مركز الاعتماد وضمان الجودة
ACCREDITATION & QUALITY ASSURANCE CENTER

Course Syllabus

1	**Course title**	Introduction to Heterocyclic Chemistry
2	**Course number**	0353432
3	**Credit hours**	3 theory
	Contact hours (theory, practical)	3 hours theory/week
4	**Prerequisites/corequisites**	0303331
5	**Program title**	B.Sc.
6	**Program code**	NA
7	**Awarding institution**	The University of Jordan
8	**School**	Science
9	**Department**	Chemistry
10	**Course level**	4th Year
11	**Year of study and semester (s)**	4th, First semester
12	**Other department (s) involved in teaching the course**	B.Sc.
13	**Main teaching language**	English
14	**Delivery method**	✓Face to face learning ☐Blended ☐Fully online
15	**Online platforms(s)**	√Moodle √Microsoft Teams ☐Skype ☐Zoom ☐Others……
16	**Issuing/Revision Date**	25-2-2024

17 Course Coordinator:

Name: Prof. Dr. Kamal Sweidan	Contact hours:10:30-11:30
Office number: 204	Phone number:22155
Email: k.sweidan@ju.edu.jo	

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18 Other instructors:

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

19 Course Description:

Synthesis and reactions of the following classes of heterocycles: saturated heterocycles containing one heteroatom (N, O or S); heteroaromatics: furan, thiophene, pyrrole, pyridine, quinoline and isoquinoline; indole; nomenclature of condensed heteroaromatics; natural occurrence and biological activity of heterocyclic compounds.

20 Course Learnings Outcomes (CLOs):

Upon successful completion of this course, students will be able to:

CLO-1 Identifying the structural and electronic features of various heterocyclic compounds.

CLO-2. Naming of various heterocyclic compounds.

CLO-3. Describe the theoretical understanding of heterocyclic chemistry which includes various methods for ring synthesis and application of those methods for the preparation of specific groups of heterocyclic systems.

CLO-4. Discuss mechanisms of various organic reactions.

B- Students Learning Outcomes (SLOs):

SO-1. Problem Solving: Graduates will be able to apply mathematical and scientific knowledge to identify, formulate, and solve technical or scientific problems relevant to the discipline of chemistry.

SO-2. Design: Graduates will be able to use their understanding of chemistry concepts and principles to formulate and design systems, processes, procedures, or programs to meet desired goals and outcomes.

SO-3. Experimental Skills: Graduates will be able to design, conduct, and analyze experiments or test hypotheses, utilizing appropriate chemical techniques and scientific judgment to draw meaningful conclusions.

SO-4. Communication: Graduates will be able to communicate scientific information effectively and accurately to a range of audiences, including both technical and non-technical audiences.

SO-5. Ethics and Global Context: Graduates will understand and apply ethical and professional responsibilities in the context of the impact of technical and scientific solutions on global, economic, environmental, and societal issues.

SO-6. Teamwork: Graduates will be able to work effectively as part of a team, establishing goals, planning tasks, meeting deadlines, and analyzing risk and uncertainty in the context of chemistry-related projects and initiatives.

SO-7. Handling Chemicals: An ability to apply the proper procedures for safe handling of chemicals.

0353432

		Student Outcomes (SO)						
		SO-1	SO-2	SO-3	SO-4	SO-5	SO-6	SO-7
Course Learning Outcomes (CLO)	CLO-1	✓	✓					
	CLO-2	✓						
	CLO-3	✓	✓					
	CLO-4	✓	✓				✓	

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21. Topic Outline and Schedule:

	Lecture	Topic	Student Learning Outcome	Learning Methods (Face to Face/Blended/ Fully Online)	Platform	Synchronous / Asynchronous Lecturing	Evaluation Methods	Resources
1	1.1	Nomenclature of simple heterocyclic compounds	CLO-2	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero.Chem. Gilchrist, 3rd Ed., Cha. 11
	1.2	Nomenclature of simple heterocyclic compounds	CLO-2	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero.Chem. Gilchrist, 3rd Ed., Cha. 11
	1.3	Nomenclature of simple heterocyclic compounds	CLO-2	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero.Chem. Gilchrist, 3rd Ed., Cha. 11
2	2.1	Effect of heteroatom on structure and properties	CLO-1	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero. Chem.: Joule and Mills, 4th Ed., Cha. 1
	2.2	Effect of heteroatom on structure and properties	CLO-1	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero. Chem.: Joule and Mills, 4th Ed., Cha. 1
	2.3	Effect of heteroatom on structure and properties	CLO-1	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero. Chem.: Joule and Mills, 4th Ed., Cha. 1
3	3.1	General methods for ring synthesis	CLO-3	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero. Chem.: Joule and Mills, 4th Ed., Chas. 3 & 27
	3.2	General methods for ring synthesis	CLO-3	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero. Chem.: Joule and Mills, 4th Ed., Chas. 3 & 27
	3.3	General methods for ring synthesis	CLO-3	Face to Face	Classroom		Quiz, Mid exam, Final	Hetero. Chem.: Joule and Mills, 4th

							exam exam	Ed., Chas. 3 & 27
4	4.1	**Three-membered heterocyles:** Saturated three-membered heterocycles containing one heteroatom. Saturated three-membered heterocycles containing more than one heteroatom. Unsaturated three-membered heterocycles.	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero. Chem.: Joule and Mills, 4th Ed., Chas. 3 & 27
	4.2	**Three-membered heterocyles:** Saturated three-membered heterocycles containing one heteroatom. Saturated three-membered heterocycles containing more than one heteroatom. Unsaturated three-membered heterocycles.	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero. Chem.: Joule and Mills, 4th Ed., Chas. 3 & 27
	4.3	**Three-membered heterocyles:** Saturated three-membered heterocycles containing one heteroatom. Saturated three-membered heterocycles containing more than one heteroatom.	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero. Chem.: Joule and Mills, 4th Ed., Chas. 3 & 27

		Unsaturated three-membered heterocycles.						
5	5.1	**Four-membered heterocycles:** Saturated four-membered heterocycles containing one heteroatom. Saturated four - membered heterocycles containing more than one heteroatom. Unsaturated four - membered heterocycles	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero. Chem.: Joule and Mills, 4th Ed., Chas. 3 & 27
	5.2	**Four-membered heterocycles:** Saturated four-membered heterocycles containing one heteroatom. Saturated four - membered heterocycles containing more than one heteroatom. Unsaturated four - membered heterocycles	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero. Chem.: Joule and Mills, 4th Ed., Chas. 3 & 27
	5.3	**Four-membered heterocycles:** Saturated four-membered heterocycles containing one heteroatom. Saturated four - membered	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero. Chem.: Joule and Mills, 4th Ed., Chas. 3 & 27

		heterocycles containing more than one heteroatom. Unsaturated four - membered heterocycles						
6	6.1	**heterocycles:** Aromatic five-membered heterocycles containing one heteroatom. Aromatic five-membered heterocycles containing more than one heteroatom. Benzo-fused aromatic five-membered heterocycles containing one heteroatom.	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero. Chem.: Joule and Mills, 4th Ed., Chas. 3 & 27
	6.2	**heterocycles:** Aromatic five-membered heterocycles containing one heteroatom. Aromatic five-membered heterocycles containing more than one heteroatom. Benzo-fused aromatic five-membered heterocycles containing one heteroatom.	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero. Chem.: Joule and Mills, 4th Ed., Chas. 3 & 27
	6.3	**heterocycles:** Aromatic five-membered heterocycles	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero. Chem.: Joule and Mills, 4th

		containing one heteroatom. Aromatic five-membered heterocycles containing more than one heteroatom. Benzo-fused aromatic five-membered heterocycles containing one heteroatom.						Ed., Chas. 3 & 27
7	7.1	**heterocycles:** Aromatic five-membered heterocycles containing one heteroatom. Aromatic five-membered heterocycles containing more than one heteroatom. Benzo-fused aromatic five-membered heterocycles containing one heteroatom.	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero. Chem.: Joule and Mills, 4th Ed., Chas. 3 & 27
	7.2	**heterocycles:** Aromatic five-membered heterocycles containing one heteroatom. Aromatic five-membered heterocycles containing more than one heteroatom. Benzo-fused aromatic five-membered heterocycles	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero. Chem.: Joule and Mills, 4th Ed., Chas. 3 & 27

		containing one heteroatom.						
	7.3	**heterocycles:** Aromatic five-membered heterocycles containing one heteroatom. Aromatic five-membered heterocycles containing more than one heteroatom. Benzo-fused aromatic five-membered heterocycles containing one heteroatom.	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero. Chem.: Joule and Mills, 4th Ed., Chas. 3 & 27
8	8.1	**heterocycles:** Aromatic five-membered heterocycles containing one heteroatom. Aromatic five-membered heterocycles containing more than one heteroatom. Benzo-fused aromatic five-membered heterocycles containing one heteroatom.	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero. Chem.: Joule and Mills, 4th Ed., Chas. 3 & 27
	8.2	**Five-membered heterocycles:** Aromatic five-membered heterocycles containing one heteroatom.	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero. Chem.: Joule and Mills, 4th Ed., Chas. 3 & 27

		Aromatic five-membered heterocycles containing more than one heteroatom. Benzo-fused aromatic five-membered heterocycles containing one heteroatom						
	8.3	**Five-membered heterocycles:** Aromatic five-membered heterocycles containing one heteroatom. Aromatic five-membered heterocycles containing more than one heteroatom. Benzo-fused aromatic five-membered heterocycles containing one heteroatom	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero. Chem.: Joule and Mills, 4th Ed., Chas. 3 & 27
9	9.1	**Five-membered heterocycles:** Aromatic five-membered heterocycles containing one heteroatom. Aromatic five-membered heterocycles containing more than one heteroatom. Benzo-fused aromatic five-membered heterocycles containing one heteroatom	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero. Chem.: Joule and Mills, 4th Ed., Chas. 3 & 27
	9.2	**Five-membered heterocycles:**	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam,	Hetero. Chem.: Joule and Mills, 4th

		Aromatic five-membered heterocycles containing one heteroatom. Aromatic five-membered heterocycles containing more than one heteroatom. Benzo-fused aromatic five-membered heterocycles containing one heteroatom					Final exam	Ed., Chas. 3 & 27
	9.3	**Five-membered heterocycles:** Aromatic five-membered heterocycles containing one heteroatom. Aromatic five-membered heterocycles containing more than one heteroatom. Benzo-fused aromatic five-membered heterocycles containing one heteroatom	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero. Chem.: Joule and Mills, 4th Ed., Chas. 3 & 27
10	10.1	**Six-membered heterocycles:** six-membered aromatic heterocycles containing one heteroatoms. Benzo-fused six-membered aromatic heterocycles containing one heteroatoms	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero.Chem. Gilchrist, 3rd Ed., Chas. 6 & 8
	10.2	**Six-membered heterocycles:** six-membered aromatic heterocycles	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero.Chem. Gilchrist, 3rd Ed., Chas. 6 & 8

		containing one heteroatoms. Benzo-fused six-membered aromatic heterocycles containing one heteroatoms						
	10.3	**Six-membered heterocycles:** six-membered aromatic heterocycles containing one heteroatoms. Benzo-fused six-membered aromatic heterocycles containing one heteroatoms	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero.Chem. Gilchrist, 3rd Ed., Chas. 6 & 8
11	11.1	**Six-membered heterocycles:** six-membered aromatic heterocycles containing one heteroatoms. Benzo-fused six-membered aromatic heterocycles containing one heteroatoms	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero.Chem. Gilchrist, 3rd Ed., Chas. 6 & 8
	11.2	**Six-membered heterocycles:** six-membered aromatic heterocycles containing one heteroatoms. Benzo-fused six-membered aromatic heterocycles containing one heteroatoms	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero.Chem. Gilchrist, 3rd Ed., Chas. 6 & 8
	11.3	**Six-membered heterocycles:** six-membered aromatic heterocycles containing one heteroatoms.	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero.Chem. Gilchrist, 3rd Ed., Chas. 6 & 8

		Benzo-fused six-membered aromatic heterocycles containing one heteroatoms						
12	12.1	**Six-membered heterocycles:** six-membered aromatic heterocycles containing one heteroatoms. Benzo-fused six-membered aromatic heterocycles containing one heteroatoms	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero.Chem. Gilchrist, 3rd Ed., Chas. 6 & 8
	12.2	**Six-membered heterocycles:** six-membered aromatic heterocycles containing one heteroatoms. Benzo-fused six-membered aromatic heterocycles containing one heteroatoms	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero.Chem. Gilchrist, 3rd Ed., Chas. 6 & 8
	12.3	**Six-membered heterocycles:** six-membered aromatic heterocycles containing one heteroatoms. Benzo-fused six-membered aromatic heterocycles containing one heteroatoms	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero.Chem. Gilchrist, 3rd Ed., Chas. 6 & 8
13	13.1	**Six-membered heterocycles:** six-membered aromatic heterocycles containing one heteroatoms. Benzo-fused six-membered aromatic heterocycles	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero.Chem. Gilchrist, 3rd Ed., Chas. 6 & 8

		containing one heteroatoms						
	13.2	**Six-membered heterocycles:** six-membered aromatic heterocycles containing one heteroatoms. Benzo-fused six-membered aromatic heterocycles containing one heteroatoms	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero.Chem. Gilchrist, 3rd Ed., Chas. 6 & 8
	13.3	**Six-membered heterocycles:** six-membered aromatic heterocycles containing one heteroatoms. Benzo-fused six-membered aromatic heterocycles containing one heteroatoms	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero.Chem. Gilchrist, 3rd Ed., Chas. 6 & 8
14	14.1	Fused heterocyclic rings	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero. Chem.: Joule and Mills, 4th Ed., Hetero.Chem. Gilchrist, 3rd Ed.,
	14.2	Fused heterocyclic rings	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero. Chem.: Joule and Mills, 4th Ed., Hetero.Chem. Gilchrist, 3rd Ed.,
	14.3	Fused heterocyclic rings	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero. Chem.: Joule and Mills, 4th Ed., Hetero.Chem. Gilchrist, 3rd Ed.,
15	15.1	Applications of heterocycles in medicinal Chemistry	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam,	Hetero. Chem.: Joule and Mills, 4th

							Final exam	Ed.,Hetero.Chem. Gilchrist, 3rd Ed.,
	15.2	heterocycles in medicinal Chemistry	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero. Chem.: Joule and Mills, 4th Ed.,Heter o.Chem. Gilchrist, 3rd Ed.,
	15.3	heterocycles in medicinal Chemistry	CLO-3 & CLO-4	Face to Face	Classroom		Quiz, Mid exam, Final exam	Hetero. Chem.: Joule and Mills, 4th Ed.,Heter o.Chem. Gilchrist, 3rd Ed.,

22 Evaluation Methods:

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

Evaluation Activity	Mark	Topic(s)	SLOs	Period (Week)	Platform
Quizzes	20%	All topics included in all CLO's	CLO-1 CLO-2 CLO-3 CLO-4	among weeks	In the department
Mid exam	30%	All topics included in all CLO's	CLO-1 CLO-2 CLO-3 CLO-4	8 weeks	In the department
Final exam	50%	All topics included in all CLO's	CLO-1 CLO-2 CLO-3 CLO-4	16 weeks	In the department

23 Course Requirements

N. A

24 Course Policies:

A- Attendance policies: A- Attendance policies:

Maximum 15% absence is allowed.

B- Absences from exams and submitting assignments on time:

Incomplete Exams are conducted later after arrangement a new date.

C- Health and safety procedures:

This is a theoretical course.

D- Honesty policy regarding cheating, plagiarism, misbehavior:

The general Jordan University's laws are applied in any case of cheating.

E- Grading policy:

Letters scale is applied.

F- Available university services that support achievement in the course:

Free Internet-access and E-learning,

25 References:

A- Required book(s), assigned reading and audio-visuals:

Heterocyclic Chemistry: Gilchrist, 3rd Ed., 1997.

Heterocyclic Chemistry: Joule and Mills, 4th Ed., 2000

B- Recommended books, materials, and media:

https://www2.chemistry.msu.edu/faculty/reusch/virttxtjml/heterocy.htm

hcopgnt.com/admin/uploads/heterocycics.pptx

26 Additional information:

N.A

Name of Course Coordinator: Kamal Sweidan Signature: K.Sweidan Date: 26-2-2024
Head of Curriculum Committee/Department: ---------- Signature: ----------
Head of Department: ---------- Signature: ----------
Head of Curriculum Committee/Faculty: ---------- Signature: ----------
Dean: ---------- Signature: ----------