Course Specification
(Bachelor)

Course Title:	Synthesis of Organic Compounds
Course Code:	CHM 132? or 142?
Program:	Bachelor of Science in Chemistry
Department:	Chemistry
College:	Science
Institution:	Imam Mohammed Ibn Saud Islamic University
Version:	2024 V2
Last Revision Date:	1 November 2024

Table of Contents

A. General information about the course:

-1. Course Identification

1. Credit hours: 2 (0 , 4)					
0 Lectures, 4 Lab					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered:					
Level 6/ Third year					
4. Course general Description:					
This course is a laboratory course designed to provide students with experience in single-step and multi-step syntheses, purifications and characterization of organic molecules with hands-on access to available instruments and techniques..					
5. Pre-requirements for this course (if any)**:**					
CHM 1221 Organic Chemistry (2)					
6. Co-requisites for this course (if any)**:**					
None					
7. Course Main Objective(s):					

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

- ***memorize the Synthetic methods of Organic Compounds***
- ***Understand the role of reagents, catalysts, and solvents in different reactions.***
- ***recognize one and multi-step technique used for selected organic compounds synthesis***
- ***list the required reactions covered in the Organic Chemistry Courses used for target synthesis.***
- ***Learn techniques such as reflux, distillation, extraction, recrystallization, and chromatography.***
- ***Master the use of rotary evaporators, drying agents, and inert atmosphere techniques for air-sensitive reactions.***
- ***write the appropriate the reaction mechanism used for synthesis.***
- ***outline the possible problems that might be faced during the synthesis, with proposed solutions.***

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	.....	100%
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	0
2.	**Laboratory/Studio**	**64**
3.	**Field**	**0**
4.	**Tutorial**	**0**
5.	**Others (specify)**	**0**
Total		....

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

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**To memorize the Synthetic methods of Organic Compounds**	**K1; K3;**	• Four hours are weekly containing Laboratory activities and Oral Discussion. • A Private study including work on writing report.	• Laboratory Reports. • Oral Discussion marks • Participation.
1.2	**To list the required reactions covered in the Organic Chemistry Courses used for target synthesis.**	**K1; K3; S2; C2**	▪ Four hours are weekly containing Laboratory activities with group discussion.	○Lab. Reports. ○Oral Discussions.

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
			Think and discuss about Required Organic Reactions	
1.3	**To write the appropriate the reaction mechanism used for synthesis.**	**K3; S1; S4**	• Four hours are weekly containing Laboratory activities with group discussion. Think and talk about the used reaction mechanism	○Laboratory Reports ○Oral Discussions.
2.0	**Skills**			
2.1	**To explain the reactivity of organic compounds.**	**K1; K3; S1; S3**	▪ Laboratory activities Think and talk about the reactivity of organic compounds.	▪ Questions in labs. ▪ Participation through Laboratories Oral Discussion,
2.2	**To predict the reaction mechanisms of target compound synthesis.**	**S1; S3**	Encourage students to communicate their logic chemical thinking, and to work and discuss cooperatively with their peers to develop individual skills.	• Questions in labs. • Participation through Laboratories ● Oral discussion
2.3	**To summarize the possible methods for synthesis of target compounds**	**S1; S3**	• labs and Group discussion ▪ Have the ability to ask and answer questions as they arise ▪ Brain storming Exercises	▪ Questions in labs. ▪ Participation through Laboratories ▪ Oral discussion.
2.4	**Demonstrate Oral Communication and technical writing skills through writing of Laboratory Reports, with**	**S2; S3; C2, C3**	▪ Group Discussion and Assignments ▪ Demonstrations and Laboratory Manuals ▪ Demonstrations and Virtual Labs.	▪ 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 program	Teaching Strategies	Assessment Methods
	operating electronic mail and Network in communicating with others.		▪ Encourage students to use electronic mail to submit LAB. reports and Assignments	
2.5	**Operate Laboratory Instruments and Perform chemical experiments during Laboratory Classes and field scales.**	**K1; S2; C1; C2**	▪ Encourage the students to use the Chemicals Glass wares and Instruments with caring and safety	▪ Oral Discussion. ▪ Discussion marks ▪ Giving marks for participation in the lab.
3.0	**Values, autonomy, and responsibility**			
3.1	**To demonstrate responsibility for their own learning and motivate for teamwork in the Laboratory section.**	**S1; S3;**	▪ Brain Storms Exercises ▪ Group Discussion	▪ Oral Discussion. ▪ Group Discussion and Assignments

C. Course Content

No	List of Experiments	Contact hours
1	GENERAL INFORMATIOM: Laboratory instructions and The laboratory rules, Common Laboratory Techniques: Filtration, Decolorization, Drying and drying agents, Reflux, Reporting results	4
2	Synthesis of 2,5-Dimethyl pyrrole: Pyrrole can be prepared from 1,4-Diketone in the Presence of Ammonium Carbonate.	**4**
3	Synthesis of Hexahydro-1,3,5-tri-*p*-tolyl-*s*-triazine. Hexa hydro-1,3,5-tri-*p*-tolyl-*s*-triazine can be prepared by the reaction of *p*-toluidine with formaldehyde at room temperature.	**4**
4	Synthesis of 2,3-diphenylquinoxaline 2,3-diphenylquinoxaline can be prepared by the reaction of benzil with *o*-phenylenediamine.	**4**

5	Synthesis of 5,5-Diphenylhydantoin 5,5-Diphenylhydantoin can be prepared by the reaction of benzil with urea in the presence of a base.	**4**
6	Synthesis of benzimidazole Benzimidazole can be prepared by the reaction of *o*-phenylenediamine with formic acid under refluxing.	**4**
7	Synthesis of Benzotriazole Benzotriazole can be prepared by the reaction of *o*-phenylenediamine with nitrous acid.	**4**
8	Synthesis of 3-Methyl-1-phenyl-5-pyrazolone 3-Methyl-1-phenyl-5-pyrazolone can be prepared by the reaction of ethyl acetoacetate with phenylhydrazine.	**4**
9	Synthesis of Pyrano pyrazole:3-Methyl-1-phenyl-5-pyrazolone can be reacted with α,β-unsaturated nitriles affording fused pyrazole	**4**
10	Synthesis of Pyridine Derivatives: Pyridine derivatives can be prepared from chalcones and active methylene comounds	**4**
11	Synthesis of Barbituric Acid Barbituric acid can be prepared by the reaction of diethylmalonate with urea in the presence of sodium ethoxide.	**4**
12	Synthesis of Hexahydro-1,3,5-tri-*p*-tolyl-*s*-triazine. Hexahydro-1,3,5-tri-*p*-tolyl-*s*-triazine can be prepared by the reaction of p-toluidine with formaldehyde at room temperature.	**4**
13	Synthesis of 2,3-diphenylquinoxaline 2,3-diphenylquinoxaline can be prepared by the reaction of benzil with *o*-phenylenediamine.	**4**
14	General Revision	4
Total		**56**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes, Attendance, Participation,	6th/ 7th week	10%
2.	Lab. Reports	11th/ 12th week	40%
3.	Midterm Exam 1	During the semester	20%
4.	Final Exam	All the semester	30%
5.	Total	17thweek	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	• ***Manual Laboratory,*** *by Organic Chemistry faculty.* • ***Understanding the Principles of Organic Chemistry A Laboratory Course, by*** *Steven Pedersen and Arlyn Myers. Brooks/Cole, Cengage Learning, ISBN-13: 978-0-495-82993-5, ISBN-10: 0-495-82993-5* • ***Macroscale and Microscale Organic Experiments,*** *Sixth Edition, by Kenneth L. Williamson, Katherine M. Masters. Brooks/Cole, Cengage Learning, ISBN-13: 978-0-538-73333-5, ISBN-10: 0-538-73333-0*
Supportive References	• ***Vogel's' Textbook of Practical Organic Chemistry,*** Vogel, A.I., Tatchell, A.R. , Furnis, B.S , Smith, P.W.G , Longman Group UK Limited, (5th Ed.), 1989 ISBN 978-0-582-46236-6
Electronic Materials	• Blackboard (https://lms.imamu.edu.sa/) • Organic Chemistry Portal (https://www.organic-chemistry.org/) • Organic Chemistry Laboratory Experiments, (https://open.bu.edu/collections/ff0df544-2c93-4250-9a7d-02f6f995adeb)
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	• **Each Laboratory should be equipped with maximum 20 seats K1; S2;** • **C2**
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)	**Direct:** course Entrance/Exit. **Indirect:** Observations - Accreditation review.
	Program Leaders	**Direct:** Course e-Portfolio. **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.
Lab Performance	Students	**Direct:** Lab reports, Final Lab exam, Course e-Portfolio.

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	COUNCIL OF DEPARTEMENT OF CHEMISTRY
REFERENCE NO.	.....
DATE	.....