COURSE OUTLINE TEMPLATE

	**SULTAN QABOOS UNIVERSITY** **COLLEGE OF SCIENCE** **BACHELOR OF SCIENCE IN CHEMISTRY** **COURSE OUTLINE**	Other logo

I. COURSE INFORMATION			
COURSE CODE	CHEM1071		
COURSE TITLE	**CHEMISTRY FOR ENGINEERING**		
OMAN QUALIFICATION FRAMEWORK (OQF) LEVEL	**5**		
CREDIT HOURS	4		
CONTACT HOURS	6		
PRE-REQUISITES	FPEL0560 OR FPEL0600 OR FPEL0601 OR FPEL0602 FPEL0603 OR FPEL0604 AND (FPMT0105 OR FPMT0108 OR FPMT0109)		
CO-REQUISITES	X		
EQUIVALENT COURSES	X		
INCOMPATIBLE COURSES	X		
COURSE CATEGORY	☐ University Requirement	☐ University Elective	
	☐ College Requirement	☐ College Elective	
	☒ Department Requirement	☐ Department Elective	
	X Specialization Requirement	☐ Specialization Elective	
	☐ Other (specify):		
COURSE OWNER	College: Science	Department: Chemistry	
	Center:	Unit:	
DELIVERY MODE	☒ Face to Face	☐ Blended	☐ Online
COURSE TYPE	XLecture	Lecture/Lab	

	☐Lecture/Seminar	☐ Lecture/Studio	
	☐ Lecture/Tutorial	☐ Lecture/Lab/Tutorial or Seminar	
	☐ Tutorial	☐ Laboratory (Practical)	
	☐ Field or Work Placement	☐ Studio	
	☐ Seminar	☐ Internship	
	☐ Workshop	☐ Project	
	☐ Thesis	☐ Other (specify):	
LANGUAGE OF INSTRUCTION	English		
COURSE DESCRIPTION	This course in general chemistry is aimed at introducing engineering students to fundamental chemical concepts and principles. It is a basic course primarily intended for majors in chemistry and other related departments. It includes experiments related to basic chemical principles. It teaches students how to think like scientists and chemists so that they can apply the problem-solving method to other aspects of their lives. They use the tools to become critical thinkers, ask questions, use rules and models, and properly evaluate the outcome. The topics covered include chemical foundations; atoms, molecules, and ions; stoichiometry; types of chemical reactions and solution stoichiometry; atomic structure and periodicity; general concepts of bonding; and thermochemistry. The lab activities are designed to help students develop the practical skills required for higher-level chemistry courses while also expanding on the principles taught in lectures.		
TEACHING AND LEARNING STRATEGIES	☐ Augmented Reality	☐ Flipped Classroom	
	☒ Blended Learning	☒ Problem-Based Learning	
	☒ Discovery-Based Learning	☐ Project-Based Learning	
	☐ Student-Led Learning	☐ Team-Based Learning	
	☐ Work-Based Learning	☐ Other (specify):	
ASSESSMENT COMPONENT AND WEIGHT	☒ In-term exams (40%)	☒ Quizzes and assignments (10%)	☐ Other (specify): (%)
	☐ Homework (%)	☐ Project (%)	
	☒ Final examination (50%)	☒ Practical/ Lab (%)	

TEXTBOOKS AND EDUCATIONAL MATERIAL	Textbook: Raymond Chang /Jason Overby. Chemistry, 13th Edition, McGraw-Hill Education, New York, 2019 Chemistry, Zumdahl S. S. & Zumdahl S. A. 9th Edition, Brooks/ Cole, Belmont (CA, USA), 2014; Lecture notes; lab manuals handouts and videos.		
GRADING METHOD	☒ A-F Scale	☐ Pass/Not Pass	☐ Other (specify):

GRADING METHOD DESCRIPTION

	Range	Letter Grade	Description
A-F GRADING SCALE:	≥90	A	**Exceptional performance:** All course objectives achieved and met in a consistently outstanding manner.
	≥86	A-	
	≥81	B+	**Very Good Performance:** The majority of the course objectives achieved (majority being at least two-thirds) and met in a consistently thorough manner.
	≥77	B	
	≥73	B-	
	≥68	C+	**Satisfactory Performance:** At least most of course objectives have been achieved and met satisfactorily
	≥64	C	
	≥60	C-	
	≥55	D+	**Minimally Acceptable Performance:** The course objectives met at a minimally acceptable level.
	≥50	D	
	<50	F	**Unacceptable performance:** The course objectives not met at a minimally acceptable level.
PASS/NOT PASS:			
OTHER:			

II. SEMESTER INFORMATION			
SEMESTER/YEAR	Fall/2024	**SECTION(S)**	01 to 04
DAY AND TIME		**VENUE(S)**	F51
COURSE COORDINATOR	Bushra AL-Wahaibi	**COURSE TEAM**	Zulfiqar Rehan Reem AL-Alawi

			Nafiseh
COORDINATOR OFFICE	2024	**OFFICE HOURS**	To be determined later
COORDINATOR EXTENSION	2053	**COORDINATOR EMAIL**	bushraw@squ.edu.om

III. ALIGNMENT OF COURSE LEARNING OUTCOMES (CLO), PROGRAM LEARNING OUTCOMES (PLO), GRADUATE ATTRIBUTES (GA), AND OMAN QUALIFICATION FRAMEWORK (OQF) CHARACTERISTICS			
CLO	**PLO**	**SQU GA**	**OQF CHARACTERISTICS (LEVEL)**
1. Perform scientific measurements/conversions applying rules of significant figures, analyze quality of scientific data and classify matter	**1 2 3**	**1 2**	**1 2 6**
2. Know atomic structure, molecules and ions, the periodic table and name simple ions/compounds	**1 2 3**	**1 2**	**1 2 6**
3. Apply the stoichiometry concept to chemical equations	**1 2 3**	**1 2**	**1 2**
4. Distinguish types of chemical reactions and use solution stoichiometry	**1 2 3**	**1 2**	**1 2**
5. Understand the theories and principles that led to the development of atomic structure	**1 2 3**	**1 2**	**1 2**
6. Understand the general concepts of chemical bonding	**1 2 3**	**1 2**	**1 2**
7. Understand and apply some general concepts of thermochemistry	**1 2**	**1 2**	**1 2**

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IV. COURSE LEARNING OUTCOMES (CLOS) AND ASSESSMENT CRITERIA AND METHODS (FOR EACH CLO)		
CLO1: PERFORM SCIENTIFIC MEASUREMENTS/CONVERSIONS APPLYING RULES OF SIGNIFICANT FIGURES, ANALYZE QUALITY OF SCIENTIFIC DATA AND CLASSIFY MATTER		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Perform scientific measurements and mathematical operations applying rules of significant figures	Assignments, work sheets, Quiz and Exams
B)	Analyze the quality of scientific data in terms of accuracy and precision and recognize types of errors	Assignments, work sheets, Quiz and Exams
C)	Classify matter and identify chemical and physical properties of matter	Assignments, work sheets, Quiz and Exams
CLO2: KNOW ATOMIC STRUCTURE, MOLECULES AND IONS, THE PERIODIC TABLE AND NAME SIMPLE IONS/COMPOUNDS		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Calculate the number of sub-atomic particles in atoms/ions and name them	Quiz and Exams
B)	Distinguish between chemical reactions and physical processes and exemplify them	Assignments, work sheets, Quiz and Exams
C)	Name the elements in the periodic table, write their chemical symbols and describe some periodic trends	Quiz and Exams
D)	Make and record observations of chemical reactions and represent reactions with chemical equations	Assignments, work sheets, Quiz and Exams
CLO3: APPLY THE STOICHIOMETRY CONCEPT TO CHEMICAL EQUATIONS		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Determine chemical formulae of compounds using the mole concept	Assignments, work sheets, Quiz and Exams
B)	Carry out stoichiometric calculations for chemical reactions	Assignments, work sheets, Quiz and Exams

C)	Find percent composition of compounds to determine their empirical and molecular formulae	Assignments, work sheets, Quiz and Exams
D)	Balance chemical equations and apply stoichiometric calculations to find amounts of reactants and products (yield)	Assignments, work sheets, Quiz and Exams
CLO4: DISTINGUISH TYPES OF CHEMICAL REACTIONS AND USE SOLUTION STOICHIOMETRY		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Describe the nature of aqueous solutions as strong and weak electrolytes	Exams
B)	Prepare standard solutions, carry out dilutions and analyze the composition of substances in solution	Exams
C)	Identify different types of reactions and perform pertinent calculations of amounts of substances/mixtures	Exams
D)	Carry out chemical reactions and perform titrimetric analyses	Exams
E)	Balance oxidation–reduction reactions	Exams
CLO5: UNDERSTAND THE THEORIES AND PRINCIPLES THAT LED TO THE DEVELOPMENT OF ATOMIC STRUCTURE		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Enumerate and explain the theories and principles that led to the development of the atomic structure	Exams
B)	Draw and describe atomic orbitals and assign them quantum numbers	Exams
C)	Write electronic configurations for atoms and monatomic ions and explain some trends in the periodic table	Exams
CLO6: UNDERSTAND THE GENERAL CONCEPTS OF CHEMICAL BONDING		
A)	Understand the types of chemical bonds and bonding	Exams
B)	Draw Lewis structures, predict shapes of simple molecules and polyatomic ions and assign polarity	Exams

C)	Explain some exceptions to the Octet Rule	Exams
D)	Draw resonance structures and assign formal charges to atoms	Exams
E)	Draw molecular structures using the VSEPR model, name their shapes and determine bond angles	Exams
CLO7: UNDERSTAND AND APPLY SOME GENERAL CONCEPTS OF THERMOCHEMISTRY		
A)	Understand the nature of chemical energy and work	Exams
B)	Measure heat of chemical reactions using calorimetry and apply the first law of thermodynamics	Exams
C)	Determine/calculate heat of reactions using Hess's law and/or standard enthalpies of formation of substances	Exams

V. COURSE CONTENT AND SCHEDULE

WEEK	LECTURES #	TOPICS/ SUBJECTS	READINGS/ CHAPTERS	REMARKS (e.g., ASSESSMENTS)
1	1 & 2	Atoms, Molecules, and Ions	Chapter 2	Quiz 1, Test 1 & Final
2	1 & 2	Atoms, Molecules, and Ions	Chapter 12	Quiz 1, Test 1 & Final
3	1 & 2	Chemical Foundations	Chapter 1	Quiz 1, Test 1 & Final
4	1 2	Chemical Foundations Stoichiometry	Chapter 1 Chapter 3	Quiz 1, Test 1 & Final
5	1 & 2	Stoichiometry	Chapter 3	Test 2 & Final
6	1 2	Stoichiometry Types of Chemical Reactions and Solution Stoichiometry	Chapter 3 Chapter 4	Test 2 & Final
7	1 & 2	Types of Chemical Reactions and Solution Stoichiometry	Chapter 4	Test 2 & Final

8	1 2	Types of Chemical Reactions and Solution Stoichiometry Electrochemistry	Chapter 4 Chapter 18	Test 2& Final
9	1 & 2	Thermochemistry	Chapter 6	Final Exam
10	1 & 2	Thermochemistry	Chapter 6	Final Exam
11-12	1 2	Atomic Structure and Periodicity Bonding: General Concepts	Chapter 7 Chapter 8	Final
13	1 & 2	Bonding: General Concepts	Chapter 8	Final
14	1 2	Bonding: General Concepts Covalent Bonding: Orbitals	Chapter 8 Chapter 9	Final

VI. ADDITIONAL INFORMATION (e.g., RUBRICS, etc.)
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VII. STUDENTS RESPONSIBILITIES	
It is the student's responsibility to know and comply with all University Academic Regulations relevant to participation in this course. These regulations specifically include attendance requirements and student academic code of conduct.	
ACADEMIC INTEGRITY	The University expects the students to approach their academic endeavors with the highest academic integrity. Please refer to the **Undergraduate Academic Regulations**.
ADD AND DROP	Students who wish to drop or add the course should review the **Undergraduate Academic Regulations**.

ATTENDANCE	Sultan Qaboos University has a clear requirement for students to attend courses as detailed in the **Undergraduate Academic Regulations**.
ASSESSMENT AND GRADING	To ensure the provision of a sound and fair assessment and grading, please review the **Undergraduate Academic Regulations**.
GRADE APPEAL	Students who wish to appeal their grades should review the **Undergraduate Academic Regulations**.
CLASSROOM POLICIES	Students are expected to dress professionally during class time as required by the University. Use of phones or any other electronic devices in the classroom during class time is strictly prohibited. Unauthorized use may lead to faculty member confiscation of the device for the remainder of the class. Behavior that persistently or grossly interferes with classroom activities is considered disruptive behavior and may be subject to disciplinary action. A student responsible for disruptive behavior may be required to leave the class.
LATE AND MAKE-UP WORK	Students are required to meet the course objectives by submitting coursework no later than the assigned due date. Students may be allowed to submit late work if approved by the Course Coordinator. Assignments submitted after the due date may be penalized.
MISSED EVALUATIONS	All quizzes, tests, clinical evaluations, and exams must be completed by the date they are assigned. If a quiz, test, or exam is missed due to a documented emergency situation (e.g., medical emergency, death in the immediate family), it is the student's responsibility to contact the instructor and/or Course Coordinator. Makeup exams will not be given for assessment criteria less than 25% of the course grade, but marks will be normalized over the other assessment components for students with valid proof of emergency situation (e.g. medical sick leave)
OTHER	-

Course Outline Appendix

A. PROGRAM LEARNING OUTCOMES

1. Perform scientific measurements and mathematical operations applying rules of significant figures

2. Analyze the quality of scientific data in terms of accuracy and precision and recognize types of errors
3. Classify matter and identify chemical and physical properties of matter
4. Distinguish between chemical reactions and physical processes, and exemplify them
5. Name the elements in the periodic table, write their chemical symbols and describe the periodic trends
6. Make and record observations of chemical reactions and represent reactions with chemical equations
7. Determine chemical formulae of compounds using the mole concept
8. Carry out stoichiometric calculations for chemical reactions
9. Prepare standard solutions, carry out dilutions and analyze the composition of substances in solution
10. Identify different types of reactions and perform pertinent calculations of amounts of substances
11. Carry out chemical reactions and perform titrimetric analyses
12. Measure heats of reaction using calorimetry and apply the first law of thermodynamics
13. Determine heats of reaction using Hess's law or standard enthalpies of formation of substances
14. Enumerate and explain the theories and principles that led to the development of atomic structure
15. Draw and describe atomic orbitals, and assign them quantum numbers
16. Write electron configurations for atoms and monatomic ions and explain the periodic trends
17. Draw Lewis structures and predict shapes of simple molecules and polyatomic ions, and assign polarity
18. Describe and explain chemical bonding in terms of hybridization and types of chemical bonds
19. Integrate scientific knowledge to make informed judgements and solve problems
20. Use scientific equipment competently, interpret data and judge the quality of measurements.

B. SQU GRADUATE ATTRIBUTES

1. Cognitive Capabilities
2. Skill and Professional Capability
3. Effective Communication
4. Autonomy and Leadership
5. Responsibility and Commitment
6. Development and Innovation

C. OQF CHARACTERISTICS

1. Knowledge
2. Skills
3. Communication, Numeracy, and Information and Communication Technology Skills.
4. Autonomy and Responsibility
5. Employability and Values
6. Learning to learn