Form: Course Syllabus	Form Number	EXC-01-02-02A
	Issue Number and Date	2/3/24/2022/2963 05/12/2022
	Number and Date of Revision or Modification	
	Deans Council Approval Decision Number	2/3/24/2023
	The Date of the Deans Council Approval Decision	23/01/2023
	Number of Pages	06

1.	Course Title	**Molecular Structure and Mechanisms of Organic Reactions**
2.	Course Number	**0303731**
3.	Credit Hours (Theory, Practical)	3
	Contact Hours (Theory, Practical)	3
4.	Prerequisites/ Corequisites	-
5.	Program Title	MsC
6.	Program Code	0303
7.	School/ Center	School of Science
8.	Department	Chemistry
9.	Course Level	Master
10.	Year of Study and Semester (s)	Second Semester 2024-2025
11.	Other Department(s) Involved in Teaching the Course	
12.	Main Learning Language	
13.	Learning Types	•Face to face learning ☐Blended ☐Fully online
14.	Online Platforms(s)	•Moodle •Microsoft Teams
15.	Issuing Date	
16.	Revision Date	

17. Course Coordinator:

Name: Prof. Dr. Jalal Zahra Contact hours:

Office number: 300 Phone number: 22163

Email: zahra@ju.edu.jo

18. Other Instructors:

Name:
Office number:
Phone number:
Email:
Contact hours:
Name:
Office number:
Phone number:
Email:
Contact hours:

19. Course Description:

As stated in the approved study plan.
An advanced study of the structures of organic compounds and organic reactions mechanisms, chemical bonds on the basis of molecular orbital theory, aromaticity, methods of study of organic mechanisms, mechanisms of selected reactions, concerted reactions, photochemical reactions, of reaction intermediates reactions.

20. Program Student Outcomes (SO's): (To be used in designing the matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program)

SO1. Demonstrate comprehensive knowledge and understanding of chemistry topics, achieving expertise in foundational research principles.

SO2. Develop independent research skills to solve complex problems, focusing on analytical and critical thinking.

SO3. Improve communication of scientific knowledge through structured reports, presentations, and discussions.

SO4. Engage in activities that enhance practical scientific skills and improve professional expertise.

SO5. Maintain ethical standards in research.

21. Course Intended Learning Outcomes (CLO's): (Upon completion of the course, the student will be able to achieve the following intended learning outcomes)

1. Define, describe, and analyze methods for investigating reaction mechanisms.

2. Understand and Apply Transition State Theory and Linear Free Energy Relationships.

3. Explain polar reactions under acidic and basic conditions.
4. Predict and analyze pericyclic reactions.
5. Understand and analyze rearrangement mechanisms.
6. Explain free radical reaction mechanisms.

Course CLOs	The learning levels to be achieved					
	Remembering	**Understanding**	**Applying**	**Analysing**	**evaluating**	**Creating**
1		**x**	**x**	**x**	**x**	**x**
2		**x**	**x**	**x**	**x**	**x**
3		**x**	**x**	**x**	**x**	**x**
4		**x**	**x**	**x**	**x**	**x**
5		x	x	x	x	x
6		x	x	x	x	x

22. The matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program:

Program SO's / Course CLO's	SO (1)	SO (2)	SO (3)	SO (4)	SO (5)
CLO (1)	•	•	•		
CLO (2)	•	•	•		
CLO (3)	•	•	•		
CLO (4)	•	•	•		
CLO (5)	•	•	•		
CLO (6)	•	•	•		

23. Topic Outline and Schedule:

Week	Lecture	Topic	CLO/s Linked to the Topic	Learning Types Face to Face (FF) Blended (BL) Fully Online (FO)	Platform Used	Synchronous (S) Asynchronous (A)	Evaluation Methods	Learning Resources
1	1.1	Elementary and Stepwise Reactions	CLO (1)	FF	on campus	S		textbook
	1.2	Bond Making and Bond Breaking, Molecularity Formulating Mechanisms	CLO (1)	FF	on campus	S		textbook
2	2.1	Why Study Mechanisms?	CLO (1)	FF	on campus	S		textbook

	2.2	Rates and Rate Constants	CLO (1)	FF	on campus	S		textbook
3	3.1	General relationship between thermodynamic stability and reactivity	CLO (2)	FF	on campus	S		textbook
	3.2	Kinetic Isotope Effects	CLO (2)	FF	on campus	S		textbook
4	4.1	Early and Late Transition States	CLO (2)	FF	on campus	S		textbook
	4.2	Hammond Postulate, Solvent Effects	CLO (2)	FF	on campus	S		textbook
5	5.1	Structure-Reactivity Relationships The Hammett relationship	CLO (2)	FF	on campus	S		textbook
	5.2	The Hammett substituent constant σ . The Hammett reaction constant ρ	CLO (2)	FF	on campus	S		textbook
6	6.1	Using the Hammett ρ values to uncover mechanisms	CLO (2)	FF	on campus	S	midterm	textbook
	6.2	Polar Reactions under Basic Conditions Substitution and Elimination at C(sp3)–X _ Bonds, Part I	CLO (3)	FF	on campus	S		textbook
7	7.1	Addition of Nucleophiles to Electrophilic _ Bonds	CLO (3)	FF	on campus	S		textbook
	7.2	Substitution at C(sp2)–X _ Bonds		FF	on campus	S		textbook
8	8.1	Substitution and Elimination at C(sp3)–X _ Bonds, Part II		FF	on campus	S		textbook
	8.2	Base-Promoted Rearrangements			on campus	S		textbook
9	9.1	Two Multistep Reactions			on campus			textbook

	9.2	Polar Reactions Under Acidic Conditions carbocations		FF	on campus	S		textbook
10	10.1	Substitution and _-Elimination Reactions at C(sp3)–X		FF	on campus	S		textbook
	10.2	Electrophilic Addition to Nucleophilic C=C Bonds		FF	on campus	S		textbook
11	11.1	Substitution at Nucleophilic C=C Bonds		FF	on campus	S		textbook
	11.2	Nucleophilic Addition to and Substitution at Electrophilic _ Bonds		FF	on campus	S	quiz	textbook
12	12.1	Pericyclic Reactions Electrocyclic Reactions		FF	on campus	S		textbook
	12.2	Cycloadditions		FF	on campus	S		textbook
13	13.1	Sigmatropic Rearrangements		FF	on campus	S		textbook
	13.2	Ene Reactions		FF	on campus	S		textbook
14	14.1	Free-Radical Reactions Free Radicals		FF	on campus	S		textbook
	14.2	Chain Free-Radical Reactions		FF	on campus	S		textbook
15	15.1	Nonchain Free-Radical Reactions		FF	on campus	S		textbook
	15.2	Miscellaneous Radical Reactions		FF	on campus	S		textbook
16					on campus		Final Exam	

24. Evaluation Methods:

Opportunities to demonstrate achievement of the CLOs are provided through the following assessment methods and requirements:

Evaluation Activity	Mark	Topic(s)	CLO/s Linked to the Evaluation activity	Period (Week)	Platform
midterm	30		CLO (1), CLO (2)	6	on campus
Quiz	30		CLO (3)	11	on campus
final	40		CLO (1), CLO (2) CLO (3), CLO (4) CLO (5), CLO (6)		on campus

25. Course Requirements:

(e.g.: students should have a computer, internet connection, webcam, account on a specific software/platform…etc.):

26. Course Policies:

A- Attendance policies:
B- Absences from exams and submitting assignments on time:
C- Health and safety procedures:
D- Honesty policy regarding cheating, plagiarism, misbehavior:
E- Grading policy:
F- Available university services that support achievement in the course:

27. References:

(1) The art of writing reasonable organic reaction mechanisms, R.B.Grossman, 2nd Ed., 2003.
(2) Mechanisms in organic reactions, R. Jackson, 2004.
(3) Organic mechanisms, R. Bruckner, English Ed., 2010.
(4) A guidebook to mechanism in organic chemistry, P. Sykes, 6th Ed., 1985.
(5) Advanced organic chemistry, part A, Carey and Sundberg, 5th Ed., 2007.
(6) Organic Chemistry, Jonathan Clayden, ick Greeves and Stuart Warren. 2nd edition, 2012

28. Additional information:

Name of the Instructor or the Course Coordinator: **Dr. Jalal Zahra, Prof.**	Signature: ……..……	Date: ……..……
The Head of Graduate Studies Committee/ Department Chemistry **Dr. Murad AlDamen, Prof.**	**Signature:** **……..……**	**Date:** **……..……**
The Head of Department of Chemistry **Dr. Murad AlDamen, Prof.**	**Signature:** **……..……**	**Date:** **……..……**
Vice Dean for Graduate Studies and Scientific Research / School of Science **Dr. Kamal Sweidan, Prof.**	**Signature:** **……..……**	**Date:** **……..……**
The Dean of School of Science **Dr. Mahmoud I. Jaghoub, Prof.**	**Signature:** **……..……**	**Date:** **……..……**