials, amphiphiles and self-assembly, biological soft matter, characterization of soft matter.

CHE 499 Cooperative Education Course (Credits= (0-6)3, AKTS=3)
Within the scope of this course, at the beginning of each semester, students will receive an introductory course at the university site for the first two weeks covering the topics of learning outcomes and objectives of the cooperative education and the evaluation procedure. Following week, students are introduced to the company. Students are obliged to work for two days a week through the semester. Students summarize their daily work loads and duties in a notebook journal and prepare a report at the end of the semester with respect to the notebook. The student will provide the notebook and defend his/her report in front of the jury at the end of the semester.