**III.2.6 BASIC SPECTROSCOPY AND ANALYSES**

**I. Course description**

**1. Credit points: 3 ECTS**

**2. Time commitment**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Items | Lecture | Tutorial/  Exercise | Practice/  Assignment | Lab-work | Total |
| No. of hours | 21 |  | 9 |  | 30 |

**3. Prerequisites**: Basic knowledge on physical and structural chemistry (atomic and molecular structure, quantum mechanics, description of a photon).

**4. Recommended background knowledge**: Basic knowledge on physical, structural and analytical analysis.

**5. Subject description**

This course is designed to introduce the basic principles of spectroscopies and their application in chemical analysis

**6. Objectives & Outcome**

Students will know the regions in the EM spectrum and will know how radiation interacts with matter (electronic, vibrational, rotational, … transitions)

Students will know the basics different spectroscopic methods (vibrational, rotational and electronic spectroscopy of atoms and molecules) and the associated spectral domains

Students will know the basics of NMR spectroscopy and MS spectrometry

Students will know how to use UV-VIS, IR, NMR and MS spectroscopy for the determination of the structure of organic compounds

**7. Assessment/ Evaluation**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Component | Attendance | Exercises | Report | Practical | Midterm | Final |
| Percentage % | 10 | 15 |  | 15 |  | 60 |

**8. Prescribed Textbook(s)**

N/A.

**II. Course content**

1 WHAT IS SPECTROSCOPY

2 THE EM SPECTRUM

3 QUANTIZATION AND THE H ATOM

4 QUANTIZATION IN POLYELECTRONIC ATOMS

5 ELECTRONIC STATES OF DIATOMIC AND POLYATOMIC MOLECULES

6 MOLECULAR VIBRATIONS

7 MOLECULAR ROTATION

8 ROTATIONAL SPECTROSCOPY

9 VIBRATIONAL SPECTROSCOPY

10 PHOTOPHYSICAL PROCESSES AND UV VIS SPECTROSCOPY

11 1D AND 2D NMR SPECTROSCOPY

12 MASS SPECTROMETRY

**III. Reference Literature**

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| [1]. Course notes provided by the lecturers. |
| [2]. Basic Atomic and Molecular Spectroscopy J.M. Hollas, 2002 (For further reading) |
| [3]. Mass Spectrometry, J.H. Gross, 2nd edition 2010 (For further reading) |
| [4]. NMR Spectroscopy: Basic Principle, Concepts and Applications in Chemistry, Harald Gunther, 3rd edition 2013 (For further reading) |