COURSE OUTLINE TEMPLATE

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

I. COURSE INFORMATION			
COURSE CODE	CHEM4422		
COURSE TITLE	**ORGANIC CHEMISTRY II**		
OMAN QUALIFICATION FRAMEWORK (OQF) LEVEL	**7**		
CREDIT HOURS	3		
CONTACT HOURS	3		
PRE-REQUISITES	CHEM3322		
CO-REQUISITES	CHEM4426		
EQUIVALENT COURSES			
INCOMPATIBLE COURSES			
COURSE CATEGORY	☐ University Requirement	☐ University Elective	
	☐ College Requirement	☐ College Elective	
	☒ Department Requirement	☐ Department Elective	
	☐ Specialization Requirement	☐ Specialization Elective	
	☐ Other (specify):		
COURSE OWNER	College: Science	Department: Chemistry	
	Center:	Unit:	
DELIVERY MODE	☒Face to Face	☐ Blended	☐ Online
COURSE TYPE	☐ Lecture	☐ 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	Chem4422 is the second course in organic chemistry. It is a continuation of Chem3322, organic chemistry I, you have taken previously. The course begins with the chemistry of benzene (chapter 16) that includes, among others, electrophilic and nucleophilic aromatic substitution. Alcohols and Phenols (chapter 17) will then be covered. This includes their synthesis and reactions. Ethers, epoxides (chapter 18) will also be discussed going through their synthesis and reactions. The chemistry of aldehydes and ketones (chapter 19) will then be covered followed by carboxylic acids and nitriles (chapter 20) and carboxylic acid derivatives (chapter 21). Substitution reactions at the α–carbon of carbonyl compounds (chapter 22) will then be taken followed by their condensation reactions (chapter 23). The latter includes reactions such as the aldol, Michael and Claisen reactions. Finally, the course concludes with the synthesis and reactions of amines (chapter 24).	
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 (s) (40%)	☒ Quizzes (5%) ☐ Other (specify): (%)
	☒ Assignments (5%)	
	☒ Final examination (50%)	
TEXTBOOKS AND EDUCATIONAL MATERIAL	Textbook, lecture notes, videos in own dedicated YouTube channel, videos in own dedicated Facebook account. Previous quizzes, assignments and exams on moodle.	
GRADING METHOD	☒ A-F Scale	☐ Pass/Not Pass ☐ Other (specify):

GRADING METHOD DESCRIPTION			
A-F GRADING SCALE:	Range	Letter Grade	Description
	90 – 100	A	

	86 – 89.9	A-	**Exceptional performance:** All course objectives achieved and met in a consistently outstanding manner.
	81– 85.9	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 – 80.9	B	
	73 – 76.9	B-	
	68 – 72.9	C+	**Satisfactory Performance:** At least most of course objectives have been achieved and met satisfactorily
	64 – 67.9	C	
	60 – 63.9	C-	
	55 – 59.9	D+	**Minimally Acceptable Performance:** The course objectives met at a minimally acceptable level.
	50 – 54.9	D	
	0 – 49.9	F	**Unacceptable performance:** The course objectives not met at a minimally acceptable level.
PASS/NOT PASS:			
OTHER:			

II. SEMESTER INFORMATION			
SEMESTER/YEAR		**SECTION(S)**	
DAY AND TIME		**VENUE(S)**	
COURSE COORDINATOR		**COURSE TEAM**	
COORDINATOR OFFICE		**OFFICE HOURS**	
COORDINATOR EXTENSION		**COORDINATOR EMAIL**	

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. Predict nomenclature of various functional groups such as alcohols, phenols, ethers, thiols, sulfides, aldehydes, ketones, carboxylic acids, esters, acid chlorides, acid anhydrides, amides and amines.	**1**	**1**	**1 (7)**
2. Predict electrophilic aromatic substitution reactions of benzenes. Develop synthetic routes to achieve di and trisubstituted benzenes.	**1** **2** **3**	**1** **2** **1**	**1 (7)** **2 (7)** **1 (7)**
3. Realize and plan methods for preparation of alcohols, ether and sulfides and their reactions.	**1** **2** **3**	**1** **2** **1**	**1 (7)** **2 (7)** **1 (7)**
4. Recognize nucleophilic addition reactions of aldehydes and ketones.	**1** **2** **3**	**1** **2** **1**	**1 (7)** **2 (7)** **1 (7)**
5. Realize and predict reactions of carboxylic acids and nitriles.	**1** **2** **3**	**1** **2** **1**	**1 (7)** **2 (7)** **1 (7)**
6. Recognize nucleophilic substitution reactions of carboxylic acid derivatives such as acid halides, acid anhydrides, esters and amides.	**1** **2** **3**	**1** **2** **1**	**1 (7)** **2 (7)** **1 (7)**
7. Realize acidity of carbonyl compounds at the alpha-carbon enolate formation reactions and subsequent reactions with alkyl halides.	**1** **2** **3**	**1** **2** **1**	**1 (7)** **2 (7)** **1 (7)**
8. Predict reactions between enolates and aldehdyes and ketones.	**1** **2** **3**	**1** **2** **1**	**1 (7)** **2 (7)** **1 (7)**
9. Predict reactions between enolates and carboxylic acid derivatives.	**1** **2** **3**	**1** **2** **1**	**1 (7)** **2 (7)** **1 (7)**
10. Realize properties of amines and their reactions.	**1**	**1**	**1 (7)**

	2 **3**	**2** **1**	**2 (7)** **1 (7)**
11. Plan synthetic strategies based on knowledge acquired.	**1** **2** **3**	**1** **2** **1**	**1 (7)** **2 (7)** **1 (7)**

IV. COURSE LEARNING OUTCOMES (CLOS) AND ASSESSMENT CRITERIA AND METHODS (FOR EACH CLO)		
CLO1: Predict nomenclature of various functional groups such as alcohols, phenols, ethers, thiols, sulfides, aldehydes, ketones, carboxylic acids, esters, acid chlorides, acid anhydrides, amides and amines.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Strictly follow IUPAC rules to name various functional groups such as alcohols, phenols, ethers, thiols, sulfides, aldehydes, ketones, carboxylic acids, esters, acid chlorides, acid anhydrides, amides and amines.	Assignments, Quizzes, Exams
B)	Strictly follow the prescribed course format for graphical representation of data.	Assignments, Exams, Project
C)	Strictly follow the prescribed course format for presentation of chemical structures, reactions and mechanisms	Assignments, Exams, Project
CLO2: Predict electrophilic aromatic substitution reactions of benzenes. Develop synthetic routes to achieve di and trisubstituted benzenes.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Recognize and realize electrophilic aromatic substitution reactions of benzenes.	Assignments, Quizzes, Exams
B)	Predict electronic effects (resonance and inductive) of substituents on electrophilic aromatic substitution reactions and their directing ability	Assignments, Quizzes, Exams
C)	Plan synthetic strategies to synthesize disubstituted and trisubstituted benzenes.	Assignments, Quizzes, Exams
CLO3: Realize and plan methods for preparation of alcohols, ether and sulfides and their reactions.		

ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		ASSESSMENT METHODS
A)	Realize properties of alcohols and subsequent effects in boiling points and acidity.	Assignments, Quizzes, Exams
B)	Recognize methods for the preparation of alcohols	Assignments, Quizzes, Exams
C)	Predict reactions of alcohols.	Assignments, Quizzes, Exams
12. CLO4: Recognize nucleophilic addition reactions of aldehydes and ketones.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Realize nucleophilic addition reactions of aldehydes and ketones.	Assignments, Quizzes, Exams
B)	Predicts various types of nucleophilic addition reactions of aldehydes and ketones.	Assignments, Quizzes, Exams
C)	Create and plan synthetic strategies based on learned nucleophilic addition reactions as key step.	Assignments, Quizzes, Exams
CLO5: Realize and predict reactions of carboxylic acids and nitriles.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Recognize properties of carboxylic acids.	Assignments, Quizzes, Exams
B)	Realize and predict various methods for the preparation of carboxylic acids and their reactions.	Assignments, Quizzes, Exams
C)	Realize and predict various methods for the preparation of nitriles and their reactions.	Assignments, Quizzes, Exams
CLO6: Recognize nucleophilic substitution reactions of carboxylic acid derivatives such as acid halides, acid anhydrides, esters and amides.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Recognize the chemical nature of nucleophilic substitution reactions of carboxylic acid derivatives.	Assignments, Quizzes, Exams
B)	Realize the difference between nucleophilic addition reaction of aldehydes and ketones and nucleophilic substitution reactions of carboxylic acid derivatives.	Assignments, Quizzes, Exams
C)	Predict methods for the preparation of carboxylic acid	Assignments, Quizzes, Exams

	derivative and various types of their nucleophilic acyl substitution reactions.	

CLO7: Realize acidity of carbonyl compounds at the alpha-carbon enolate formation reactions and subsequent reactions with alkyl halides.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Recognize acidity of carbonyl compounds at the alpha carbon.	Assignments, Quizzes, Exams
B)	Predict methods of enolate formation reactions.	Assignments, Quizzes, Exams
C)	Predict reactions of enolates with alkyl halides as electrophiles.	Assignments, Quizzes, Exams

CLO8: Predict reactions between enolates and aldehdyes and ketones.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Recognize reactivity of enolates at the alpha carbon.	Assignments, Quizzes, Exams
B)	Realize intermolecular and intramolecular nucleophilic addition reactions of enolates on aldehdyes and ketones	Assignments, Quizzes, Exams
C)	Formualate synthetic strategies for synthetic targets using enolate chemistry as key steps	Assignments, Quizzes, Exams

CLO9: Predict reactions between enolates and carboxylic acid derivatives.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Realize enolate nucleophilic acyl substitution reactions on carboxylic acid derivatives.	Assignments, Quizzes, Exams
B)	Predict intramolecular nucleophilic acyl substitution reactions on carboxylic acid derivatives.	Assignments, Quizzes, Exams
C)	Formualate synthetic strategies for synthetic targets using nucleophilic acyl substitution reactions as key steps	Assignments, Quizzes, Exams

CLO9: Realize properties of amines and their reactions.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Recognize properties of amines.	Assignments, Quizzes, Exams
B)	Realize various methods for the preparation of amines.	Assignments, Quizzes, Exams
C)	Predict reactions of amines.	Assignments, Quizzes, Exams

V. COURSE CONTENT AND SCHEDULE

WEEK	LECTURES #	TOPICS/ SUBJECTS	READINGS/ CHAPTERS	REMARKS (e.g., ASSESSMENTS)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

VI. ADDITIONAL INFORMATION (e.g., RUBRICS, etc.)

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, 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. Make-up 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. Demonstrate factual knowledge of chemistry
2. Assimilate new information into existing knowledge
3. Integrate knowledge in problem-solving, critical thinking, and analytical reasoning.
4. Appraise time requirements for assigned tasks, and manage time appropriately
5. Work within a team

6. Use modern instrumentation and techniques to conduct experiments following established procedures
7. Use and dispose of chemicals safely following appropriate procedures and regulations
8. Employ efficient use of computers for data acquisition and analysis
9. Use information sources to retrieve chemical information
10. Formulate hypothesis, design, and perform experiments
11. Communicate chemical information to specialist and non-specialist audience

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