İZMİR INSTITUTE OF TECHNOLOGY
FACULTY OF SCIENCE
CHEMISTRY DEPARTMENT
(To be applied starting with the 2011-2012 academic year)

1st SEMESTER

				PREREQUISITE (PREREQ.) COREQUISITE (COREQ.)
CHEM	100	Chemical Orientation	(1-0) NC	
CHEM	101	General Chemistry I	(4-0) 4	
CHEM	111	Technical English for Chemistry I	(1-0) 1	
CHEM	131	General Chemistry Laboratory I	(0-4) 2	(COREQ.) CHEM 101
PHYS	101	General Physics I	(2-2) 3	
PHYS	111	General Physics I Laboratory	(0-2) 1	
MATH	141	Basic Calculus I	(3-2) 4	
ENG	101	Development of Reading and Writing Skills I	(3-0) 3	
		Credits :	**18**	

2nd SEMESTER

				PREREQUISITE (PREREQ.) COREQUISITE (COREQ.)
CHEM	102	General Chemistry II	(4-0) 4	
CHEM	112	Technical English for Chemistry II	(1-0) 1	
CHEM	132	General Chemistry Laboratory II	(0-4) 2	(COREQ.) CHEM 102
PHYS	102	General Physics II	(2-2) 3	
PHYS	112	General Physics II Laboratory	(0-2) 1	
MATH	142	Basic Calculus II	(3-2) 4	
ENG	102	Development of Reading and Writing Skills II	(3-0) 3	
CS	102	Basic Computer Science and Programming	(2-2) 3	
		Credits :	**21**	

3rd SEMESTER

				PREREQUISITE (PREREQ.) COREQUISITE (COREQ.)
CHEM	201	Analytical Chemistry I	(3-0) 3	(PREREQ.) CHEM 101,CHEM 102
CHEM	203	Organic Chemistry I	(3-2) 4	(PREREQ.) CHEM 101,CHEM 102
CHEM	205	Mathematics for Chemist	(3-2) 4	(PREREQ.) MATH 141,MATH 142
CHEM	231	Analytical Chemistry Laboratory I	(0-4) 2	(COREQ.) CHEM 201
CHEM	233	Organic Chemistry Laboratory I	(0-4) 2	(COREQ.) CHEM 203
TURK	201	Turkish Language I	(2-0) NC	
HIST	201	Principles of Ataturk I	(2-0) NC	
		Non-technical Elective	(3-0) NC	
		Credits :	**15**	

4th SEMESTER

				PREREQUISITE (PREREQ.) COREQUISITE (COREQ.)
CHEM	202	Analytical Chemistry II	(3-0) 3	(PREREQ.) CHEM 101,CHEM 102
CHEM	204	Organic Chemistry II	(3-2) 4	(PREREQ.)CHEM 101,CHEM 102, (COREQ.)CHEM 203
CHEM	206	Introduction to Quantum Chemistry	(3-2) 4	(PREREQ.) CHEM 101,CHEM 102
CHEM	232	Analytical Chemistry Laboratory II	(0-4) 2	(COREQ.) CHEM 202
CHEM	234	Organic Chemistry Laboratory II	(0-6) 3	(COREQ.) CHEM 204
TURK	202	Turkish Language II	(2-0) NC	
HIST	202	Principles of Ataturk II	(2-0) NC	
		Non-technical Elective	(3-0) NC	
		Credits :	**16**	

5th SEMESTER

				PREREQUISITE (PREREQ.) COREQUISITE (COREQ.)
CHEM	301	Inorganic Chemistry I	(4-0) 4	(PREREQ.) CHEM 101,CHEM 102
CHEM	303	Physical Chemistry I	(4-0) 4	(PREREQ.) CHEM 101,CHEM 102
CHEM	305	Instrumental Analysis I	(3-0) 3	(PREREQ.) CHEM 101,CHEM 102
CHEM	333	Physical Chemistry Laboratory I	(0-4) 2	(COREQ.)CHEM 303
CHEM	335	Instrumental Analysis Laboratory	(0-4) 2	(COREQ.) CHEM 305
		Technical Elective	(3-0) 3	
		Credits :	**18**	

6th SEMESTER

				PREREQUISITE (PREREQ.) COREQUISITE (COREQ.)
CHEM	302	Inorganic Chemistry II	(4-0) 4	(PREREQ.) CHEM 101,CHEM 102
CHEM	304	Physical Chemistry II	(4-0) 4	(PREREQ.) CHEM 101,CHEM 102
CHEM	306	Instrumental Analysis II	(3-0) 3	(PREREQ.) CHEM 101,CHEM 102
CHEM	310	Chemical Biology	(3-0) 3	
CHEM	332	Inorganic Chemistry Laboratory	(0-4) 2	(COREQ.) CHEM 302
CHEM	334	Physical Chemistry Laboratory II	(0-4) 2	(COREQ.) CHEM 304
		Credits :	**18**	

7th SEMESTER

				PREREQUISITE (PREREQ.) COREQUISITE (COREQ.)
CHEM	300	Summer Practice	NC	
CHEM	401	Graduation Project I	(0-4) NC	
CHEM	411	Biochemistry	(2-2) 3	(PREREQ.) CHEM 101,CHEM 102
		Non-technical Elective	(3-0) 3	
		Technical Elective	(3-0) 3	
		Technical Elective	(3-0) 3	
		Credits :	**12**	

8th SEMESTER

				PREREQUISITE (PREREQ.) COREQUISITE (COREQ.)
CHEM	402	Graduation Projec II	(0-6) 3	
		Non-technical Elective	(3-0) 3	
		Technical Elective	(3-0) 3	
		Technical Elective	(3-0) 3	
			Credits : 12	

Total Credits : 130

İZMİR INSTITUTE OF TECHNOLOGY
FACULTY OF SCIENCE, CHEMISTRY DEPARTMENT
DECSRIPTION OF MANDATORY COURSES

CHEM 100 CHEMICAL ORIENTATION (1+0)NC
This course aims to inform freshmen about the program end department. Faculty members, graduate, and undergraduate students will discus and share their experiences. Moreover, it is intended to make them aware of the profession as Chemist.

CHEM 101 GENERAL CHEMISTRY I (4+0)4
Matter-its properties and measurement. Atoms and atomic theory. Chemical compounds. Chemical reactions. Introduction to reactions in aqueous solutions. Gases. Thermochemistry. Electrons in atoms. The periodic table and some atomic properties. Chemical bonding. Liquids, solids and intermolecular forces. Solutions and their physical properties.

CHEM 102 GENERAL CHEMISTRY II (4+0)4
Chemical kinetics. Principles of chemical equilibrium. Acids and bases. Solubility and complex ıon equilibria. Entropy and free energy. Electrochemistry. Nuclear chemistry. Main group elements I: metals, main group elements II: nonmetals. Complex i on and coordination compounds. Transition metals.

CHEM 111 TECHNICAL ENGLISH FOR CHEMISTRY I (1+0)1
The lecture is aimed to teach the basic concepts and terms of chemistry in English to the students of Chemistry Department. The lecture will be given by one of the Academic Staff of the Chemistry Department to the first year Chemistry students, in the first semester as one hour a week.

CHEM 112 TECHNICAL ENGLISH FOR CHEMISTRY II (1+0)1
The lecture is aimed to teach the basic concepts and terms of chemistry in English to the students of Chemistry Department. The lecture will be given by one of the Academic Staff of the Chemistry Department to the first year Chemistry students, in the second semester as one hour a week.

CHEM 121 GENERAL CHEMISTRY I (3+0)3
Matter-its properties and measurement. Atoms and atomic theory. Chemical compounds. Chemical reactions. Introduction to reactions in aqueous solutions. Gases. Thermochemistry. Electrons in atoms. The periodic table and some atomic properties. Chemical bonding. Liquids, solids and intermolecular forces. Solutions and their physical properties.

CHEM 122 GENERAL CHEMISTRY II (3+0)3
Chemical kinetics. Principles of chemical equilibrium. Acids and bases. Solubility and complex ıon equilibria. Entropy and free energy. Electrochemistry. Nuclear chemistry. Main group elements I: metals, main group elements II: nonmetals. Complex i on and coordination compounds. Transition metals.

CHEM 131 GENERAL CHEMISTRY LAB. I (0+4)2
Experiments are related to the topics covered by CHEM 101 Course.
Corequisite : CHEM 101

CHEM 132 GENERAL CHEMISTRY LAB. II (0+4)2
Experiments are related to the topics covered by CHEM 102 Course.
Corequisite : CHEM 102

CHEM 201 ANALYTICAL CHEMISTRY I (3+0)3
Fundamental theories and principles of quantitative methods of analysis. Errors in chemical analysis and statictical treatment of analytical data. Gravimetric methods of analysis. Titrimetric methods of analysis. Aqueous-solution chemistry and effect of electrolytes on ionic equilibria. An introduction to electrochemistry. Theory of neutralization, precipitation, complex-formation, and oxidation/reduction titrations.
Prerequisite: CHEM 101, CHEM 102

CHEM 202 ANALYTICAL CHEMISTRY II (3+0) 3
Electrochemical methods of analysis. Theory and applications of potentiometry. Electrogravimetric and coulometric methods. Theory of voltametry. An introduction to spectrochemical analysis methods. Molecular absorption and fluorescence spectroscopy. Atomic absorption and emission spectroscopy based on uv-visible radiation. An introduction to chromatographic methods of analysis including gas and liquid chromatography. Sample preparation techniques.
Prerequisite:CHEM 101, CHEM 102

CHEM 203 ORGANIC CHEMISTRY I (3+2)4
Carbon compounds & chemical bonds. Alkenes. Cycloalkanes conformational analysis. Stereo chemistry. Nucleophilic subsititution. Alkenes. Alcohols. Ethers. Radical reactions. Aromatic compounds.
Prerequisite: CHEM 101, CHEM 102

CHEM 204 ORGANIC CHEMISTRY II (3+2)4
Reactions of aromatic compounds. Spectroscopic methods. Phenols. Oxidation reduction reactions. Organometallic compounds. Aldehydes & ketones. Carbonyl compounds. Carboxylic acids & derivatives. Amines and ß-dicarbonyl compounds.
Prerequisite: CHEM 101, CHEM 102, CHEM 203 (coreq.)

CHEM 205 MATHEMATICS FOR CHEMISTS (3+2)4
Series; power series, fourier series. Complex numbers. Linear equations; matrices, determinants and vectors. Partial differentiation and multiple integrals, max-min problems with constraints. Lagrange multipliers, change of variables. Numerical methods; Newton Raphson, numerical integration and differentiation, curve-fitting. Differential equations; First order differential equations, separable, exact, linear. Higher order differential equations with constant coefficients, series solutions.
Prerequisite: MATH 141, MATH 142

CHEM 206 INTRODUCTION TO QUANTUM CHEMISTRY (3+2)4
The origins of quantum mechanics, waves and particles. Postulates in quantum mechanics. Solutions of Schrödinger equation for particle in a box, harmonic oscillator and H-atom. The structures of many electron atoms, atomic spectra. Introduction to MO theory and molecular structure. SCF method. Molecular rotations, vibrations and electronic transitions. Introduction tospectroscopy.
Prerequisite: CHEM 101, CHEM 102

CHEM 221 ORGANIC CHEMISTRY II (4+0)4
Carbon compounds & chemical bonds. Alkenes. Cycloalkanes conformational analysis. Stereo chemistry. Nucleophilic subsititution. Alkenes. Alcohols. Ethers. Radical reactions. Aromatic compounds.

CHEM 222 INTRODUCTION TO BIOCHEMISTRY (3+0)3
An introductory course describing the fundamentals of biochemistry subjects.

CHEM 231 ANALYTICAL CHEMISTRY LAB. I (0+4)2
Laboratory includes special projects to give the students actual hands on experience with the instruments and techniques discussed in lecture.
Prerequisite or corequisite: CHEM 201

CHEM 232 ANALYTICAL CHEMISTRY LAB. II (0+4)2
Laboratory includes special projects to give the students actual hands on experience with the instruments and techniques discussed in lecture.
Prerequisite or requisite: CHEM 202

CHEM 233 ORGANIC CHEMISTRY LAB. I (0+4)2
Experiments are related to the topics covered by CHEM 203
Corequisite: CHEM 203

CHEM 234 ORGANIC CHEMISTRY LAB. II (0+6)3
Experiments are related to the topics covered by CHEM 204.
Corequisite: CHEM 204

CHEM 300 SUMMER PRACTISE (NC)

CHEM 301 INORGANIC CHEMISTRY I (4+0)4
Introduction to inorganic chemistry. Atomic structure. Simple bonding theory. Symmetry. Molecular orbitals. Acid-base and donor-acceptor chemistry.
Prerequisite: CHEM 101, CHEM 102

CHEM 302 INORGANIC CHEMISTRY II (4+0)4
Coordination chemistry: Structures and isomers. Bonding. Electronic spectra of coordination compounds. Reactions and mechanisms. Spectroscopic tecniques in inorganic chemistry.
Prerequisite: CHEM 101, CHEM 102

CHEM 303 PHYSICAL CHEMISTRY I (4+0)4
The properties of gases. The first law. The second law. The phase rule and chemical reactions. Equilibrium electrochemistry. Ions and electrochemical cells.
Prerequisite: CHEM 101, CHEM 102

CHEM 304 PHYSICAL CHEMISTRY II (4+0)4
Molecules in motion: the kinetic theory of gases, ion transport and molecular diffusion. The rates of chemical reactions, The kinetics of complex reactions, Molecular reaction dynamics. Quantum theory and model systems.
Prerequisite: CHEM 101, CHEM 102

CHEM 305 INSTRUMENTAL ANALYSIS I (3+0) 3
Introduction to instrumental methods of analysis. Sources of noise in instrumental analysis and Signal-to-Noise enhancement. Instruments for optical spectroscopy. Theory and applications of UV-Visible and Infrared Spectroscopy. Molecular Fluorescence, Phosphorescence, and Chemiluminescence. Atomic Absorption and Emission Spectroscopy. X-Ray, Nuclear Magnetic Resonance (NMR), and Mas spectroscopy. Recent developments in surface analysis techniques. Radiochemical methods. Modern electroanalytical chemistry. Thermal analysis methods. Seperation techniques. Introduction to hypenated and automated analysis methods. Laboratory includes special projects to give the students actual hands on experience with the instruments and techniques discussed in lecture.
Prerequisite: CHEM 101, CHEM 102

CHEM 306 INSTRUMENTAL ANALYSIS II (3+0) 3
Optic Spectroscopic, Electroanalytical and Chromatographic instruments: Infrared Spectroscopy, Raman Spectroscopy, Modern electroanalytical chemistry, (Potentiometry, Coulometry, Voltammetry), Separation techniques, Gas chromatography, Liquid chromatography.

CHEM 310 CHEMICAL BIOLOGY (3+0) 3
An introductory course decribing the fundamentals of chemical biology subjects. The chemistry of life, the cell structure and genetics will be explained.

CHEM 321 PHYSICAL CHEMISTRY (3+0)3
Molecules in motion: the kinetic theory of gases, ion transport and molecular diffusion. The rates of chemical reactions, The kinetics of complex reactions, Molecular reaction dynamics. Processes at solid surfaces. Dynamic electrochemistry.

CHEM 332 INORGANIC CHEMISTRY LAB (0+4)2
Experiments related to topics covered in CHEM 301 and CHEM 302.

CHEM 333 PHYSICAL CHEMISTRY LABORATORY I (0+4)2
Experiments related to topics covered in CHEM 303.
Corequisite: CHEM 303

CHEM 334 PHYSICAL CHEMISTRY LAB. II (0+4)2
Experiments related to topics covered in CHEM 304.
Corequisite: CHEM 304

CHEM 335 INSTRUMENTAL ANALYSIS LAB. I (0+4)2
Experiments related to topics covered in CHEM 305.
Corequisite: CHEM 305.

CHEM 351 SEPERATION TECHNIQUES (3+0)3
The theories behind various types of analytical separation methods including; chromatography, extraction, and electrophoresis. Gas and liquid chromatography, supercritical fluid extraction, solid phase microextraction, capillary and gel electrophoresis. Types of detectors used in analytical separation methods.

CHEM 352 INTRODUCTION TO ENVIRONMENTAL CHEMISTRY (3+0)3
Atmospheric pollutants; oxides of carbon, sulphur dioxide, hydrogen sulphide, oxides of nitrogen, ozone, chlorofloro hydrocarbons. The hydrosphere; the water cycle, the chemistry of water. Water pollution; metals, dissolved oxygen, the treatment of sewage. The lithosphere; soil, chemical weathering. Pollution of lithosphere; soil pollution, solid wastes, hazardous and toxic wastes.

CHEM 353 INTRODUCTION TO CHEMOMETRICS (3+0)3
The following topics will be covered in this course: Basic statistics, simple comarative experiments, hypothesis testing, design of experiments and optimization, classification and clustering techniques, pattern recognition, principle component analysis (PCA), multivariate regression and calibration methods, genetic algorithms for variable selection and optimization methods.

CHEM 362 INTRODUCTION TO BIOLOGICAL CHEMISTRY (3+0)3
An introductory course describing the fundamentals of biological chemistry subjects.

CHEM 371 INTRODUCTION TO SOLID STATE CHEMISTRY (3+0)3
This course will have general coverage of solid state chemistry and applications.

CHEM 391 COMPUTATIONAL CHEMISTRY I (3+0)3
Some numerical techniques applied to chemistry. Computer simulation methods; Monte Carlo and Molecular Dynamics simulations and some applications.
Prerequisite: CHEM 211, CS 102

CHEM 392 SURFACTANT SCIENCE (3+0)3
Characteristic features of surfactants, adsorption of surfactants at interfaces, EDL. Micella formation by surfactants. Solubilization by solutions of surfactants. Reduction of surface and interfacial tension by surfactants. Wetting and its modification by surfactants. Foaming and antifoming by surfactants. Emulsification, dispersion and aggregation of solids in liquid media. Detergency and its modification. Molecular interaction and synergism in mixtures of two surfactants.

CHEM 393 INTRODUCTION TO CHEMICAL KINETICS (3+0)3
The rates of Chemical reactions, The kinetics of complex reactions ,Molecular reaction Dynamics, Kinetics in the liquid phase, Kinetics of processes at solid surfaces.

CHEM 394 INTRODUCTION TO NUCLEAR CHEMISTRY (3+0)3
Fundamental theories behind the nuclear chemistry. Process of radioactive decay and interaction of radiation with matter. Radiation detection. Methods of various types of nuclear spectroscopy including; Gamma-ray and beta-ray spectrometry. Nuclear reaction experiments and radiolabeling of organic and inorganic compounds for nuclear medicine.

CHEM 401 GRADUATION PROJECT I (0+4)NC
A course to guide students about professional opportunities and issues to inform about the recent advances in the areas of Chemistry research. Lecture will be conducted by the related instructor and respected Chemists from industry for one year term.

CHEM 402 GRADUATION PROJECT II (0+6)3
Continuation of CHEM 401

CHEM 411 BIOCHEMISTRY (2+2)3
Aminoacids, peptides and proteins, enzyme and coenzymes. Nucleic acids and protein biosynthesis, protein metobolism, oxidative decarboxylation and citrate cyle. Simple sugars and monasaccharide and polysaccharides. Izoprenoid lipids, fats and fat metobolism, phospholipids, glycolipids and lipoproteins.Biologic membrans.

CHEM 451 ATOMIC AND MOLECULAR SPECTROMETRY (3+0)3
Review of modern instrumental analysis techniques, recent developments in instrumental designs and applications.

CHEM 452 SPECIAL TOPICS IN ANALYTICAL CHEMISTRY (3+0)3
Selected anaytical methods used in many areas of science. Modern developments in analytical chemistry appeared on current literatur. Topics covered may vary each year depending on the students interest.

CHEM 453 ELECTROCHEMISTRY (3+0)
Fundamentals of electrochemistry and electroanalysis. Types of electroanalytic methods. Ion selective interfaces and electrodes. Electrochemical sensors and their applications in various fields including biochemistry and medicine. Electrochemical detectors applied to other analytical techniques.

CHEM 464 SELECTED TOPICS İN BIOCHEMISTRY (3+0)3
Metabolism (chemical reactions in cell) in Biochemistry.

CHEM 466 BIOINORGANIC CHEMISTRY (3+0)3
The chemical and physical factors controlling the elements of life. Physical separation of elements. Compartments and zones in biology. The non-haem iron proteins. The iron-sulphur proteins; iron-sulphur clusters in biology, haem proteins. Copper enzymes, copper and electron transfer, molybdoenzymes. Zinc biochemistry,biominerals, elements in medicine.

CHEM 471 TRANSITION METAL CHEMISTRY (3+0)3
Introduction to transition metals. Physical properties and chemical properties. Chemistry of first row transition metals. Coordination numbers and geometries in transition metal complexes. Bonding in some transition metal complexes.

CHEM 472 ORGANOMETALLIC CHEMISTRY (3+0)3
Introduction to organometallic chemistry. The 18-electron rule. Ligands in organometallic chemistry. Bonding between metal atoms and organic Pi systems. Complexes containing M-C, M=C, and M□C bonds. Organometallic reactions and catalysis. Spectral analysis and characterization of organometallic complexes.

CHEM 473 SPECTROSCOPIC METHODS IN INORGANIC CHEMISTRY (3+0)3
his course will have general coverage of EPR, Electronic and Photoelectron spectroscopy, Vibrational (IR, Raman), one and two dimetional NMR, Mass spectrometry and their applications.

CHEM 481 REACTION MECHANISM IN ORGANIC CHEMISTRY (3+0)3
Polar mechanisms, free-radikal mechanisms, Pericyclic mechanisms, Transitional-metal-catalyzed and mediated mechanisms.

CHEM 482 SPECTROSCOPIC METHODS IN ORGANIC CHEMISTRY (3+0)3
Analysis and interpretation of organic materials by means of IR,MS and NMR (1H and 13C) techniques.

CHEM 483 SELECTED TOPICS IN ORGANIC CHEMISTRY (3+0)3
Contents vary according to student's research interest.

CHEM 484 INTRODUCTION TO BIOORGANIC AND MEDICINAL CHEMISTRY (3+0)3
Since bioorganic chemistry involves both organic chemistry and biochemistry, through the course students will encounter all of the following topics at the introductionary level: organic synthesis of small molecules, biological activities of those small molecules and their mechanism(s) of action, and structure-activity relationships of the known analogous structures.

CHEM 491 COMPUTATIONAL CHEMISTRY II (3+0)3
Electronic structure methods; semi-empirical, ab-initio methods. Density Functional Theory and their applications in chemistry.

CHEM 492 INTRODUCTION TO COLLOID CHEMISTRY (3+0)3
Definition and classification of colloids. Particle size. Electrical double layer. Van Der Waals forces. DLVO theory. Steric effects. Termodynamics of interfaces.

CHEM 493 INTRODUCTION TO POLYMER SCIENCE (3+0)3
This course covers basic concepts of polymer chemistry and polymer physics. Some of these concepts are as follows: polymerization processes, (condensation, free radical, ionic, and coordination), polymerization mechanisms (step-growth and chain growth), characterization of polymers (molecular mass determination, thermal analysis, and spectroscopic techniques), structure-property relationships of bulk polymers, industrial polymers (plastics, fibers, coatings, adhesives), and rubbers.

CHEM 494 POLYMER COMPOSITES (3+0)3
This course offers an overview of nanocomposite materials, particularly polymer-based composites. It mainly includes the definition and classification of nanocomposites, composite preparation methods, engineering surfaces and interfaces, characterization techniques of nanostructures, and applications of these materials in various disciplines. This course also provides the ability to select appropriate components and processing techniques to obtain tailor-made composite materials.

CHEM 495 PHOTOCHEMISTRY (3+0)3
Fundamental principles of photochemistry and photophysics will be the subject of this course along with basic instrumentation to observe photochemical processes.

CHEM 496 MOLECULAR PHOTONICS (3+0)3
The concept of molecular photonics, molecular materials and its applications in nanophotonics, photobiology and biological imaging will be provided.

CHEM 497 INTRODUCTION TO MASS SPECTROMETRY..(3+0)3
Giving Information about Mass Spectrometry and its application.

CHEM 499 INDUSTRIAL CHEMISTRY (3+0)3
Main inorganic industrial chemicals and their manufacturing processes with special emphasis on their economic aspects.Development of interrelationships of different industries with regard to their raw materials and product.