



Course Specifications

| | |
|----------------------|-----------------------------------|
| Course Title: | Organic Spectroscopy |
| Course Code: | 4023561-3 |
| Program: | Chemistry |
| Department: | Department of chemistry |
| College: | Faculty of Applied Science |
| Institution: | Umm Al-Qura University |

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A. Course Identification

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|--|
| 1. Credit hours: |
| 2. Course type |
| a. University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/> |
| b. Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/> |
| 3. Level/year at which this course is offered: 5 th level/3 rd year |
| 4. Pre-requisites for this course (if any): Physical Organic Chemistry |
| 5. Co-requisites for this course (if any): |

6. Mode of Instruction (mark all that apply)

| No | Mode of Instruction | Contact Hours | Percentage |
|----|-----------------------|---------------|------------|
| 1 | Traditional classroom | √ | 73% |
| 2 | Blended | - | - |
| 3 | E-learning | √ | 27% |
| 4 | Distance learning | - | - |
| 5 | Other | - | - |

7. Contact Hours (based on academic semester)

| No | Activity | Contact Hours |
|----|--|---------------|
| 1 | Lecture | 22 |
| 2 | Laboratory/Studio | 30 |
| 3 | Tutorial | - |
| 4 | Others (E-learning + Exams + office hours) | 15 |
| | Total | 67 |

B. Course Objectives and Learning Outcomes

1. Course Description

This course is designed to help the students to an understanding of characterization techniques of organic compounds by spectroscopy and how to determine the structure of organic compounds

2. Course Main Objective

- By the end of this course student will be elucidate the structure of organic compound and interpretation of spectroscopic data

3. Course Learning Outcomes

| CLOs | | Aligned PLOs |
|------|--|--------------|
| 1 | Knowledge and Understanding | |
| 1.1 | Recognize the general principals and theoretical basis of different types of spectroscopy. | K1 |
| 1.2 | Select the suitable spectroscopic tool for confirmation of compounds | K2 |

| CLOs | | Aligned PLOs |
|----------|---|--------------|
| 1.3 | Identify the functional groups in organic compound using spectroscopy | K2 |
| 1.4 | Familiar with the factors affecting absorption frequency | K1 |
| 2 | Skills : | |
| 2.1 | Practice the spectroscopy tools for different organic compounds . | S3 |
| 2.2 | Determine the structure of compounds by spectroscopy | S2 |
| 2.3 | Match the structure of the compounds with the spectroscopic data | S2 |
| 2.4 | Distinguish between compounds by spectroscopy | S3 |
| 2.5 | Estimate the spectroscopic values of organic compounds | S1 |
| 2.6 | Choose the suitable spectroscopic tool for confirmation of compounds | S1 |
| 2.7 | Use computers and internet to find all information related mechanisms of organic reactions | S5 |
| 3 | Values: | |
| 3.1 | Write and present a chemical report related structural elucidation of organic compound | V2 |
| 3.2 | work individually and in a team to perform a specific experiment or preparing a report on the spectroscopic tools | V3 |

C. Course Content

| No | List of Topics | Contact Hours |
|--------------|---|---------------|
| 1 | Principals of spectroscopy and index of hydrogen deficiency | 2 |
| 2 | UV Spectroscopy: ground and excited states, molar absorptivity, an calculation of A_{max} to the possible structure | 4 |
| 3 | Applications and solving problems | 2 |
| 4 | Factors affecting absorption frequency, experimental aspects of IR spectroscopy. | 2 |
| 5 | Interpretation of IR charts. | 2E |
| 6 | The nature of NMR absorption instrumentation; chemical shifts in 1H NMR spectroscopy. | 2 |
| 7 | Shielding and de shielding effect magnetic anisotropy, spin-spin coupling in 1H NMR spectroscopy. | 4 |
| 8 | ^{13}C NMR spectroscopy (chemical shift);more complex spin-spin splitting patterns. | 2 |
| 9 | Mass Spectrometry (MS): ionization process and instrumentation. | 2 |
| 10 | Examples of common types of fragmentation processes. | 2 |
| 11 | Applications and solving problems. | 2E |
| 12 | Apply all Spectra. | 4E |
| Total | | 30 |

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

| Code | Course Learning Outcomes | Teaching Strategies | Assessment Methods |
|------------|--|---|--|
| 1.0 | Knowledge and Understanding | | |
| 1.1 | Recognize the general principals and theoretical basis of different types of spectroscopy. | Lectures | Final and mid-term exam. |
| 1.2 | Select the suitable spectroscopic tool for confirmation of compounds | Lectures Lab work | Final and mid-term exam. Lab exam |
| 1.3 | Identify the functional groups in organic compound using spectroscopy | Lectures | Final and mid-term exam. |
| 1.4 | Familiar with the factors affecting absorption frequency | Lectures | Final and mid-term exam. |
| 2.0 | Skills | | |
| 2.1 | Practice the spectroscopy tools for different organic compounds . | Lectures Lab work | Final and mid-term exam. Lab exam |
| 2.2 | Determine the structure of compounds by spectroscopy | Lectures E-learning | Final and mid-term exam. Assignments and activities on blackboard |
| 2.3 | Match the structure of the compounds with the spectroscopic data | Lectures Self-Directed private Study | Final and mid-term exam. Assignments and activities on blackboard |
| 2.4 | Distinguish between compounds by spectroscopy | Lectures Lab work Self-Directed private Study | Final and mid-term exam. Assignments and activities on blackboard |
| 2.5 | Estimate the spectroscopic values of organic compounds | Lectures | Final and mid-term exam. |
| 2.6 | Choose the suitable spectroscopic tool for confirmation of compounds | Lectures | Final and mid-term exam. |
| 2.1 | Practice the spectroscopy tools for different organic compounds . | Lectures Lab work | Final and mid-term exam. Practical Lab report and Exam |
| 2.7 | Use computers and internet to find all information related mechanisms of organic reactions | Research activity. Web based study. | Assignments and activities on blackboard |
| 3.0 | Values | | |
| 3.1 | Write and present a chemical report related structural elucidation of | Lab work Library visit. | Practical Lab report and Exam |

| Code | Course Learning Outcomes | Teaching Strategies | Assessment Methods |
|------|---|----------------------------|-------------------------------|
| | organic compound | | |
| 3.2 | work individually and in a team to perform a specific experiment or preparing a report on the spectroscopic tools | Lab work Library visit. | Practical Lab report and Exam |

2. Assessment Tasks for Students

| # | Assessment task* | Week Due | Percentage of Total Assessment Score |
|---|--|-----------|--------------------------------------|
| 1 | E-learning | All weeks | 5% |
| 2 | Assignments and activities | All weeks | 5% |
| 3 | Mid-term Exam | 6 | 20% |
| 4 | Practical Lab Work (Reports and Exams) | 11 | 30% |
| 5 | Final Exam.(2 hours exam) | 12 | 40% |

*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

- A faculty member was assigned to provide counseling and advice (about 20-25 student/ one faculty member).
- Office hours of the instructor: during the working hours weekly.

F. Learning Resources and Facilities

1. Learning Resources

| | |
|---------------------------------------|--|
| Required Textbooks | <ul style="list-style-type: none"> • Pavia, D.; Lampman, G.M.; Kriz, G.S.; Vyvyan, J.R. Introduction to Spectroscopy, 4 th edition, 2009, Belmont : Brooks/Cole, Cengage Learning. • Silverstein, R.M.; Webster, F.X.; Kiemle, D.J. Spectrometric Identification of Organic Compounds. 7th edition, 2005, N.Y. : John Wiley & Sons, Inc. • Prof.Dr.AbdullahM.Asiri, MahaM.AIOtaibi "<i>Spectroscopic Methods in Organic Chemistry, 1st Edition</i>, 2012. |
| Essential References Materials | Prof.Dr.Abdullah M.Asiri,Dr.Abood Bahajaj " Principles of Spectroscopic Analysis of Organic Compounds " |
| Electronic Materials | <ul style="list-style-type: none"> • Lecture Hand-out available as a PowerPoint presentation. • http://www.chemweb.com • http://www.sciencedirect.com • http://www.rsc.org |
| Other Learning Materials | |

2. Facilities Required

| Item | Resources |
|--|--|
| Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) | Classroom with capacity of (30) students. A laboratory with capacity of (15) students Including all practical facilities |
| Technology Resources (AV, data show, Smart Board, software, etc.) | Teaching halls and laboratories are equipped with data show. |
| Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list) | - |

G. Course Quality Evaluation

| Evaluation Areas/Issues | Evaluators | Evaluation Methods |
|--|--|--------------------|
| Effectiveness of teaching and assessment | Program leader, curriculum committee; external reviewers | Direct |
| Extent of achievement of CLO's | Peer Reviewer | Direct |
| Quality of learning resources | Students, faculty members and External reviewers | Direct |

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

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

Assessment Methods (Direct, Indirect)

H. Specification Approval Data

| | |
|----------------------------|--|
| Council / Committee | Quality committee and department counsel |
| Reference No. | |
| Date | 2022 |

Head of Chemistry Department


Dr Moataz Morad

