

**AKDENIZ UNIVERSITY**  
**DEPARTMENT OF CHEMISTRY**  
**COURSE CONTENT**

**0303101 GENERAL CHEMISTRY I**

Atomic structure, chemical bonds, molecular geometry, stoichiometry (chemical equations and quantitative correlation) gases, liquids and solids, oxygen and hydrogen, solutions, electrochemistry, nonmetals.

**0303112 GENERAL CHEMISTRY II**

Chemical kinetics and equilibrium, chemical thermodynamics, , acids and bases, ionic equilibria, metals, complex compounds, nuclear chemistry.

**0303113 PHYSICS I**

Mathematical Introduction: Vectors & Vector Algebra, Unit Systems, Dimension Equation and Error Calculation, Mecanic: Statics, Kinematic&Dynamics, Work-Power & Energy, Impulse & Momentum, Spin Motion and Inertial Moment, Harmonic Motion.

**0303114 PHYSICS II**

Electrostatics & Electrical Charge, Conductors & Insulators, Charge Units & Coulomb's Law, Electric Field & Field Lines, Gauss's Law & Applications of It, Millikan's Experiment, Electrical Potential, Poisson's & Laplace's Equations, Capacitance & Capacitors, Resistance & Resistivity, Selfconductivity & Superconductivity, Ohm's & Joule's Laws, Direct & Alternating Currents, Equation of Circuit & EMF, Kirchhoff's Laws.

**0303115 ANALYSIS I**

The Real Line And Order, Exponents and Radicals, Functions Trigonometric Functions, Inverse Trigonometric Functions, Sequences, Limit, Continuity, Derivative, Applications of The Derivative, Maksimum Minimum Problems, Asymtotes, Curves And Graphs.

**0303116 ANALYSIS II**

Indefinite Integral, Definite Integral, Techniques of Integration, Applications of the Integral, Polar Coordinates and Plane Curves, Infinite Series, Vectors and Vector Calculus, Functions of Several Variables, Multiple Integrals.

### **0303166 GENERAL CHEMISTRY LABORATORY**

Introduction to the laboratory equipments and basic technics. Experiments related to the topics discussed in 0303112 General Chemistry II.

### **0303221 ANALYTICAL CHEMISTRY I**

Data evaluation, gravimetry, titrimetry, review of solution chemistry, acid-base titrations.

### **0303222 ANALYTICAL CHEMISTRY II**

Complex acid-base titrations, applications of acid-base titrations, precipitation titrations, theory of complexometric titrations, redox titrations and their applications, potentiometry.

### **0303223 INORGANIC CHEMISTRY I**

General information, nature of chemical bond, properties of molecules (shapes, geometries), Acid-Base Chemistry, Theories of Molecular Bonding (MO, VSEPR), Naming of inorganic compounds

### **0303224 INORGANIC CHEMISTRY II**

Bonding, Stereochemistry (isomerization, special topics), Complex formation theories (MO, Crystal Field Theory), Electronic, magnetic properties of complexes

### **0303205 QUALITATIVE ANALYSIS LABORATORY**

Identification of about forty cation and anion in a systematic way, qualitative analysis of unknown solid and liquid samples.

### **0303206 QUANTITATIVE ANALYSIS LABORATORY**

Quantitative analysis methods such as neutralimetry, argentometry, manganometry, iodimetry and gravimetry and their applications, quantitative analysis of components of unknown samples, ore analysis.

### **0303209 ORGANIC CHEMISTRY I**

Carbon compounds and chemical bonds, Representative carbon compounds, Acids and bases in organic chemistry, Alkanes and cycloalkanes-conformation of molecules, Stereochemistry - chiral molecules, Ionic reactions – nucleophilic substitution and elimination reactions, Radical reactions, Alkenes and alkynes I : Properties and synthesis, Alkenes and alkynes II : Addition reactions.

### **0303210 DIFFERENTIAL EQUATIONS**

Equations of first order, Variable, Exact equations, Homogeneous linear equations, Linear equations, with constant coefficients, Equations of the second order, Power series methods.

### **0303212 ORGANIC CHEMISTRY II**

Alcohols from carbonyl compounds: Oxidation–reduction and organometallic compounds, Conjugated unsaturated systems, Aromatic compounds, Electrophilic aromatic substitution,

### **0303213 ENVIRONMENTAL CHEMISTRY**

Introduction (general review of environmental problems) Classification of environmental pollutions and analysis methods, atmospheric chemistry and pollutions, Ozon layer, health effects of the outdoor and indoor air pollution, greenhouse effect, analysis methods of atmospheric pollutants, Water pollution (ground and underground water, drinking water) wastewater treatment, disinfection of drinking water, drinking and irrigation water quality, energy production and its environmental importance.

### **0303215 TECHNICAL ENGLISH FOR CHEMISTS I**

Reading and translations of the all types of chemistry topics written in English. Translations of the Turkish chemistry texts to English.

### **0303217 STATISTIC FOR CHEMISTS**

Statistical evaluation of quantitative analysis results, comparison of analysis methods, methods for the determination and correction of errors, some statistical hypothesis and tests, calibration, variance analysis.

### **0303313 ORGANIC CHEMISTRY LABORATORY I**

Qualitative tests for elements and functional groups, Distillation techniques (Simple distillation, Steam distillation, Fractional distillation, Vacuum distillation), Extraction, Adsorption chromatography, Preparation of cyclohexene, Preparation of n-butylbromide, Ester hydrolysis: Soaps.

### **0303314 ORGANIC CHEMISTRY LABORATORY II**

Aldol condensation: Preparation of benzoin, Preparation of benzalacetone, Aromatic nitro compounds: Nitration of phenol, Skraup synthesis of quinoline, Preparation of aniline from nitrobenzene, Isolation of caffeine, Dyes: Malachite green and methyl orange.

### **0303315 INORGANIC CHEMISTRY LABORATORY**

General inorganic chemistry laboratory information, boric acid synthesis, synthesis of complex compounds, synthesis of some industrial inorganic compounds, synthesis of compounds containing alkali and earth alkali elements, oxides and salts

### **0303316 PHYSICAL CHEMISTRY II**

Second and third laws of thermodynamics, Entropy and equilibrium, Spontaneous changes, Gibbs energy, Thermodynamic properties of mixtures, Chemical equilibrium, Ideal solutions, Gibbs-Duhem equation, Intermolecular forces, Phase rule, Phase diagrams.

### **0303307 PHYSICAL CHEMISTRY I**

General properties of gases, Ideal gas law, Real gases, Kinetic theory of gases, Maxwell – Boltzmann distribution, Thermal conductivity, diffusion and viscosity of a gases, Heat capacity, Zeroth and first laws of thermodynamics, Heat and work,, Second law of thermodynamics.

### **0303308 PHYSICAL CHEMISTRY LABORATORY I**

The Basic Experiments on Equilibrium, Coligative properties, Viscosity, Polarimetry, Beer's Law and Spectrophotometry

### **0303309 FOOD CHEMISTRY**

Water, carbohydrates, lipids, proteins, minerals, vitamins, enzymes, natural and synthetic aroma-giving substances, harmful substances in foods, food additives.

### **0303310 QUANTUM CHEMISTRY**

Photoelectric effect; black body radiation; Compton effect; Bohr atom model; Schrödinger equation and applications; quantum mechanics; spectroscopy

### **0303311 ORGANIC CHEMISTRY III**

Aldehydes and ketones I: Nucleophilic additions to carbonyl group, Aldehydes and ketones II: Aldol reactions, Carboxylic acids and their derivatives – nucleophilic substitution at the acyl carbon, Amines, Synthesis and reactions of  $\beta$ -Dicarbonyl compounds: More chemistry of enolate ions, Phenols and acyl halides – nucleophilic aromatic substitution, Carbohydrates.

### **0303321 INORGANIC CHEMISTRY III**

General properties of metals, ametals, transition elements, description, explanation and industrial applications of them ;Some special topics of periodic elements

### **0303322 SEPARATION PROCESSES**

Distillation; evaporation; extraction; cristallization; ion exchange and filtration techniques; related technological and scientific developments

### **0303323 NUTRITION CHEMISTRY**

Components of foods; digestion and absorption in the body; nourishments and energy; energy requirement calculations; factors influencing the body weight; chemistry of some special food products.

### **0303324 BIOPHYSICAL CHEMISTRY**

Basic concepts; chemical equilibrium and Gibbs energy changes; ligand bonding equilibria; calorimeter; heat.

### **0303325 PHYSICAL ORGANIC CHEMISTRY**

Kinetic methods of organic reaction mechanisms; activation parameters; isotope effect; solvent effect; acidity functions; Hammett and Bronsted equations; reactions with special mechanist property.

### **0303326 PHOTOCHEMISTRY**

Photochemical equivalence law; photochemical processes; photochemical reactions; photosynthesis; photostationary state; atomic and molecular spectroscopy.

### **0303350 TECHNICAL ENGLISH FOR CHEMISTS II**

Technical terms in chemistry, understanding and translating the papers related to important topics in chemistry.

### **0303328 IRREVERSIBLE THERMODYNAMICS**

Basics of irreversible thermodynamics; chemical applications and principles.

### **0303329 COORDINATION CHEMISTRY**

Introduction to the coordination chemistry, isomeri on the complex compounds, bond theories (VBT, CFT, LFT, MOT), application of the group theory to the complex compounds, spectral analysis, reactions and the reaction mechanisms of the complex compounds.

### **0303330 HISTORY OF CHEMISTRY AND SCIENCE**

Chemistry in ancient civilization, Theory of chemistry until B.C. Simya age, Modern chemistry and development of science, Chemistry and science in Turkey.

### **0303331 PESTICIDE CHEMISTRY**

Pesticides; properties and classification; application; risks and preventive measures.

### **0303332 CURRENT TOPICS IN CHEMISTRY**

Some special oranometallic compounds, Some important synthesis methods( carboniyl compounds, hydrosilation, hydroformylation, alkene polimerization), Current topics in chemistry

### **0303333 CLINICAL CHEMISTRY**

Introduction; measurement, quality control; view to analytical methods; proteins; electrophoresis; immunological methods; enzymes; liver function; kidney function; carbohydrates; lipids; hormones; electrolytes.

### **0303334 CHEMICAL DYNAMICS**

Molecular reaction dynamics; collision theory; diffusion controlled reactions; activated theory; thermodynamic properties.

### **0303335 HETEROCYCLIC COMPOUNDS**

Description of heteroannular and heteroaromatic compounds, classification, synthesis and reactions of these compounds.

### **0303336 CHEMICAL KINETICS**

Empirical laws and mechanism; radioactive decay; consecutive condition and complex reactions; free radical mechanism; homogeneous-heterogeneous catalytics.

### **0303337 INTRODUCTION TO POLYMER CHEMISTRY**

General definitions (monomer, oligomer, polymer etc.) and types of polymers. Polymerization reactions; condensation, anionic, cationic, free-radical, ring-opening, photolytic radiation, electrolytic and coordination polymerizations. Average molecular weight definitions and the techniques used for determination of average molecular weights of polymers; viscometry, light-scattering, osmometry and chromatography. Determination of morphology, glass transitions and crystallinity of polymers.

### **0303338 MATTER AND ENERGY EQUILIBRIA**

Introduction to engineering calculations; matter equalities; matter energy equalities

### **0303340 MAGNETOCHEMISTRY**

Magnetic properties of chemicals; magnetic moment; ferromagnetism; paramagnetism; diamagnetism; magnetic susceptibility; ESR; NMR.

### **0303342 SPECTRAL ANALYSIS OF ORGANIC COMPOUNDS**

The interaction of light with atoms and molecules. Ultraviolet and visible spectra, Infrared spectroscopy, Nuclear Magnetic Resonance Spectroscopy ( $^1\text{H-NMR}$ ,  $^{13}\text{C-NMR}$ ) applications and identification of organic structures.

### **0303344 SYNTHETIC INORGANIC AND ORGANIC CHEMISTRY**

Synthetic petrochemical products, natural gas, industrial salts and their production processes, pigments, super conductors, semiconductors, pharmaceutical chemistry, explosives.

### **0303346 ANALYTICAL CHEMISTRY OF FOODS**

Principles of techniques used in food analysis, theory of analytical methods for certain food components, experimental procedures, estimation of main food components, general food studies.

### **0303352 REACTIVE INTERMEDIATE CHEMISTRY**

Carbenes, Carbanions, nitrenes, carbocations, radicals and general reactions of these organic intermediates.

### **0303354 CHROMATOGRAPHIC SEPARATION METHODS**

The introduction of chromatography and its classification, basic principles of chromatographic methods, Column and Thin Layer Chromatographies, Gas Chromatography (GC), High Performance Liquid Chromatography (HPLC), Super Critical Fluid Chromatography (SFC), Ion Exchange Chromatography (IC), Size Exclusion Chromatography (SEC) and application fields of chromatographic methods.

### **0303358 SYMMETRY AND GROUP THEORY FOR CHEMISTRY**

Symmetry elements and symmetry operations, point groups, systematic classification of molecules into point groups, character tables, matrices, reducible and irreducible representations, applications to chemical bonding and molecular vibrations of group theory.

### **0303348 DESIGN OF CHEMICAL REACTORS**



Cut reactor design; continuous stirring tank and tube reactor design; deviation of the behaviour from the ideal reactor; distribution of time spending in the reactor; temperature and pressure effects.

### **0303401 GRADUATION WORK I**

A specific study on a special topic assigned to each student under the supervision of a staff member which involves a literature survey and may be supported by experiments.

### **0303402 GRADUATION WORK II**

At the end of the work the student prepares a report and presents a seminar.

### **0303404 BIOCHEMISTRY II**

Introduction to metabolism, properties of nucleotides and nucleic acids, replication, transcription, translation; Catabolism and generation of chemical energy: glycolysis, fermentation, Krebs cycle and its regulation, electron transport and oxidative phosphorylation, Gluconeogenesis, Glyoxylate cycle, Pentose phosphate pathway, Photosynthesis

### **0303406 INDUSTRIAL ORGANIC PROCESSES**

Oil industry, waxes, soaps and detergent, sugar and starch industries, paper industry, agricultural chemicals industry, fermentation industries.

### **0303407 INDUSTRIAL INORGANIC PROCESSES**

Chemical and physical applications in industry, chemical manufacturing processes and economy, relationships among different industry from the point of raw materials and products; water supply and water purification, industrial gases, ceramics, cement, glass, sulfur and sulfuric acid, phosphor industries, nitrogen industries, surface coating (dye) industries.

### **0303409 PHYSICAL CHEMISTRY LABORATORY II**

The Basic Experiments on Chemical Kinetics, , Electrolysis, Potentiometry and Conductometry.

### **0303415 BIOCHEMISTRY I**

Description of biochemistry, Cell types, Structure and function of Organelles, The role of water in biological processes, Amino acids and their properties, Peptide

and Protein structure and functions, Determination techniques of amino acids, peptides and proteins

### **0303417 PHYSICAL CHEMISTRY III**

Chemical Kinetics, orders of reactions, opposing, consecutive and parallel reactions, Unimolecular reactions, Complex reactions, homogeneous reaction kinetics and catalysis, Electrolytic Solutions and Activity Concept, the Debye-Hückel Theory, Ionic Strength, Electrochemical cells, Electrode Potentials, Electrode Kinds, Conduction in Electrolytic Solutions,

### **0303418 ELECTROCHEMISTRY**

Electrolytic Solutions and Activity Concept, the Debye-Hückel Theory, Ionic Strength, Electrochemical cells, Electrode Potentials, Electrode Kinds, Conduction in Electrolytic Solutions, Electrolysis and Faraday's Rules, Transference Numbers and Determining of Transference Numbers (Hittorf Method and The Moving-Boundary Method), Batteries and Fuel Cells.

### **0303420 INSTRUMENTAL ANALYSIS METHODS**

Electromagnetic radiation, spectroscopic and chromatographic techniques and laboratory works involving the applications of these techniques.

### **0303421 ISOTOPE CHEMISTRY RESEARCH AND INDUSTRIAL USAGE**

Properties and synthesis of isotopes; applications of isotopes in chemistry and medical science; detectors.

### **0303423 CHEMICAL BOND**

Allens bond; molecular orbital and crystal field theories; principals and applications of chemical bonding.

### **0303425 TEXTILE AND DYESTUFF CHEMISTRY**

Classification and basic properties of fibers, natural fibers, regenerate and synthetic fibers, inorganic fibers, fiber production techniques, woven and textile finishing, organic dyestuffs, colour and structure, dye and dyestuff, classification and application of dyestuffs.

### **0303427 APPLIED THERMODYNAMICS**

Review of basic thermodynamic principles and their applications on refrigeration, combustion, heat transfer, air-conditioning, and gas mixtures.

### **0303429 SURFACTANTS AND COLLOID CHEMISTRY**

Development of the detergent industry, Water quality, Surfactants, Builders, Bleaches, Auxiliary agents, Various type detergents, After treatment aids, Ecology, Toxicology, Production processes of detergents, Analytical methods.

### **0303431 HISTORY OF PHYSICAL CHEMISTRY**

Evolution of physical chemistry and the works of scientists who contributed to the evolution of physical chemistry, the developments of physical chemistry areas such as thermodynamics, kinetics, spectroscopy, electrochemistry and statistical mechanics up to the present time.

### **0303433 PHARMACEUTICALS AND PHARMACEUTICAL INDUSTRY**

Metabolism of pharmaceuticals; general concepts; autonomic pharmaceuticals, cardiovascular pharmaceuticals; pharmaceuticals affecting smooth muscles, central nerve system; chemotherapeutic agents; cosmetics; pharmaceutical industry in Turkey; pharmaceutical production.

### **0303435 POLYMER CHEMISTRY**

Introduction, Basic definitions, classification of polymers, molecular weight, thermal transitions, thermoset and thermoplastics, chemical structure and physical properties. Polymer characterization, types of molecular weights and molecular weight determination. End group analysis, colligative properties, light scattering, refractive index, ultracentrifugation, viscosity, gel permeation chromatography, spectroscopic analysis. Mechanical properties, viscoelasticity, stress-strain relations, deformation, mechanical analysis. Thermal properties, glass transition temperature, polymer morphology, thermal analysis.