جامعة الملك عبدالله
للعلوم والتقنية
King Abdullah University of
Science and Technology

# Course Syllabus: Spectroscopy Analysis - ChemS 212

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| **Division** | Physical Science and Engineering Division |
| **Course Number** | ChemS 212 |
| **Course Title** | Spectroscopy Analysis |
| **Academic Semester** | Spring |
| **Academic Year** | 2017/2018 |
| **Semester Start Date** | 01/28/2018 |
| **Semester End Date** | 05/24/2018 |
| **Class Schedule** (Days & Time) | 02:30 PM - 04:00 PM \| Sun Thu |

## Instructor(s)

| Name | Email | Phone | Office Location | Office Hours |
|---|---|---|---|---|
| Kuo-Wei Huang | kuowei.huang@kaust.edu.sa | +966128080328 | 4232, 3, Ibn Sina (bldg. 3) | Sun 4:40-5:30 PM |
| Omar Farghaly Mohammed Abdelsaboor | Omar.Abdelsaboor@KAUST.EDU.SA | +966128084491 | | Thu 4:40-5:30 PM |

## Teaching Assistant(s)

| Name | Email |
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## Course Information

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| **Comprehensive Course Description** | This course will give an introduction to modern spectroscopic techniques including time-resolved laser methods. It is target towards master and PhD students in chemistry, materials science, electrical engineering, and bioscience. Theory and application to chemical research problems on will be discussed, including mass spectrometry, ultraviolet and visible spectroscopy, infrared spectroscopy, Raman, fluorescence, nuclear magnetic resonance spectroscopy, time-resolved spectra including lifetime measurements, etc. Emphasis will be placed on training the students to interpret spectra and to design experiments to address questions related to selectivity, reactivity, kinetics, etc. One NMR laboratories session will allow the students to be familiar with standard operations to acquire 1D and 2D spectra. It also provides detailed information about many photo-physical processes and every possible deactivation pathways of the excited systems including organic, inorganic and nanoscales materials. |
| **Course Description from Program Guide** | An introduction to the theory, application, and interpretation of four (4) major types of spectroscopy: absorption, infrared, and nuclear magnetic resonance spectroscopy, and mass spectrometry. It will focus heavily on interpretation of spectra and application of these tools to address questions of structure and reactivity of organic, organometallic, and inorganic materials. A training session of two (2)- dimensional nuclear magnetic resonance (COSY, NOESY, HSQC, HMBC, etc) will be offered. |
| **Goals and Objectives** | This course will give an introduction to modern spectroscopic techniques including time-resolved laser methods. It is target towards master and PhD students in chemistry, materials science, electrical engineering, and bioscience. Theory and application to chemical research problems on will be discussed, including mass spectrometry, ultraviolet and visible spectroscopy, infrared spectroscopy, Raman, fluorescence, nuclear magnetic resonance spectroscopy, time-resolved spectra including lifetime measurements, etc. Emphasis will be placed on training the students to interpret spectra and to design experiments to address questions related to selectivity, reactivity, kinetics, etc. One NMR laboratories session will allow the students to be familiar with standard operations to acquire 1D and 2D spectra. It also provides detailed information about many photo-physical processes and every possible deactivation pathways of the excited systems including organic, inorganic and nanoscales materials. |

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| **Required Knowledge** | Organic Chemistry and Inorganic Chemistry |
| **Reference Texts** | **Spectrometric Identification of Organic Compounds**, *7th Edition*<br>*by* Robert M. Silverstein, Francis X. Webster, David Kiemle<br>Publisher: John Wiley & Sons |
| **Method of evaluation** | **30.00**% - Active participation<br>**40.00**% - Midterm exam<br>**30.00**% - Homework /Assignments |
| **Nature of the assignments** | Two Problem sets 30%<br>Two Midterms 40%<br>Class participation 30% |
| **Course Policies** | There will be two sets of tutorial questions given. Students are expected to submit written answers; the first set is due in class on March 15th, 2017 and the second set on May 10th. |
| **Additional Information** | |

| Tentative Course Schedule<br>*(Time, topic/emphasis & resources)* | | |
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| **Week** | **Lectures** | **Topic** |
| 1 | Sun 01/28/2018 | Introduction & Mass Spectrometry-I |
| 1 | Thu 02/01/2018 | Introduction & Mass Spectrometry-I |
| 2 | Sun 02/04/2018 | Mass Spectrometry-II |
| 2 | Thu 02/08/2018 | Mass Spectrometry-II |
| 3 | Sun 02/11/2018 | NMR: Basic NMR Spectroscopy |
| 3 | Thu 02/15/2018 | NMR: Basic NMR Spectroscopy |
| 4 | Sun 02/18/2018 | NMR: Spin-Spin Coupling |
| 4 | Thu 02/22/2018 | NMR: Spin-Spin Coupling |
| 5 | Sun 02/25/2018 | NMR: 2D NMR-I |
| 5 | Thu 03/01/2018 | NMR: 2D NMR-I |
| 6 | Sun 03/04/2018 | NMR Lab (3 hours) |
| 6 | Thu 03/08/2018 | no class |
| 7 | Sun 03/11/2018 | NMR: 2D NMR-II |
| 7 | Thu 03/15/2018 | NMR: 2D NMR-II |
| 8 | Sun 03/18/2018 | Midterm I |
| 8 | Thu 03/22/2018 | no class |
| 9 | Sun 03/25/2018 | Ultraviolet and Visible Spectroscopy |
| 9 | Thu 03/29/2018 | Ultraviolet and Visible Spectroscopy |
| 10 | Sun 04/01/2018 | Spring Break |
| 10 | Thu 04/05/2018 | Spring Break |
| 11 | Sun 04/08/2018 | Infrared Spectroscopy-I |
| 11 | Thu 04/12/2018 | Infrared Spectroscopy-I |
| 12 | Sun 04/15/2018 | Infrared Spectroscopy-II |
| 12 | Thu 04/19/2018 | Infrared Spectroscopy-II |
| 13 | Sun 04/22/2018 | Raman Spectroscopy-I |
| 13 | Thu 04/26/2018 | Raman Spectroscopy-I |
| 14 | Sun 04/29/2018 | Raman Spectroscopy-II |
| 14 | Thu 05/03/2018 | Raman Spectroscopy-II |
| 15 | Sun 05/06/2018 | Photoelectron Spectroscopy |
| 15 | Thu 05/10/2018 | Photoelectron Spectroscopy |
| 16 | Sun 05/13/2018 | no class |
| 16 | Thu 05/17/2018 | Midterm II |
| 17 | Sun 05/20/2018 | no class |
| 17 | Thu 05/24/2018 | no class |

**Note**

The instructor reserves the right to make changes to this syllabus as necessary.