Universidad Zaragoza

Year : 2020/21

60460 - Supramolecular chemistry

Syllabus Information

Academic Year: 2020/21
Subject: 60460 - Supramolecular chemistry
Faculty / School: 100 - Facultad de Ciencias
Degree: 543 - Master's in Molecular Chemistry and Homogeneous Catalysis
ECTS: 2.0
Year: 1
Semester: Second semester
Subject Type: Optional
Module: ---

1.General information

1.1.Aims of the course

The course and the expected results meet the following approaches and objectives:

- To be familiar with the non-covalent interactions, responsible for the formation of different supramolecular systems, and to establish the principles of recognition between molecules.
- To know the potential and applications of supramolecular systems.

1.2.Context and importance of this course in the degree

The course aims to provide a general overview and basic knowledge of supramolecular chemistry, based on non-covalent interactions, emphasizing its character as a versatile and effective tool for building complex systems from well-defined units and their application in different areas of work and research. This is an optional subject (2 ECTS) that is taught in the second semester. It is included into the optional module *Horizons in Molecular Chemistry*.

The course is key to know, understand and apply the wide variety of non-covalent interactions in different fields of chemistry, with special emphasis on catalytic processes, materials development and processing of biological and biomimetic processes. Contents of the course directly connect with the subjects of *Molecular Chemistry and Catalysis* module, and it is essential for contextualizing subjects such as *Advanced Materials Chemistry*, *Chemistry at the Frontiers of Biology* and *Sustainable Chemistry and Catalysis*.

1.3.Recommendations to take this course

Knowledge of Organic Chemistry, Inorganic Chemistry, Physical Chemistry and Biochemistry is required. Text comprehension in scientific English is desirable. Class attendance and continuous study facilitates passing the course.

2.Learning goals

2.1.Competences

To apply the acquired knowledge and skills of problem-solving with Supramolecular Chemistry tools in wider or multidisciplinary contexts related to Molecular Chemistry and Catalysis, including original contributions transferable to the social environment.

To extend and utilize specific vocabulary and terminology of Supramolecular Chemistry under the context of Inorganic, Organometallic, and Organic Chemistry and Catalysis.

To be able to design and synthesize new organic, inorganic or organometallic molecules of industrial and technological interest.

To apply protocols, procedures and advanced experimental techniques of synthesis and characterization of supramolecular systems.

Capacity to assimilate, evaluate and critically analyze research findings in Molecular Chemistry and Catalysis in an objective manner, and relate these findings with the acquired theoretical knowledge.

2.2.Learning goals

To know and apply the fundamental concepts and identify the basic interactions of supramolecular chemistry.

To understand the types and basic processes of formation of supramolecular systems.

To be familiar with the main types of supramolecular systems.

To know and apply most common preparation methods of supramolecular systems.

To apply the most suitable techniques for the characterization of supramolecular systems.

To be familiar with the applications of supramolecular chemistry and supramolecular systems in catalysis, biomimetic systems and materials.

2.3.Importance of learning goals

Through knowledge of the basics of Supramolecular Chemistry and the different types of supramolecular systems, the graduate will have new knowledge, complementary to those acquired in previous degrees, and a versatile and effective tool, which will allow her/him to propose and evaluate the design, development and characterization of molecular systems with a wide range of applications and innovative and impacting possibilities, particularly in the field of catalytic processes, materials science and nanoscience.

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

The assessment of this course is based on the following activities, weighted as indicated:

- A1: Problem solving, theoretical and practical issues and related activities (15%)
- A2: Analysis and discussion, individually or in groups, of scientific publications related to the contents of the course (35%).
- A3: Global written test will be performed in the evaluation period and consists of solving problems and issues (50%).

The final grade will be the best of the following marks:

MARK 1 = (0.15 × mark A1) + (0.35 x mark A2) + (0.50 x mark A3).

MARK 2 = global written test mark.

The global written test will consist of an examination on all the contents covered in the course, including those from the different activities. The course is considered passed if the weighted average according to the indicated percentages is equal to or higher than 5 points on a maximum score of 10.

The number of official examination calls (2 per registration) and their use will be subjected to the statements of the *Regulation of Permanence in Master Studies and the Regulation of the Learning Assessment (Normativa de Permanencia en Estudios de Máster y al Reglamento de Normas de Evaluación del Aprendizaje)* (https://ciencias.unizar.es/normativas-asuntos-academicos). The latest document will also regulate the general design and scoring criteria of the assessment activities, as well as the exam schedules and timetable for the post-examination review.

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The learning process designed for the course is essentially based on lectures, practice sessions and tutorials. In the problem-solving sessions, practical questions about the contents of the course, as well as discussions about scientific publications with the participation of students will take place.

4.2.Learning tasks

The course includes the following learning tasks:

- Interactive lectures (1.2 ECTS)
- Problem-solving and practice sessions (0.4 ECTS)
- Analysis and discussion of scientific publications (0.4 ECTS).

Teaching and assessment activities will be carried out in the classroom with all students in person unless, due to the health situation, the provisions issued by the competent authorities and by the University of Zaragoza arrange to carry them out by telematics means. If the number of enrolled students exceeds the established capacity of the classroom, the teaching will follow the guidelines of the Faculty of Sciences and/or the University of Zaragoza. Tutorial activity will be carried out mainly in remote using on-line tools.

4.3.Syllabus

The course will address the following topics:

Topic 1. Introduction to Supramolecular Chemistry.

Topic 2. Molecular recognition. Host-Guest systems.

Topic 3. Principles of Self-Assembly. Self-assembled coordination compounds. Intercalated molecules.

Topic 4. Molecular self-assemblies. Supramolecular crystals.

Topic 5. Supramolecular aggregates (micelles, vesicles and others). Liquid crystals.

Topic 6. Gels. Self-assembled systems at interfaces (SAM LB and LBL).

Topic 7. Learning from nature: bio-supermolecules.

Topic 8. Applications of Supramolecular Chemistry. Molecular devices, molecular machines and other supramolecular systems.

4.4.Course planning and calendar

Programmed activities will take place during the second semester in weekly two-hour sessions. Information about schedules, calendars and exams is available at the websites of the Sciences Faculty (https://ciencias.unizar.es/calendario-y-horarios), and the Master (http://masterqmch.unizar.es).

Students will be provided with diverse teaching material either at reprography or through the ADD University's virtual platform (https://moodle2.unizar.es/add/).

4.5.Bibliography and recommended resources