



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	Synthetic Organic Chemistry
2.	Course Number	0333932
3.	Credit Hours (Theory, Practical)	3
	Contact Hours (Theory, Practical)	3
4.	Prerequisites/ Corequisites	-
5.	Program Title	
6.	Program Code	
7.	School/ Center	School of Science
8.	Department	Chemistry
9.	Course Level	PhD
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	<input checked="" type="checkbox"/> Face to face learning <input type="checkbox"/> Blended <input type="checkbox"/> Fully online
14.	Online Platforms(s)	<input checked="" type="checkbox"/> Moodle <input checked="" type="checkbox"/> Microsoft Teams
15.	Issuing Date	
16.	Revision Date	

17. Course Coordinator:

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

**18. Other Instructors:**

Name:

Office number:

Phone number:

Email:

Contact hours:

Name:

Office number:

Phone number:

Email:

Contact hours:

19. Course Description:

Planning organic synthesis. Disconnection and retrosynthesis approach. Functional groups interconversions. Carbon-carbon bond forming reactions: enolates, enamines, ylides, organometallics, cyclization, annulation, and cycloaddition reactions. Stereochemistry and asymmetric synthesis. Supramolecular chemistry. Examples on total synthesis of naturally occurring compounds.

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. Develop chemistry expertise, focus on theory and practice, and contribute to advancing knowledge in a specific research field.

SO2. Conduct original, high-quality research that advances knowledge in chemistry by developing complex projects using innovative methodologies.

SO3. Mentor junior researchers and students and demonstrate leadership in the scientific community through collaboration, peer review, and knowledge exchange.

SO4. Recognize the ethical implications and responsibly use chemistry solutions to tackle global challenges.

SO5. Participate in ongoing professional development to stay up to date with the latest research and innovations.

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) To analyze complex organic molecules and propose retrosynthetic pathways, disconnection strategies break down target structures into simpler precursors.
- 2) To develop synthetic pathways for target molecules by incorporating functional group interconversions and strategic bond disconnections for efficient synthesis routes.
- 3) To demonstrate the ability to choose suitable organic synthesis reagents, catalysts, and reaction conditions.
- 4) To evaluate synthetic routes, analyze the efficiency, cost, and feasibility of various synthetic strategies.
- 5) To understand and explain the mechanistic basis of key reactions used in synthesis.

Course CLOs	The learning levels to be achieved					
	Remembering	Understanding	Applying	Analysing	evaluating	Creating
1		x	x	x	x	
2		x	x	x	x	
3		x	x	x	x	x
4		x	x	x	x	x
5		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	SO (1)	SO (2)	SO (3)	SO (4)	SO (5)
Course CLO's					
CLO (1)	•	•			•
CLO (2)	•	•			•
CLO (3)	•	•			•
CLO (4)	•	•			•
CLO (5)	•	•			•



23. Topic Outline and Schedule:

Week	Lecture	Topic	CLO/s Linked to the Topic	Learning Types Face to Face (FF) Blended (BL)	Platform Used	Synchronous (S) Asynchronous (A)	Evaluation Methods	Learning Resources
1	1.1	The Disconnection Approach	CLO (1)	FF	on campus	S		textbook
	1.2	Basic Principles: Synthons and Reagents: Synthesis of Aromatic Compounds	CLO (1)	FF	on campus	S		textbook
2	2.1	Strategy I: The Order of Events	CLO (2)	FF	on campus	S		textbook
	2.2	One-Group C-X Disconnections	CLO (1)	FF	on campus	S		textbook
3	3.1	Strategy II: Chemoselectivity	CLO (2)	FF	on campus	S		textbook
	3.2	Two-Group C-X Disconnections	CLO (1)	FF	on campus	S		textbook
4	4.1	Strategy III: Reversal of Polarity, Cyclisations. Summary of Strategy	CLO (2)	FF	on campus	S		textbook
	4.2	Amine Synthesis	CLO (2)	FF	on campus	S		textbook
	4.3	Strategy IV: Protecting Groups	CLO (2)	FF	on campus	S		textbook
5	5.1	One-Group C-C Disconnections I: Alcohols General Strategy A: Choosing a Disconnection	CLO (3)	FF	on campus	S		textbook
	5.2	Strategy V: Stereoselectivity	CLO (3)	FF	on campus	S		textbook
6	6.1	One-Group C-C Disconnections II: Carbonyl Compounds	CLO (3)	FF	on campus	S		textbook
	6.2	Strategy VI: Regioselectivity	CLO (2)	FF	on campus	S		textbook
7	7.1	Alkene Synthesis	CLO (3)	FF	on campus	S		textbook
	7.2	Strategy VII: Use of Acetylenes (Alkynes)	CLO (3)	FF	on campus	S		textbook
8	8.1	Two-Group C-C Disconnections I: Diels-Alder Reactions	CLO (3)	FF	on campus	S		textbook
	8.2	Strategy VIII: Introduction to Carbonyl Condensations	CLO (1)	FF	on campus	S		textbook
9	9.1	Two-Group C-C Disconnections II: 1,3-Difunctionalised Compounds	CLO (1)	FF	on campus	S		textbook
	9.2	Strategy IX: Control in Carbonyl Condensations	CLO (5)	FF	on campus	S		textbook
10	10.1	Two-Group C-C Disconnections III: 1,5-Difunctionalised Compounds Conjugate(Michael) Addition and Robinson Annulation.	CLO (5)	FF	on campus	S		textbook



	10.2	Strategy X: Aliphatic Nitro Compounds in Synthesis	CLO (1)	FF	on campus	S		textbook
11	11.1	Two-Group Disconnections IV: 1,2-Difunctionalised Compounds	CLO (4)	FF	on campus	S		textbook
	11.2	Strategy XI: Radical Reactions in Synthesis	CLO (1)	FF	on campus	S		textbook
12	12.1	Two-Group Disconnections V: 1,4-Difunctionalised Compounds	CLO (5)	FF	on campus	S		textbook
	12.2	Strategy XII: Reconnection	CLO (5)	FF	on campus	S		textbook
13	13.1	Two-Group C-C Disconnections VI: 1,6-diCarbonyl Compounds	CLO (4)	FF	on campus	S		textbook
	13.2	Introduction to ring synthesis: Saturated heterocycles	CLO (5)	FF	on campus	S		textbook
14	14.1	Three-membered rings	CLO (5)	FF	on campus	S		textbook
	14.2	Rearrangement in Synthesis.	CLO (5)	FF	on campus	S		textbook
15	15.1	Four-membered rings: Photochemistry in Synthesis	CLO (5)	FF	on campus	S		textbook
	15.2	The five-membered Rings, Six-membered Rings	CLO (5)	FF	on campus	S		textbook
16							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	15		CLO (3)	11	on campus
	15	Preparation and presentation of a report reviewing the retrosynthesis of a selected compound.			



final	40		CLO (1), CLO (2), CLO (3), CLO (4) CLO (5).		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:

The course relies heavily on recent literature presented in journals and the latest references. Basic ideas and concepts can be found in a variety of books, some of which are listed below:

1. Organic Synthesis: The Disconnection Approach, by S. Warren and Paul Wyatt. 2nd Edition. 2009. Wiley
2. Organic Synthesis: Strategy and Control by Paul Wyatt, Stuart Warren, 2007, Wiley
3. Name Reactions, A Collection of Detailed Reaction Mechanisms, Third Edition, Jie Jack L.
4. Classics in Total Synthesis, by K.C. Nicolaou and E. J. Sorensen.



5. The Logic of Chemical Synthesis E. J. Corey and Xue-Min Chelg
6. Organic Chemistry, Jonathan Clayden, ick Greeves, and Stuart Warren. 2nd edition, 2012
7. Organic Synthesis, by M. B. Smith

28. Additional information:

Name of the Instructor or the Course Coordinator:	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: