Course Description Form	
Course Code and Name	CHEM103 – CHEMISTRY
Course Semester	1
Catalog Content	Properties of the Matter and Its Measurements; Atoms, Atomic Theory and Some Basic Concepts; Electronic Structure and Periodic Properties of Atoms; Chemical Stoichiometry and Reaction Types; Chemical Bonds; Gas Laws; Thermodynamics; Intermolecular Forces, Liquids and Solids; Solutions and Its Properties; Chemical Kinetics; Chemical Equilibrium; Acid-Base Chemistry and Equilibrium of Aqueous Solutions; Electrochemistry.
Textbook	General Chemistry: The Essential Concepts, Raymond CHANG
Supplementary Textbooks	General Chemistry: Principles and Modern Applications. Authors: Petrucci, Harwood, Herring.
Credit	4 (6)
Prerequisites of the Course (Attendance Requirements)	There is no prerequisite or co-requisite for this course.
Type of the Course	Compulsory
Instruction Language	English
Course Objectives	To have the basic knowledge of chemistry in engineering education.
Course Learning Outcomes	1. Students are expected to comment on the structure and theories about the atom, and applications of the periodic table. 2. Make calculations using stoichiometry in chemical reactions. 3. Apply theories about liquid solutions and gases and can solve problems. 4. Can make calculations related to heat, work, enthalpy and internal energy changes. 5. Explain the three-dimensional structures of compounds by using various theories about chemical bonding concept. 6. Acquire knowledge on crystal structures of solids and can solve related questions 7. Solve problems related to Thermodynamics, Chemical Equilibrium, Acids and Bases. Can use this information in real life applications.
Instruction Methods	Face to face
Weekly Schedule	1. Week. Properties of Matter: Purpose of Chemistry, Main Areas and Research Subjects of Chemistry, Measurements of Matter, International Units of Measurements, Using the Linear Methods in Problem Solving, Unit Conversion, Significant Figures; Rounding Numbers 2. Week. Atoms, Theory of Atoms and Some Basic Concepts: Atom, Proton, Neutron, Electron, Isotopes, Elements, Molecules, Compounds, Avogadro's Number, Mole Concepts, Atomic and Mole Mass, Chemical Compounds, Writing Formulas and Naming of the Chemical Compounds: Inorganic and Organic Compounds, Composition of Chemical Compounds, Oxidation Steps. 3. Week. Electronic Structure and Periodic Properties of Atom: Electromagnetic Radiation, Atomic Spectra, Bohr Atom Model, Quantum Theory, Quantum Numbers and Electronic Configurations, Periodic Table, Atomic and Ionic Radius, Electronegativity, Ionization Energy, Electron Affinity, Magnetic Properties, Finding Periods and Groups of the Elements 4. Week. Chemical Stoichiometry and Reaction Types: Empirical (simple) and Molecular Formula of a Compound, Chemical Equations, Stoichiometry, Limiting Reagents, Yield Calculations of

	a Reaction, Definition of a Solution, Electrolyte and Non-Electrolyte Solutions, Concentration of a Solution, Molarity, Molality, Mole Fraction, Percentage of Composition, Acids, Base and Salt Definitions (Arrhenius), Acid-Base Reactions, Precipitation Reactions, Oxidation-Reduction (Redox) Reactions, Balancing Oxidation-Reduction (Redox) Reactions 5. Week. Chemical Bonds: Chemical Bond Types, Covalent Bonds, Ionic Bonds, Metallic Bonds, Electronegativity and Bond Polarity, Dipole Moment, Lewis Symbols, Writing Lewis Structures, Finding Formal Charges 6. Week. Gases: General Properties of Gases, Simple Gas Laws: Boyle, Charles, and Avogadro's Number, Ideal and General Gas Equations, Gases in Chemical Reactions, Gas Mixtures, Dalton's Law, Diffusion of Gases, Graham's Law 7. Week. Thermodynamics: Thermodynamic Concepts, System, Surroundings and Environment, Work, Heat and Energy, State and Path Functions, First Law of Thermodynamics, Internal Energy and Enthalpy, Reaction Temperature and its Measurement: Calorimetry, Standard Enthalpy of Formation, Finding the Reaction Temperature indirectly; Hess Law, Spontaneous and Nonspontaneous Processes: Entropy, Second Law of Thermodynamics, Free Energy, Standard Free Energy Differences and Equilibrium 8. Week. MIDTERM EXAM 9. Week. Intermolecular Forces, Liquids and Solids: Intermolecular Forces, Van der Waals Forces, Hydrogen Bonds, Some Properties of Liquids: Surface Tension, Viscosity, Evaporation of Liquids, Phase Diagrams of Water (Boiling Point, Critical Temperature and Critical Pressure), Vapor Pressure-Temperature Relationships, Clausius-Clapeyron Equation, Solids and Some Properties: Melting, Sublimation, Structures of Solids, Crystal Structures, Simple Cubic Crystal Systems 10. Week. Solutions and its Physical Properties: Types of Solutions, Solubility of the Gases, Henry's Law, Vapor Pressure of Ideal Solutions: Raoult and Dalton's Laws, Numerical (Colligative) Properties, Molar Mass Calculations using Pressure Differences, Boiling Point Elevation, Freezing Point Descent, Osmotic Pressure 11. Week. Chemical Kinetics: Reaction Rates, Rate Law, Relationship Between Reaction Concentrations and Time, Zeroth and First Order Reactions, Activation Energy and Dependence of Rate Constant on Temperature: Arrhenius Equation, Effects of Catalysts 12. Week. Chemical Equilibrium: The Concept of Chemical Equilibrium, Dynamic Equilibrium, Equilibrium Constant Equations (Kp, Kc), Reaction Rate Expressions, Q: Determination of Net Reaction Direction, Dependence of Temperature on Equilibrium Constants, Factors Affecting Equilibrium: Le Chatelier Principle 13. Week. Acids-Bases and Aqueous Solution Equilibriums: Acid-Base Definitions, Ionization of Water and pH, Arrhenius, Lowry-Bronsted and Lewis Theories of Acidity/Basicity and pH, Strong Acid-Base and Weak Acid-Bases; pH Calculations for Monoprotic Acids and Bases, Buffer Solutions, Solubility Equilibria 14. Week. Electrochemistry: Galvanic and Electrolytic Cells, Standard (Reduction) Electrode Potentials, Cell Diagrams (Cell Schemes), Standard Cell Potential, Free Energy Change (ΔG) and Equilibrium Constant (K) Relationships, Electrolysis and Batteries.
Teaching and Learning Methods *(These are examples. Please fill which activities you use in the course)*	Weekly theoretical course hours 4 Reading Activities 28 Literature review, library studies 28 Preparation of Midterm and Midterm Exam 10 Final Exam and Preparation for Final Exam 10 Other 10
Assessment Criteria	

	Numbers	**Total Weighting**	

			(%)
	Midterm Exams	2	60%
	Assignment	0	0
	Application	0	0
	Projects	0	0
	Practice	0	0
	Quiz	0	0
	Percent of In-term Studies (%)		60%
	Percentage of Final Exam to Total Score (%)		40%
	Attendance		-

Workload

Activity	**Total Number of Weeks**	**Duration (weekly hour)**	**Total Period Work Load**
Weekly Theoretical Course Hours	14	4	56
Weekly Tutorial Hours			0
Reading Tasks	14	2	28
Studies	14	2	28
Material Design and Implementation			0
Report Preparing			0
Preparing a Presentation			0
Presentations			0
Midterm Exam and Preperation for Midterm Exam	1	10	10
Final Exam and Preperation for Final Exam	1	10	10
Other (should be emphasized)	5	2	10
Total Workload			142
Total Workload / 25			5.68
Course Credit (ECTS)			6

Contribution Level Between Course Learning Outcomes and Program Outcomes

No	Program Çıktıları	1	2	3	4	5
1	To acquire sufficient theoretical and applied knowledge on engineering, mathematics and science in order to identify, define and formulate engineering problems.				X	
2	To be able to choose and apply analysis, modeling and design methods suitable for solving engineering problems.	X				
3	To be able to design a system, process or product related to engineering problems in line with the requirements of a defined goal; To be able to use modern design tools for this purpose.	X				
4	To be able to evaluate engineering solutions with design quality, realistic constraints and conditions, including safety, durability,	X				

		adaptability, economy, environmental issues, sustainability and manufacturability.					
	5	Ability to simulate or experiment and design and interpret results for the analysis and solutions of engineering problems. Ability to analyze data for real life industry problems.	X				
	6	To be able to use modern techniques and calculation tools required for engineering applications; to be able to use information technologies effectively.	X				
	7	To be able to work effectively in a group or as an individual for a particular discipline or interdisciplinary studies. Ability to act independently, use initiative and creativity.	X				
	8	To be able to communicate effectively by expressing their ideas orally and in writing in a clear and concise way in English. To be able to communicate in using at least one foreign language effectively for the profession.	X				
	9	To be able to plan and manage projects; ability to comprehend the importance of approaches like entrepreneurship, innovativeness etc. in business life.	X				
	10	Understanding the necessity of lifelong learning and the ability to renew oneself with the awareness of being open to innovations.	X				
	11	Having professional and moral responsibility.	X				
	12	Development of personality traits such as self-confidence, endurance in hardships, determination and patience.	X				
	13	Have an awareness of the current social, economic, environmental, etc. problems and practice engineering profession with the responsibility brought by this awareness.	X				

The Course's Lecturer(s) and Contact Informations	All chemistry faculty members http://kimya.gazi.edu.tr/?language=en_US