



SYLLABUS

A. Course Description

Course Code	Course Num.	Course Name	Credit Hours	Lec.	Lab.	Tut.	Private study	Pre-requisites	Course Level	Language
CHM	325	Heterocyclic Chemistry	3	3	0	0	6	CHM 221	5	English

This course provides students with an introduction to heterocyclic chemistry, methods, reactivity and application of heterocyclic compounds in medicinal chemistry and industry. Topics covered in the course include a structure of heterocycles, Heterocycles with three members with one heteroatom, Structure of Five-membered Rings with One Heteroatom, Structure of Five-membered Rings with Two or More Heteroatoms, Structure of Six-membered Rings with One Heteroatom, Heterocycles with Six members with Two or More Heteroatoms, Biologically important heterocycles.

At the end of this course the student will be able to:

- To list the structures of important classes of Heterocyclic Aromatic Compounds.
- To state electron deficient or electron rich in heterocyclic compounds.
- To write sequences for some heterocyclic compounds synthesis under the influence of reaction conditions.
- To memorize preparation and reactions of organic compounds.
- To describe preparation and reactions of five, six and fused member ring.
- To list the basic reactions covered in the required basic organic chemistry course.

B. References: Required Textbook & Internal Website

I shall use

Heterocyclic Chemistry, Joule, John A., Mills. K., (5th Ed.), Wiley-Blackwell, 2010, ISBN: 978-1-4051-3300-5.

Students are required to purchase the textbook/materials (it is an obligation). The book contains the lecture notes as well as activities for the students to take part in; the book serves as a workbook.

Other references:

- **Handbook of Heterocyclic Chemistry**, Katritzky, A. R.; Pozharskii, A. F.; (2nd Ed.); Pergamon: Oxford., 2000, ISBN: 978-0-08-095843-9
- **Heterocyclic Chemistry**, Gilchrist, T. L.; Addison Wesley Longman: Edinburgh Gate, (3rd Ed.), 1997, ISBN-10: 0582278430



C. Topics Outline

Disclaimer: this is a very fast-paced course. There will be little time—if any—for review. What follows is an approximate outline of the pace of the course. We may go faster or slower, contingent on the class response. The tentative list of topics to cover:

1. **Structure of Heterocycles:** Introduction, Relationship of Heterocyclic and Carbocyclic Aromatic Compounds, Systematic Nomenclature, The Relation between Benzene Ring and the Heterocyclic Rings, Aromaticity Rules, Nomenclature of Heterocyclic Compounds of Five and Six Member-ring with Two Heteroatom's, Fused with Benzene Ring, Fused Heterocyclic Ring Systems,
2. **Heterocycles with three members with one heteroatom:** Different Methods for the Preparation of Oxirane, Formation of Aziridines using Haloamines, Methylene Insertion Reactions. Some Examples of Nucleophilic and Electrophilic Ring Openings.
3. **Structure of Five-membered Rings with One Heteroatom:** Reactivity of Five-membered Rings with One Heteroatom, Electrophilic attack, Nucleophilic attack, Nucleophilic Attack at Nitrogen Heteroatom, Nucleophilic Attack at Hydrogen Attached to Ring Carbon or Ring Nitrogen, Benzo derivatives of Five-membered Heterocycles with One Heteroatom.
4. **Structure of Five-membered Rings with Two or More Heteroatoms:** Azoles with Heteroatoms in the 1,2-positions, Azoles with Heteroatoms in the 1,3-positions, Reactivity of Five-membered Rings with Two or More Heteroatoms
5. **Structure of Six-membered Rings with One Heteroatom:** Reactivity of Six-membered Rings with One Heteroatom (Pyran, Thiopyran, Pyridine), Electrophilic attack, Nucleophilic attack, Nucleophilic Attack at Nitrogen Heteroatom, Nucleophilic Attack at Hydrogen Attached to Ring Carbon or Ring Nitrogen, Benzo derivatives of Six-membered heterocycles with one heteroatom.
6. **Heterocycles with Six-members with Two or More Heteroatoms:** Structure and Reactivity of Aromatic Six-Membered Systems with two or More Heteroatoms, Synthesis and Reactivity of 1,2- and 1,4- and 1,3- Diazines such as Pyrimidines; Six-membered Ring Systems with Three and More Heteroatoms: Triazines, Tetrazines, Oxadiazines and Oxathiazines.
7. **Biologically important heterocycles:** Pyrimidines, and Purines, structure, synthesis, Nucleic acids and enzymes, the Biological Processes

D. Exams & Grading System

The semi-official dates and the workload of students for this course are:

- Midterm 1: 1 exam
- Midterm 2: 1 exam
- Quizzes : 2 quizzes
- Homeworks: 3 homeworks (9 Hours)
- Final Exam: 16th week.



	Teaching/learning activities	Contact Hours	Frequency	Total Contact hours	Self-study hours (hrs)	Total self-study hours	Student Learning Time
1	Lecture	3	15	45	4	60	105
2	Tutorial	0	0	0	0	0	0
3	Lab\Practical	0	0	0	0	0	0
4	Lab report	0	0	0	0	0	0
5	Homework	0	5	0	1	5	5
6	Quiz	0.25	3	1	1	3	4
7	Test (Midterm)	1.5	2	3	5	10	13
8	Final Exam	2	1	2	8	8	10
Total				63		86	137

Independent self-study = $86/15 \cong 5.7$ hrs per week

Your course grade will be based on Final Exam, Midterms, Homework, Quizzes, Participation, Attendance and Project.

Midterm 1: 20 %	Midterm 2: 20 %	Final Exam: 40 %
Quizzes; Homework & Attendance & Participation: 20 %		

The grading distribution:

A ⁺	A	B ⁺	B	C ⁺	C	D ⁺	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

E. Student Attendance/Absence

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.



Executive Rules for Study Regulations and
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