



## SYLLABUS

### A. Course Description

Course Code	Course Num.	Course Name	Credit Hours	Lec.	Lab.	Tut.	Private study	Pre-requisites	Course Level	Language
CHM	224	Organic Compounds Spectroscopy	2	2	0	0	4	CHM 221	4	English

This course provides students with an Introduction for Organic Compounds Spectroscopy, which covers all techniques: UV-vis spectroscopy, infrared spectroscopy, <sup>1</sup>H and <sup>13</sup>C NMR spectroscopy, with practice problems.

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.

### B. References: Required Textbook & Internal Website

I shall use

*Spectrometric Identification of Organic Compounds*, Robert M. Silverstein; Wiley: New York,(7<sup>th</sup>Ed.), 2005, ISBN-10: 0471393622.

**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:

- *The Systematic Identification of Organic Compounds*; Ralph L. Shriner, Christine K. F. Hermann, Terence C. Morrill, David Y. Curtin, Reynold C. Fuson, (8<sup>th</sup> Ed.), Wiley: New York.. 2004. ISBN-10: 0471215031
- *Introduction to Spectroscopy*, Donald L. Pavia, Gary M. Lampman, George S. Kriz, James A. Vyvyan., Brooks/Cole, (4<sup>th</sup> Ed.), Gerage Learning, 2009; ISBN-10: 0495114782
- *Organic Structural Spectroscopy*, Lambert, J.; Shurvell, H. F.; Lightner, D. A.; Cooks, R.,; Prentice Hall Inc, 1998. ISBN-13: 978-0132586900, ISBN-10: 0132586908.
- *Organic Spectroscopy Analysis*, Anderson, R. J.; Bendell, D. J.; Groundwater, P.W.; Royal Society of Chemistry, 2004. ISBN: 0-85404-476.

Google Classroom Webpage:<http://www.imamm.org/>



### 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. **UV/VIS:** Introduction, Theory and instrumentation, Absorption laws, Solvents, Characteristic Absorption of Organic Molecules (Saturated hydrocarbons, Alkenes, Alkynes, Carbonyl compounds, Aromatic Compounds).
2. **Infrared Spectrometry:** Introduction, short notes about theory and Instrumentation, Interpretation of spectra, Characteristic Absorption of 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, Heteroaromatic 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 Geminal coupling, Low-Range Coupling.
4. **Carbon<sup>13</sup>NMR Spectrometry:** Introduction, Theory (Decoupling Techniques, Chemical Shift Scale and Range, Solvents), Interpretation of simple <sup>13</sup>C 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).

### D. Exams & Grading System

The semi-official dates of the exams for this course, with all the caveats, that the word “semi-official” entails, can be found here:

- **Midterm 1:** 6<sup>th</sup> or 7<sup>th</sup> week      & **Midterm 2:** 11<sup>th</sup> or 12<sup>th</sup> week
- **Quizzes & Homework: During the semester**

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 %		

#### Grading distribution:

A+: [95, 100], A: [90, 95), B+: [85, 90), B: [80, 85), C+: [75, 80), C: [70, 75), D+: [65, 70), D: [60, 65), F: [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 Exams](https://www.examsgoo.gl/ykm7t3)  
[goo.gl/ykm7t3](https://www.examsgoo.gl/ykm7t3)

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