KIM 103 GENERAL CHEMISTRY	CIVIL ENGINEERING		
Semester	**Credit Structure**		
	Lecture	**Recitation**	**Laboratory**
1	3	1	
Language	Turkish		
Compulsory / Elective	Compulsory		
Prerequisites	none		
Catalog Description	Chemical equations and reactions, gases, thermochemistry, the periodic table and some atomic properties, chemical bonding, liquids, solids and intermolecular forces, solutions, chemical equilibrium, acids, bases and equilibrium in aqueous solutions, thermodynamic, electrochemistry, nuclear chemistry, organic chemistry.		
Course Objectives	We are aware that most general chemistry students have career interests not in chemistry but in biology, medicine engineering, and environmental and agricultural sciences as well as in many other fields. Therefore, the general principles and modern applications are aimed in this course.		
Course Outcomes	To solve the problems about biological sciences, engineering and environmental sciences, this course contains a number of special features designed to help the students gain an understanding of the basic concepts and methods.		
Textbook and /or References	**Ralph H. Petrucci, William S. Harwood, F. Geoffy Herring,** General Chemistry ,*principles and modern applications*, Prentice-Hall, Inc (2002), New Jersey 2) **Charles E. Mortimer,** Chemistry**,** A Conceptual Approach, D. Van Nostrand Company , New York		
Assessment Criteria		**Quantity**	**Percentage**
	Midterm Exams	1	50
	Quizzes		
	Homeworks		
	Projects		
	Term Paper		
	Laboratory Work		
	Other		
	Final Exam	1	50
Course Category by Content (%)	**Mathematics and Basic Sciences**	75	
	Engineering Science	20	
	Engineering Design	5	
	Social Sciences	0	
Instructors	**Prof. Dr. Bekir Sarı, Prof. Dr. Beytiye Özgün**		

COURSE PLAN	
Week	**Topics**
1	**CHEMICAL EQUATIONS AND REACTIONS:** Chemicals, measurement, SI units, Early chemical discoveries, Dalton atomic theory, isotopes, mole concept, empirical molecular formulas, chemical equations, limiting reactant, percent yield, electrolyte and non-electrolyte solutions, acid and base reactions, neutralization, precipitation, oxidation and reduction reactions, molarity.
2	**GASES :** properties of gases : gas pressure, pressure, volume and temperature relationships, the ideal gas equation, applications of the ideal gas equations, gases in chemical reactions, mixtures of gases, Dalton's law of partial pressure, kinetic-molecular theory of gases, Graham's law of effusion, real gases.
3	**THERMOCHEMISTRY :** kinetic and potential energy, heat and work, heat of reaction and calorimetry, the first law of thermodynamics, enthalpy(H) , internal energy(E), Hess's law, enthalpies of formation
4	**THE PERIODIC TABLE AND SOME ATOMIC PROPERTIES:** Electromagnetic radiation and atomic spectra, quantum theory , Bohr's model of atom , wave mechanics, uncertainty, quantum numbers and electron orbital, periodic table, the sizes of atoms and ions, ionization energy, electron affinity and magnetic properties.
5	**CHEMICAL BONDING:** Lewis theory, covalent bonding, electronegativity and polarity of bonds, writing Lewis structures, formal charge and resonance.
6	**LIQUIDS, SOLIDS AND INTERMOLECULAR FORCES:** some properties of liquids, some properties of solids, intermolecular forces (van der Waals forces hydrogen bonding), phase diagrams, crystal structures, crystal lattice, X- ray diffraction.
7	**SOLUTIONS:** percent concentration, mole fraction, enthalpy of dissolution, intermolecular forces in solutions, temperature effect on solubility, solubility of gases and effect of pressure and temperature, vapor pressure of solutions, Raoult's law, colligative properties of electrolyte and non-electrolyte solutions (freezing point depression and boiling point elevation, vapor pressure lowering and osmotic pressure), solutions of electrolytes.
8	**CHEMICAL EQUILIBRIUM:** Reaction rates, collision and transition state theory, dynamic equilibrium in chemical equilibrium, the equilibrium constant expression, Kc and Kp, homogeneous and heterogeneous equilibrium, predicting of the direction of a net reaction, altering equilibrium conditions : Le Chatelier's principle.
9	**ACIDS, BASES AND EQUILIBRIUM IN AQUEOUS SOLUTIONS :** The Arrhenius theory, Bronsted-Lowry theory, the self-ionization of water and pH scale, strong acids and bases, weak acids and bases, calculations on acid-base reactions, the common-ion effect in acid-base equilibrium, buffer solutions, solubility equilibrium, the solubility product constant, K_{sp}, criteria for precipitation (Q_{cc} and K_{cc}) , fractional precipitation.
10	**THERMODYNAMIC:** Spontaneous and non-spontaneous change, entropy and free energy, second law of thermodynamics, third law of thermodynamics, ∇G and equilibrium, ∇G^{o} and K_{eq} as functions of temperature
11	**Mid-Term exam**.
12	**ELECTROCHEMISTRY :** electrode potentials and their measurements, standard electrode potentials, E_{cell} and spontaneous change, E_{cell} as a function of concentration, relation between E_{cell} and K_{eq} , Nernst equation, electrolysis, determination by electrolysis.
13	**NUCLEAR CHEMISTRY :** Radioactivity, alpha, beta and gamma rays, electron captures, nuclear reactions and artificially induced radioactivity, rate of radioactive decay, energies of nuclear reactions, nuclear stability, fission and fusion, effect of radiation on matter, applications of radioisotopes
14	**ORGANIC CHEMISTRY:** Organic compounds and structures, alkynes, aromatic hydrocarbons, nomenclatures, alcohols, phenols and ethers, aldehydes and ketones, carboxylic acids , amines, heterocyclic compounds.

RELATIONSHIP BETWEEN THE COURSE AND DEPARTMENT CURRICULUM				
	Program Outcomes	**1**	**2**	**3**
1	An ability to apply knowledge of mathematics, science, and engineering		x	
2	An ability to design and conduct experiments, as well as to analyze and interpret data		x	
3	An ability to design a system, component, or process to meet desired needs		x	
4	An ability to function on multi-disciplinary teams		x	
5	An ability to identify, formulate, and solve engineering problems		x	
6	An understanding of professional and ethical responsibility		x	
7	An ability for effective written and oral communication in Turkish and English			x
8	The broad education necessary to understand the impact of engineering solutions in a global and societal context		x	
9	A recognition of the need for, and ability to engage in life-long learning		x	
10	A knowledge of contemporary issues		x	
11	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice		x	
Contribution of the course : 1:None 2:Partially 3:Completely				