Course Specification
(Bachelor)

Course Title:	**Organic Compounds Spectroscopy**
Course Code:	**CHM 1322**
Program:	**Bachelor of Science in Chemistry**
Department:	**Chemistry**
College:	**Science**
Institution:	**Imam Mohammed Ibn Saud Islamic University**
Version:	2024 V1
Last Revision Date:	13 October 2024

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A. General information about the course:

-1. Course Identification

1. Credit hours: 2 (2, 0, 0)					
2 (2 Lectures, 0 Tutorials, 0 Lab)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: Level 5/ Third year					
4. Course general Description:					
This course provides students with an Introduction for Organic Compounds Spectroscopy, which covers all techniques: UV-vis spectroscopy, infrared spectroscopy, ^{1}H and ^{13}C NMR spectroscopy, with practice problems					
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:

- **To recognize the basic spectroscopy of Organic Compounds**
- **To describe the spectroscopic data of Organic Compounds by determination the Functional Group and number of protons and carbons.**
- **To outline scientific methods for identifying and elucidating organic compounds.**
- **To interpret the structure of organic compounds from spectroscopic data.**
- **To define factors influence the chemical structure**

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	**30**	**100%**
2	E-learning	**0**	**0**
3	Hybrid • Traditional classroom • E-learning	**0**	**0**
4	Distance learning	**0**	**0**

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	**30**
2.	**Laboratory/Studio**	**0**
3.	**Field**	**0**
4.	**Tutorial**	**0**
5.	**Others (specify)**	**0**
Total		30

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 recognize the basic spectroscopy of organic compounds.**	**K1; K3**	▪ Two hours are weekly containing lectures ▪ A Private study including home exam.	▪ Quizzes Assignments ▪ Discussions. ▪ Participation.
1.2	**To describe the spectroscopic data of organic compounds by determination the functional group and number of protons and carbons.**	**K1; K3**	• Two hours are weekly containing lectures, • Group discussion	▪ Quizzes Assignments. • Oral Discussion marks
1.3	**To outline the structure of Organic Compounds from spectroscopic data with defining factors influence the chemical structure**	**K3**	▪ Two hours are weekly for lectures ▪ Think and talk about elucidating of organic compounds spectro-scopically.	• Midterms. • Assignments • Oral Discussions. • Quizzes.
2.0	**Skills**			
2.1	**To analyze information related to applied organic chemistry.**	**S1; S3**	Introduce some solved and unsolved examples of Organic Compounds with a variety of chemical structures	▪ Quizzes Assignments ▪ Discussions. ▪ Participation.

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
2.2	**To interpret data and results through analytical, logical thinking.**	**S1; S3**	• Group discussion • Brainstorming for some complex examples	▪ Quizzes Assignments. ▪ Oral Discussion marks
2.3		**S1; S3**	• Group Discussions • Think and talk about elucidating organic compounds spectroscopically.	▪ Midterms. ▪ Assignments ▪ Oral Discussions. ▪ Quizzes.
2.4	**To Demonstrate Oral Communication and writing of mini-Reports regarding the Structure Elucidation of organic compounds using electronic mail and Networks in communicating with others.**	**S2; S3**	▪ Oral Discussions. ▪ Brainstorming Exercises	▪ Quizzes Assignments ▪ Discussions. ▪ Participation.
3.0	**Values, autonomy, and responsibility**			
3.1	**To appraise teamwork, decision-making in unpredictable work, and management of resources and time.**	**V1; V2**	• Group discussions and assignments	• Group discussion marks. • Group worksheet assignments.

C. Course Content

No	List of Topics	Contact Hours
1.	**Mass Spectrometry:** Principles, ionization, Mass analyzer, MS peakes interpretation, MS of functional groups.	
2.	**Infrared Spectrometry:** Introduction, short notes about theory and Instrumentation, Interpretation of spectra, Characteristic Absorption of	4

	Organic Molecule (Normal Alkanes, branched Alkanes, Cyclic Alkanes, Alkenes, Mononuclear Aromatic Hydrocarbons, Alcohols and Phenols, Ethers, Epoxides and Peroxides, Ketones, Aldehydes, Esters and Lactones, Acid Halides, Amides and Lactams, Carboxylic acids, Amines, Amine Salts, Amino Acids and its Salts, Isonitrile, Organic Sulphur Compounds, Organic Halogen Compounds, Silicon Compounds, Phosphorus Compounds, Hetero aromatic Compounds, Heteroaromatic Compound).	
3	**Proton NMR Spectroscopy:** Introduction, Short notes about Theory and Instrumentation,Chemical Shift, Spin Coupling; Multiples; Spin System, Proton on Oxygen; Nitrogen; Sulphur Atoms, Exchangeable Protons, Simple Introduction for Chemical Shift Equivalence with examples, Magnetic Equivalent (Spin-Coupling Equivalence), AMX, ABX, and ABC Rigid System with Three Coupling Constants, Chirality, Vicinal and Giminal coupling, Low-Range Coupling.	8
4	**Carbon ^{13}NMR Spectrometry:**Introduction, Theory (Decoupling Techniques, Chemical Shift Scale and Range, Solvents), Interpretation of simple 13C spectra, Chemical Shift Equivalence, Chemical Classes and Chemical Shifts (Alkanes, Alkenes, Alkynes, Aromatic Compounds, Alcohols, Ethers,Acetals and Epoxides, Halides, Amines, Thiols, Functional Groups Containing Carbon)..	8
5	**UV/VIS:** Introduction, Theory and instrumentation, Absorption laws, Solvents, Characteristic Absorption of Organic Molecules (Saturated hydrocarbons, Alkenes, Alkynes, Carbonyl compounds, Aromatic Compounds).	8
Total		**30**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm 1	6th/ 7th week	20 %
2.	Midterm 2	11th/ 12th week	20 %
3.	Quizzes, Home Works, class participation, and mini projects	During the semester	20 %
5.	Final Exam	16-17thweek	40 %
6.	Total	All weeks	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	**Spectrometric Identification of Organic Compounds**, Robert M. Silverstein; Wiley: New York,7th ed.,2005, ISBN-10: 0471393622.
Supportive References	• **The Systematic Identification of Organic Compounds**; Ralph L. Shriner, Christine K. F. Hermann, Terence C. Morrill, David Y. Curtin, Reynold C. Fuson, Wiley: New York.8th ed. 2004. ISBN-10: 0471215031 • **Introduction to Spectroscopy,** Donald L. Pavia, Gary M. Lampman, George S. Kriz, James A. Vyvyan., Brooks/Cole, Gerage Learning, 4th Ed., 2009; ISBN-10: 0495114782 • **Organic Chemistry**, John E. McMurry, Mary Finch (Cengage Group), 8ed (2012), ISBN-10: 0495118370 | ISBN-13: 978-0495118374 • **Organic Chemistry.** Paula YurkanisBruice, 2nd Ed, PRENTICE HALL, Upper saddle River New Jersey 07458), 1998, ISBN-10: 0321803221
Electronic Materials	• Blackboard • http://www.sigmaldrich.com •
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	• Each of the class room should be equipped with a whiteboard and a projector, with a maximum of 20 students. • In each laboratory, a list of safety and precautions are provided. • In each lab has proper ventilation, and well equipped with instruments. • In each lab, containers for solid waste, liquid waste, and crushed glasses. • Each lab has a small pharmacy for first aid in case of an accident • In each lab, the rules, conditions, and safety mechanism as well list of Risk, Safety precautions according to Merck Catalogue are hanging in the labs

Items	Resources
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)	• Appropriate Glasswares for carrying the requested experiments (conical flasks, beakers, measuring cylinders) • Appropriate fine chemicals and solvents (distilled Water ammonium nitrate) • Analytical balance (3 digits), Set gas laws with the glass jacket Data acquisition set for gas laws with glass jacket, PC, Windows® 95 or higher, calorimeter, thermometer, Filter papers , clamps, stands

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.

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**COUNCIL OF DEPARTMENT OF CHEMISTRY**
REFERENCE NO.	**7 (NO. 2/3)**
DATE	**29/3/1446 - 2/10/2024**