COURSE OUTLINE TEMPLATE

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

I. COURSE INFORMATION			
COURSE CODE	CHEM4425		
COURSE TITLE	**ADVANCED ORGANIC CHEMISTRY LABORATORY**		
OMAN QUALIFICATION FRAMEWORK (OQF) LEVEL	**8**		
CREDIT HOURS	3		
CONTACT HOURS	6		
PRE-REQUISITES	CHEM4422 AND CHEM4426		
CO-REQUISITES			
EQUIVALENT COURSES			
INCOMPATIBLE COURSES			
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	X Face to Face	☐ Blended	☐ Online
COURSE TYPE	☐ Lecture	X 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 practical organic chemistry course trains the students in techniques such as: Thin Layer Chromatography (TLC), extraction of an organic product from reaction mixture, carrying out multi-step synthesis, product isolation and product purification. Students will learn how to plan an organic reaction and carry out advance-preparation. The students will develop skills in writing and maintaining record of laboratory work in a research notebook following standard notebook formats. The students will be able to acquire skills in various organic chemistry techniques such extraction, distillation, recrystallization, TLC, distillation, melting point and NMR spectroscopy. This course will train the students in carrying out a reaction in the organic laboratory, monitor the progress of the reaction, work up the reaction and purify the product using recrystallization, column chromatography, distillation under atmospheric pressure, and vacuum (reduced pressure) distillation. The students will extensively use spectroscopy method in order to characterize products obtained. Towards this end, spectroscopic techniques such as 1H and 13C NMR and IR spectroscopy will be used.	
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) (%)	☒ Quizzes (10 %)	☐ Other (practical work assessment): (10%)
	☐ Homework (%)	☒ Project (10%)	
	☒ Final examination (35%)	☒ Practical/ Lab (35%)	
TEXTBOOKS AND EDUCATIONAL MATERIAL	Experimental Organic Chemistry, Harwood, Moody, Percy, 2nd Edition, Blackwell Science.		
GRADING METHOD	☒ A-F Scale	☐ Pass/Not Pass	☐ Other (specify):

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

	≥86	A-	**Exceptional performance:** All course objectives achieved and met in a consistently outstanding manner.
	≥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)**	10 and 11
DAY AND TIME	Wednesday 8:00 – 1:50	**VENUE(S)**	E 13 and SCI 1006
COURSE COORDINATOR	Dr. W. M. Zoghaib	**COURSE TEAM**	Dr. Petra Galer
COORDINATOR OFFICE	SCI 2080	**OFFICE HOURS**	Sunday and Tuesday 9:00 – 10:30
COORDINATOR EXTENSION	2472	**COORDINATOR EMAIL**	zoghaibw@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. Plan an organic reaction in the laboratory	**A-1**	**1** **2** **4** **5**	**1 (5)** **2 (5)** **3 (6)** **5 (6)**
2. Outline functional group transformations	**A-1**	**1** **2** **5**	**1 (6)** **2 (6)** **4 (7)** **6 (5)**
3. Explain and recognize the theory of the techniques (simple, fractional, vacuum) of distillation, recrystallization	**A-3** **A-6**	**1** **2** **3** **4**	**1 (5)** **2 (6)** **3 (6)** **4 (5)**
4. Acquire experience in dealing and handling of organic chemicals	**B-3** **B-4**	**1** **2** **3** **5**	**1 (7)** **2 (6)** **3 (5)** **5 (5)**
5. Develop experience in dealing and handling of organic solvents and recognize their potential hazard	**B-3** **B-4**	**1** **2** **5** **6**	**1 (7)** **2 (7)** **4 (5)** **5 (5)**
6. Plan a multi-step synthetic sequence in a form a mini project	**A-1** **B-2**	**1** **2** **4** **5**	**1 (6)** **2 (6)** **4 (5)** **6 (5)**
7. Conduct the various stages of chemical reaction such preparation, the reaction, workup, purification and analysis	**A-1** **A-3** **B-2** **B-3**	**1** **2** **3** **4**	**1 (5)** **2 (6)** **4 (6)** **5 (6)**
8. Perform different purification methods and determine the extent of purity using physical, chemical and spectroscopic methods	**A-3** **B-3**	**1** **2**	**1 (6)** **2 (6)**

		4	**3 (6)** **4 (7)**
9. Develop skills in structure elucidation using then techniques of Nuclear Magnetic Resonance (NMR) and other spectroscopic techniques	**A-1** **A-2**	**1** **3** **5**	**1 (6)** **3 (6)** **4 (6)** **6 (7)**
10. Write a thorough and scientific record of laboratory work in a form of written scientific report	**A-1** **A-11** **B-1** **B-3**	**1** **3** **4** **6**	**1 (6)** **3 (6)** **5 (6)** **6 (7)**

IV. COURSE LEARNING OUTCOMES (CLOS) AND ASSESSMENT CRITERIA AND METHODS (FOR EACH CLO)		
CLO1: Demonstrate correct and consistent formatting when reporting scientific information and data		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Strictly follow the prescribed course format for written documents/reports.	Quiz, Weekly Report, Project
B)	Strictly follow the prescribed course format for graphical representation of data.	Quiz, Weekly Report, Project
C)	Strictly follow the prescribed course format for presentation of chemical structures, reactions and mechanisms	Quiz, Weekly Report, Project
CLO2: Apply numerical methods to analyze chemical data		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Recognize when data is best suited to analyses using numerical methods (rather than analytical solution)	Quiz, Weekly Report, Project, Final Exam
B)	Demonstrate accurate use of the method of successive approximation	Quiz, Weekly Report, Project, Final Exam
C)	Demonstrate accurate use of the method of least squares	Quiz, Weekly Report, Project, Final Exam
CLO3: Explain and recognize the theory of the techniques (simple, fractional, vacuum) of distillation, recrystallization		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE		**ASSESSMENT METHODS**

STUDENT MUST)		
A)	Demonstrate accurate use of the method and technique	Quiz, Weekly Report, Supervisor Assessment
B)	Recognize the difference between these techniques	Quiz, Weekly Report, Supervisor Assessment
C)	Selectively choosing the most appropriate technique	Quiz, Weekly Report, Supervisor Assessment
CLO4: Acquire experience in dealing and handling of organic chemicals		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Demonstrate accurate use of glassware and safe procedures	Quiz, Weekly Report, Supervisor Assessment
B)	Demonstrate accurate and competent use of measuring devices	Quiz, Weekly Report, Supervisor Assessment
C)	Use information sources to retrieve chemical information	Quiz, Weekly Report, Supervisor Assessment, Final Exam
CLO5: Develop experience in dealing and handling of organic solvents and recognize their potential hazard		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Demonstrate accurate use of glassware and safe procedures	Quiz, Weekly Report, Supervisor Assessment, Final Exam
B)	Demonstrate accurate and competent use of measuring devices	Quiz, Weekly Report, Supervisor Assessment, Final Exam
C)	Use and dispose of chemicals safely following appropriate procedures and regulations	Quiz, Weekly Report, Supervisor Assessment, Final Exam
CLO6: Plan a multi-step synthetic sequence in a form a mini project		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Integrate knowledge in problem solving, critical thinking and analytical reasoning	Quiz, Weekly Report, Supervisor Assessment, Final Exam
B)	Appraise the requirements for assigned tasks and manage time appropriately	Quiz, Weekly Report, Supervisor Assessment, Final Exam
C)	Demonstrate factual knowledge of Chemistry	Quiz, Weekly Report, Supervisor Assessment, Final Exam
CLO7: Conduct the various stages of chemical reaction such as preparation, the reaction, workup, purification and analysis		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Appraise the requirements for assigned tasks and manage time appropriately	Quiz, Weekly Report, Supervisor Assessment, Final Exam
B)	Demonstrate factual knowledge of Chemistry	Quiz, Weekly Report, Supervisor Assessment, Final Exam

C)	Integrate knowledge in problem solving, critical thinking and analytical reasoning	Quiz, Weekly Report, Supervisor Assessment, Final Exam
CLO8: Perform different purification methods and determine the extent of purity using physical, chemical and spectroscopic methods		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Appraise the requirements for assigned tasks and manage time appropriately	Quiz, Weekly Report, Supervisor Assessment, Final Exam
B)	Demonstrate factual knowledge of Chemistry	Quiz, Weekly Report, Supervisor Assessment, Final Exam
C)	Demonstrate competence in accurate use of glassware and equipment	Quiz, Weekly Report, Supervisor Assessment, Final Exam
CLO9: Develop skills in structure elucidation using then techniques of Nuclear Magnetic Resonance (NMR) and other spectroscopic techniques		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Appraise the requirements for assigned tasks and manage time appropriately	Quiz, Weekly Report, Supervisor Assessment, Final Exam
B)	Demonstrate factual knowledge of Chemistry	Quiz, Weekly Report, Supervisor Assessment, Final Exam
C)	Integrate knowledge in problem solving, critical thinking and analytical reasoning	Quiz, Weekly Report, Supervisor Assessment, Final Exam
CLO10: Write a thorough and scientific record of laboratory work in a form of written scientific report		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Appraise the requirements for assigned tasks and manage time appropriately	Quiz, Weekly Report, Supervisor Assessment, Final Exam
B)	Demonstrate factual knowledge of Chemistry	Quiz, Weekly Report, Supervisor Assessment, Final Exam
C)	Integrate knowledge in problem solving, critical thinking and analytical reasoning	Quiz, Weekly Report, Supervisor Assessment, Final Exam

V. COURSE CONTENT AND SCHEDULE

WEEK	LECTURES #	TOPICS/ SUBJECTS	READINGS/ CHAPTERS	REMARKS (e.g., ASSESSMENTS)
1				
2	1	Basic laboratory techniques. Training on equipment.	Chapters 2 and 3	

3	2	Pre-lab discussions for Experiments 6 & performing Exp. # 6	Exp. # 6	Quiz, weekly report and in-lab assessment
4	3	Post-lab Exp # 6, pre-lab Exp # 20-1 and performing Exp # 20-1	Exp # 20-1	Quiz, weekly report and in-lab assessment
5	4	Post-lab Exp # 20-1, pre-lab Exp # 20-2 and performing Exp # 20-2	Exp # 20-2	Quiz, weekly report and in-lab assessment
6	5	Post-lab Exp # 20-2, pre-lab Exp # 4 and performing Exp # 4	Exp # 4	Quiz, weekly report and in-lab assessment
7	6	Post-lab Exp # 4, pre-lab Exp # 50 and performing Exp # 50	Exp # 50	Quiz, weekly report and in-lab assessment
8	7	Post-lab Exp # 50, pre-lab Exp # 1 and performing Exp # 1	Exp # 1	Quiz, weekly report and in-lab assessment
9	8	Post-lab Exp # 1, pre-lab Exp # 41-2 and performing Exp # 41-2	Exp # 41-2	Quiz, weekly report and in-lab assessment
10	9	Post-lab Exp # 41-2, pre-lab Exp # 61 and performing Exp # 61	Exp # 61	Quiz, weekly report and in-lab assessment
11	10	Post-lab Exp # 61, pre-lab Exp # 71 and performing mini-project # 71	Exp # 71	Quiz, and in-lab assessment
12	11	performing mini-project # 71		in-lab assessment
13	12	performing mini-project # 71		in-lab assessment and Formal Report
14	13	Practical Final Exam		Report
15	14	Written Final Exam		
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