Universidad Zaragoza

Academic Year/course: 2023/24

69713 - Nano-therapy

Syllabus Information

Academic year: 2023/24
Subject: 69713 - Nano-therapy
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 633 - Master's Degree in Biomedical Engineering
ECTS: 3.0
Year:
Semester: Second semester
Subject type: Optional
Module:

1. General information

Nanotherapy is the branch of nanotechnology that seeks to provide new therapeutic tools based on nanomaterials for the treatment of various pathologies, mainly cancer, antimicrobial therapies, pain treatment, haematological diseases and rare diseases. In many cases, another of its objectives is also to avoid the side effects of many of the traditional therapies by directing the active ingredient only where the therapy is needed.

The subject describes how controlled and/or localized drug delivery, real-time assessment of the efficacy of a therapy, development of active scaffolds for tissue engineering and implants, photothermal and photodynamic therapies as well as simultaneous treatment and monitoring of diseases are all made possible by the use of nanoparticulate materials.

2. Learning results

To write a scientifically valid report developing one of the examples described during the subject on materials and devices currently used in nanoscience or nanotechnology applied to therapy. The work required to pass the subject is so demanding that a merely informative work with no scientific value is not acceptable.

By passing this subject, the student acquires a basic knowledge in the field of biomedical applications of nanoscience. It starts with the learning on how to synthesize these nanomaterials, characterize and apply them in therapy.

Manage the basic terminology of the field of nanomedicine, understand the concepts and relate them with each other.

See the importance and role of nanobiomedicine in the global context of biomedical applications

The student can broaden the range of possibilities that their training offers after completing the master's degree by "discovering" the multidisciplinary possibilities that nanoscience offers. They may also apply their training to the pharmaceutical, biotechnology, chemical, health and other industries.

The importance of the learning results designed for this subject lies in being able to demonstrate basic knowledge in one of the fields of greatest current projection in the field of bioengineering, biomaterials, personalized medicine and biomedical applications.

Students will be able to understand that nanotechnology employs nano-scale materials, which, due to their size, interact with biological systems at the molecular level and can revolutionize the treatment of diseases by stimulating, responding to, and interacting with specific sites to induce physiological responses while minimizing the side effects of conventional therapies.

Students will also acquire key practical skills through laboratory practices where they will synthesize nanoparticles applied in therapy.

Students will acquire public speaking skills and will be able to convey relevant information on a subject topic through public presentation work using scientific language.

3. Syllabus

Topic 1. General. General applications, localized drug and gene delivery, magnetic hyperthermia or optogenetics, tissue engineering.

Topic 2. History of localized drug delivery.

Topic 3. Gene therapy. History of gene therapy and examples of application.

Topic 4. Materials used in localized drug delivery. Applications of organic and inorganic nanoparticles in localized drug delivery.

Topic 5: Applications of nanoparticles in theragnosis (therapy and diagnosis).

Topic 6. Selectivity. Drug localization where therapy is needed using active and passive strategies.

Topic 7. Pharmacokinetics and pharmacodynamics.

4. Academic activities

The presentation of theoretical content in the form of lectures and the supervised practical work and its public exhibition will be

the fundamental activities, in addition to the laboratory practices. The teacher will propose to each of the students a topic related to the subject matter that is as close as possible to their personal interests, taking into account, where appropriate, their professional tasks, the thesis project, master's thesis, etc. that they are developing, in order to relate these personal interests to the subject.

Nanoparticles will be synthesized in the laboratory and the work will be presented in public.

5. Assessment system

The assessment system consists of the presentation of a scientific review paper (50% of the final grade) and an exam with multiple-choice, true or false, short development, multiple-choice, etc. questions (50% of the final grade).
In order to average both assessment activities, it will be necessary to obtain at least 4 points out of 10 in each of them.

Regarding the work: the student (individually or in groups, according to their preference) must be able to publicly present a scientific review article. The work required to pass the subject is so demanding that a merely informative work with no scientific value is not acceptable. The presentation will have a defined structure, which will be detailed during the presentation of the subject. It will not be necessary to present a written report on the work, only to expose it publicly. A rubric will be available for the student to know the evaluable criteria.

Students will also have the option of a single assessment test in the first and second call, which will consist of 10 multiple-choice, true or false, short development, multiple choice, etc. questions.