Syllabus for the Course: Introduction to Nuclear Magnetic Resonance (Institute of Chemistry, Technion)

0351.3115 Course for the First Degree Opened to Advanced Degrees

Mentor: Prof. Yoram Cohen

Prerequisites:

1. Application of Physical Methods in Organic Chemistry or Magnetic Resonance Spectroscopy

Course Description of the Engineering Simulation on Nuclear Magnetic Resonance (Chemistry).

The course is aimed at understanding of basic polars in relation to the vector of magnetization, in order to perform advanced techniques of these.

In the course, the potential of application and use of these techniques in the field of organic chemistry and in various aspects related to the study of central nervous systems.

Course topics:

1. Introduction: Chemical Shifts and Spin-Spin.

2. Vector of Magnetization Model.


4. Dynamic Processes in -NMR (DNMR).

5. NOE, Overhauser effect.

6. DEPT, INEPT, SPT. Changes in nuclear magnetic resonance (1D-COSY, J-resolved, SEFT).

7. NOESY9, HSQC, HMBC, HMQC X-H heteronuclear correlation.

8. Measurement of T2, T1 and T2* weighted MRI.

9. HDR techniques in Magnetic Resonance, NMR, and nuclear magnetic imaging.

10. Diffusion weighted MRI.

11. Static images of spectroscopy applied methods and applications of MRI.

The grade in the course will be given based on the examination.
Syllabus for: Introduction to Nuclear Magnetic Resonance in Chemistry and Biomedicine

0351.3115

Lecturer: Prof. Yoram Cohen

Credit: 3 points

Prerequisite:

Course Objective: To introduce the students to basic knowledge in the fields of magnetic resonance spectroscopy and imaging (NMR and MRI, respectively). The course aims at explaining basic pulse sequences, focusing on the vector of magnetization model, for more educated use of these MR methodologies. In course we well present the potential embedded in the applications of these MR methodologies in the fields of organic chemistry and in few aspects in CNS research.

Course Topics:

1. Introduction: chemical shifts and spin-spin coupling.
2. The magnetization vector model
3. Relaxation time: T1, T2 and T2* - definition and measuring techniques, Gradient in NMR, diffusion NMR, gradients for signal suppression and selection of coherences.
4. Dynamic processes in NMR (D-NMR) , the coalescence temperature, extraction of kinetic parameters.
5. NOE – Nuclear Over hauser Effect.
7. 2D NMR: SEFT to J-resolved 2D-NMR, COSY and it variants (1D-COSY).
8. X-H heteronuclear correction, HMBC, HMQC, HSQC and NOESY as a parameter for 3D-structure.
10. Principle of MRI, contrast mechanisms in MR image (T1, T2 and T2*).
   Diffusion MRI, DWI).
11. Localized spectroscopy and applications of MRI in CNS.

**Required Reading:** None

**Grade:** Written Exam