

Identification	Subject	CHEM 111 General Chemistry-1 6 ECTS	
	Department	Chemistry and Chemical Engineering	
	Program	Undergraduate	
	Term	Spring 2024	
	Instructor	Khatira Garazadeh	
	E-mail:	garazade77@mail.ru	
	Phone:	+(994)556057466	
	Classroom/hours	11 Mahsati Street,	
Prerequisites			
Language	English		
Compulsory/Elective	Compulsory		
Required textbooks and course materials	R.Chang, Chemistry. New-York, 1988, 3-rd edition [1] Mcquarie, D.A., Rock, P.A., Gallogly, E.B. "General Chemistry, Atoms first" University Science Books (www.uscibooks.com) [2] Keller, P.C., Keller, J.L., Chang, R. "Student solution manual for Chang's Chemistry third edition" [3] Mcquarrie, C.H., "Students solutions manual to accompany General chemistry" Fourth edition [4]		
Teaching methods	Lecture	x	
	Group discussion	x	
	Research from internet	x	
	Others	x	
Evaluation	Methods	Date/deadlines	Percentage (%)
	Participation	Every week	5
	Quiz	Week 8, 14	10
	Midterm Exam	Week 9	30
	Activity	Every week	5
	Presentation	Week 10-15	10
	Final Exam		40
	Total		100
Course outline	General Chemistry is a two part survey course, which serves the purpose of giving students a solid and diverse introduction to the discipline. General Chemistry-1 covers the qualitative and quantitative aspects of scientific measurement, atomic theory, the nature of matter, stoichiometry, basic chemical reactions, thermochemistry, atomic structure and the periodic table, chemical bonding.		
Course objectives	<ol style="list-style-type: none"> 1. To teach the basic concepts and principles of chemistry. 2. To provide the theoretical and practical knowledge together. 3. To improve the ability of problem solving skill and to make critical decisions. 4. To give the importance of chemistry on the daily life. 5. To help the students thinking positively, logical and to understand the principles of nature. 		

<p>Learning outcomes</p>	<p>Student, who passed the course satisfactorily can:</p> <ul style="list-style-type: none"> • distinguish between the physical and chemical properties of matter; • perform mathematical operations involving significant figures; • describe the arrangement of the periodic table; • identify and write electron configurations; • draw Lewis structures for molecules; • name ionic and covalent compounds using the rules for nomenclature of inorganic compounds; • perform stoichiometric calculations; • use the Ideal Gas Law to calculate properties of gases; • calculate enthalpy change for a given process, and explain the relationship between enthalpy change and the tendency for reactions to occur; • conduct pH calculations and use the pH scale to classify solutions as acidic, basic, or neutral; • write and balance oxidation-reduction reactions.
<p>Policy</p>	<ul style="list-style-type: none"> • Participation <p>The students are required to attend all classes as a part of their studies and those having legitimate reasons for absence (illness, family bereavement, etc.) are required to inform the instructor. Students exceeding the 25% absence limit will not be allowed to participate at final exam. Participation will account for 5 percent of the total course grade.</p> <ul style="list-style-type: none"> ▪ Quiz <p>At least two (2) quizzes (in written form) will be held in order to evaluate factual standing points of students in terms of the covered topics. The total score for two quizzes is 10 points. A main purpose of carrying out quizzes is to enforce students' focuses on covered lectures and provide students experience in solving several types of questions.</p> <ul style="list-style-type: none"> ▪ Activity <p>A student can get an activity grade. There are several ways to get activity points: engage in discussions; contribute with insights and feedback; solve problems in the class etc. Activity will account for 5 percent of the total course grade, which depends on a student's good class attendance and active participation in class discussions.</p> <ul style="list-style-type: none"> ▪ Presentation <p>Presentation will be conducted by each student. The presentation includes the following: title, introduction, literature review, methodology, and proposed data analysis. Presentation will constitute 10 % of the total course grade. Students must present the research paper they have prepared during the session at the end of the session (last two weeks). The presentation is presented in the "Power Point" program, consisting of at least 20 slides. The student presents a brief summary of the topic and results of the research.</p> <ul style="list-style-type: none"> • Withdrawal (pass / fail) <p>The School of Science and Engineering grading guidelines are carefully adhered to throughout this course. In order to pass, a student must typically receive a mark of at least 60%. In case of failure, he/she will be referred or required to repeat the course the following term or year. For referral, the student will be required to take examination scheduled by instructor.</p> <ul style="list-style-type: none"> • Cheating / plagiarism

	<p>Any form of plagiarism or cheating on a test, quiz, or project will result in the cancellation of the assignment. In this scenario, the student will receive a score of zero (zero) without any further consideration.</p> <ul style="list-style-type: none"> • Professional behavior guidelines <p>During class hours, students are expected to conduct themselves in a way that fosters a positive academic and professional atmosphere. Discussions without permission and unethical conduct are absolutely forbidden.</p> <ul style="list-style-type: none"> • Ethics <p>Use of any electronic devices is prohibited in the classroom. All devices should be turned off before entering class. This is a university policy and <u>violators will be reprimanded accordingly</u></p> <ul style="list-style-type: none"> • For successful completion of the course, the students shall take an active part during the class time, raising questions and involving others to discussions. 	
Tentative Schedule		
Weeks	Topics	Reference books
1	Topic 1. Tools of Chemistry Chemistry today, Science and its methods, Some basic definitions, Chemical Elements and Periodic table, Measurement, Units of measurement Handling number, The factor-label method of solving problems	[1], [2]
	Solving problems on the topic	
2	Topic 2. Atoms, Molecules and Ions The atomic theory, The structure of the atom, Mass relationships of atoms, Molecules: atoms in combination, Ions and Ionic Compounds, Percent Composition by Mass of compounds, Laws of Chemical combination , Experimental determination of atomic and molecular masses, Naming inorganic compounds	[1], [3]
	Solving problems on the topic	
3	Topic 3. Stoichiometry: The arithmetic of Chemistry <input type="checkbox"/> The chemical equations (84) Writing chemical equations, Balancing chemical equations <input type="checkbox"/> Properties of aqueous solutions, Electrolytes versus nonelectrolytes <input type="checkbox"/> Types of Chemical Reactions Combination reactions Decomposition reactions Displacement reactions Hydrogen displacement Metal displacement Halogen displacement Metathesis reactions	[1], [4]

	Neutralization reactions <input type="checkbox"/> Amounts of Reactants and Products <input type="checkbox"/> Limiting reagents <input type="checkbox"/> Yields: theoretical, actual, and percent	
	Solving problems on the topic	
4	Topic 4. Concentration and dilution of solutions <input type="checkbox"/> Concentration <input type="checkbox"/> Dilution of solutions <input type="checkbox"/> Gravimetric analysis <input type="checkbox"/> Acid–Base titrations	[1], [3]
	Solving problems on the topic	
5	Topic 5. Thermochemistry <input type="checkbox"/> Some definitions <input type="checkbox"/> Energy, Work and Heat <input type="checkbox"/> Energy changes in Chemical Reactions <input type="checkbox"/> Enthalpy <input type="checkbox"/> Calorimetry <input type="checkbox"/> Hess’s law <input type="checkbox"/> Standard enthalpies of formation and reaction <input type="checkbox"/> Heats of solution and dilution <input type="checkbox"/> Molecular Basis of Heat capacity	[1], [2]
	Solving problems on the topic	
6	Topic 6. Electronic structure of atoms Quantum numbers Atomic orbitals Electron configuration The Pauli Exclusion Principle, Diamagnetism and Paramagnetism, The shielding effect in many electron atoms, Hund’s rule , General rules for assigning electrons to atomic orbitals Building up Principle of the periodic table	[1], [3]
	Solving problems on the topic	
7	Topic 7. Periodic Relationships among the elements Development of periodic table Periodic classification of the elements Representing free elements in chemical equations, Electron configurations of cations and anions, Ions derived from representative elements, Cations derived from Transition metals Periodic variation in physical properties Effective nuclear charge	[1], [3]
	Solving problems on the topic	

8	Topic 8. Atomic radius, ionic radius Variation in physical properties across a period, predicting physical properties ionization energies Ionisation energies in many electron atoms Electron affinity General trends in Chemical Properties , Chemical Properties in individual groups , Comparison of group 1A and 1B elements	[1], [4]
	Solving problems on the topic	
9	MID EXAM	
10	Topic 9: Chemical Bonding: Molecular geometry and molecular orbitals <input type="checkbox"/> Molecular geometry <input type="checkbox"/> The tetrahedron <input type="checkbox"/> The valence shell electron pair repulsion (VSEPR) model <input type="checkbox"/> Structure and Dipole moments <input type="checkbox"/> Valence Bond theory <input type="checkbox"/> Hybridisation of atomic orbitals <input type="checkbox"/> sp, sp ² , sp ³ localised bond orbitals <input type="checkbox"/> Hybrid orbitals from d Orbitals <input type="checkbox"/> Hybridisation in molecules containing double and triple bonds <input type="checkbox"/> Delocalised Molecular orbitals <input type="checkbox"/> Molecular Orbital theory <input type="checkbox"/> Molecular Orbital configurations	[1], [3]
	Solving problems on the topic	
11	Topic 10: Chemical Bonding : Basic concepts <input type="checkbox"/> Lewis dot symbols <input type="checkbox"/> Elements that form ionic compounds <input type="checkbox"/> Lattice energy of ionic compound <input type="checkbox"/> The covalent bond <input type="checkbox"/> Electronegativity <input type="checkbox"/> Polar bonds <input type="checkbox"/> The octet rule <input type="checkbox"/> Formal charge and Lewis structure <input type="checkbox"/> The concept of resonance <input type="checkbox"/> Free radicals <input type="checkbox"/> Exceptions to the Octet rule <input type="checkbox"/> Strength of the covalent bond	[1], [2]
	Solving problems on the topic	
12	Topic 11: The gaseous state <input type="checkbox"/> The three states of matter <input type="checkbox"/> Substance that exist as gases <input type="checkbox"/> Pressure of a gas <input type="checkbox"/> Measurement of pressure <input type="checkbox"/> The Gas laws <input type="checkbox"/> The Ideal gas equation	[1], [4]

	<input type="checkbox"/> Stoichiometry involving gases <input type="checkbox"/> Dalton's law of partial pressures <input type="checkbox"/> The kinetic molecular theory of gases <input type="checkbox"/> Mean free path <input type="checkbox"/> Maxwell-Boltzmann distribution <input type="checkbox"/> Graham's law of diffusion and effusion <input type="checkbox"/> Deviation from ideal behavior	
	Solving problems on the topic	
13	Topic 12 : Oxidation – Reduction reactions <input type="checkbox"/> Oxidation – Reduction reactions: definitions <input type="checkbox"/> Oxidation numbers, Oxidation states <input type="checkbox"/> Half reactions <input type="checkbox"/> Types of Redox reactions <input type="checkbox"/> Balancing Redox reactions <input type="checkbox"/> Quantitative aspects of redox reactions <input type="checkbox"/> Chemical analysis <input type="checkbox"/> Corrosion	[1], [4]
	Solving problems on the topic	
14	Presentations	
15	Presentations	
Final exam		