Course Specification

(Postgraduate Programs)

Course Title:	**Advanced Organic Chemistry**
Course Code:	**CHM 6121**
Program:	**Master of science in chemistry**
Department:	**Chemistry**
College:	**Science**
Institution:	: Imam Mohammad Ibn Saud Islamic University
Version:	*Course Specification Version Number*
Last Revision Date:	*Pick Revision Date.*

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A. General information about the course:

1. Course Identification:

1. Credit hours: (.....)

4 (4 Lectures, 0 Lab, 0 Tutorials)

2. Course type

A.	☐University	☐College	☐Department	☐Track	
B.	☒ Required		☐Elective		

3. Level/year at which this course is offered: (Level 1/ Year 1)

4. Course General Description:

The course designed as an advanced understanding for the alkylation of anoles, carbon nucleophiles, and the interactions of carbon nucleophiles with carbonyl compounds. The transformation of the functional groups by substitution and protection, the addition reactions of multiple carbon bonds, and the reduction reactions of the multiple carbon bonds and other functional groups will be studied. The reactions of ring addition, thermal elimination, and organometallic compounds of Group 1 and 2 metals are topics of interest to the course. The course will include multi-step preparations, photochemistry, and topics of interest in this subject.

5. Pre-requirements for this course (if any):

None

6. Pre-requirements for this course (if any):

None

7. Course Main Objective(s):

- **Recognize types of organic reactions.**
- **• Understand the nucleophilic reaction that occur in basic medium and differentiate the types of nucleophilic reactions.**
- **• Familiarize the alkylation and acetylation reactions for aromatic compounds and aliphatic compounds.**
- **• Investigate the nucleophilic substitution reactions for sp2 carbons.**
- **• Understand the reactions for preparations of organometallic compounds from metals in groups 1, 2, 1B, and 2B.**

2. Teaching Mode: (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	E-learning		
3	Hybrid		

No	Mode of Instruction	Contact Hours	Percentage
	• Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours: (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	60
2.	**Laboratory/Studio**	0
3.	**Field**	0
4.	**Tutorial**	0
5.	**Others (specify)……**	0
	Total	60

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods:

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	To recall and apply knowledge of the Chemistry of functional groups in Organic Reactions.	K1. *Inorg.*; K4. *Inorg.*	▪ Five hours/week lectures. ▪ Self-study Home-exam.	▪ Regular Exams ▪ Assignments ▪ Short Quizzes ▪ Oral Discussion Participation.
1.2	To describe the Nucleophilic and Electrophilic Reactions and factors that influence the reactivity.	K1. *Inorg.*; K2. *Inorg.*; K4. *Inorg.*	▪ Five hours/week lectures. ▪ Think, to justify nucleophilic and electrophilic reactions, using available references (SDL) online. Open discussion.	▪ Oral Discussion marks ▪ Literatures Survey ▪ Mini-seminar. ▪ Participation.
1.3	To outline Intramolecular of	K1. *Inorg.*; K2. *Inorg.*; K4. *Inorg.*	▪ Five hours/week lectures.	▪ Midterm. ▪ Assignments. ▪ Group Discussions.

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	Functional Groups and Protection groups.		Group Discussion using available references (SDL) online.	▪ Literatures Survey ▪ Mini-seminar. Participation.
1.4	To state Multistep Syntheses and Photochemistry Reactions in Organic Chemistry.	K2. *Inorg.*; K4. *Inorg.*	▪ Five hours/week lectures. Group Discussion on Multistep and Photochemistry synthesis using available references (SDL) online.	▪ Assignments ▪ Open Discussions. ▪ Literatures Survey ▪ Mini-seminar. Participation.
2.0	**Skills**			
2.1	To summarize concepts of Organic Chemical Reactions and Synthetic Methods.	S1. *Inorg.*; S2. *Inorg.*	▪ Questions in Lectures. ▪ Short Quizzes and Exams. ▪ Open Discussions. ▪ Participation Mini -seminar.	▪ Questions in Lectures. ▪ Short Quizzes and Exams. ▪ Open Discussions. ▪ Participation Mini -seminar.
2.2	To justify the appropriate mechanism for specific molecules synthesis.	S1. *Inorg.*; S2. *Inorg.*	1.Questions in Lectures. 2.Participation 3.Oral Discussion Short Quizzes.	▪ Questions in Lectures. ▪ Participation ▪ Oral Discussion Short Quizzes.
2.3	To illustrate a reasonable argument to preparations of organometallic compounds from metals in groups 1, 2, 1B, and 2B.	S1. *Inorg.*; S2. *Inorg.*; S3. *Inorg.*	1. Questions in Lectures. 2. Short Quizzes and Exams. 4.Oral Discussion. Participation.	▪ Questions in Lectures. ▪ Short Quizzes and Exams. ▪ Oral Discussion. Participation.
2.4	To demonstrate Oral Communication on principles on the functional group on Organic Reactions, accompanying mini-Reports, operating electronic mail, and Network in	S1. *Inorg.*; S2. *Inorg.*	1.Oral Discussion. 2. Quizzes, and Exams. 3.Giving marks for Oral Discussion in Lectures. Marks given for Assignments.	▪ Oral Discussion. ▪ Quizzes, and Exams. ▪ Giving marks for Oral Discussion in Lectures. Marks given for Assignments.

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	communicating with others.			
3.0	**Values, autonomy, and responsibility**			
3.1	Perform communications to integrity, academic ethical practices to find solutions for scientific and social issues, and a commitment to responsible citizenship and using IT.	V1. *Inorg.*	▪ Oral Discussion. ▪ Group Discussion ▪ Assignments.	▪ Oral Discussion. ▪ Group Discussion ▪ Assignments.
3.2	Appraise effectively in research or professional groups and make decisions, develop knowledge, enhance society's quality, and contribute to its advancement.	V1. *Inorg.*; V2. *Inorg.*	5. Participation 6. Homework's Mini-project(s).	▪ Participation ▪ Homework's Mini-project(s).
...				

C. Course Content:

No	List of Topics	Contact Hours
1.	***Enols alkylation and Nucleophilic Carbon:*** Formation of enols, alkylation of enols, Nitrogen as analogy of enols, and imins and their anions.	**5**
2.	***Reactions of nucleophilic carbon with carbonyl compounds:*** condensation reactions, addition of amines and ammonium ions.	**5**
3.	***Acetylation of nucleophilic carbon:*** olefins reactions, cycloaddition reactions, conjugated addition for carbon as Nu.	**6**
4.	***Intramolecular of functional groups, and Protection of functional groups:*** converting alcohols to alkylation agents, substitution reactions of functional groups at carbon sp3; cleavage c-o bond; intramolecular conversion for carboxylic and their derivatives.	**4**
5.	***Addition Reactions of carbon multiple bonds;*** electrophilic add for alkenes; electrophilic cycloaddition; electrophilic substitution for alpha carbon; addition of allenes and alkynes; boron compounds in addition reactions.	**4**
6.	***Reduction reactions of carbon multiple bonds and other functional groups;*** H2 additions; hydrides in group three and four; dissolved metal reductions; reduction of Oxygen.	**4**

7.	***Addition reactions for cyclic compounds, and thermal elimination:*** cycloaddition, Diels-Alder reaction and effect of substituents on the reactivity; Lewis acids in D-A reaction; 1,3 addition for dipoles cycles; cyclization using electro chemistry with examples.	7
8.	***Organo-metallic compounds for group 1 and 2:*** Preparations Li and Mg organic compounds; reactions of Mg and Li compounds; Compounds of groups 2B and 3B; Organo lanthides.	7
9.	***Carbocations reactions, Carbenes, and Radicals as active intermediates:*** reactions and rearrangements.	4
10.	***Multisteps syntheses;*** plan and analysis for preparations; examples; preparations in solid phase; combinatorial synthesis.	7
11.	***Photochemistry reactions in organic chemistry:*** introduction; principals; alkenes reactions; carbonyls; aromatics.	7
Total		**60**

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Class Activities (Open Discussion, Mini-reports, Oral Presentation, solving questions)**	**weekly**	**30 %**
2.	**Midterm Exam**	**9 th week**	**30 %**
3.	**Final Exam**	**Around 17th week**	**40 %**
...	**Total**		**100%**

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

E. Learning Resources and Facilities:

1. References and Learning Resources:

Essential References	***Advanced Organic Chemistry Part A: Sturcture and Mechnisms***, Carey, F. A., Sundberg, R. J.; Springer Science, 5th edition, 2007. ISBN: 978-0-387-44897-8. ***Advanced Organic Chemistry Part B: Reactions***, Carey, F. A., Sundberg, R. J.; and Synthesis, Springer Science,(5th edition, 2007. ISBN: 978-0-387-44897-8. ***March's Advanced Organic Chemistry,*** Smith, M. B., March, J.;, 7th edition, Wiley, 2013. ISBN: 978-0-470-46259-1
Supportive References	NONE
Electronic Materials	Saudi Digital Library
Other Learning Materials	• Blackboard

	• Multimedia associated with the text book and the relevant websites

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	**Each of the classroom should be equipped with a whiteboard and a projector, with a maximum of 20 students.**
Technology equipment (Projector, smart board, software)	**The rooms are equipped with data show, Smart Board, WI-FI access.**
Other equipment (Depending on the nature of the specialty)	**None**

F. Assessment of Course Quality:

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	**Direct:** Questionnaire.
	Course Responsible	**Direct:** Course e-Portfolio. **Indirect:** Second examiner checklist-Course report.
	Peer Reviewer	**Direct:** Questionnaire. **Indirect:** External assessor report.
Effectiveness of students' assessment	Program Leaders	**Direct:** Course e-Portfolio. **Indirect:** Course report.
Quality of learning resources	Students	**Indirect:** Second examiner checklist-Course report.
	Faculty (Academic Advisory-GCC)	**Direct:** course Entrance/Exit. **Indirect:** Observations - Accreditation review.
	Program Leaders	**Direct:** Course e-Portfolio.
	Course Responsible	**Indirect:** Course evaluation survey- Observations- Syllabus review- Accreditation review.
The extent to which CLOs have been achieved	Course Responsible	**Direct:** Exams - Course e-Portfolio. **Indirect:** Second examiner checklist-Course report.
	Program Leaders	**Indirect:** Exams.
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval Data:

COUNCIL /COMMITTEE	Council of Chemistry Department
REFERENCE NO.	10 (No. 2/10)
DATE	21/04/1444- 15/11/2022