



66109 - 8.c. NanoBioMedicine

Course 2013 - 2014

Curso: 1, Semestre: 0, Créditos: 5.0

Basic information

Teachers

- **Gerardo Fabián Goya Rossetti** goya@unizar.es
- **Silvia Irusta Alderete** sirusta@unizar.es
- **Alejandro Tres Sánchez** atreszar@unizar.es
- **María Valeria Grazú Bonavia** vgrazu@unizar.es

Recommendations to attend this course

The "Nano-biomedicine" module is optional and counts for 5 ECTS credits or 125 student work hours. The course is given in the second term of the academic year. As with the other modules in this Master's, this module is taught and assessed completely in English.

The objective of this module is that the student specialises in biomedical applications of Nanoscience. It is useful if the students taking this module have prior experience in biochemistry, pharmacy or medicine.

As the whole course is taught in English, students need to have an upper-intermediate level in the language: minimum level B1 in the European Common Framework Language Reference, but preferably level B2. Level B1 is reached when the student is able to understand the main points of clear, standard-language texts when covering known matters - whether in terms of work, study or leisure; when able to cope in most situations which the student encounters during a trip to places where the language is spoken; when able to write simple, coherent texts on familiar topics or those in which the student has an interest; and when able to describe experiences, happenings, wishes and ambitions as well as briefly justify opinions or explain plans. B2 is achieved when the student is able to understand the main ideas of complex texts that deal with both specific and abstract topics, even if these are technical - though within the field of specialisation; when able to communicate with native speakers with the degree of fluency and ease such that the communication takes place without effort on either side; and when able to write clear, detailed texts on diverse subjects as well as defend a point of view on general topics - giving the pros and cons of the different options.

Additional information about this master (grants, events, etc.) can be found on the web site:

www.unizar.es/nanomat

Course Schedule and Deadlines

The module is taught in the second term, in May, and lasts about three and a half weeks.

The course is given in the afternoon and the calendar for classes and exam dates will be published prior to the beginning of each academic year in the web site of the Faculty of Science (<https://ciencias.unizar.es/web/horarios.do>).

Home

Learning outcomes that define this course

The student, in order to pass the course, will have to show her/his competence in the following skills:

- 1:** See and assess the interactive possibilities of the various levels of biological organisation (cells, tissue, organs, ...) and complexity with materials, structures or devices whose properties are defined at the nanometric scale.
- 2:** See the state of the art of medical practices – including prevention, diagnosis and therapy – that could benefit from specific nanotech developments.
- 3:** Identify the difficulties and assess the degree of complexity existing for the advances achieved in the laboratory to be put into medical practice.

Introduction

Brief presentation of the course

In this module, there is an in-depth study of different aspects of Nanoscience applications for real problems in current medicine (nanodiagnosis, drug supply, etc.).

The contents of this subject are:

Importance of Nanoscience in biomedicine. Basic concepts. Bio-compatibility and toxicity of nanomaterials. Nanotech applications for in vitro analysis and diagnosis: biosensors, biochips, lab-on-a-chip. Applications for in vivo diagnosis: nanodevices for diagnosis, contrast agents, etc. Nanotech applications in regenerative medicine: opportunities to direct cellular proliferation and differentiation through micro/nanostructured devices. Applications to drug supply: mobile vector delivery systems, fixed-platform delivery systems. Loading and unloading drugs. Pharmacokinetics.

Competences

General aims of the course

The expected results of the course respond to the following general aims

The subject and its expected results respond to the following general planning and objectives:.

This is an optional module designed to give students who have significant prior training in biochemistry a more advanced and specialised level in the application of Nanoscience to biomedicine.

Context/Importance of the course for the master degree

This module is taught in the second half of the course when the students already have broad general knowledge of Nanoscience and Nanotechnology. With this broad view of the issue, it is intended to return to the starting point and the basic training of the students to give them highly specialised tools in nano-biomedicine.

After completing the course, the student will be competent in the following skills:

- 1:** Assess, identify and recognise the importance and potential of Nanoscience in biomedical applications.
- 2:** See at first hand specific developments in research within the field of Nanomedicine, assess the degree of advance made, the problems still to be solved and be able to design, plan and suggest new ideas and solutions in the context of nanodiagnosis and the treatment of illnesses through drug dispensation via nanotechnology.

Relevance of the skills acquired in the course

Through this highly specialised module, the student can apply this knowledge to the solving of problems of interest in the nano-biomedicine context (regenerative medicine, nanocures, nanodiagnosis, etc.).

Evaluation

Assessment tasks

The student will prove that he/she has achieved the expected learning results by means of the following assessment tasks:

- 1:**
ONGOING ASSESSMENT

Problem solving, exercises, questions or brief monographic reviews set during the classes responded to individually by the student in the same classes or handed in after to the lecturer giving the class. With these questions, the student must show knowledge of this subject's topics (described in the "brief introduction to the subject" section in this manual). Specifically, the following will be assessed: correct approach (choice of most adequate scientific-technical tools for each case) to the solution of the matter or problem, correct solution and interpretation of the results of the problem, question or monographic review, accompanied by the mathematical, computational and/or visual tools where necessary. The student will be marked between 1 and 10 for knowledge and ability to integrate the problems in nano-biomedicine in a multi-disciplinary fashion. Oral and written communication will also be assessed via these questions, debates and monographic reviews.

2: HYBRID AND OTHER SITTINGS

For hybrid students coming to other sittings or wishing to increase their mark, the assessment consists of a written test (50%) and an oral test (50%) before a tribunal of three lecturers from the subject area. In these tests, the student must display knowledge regarding the topics taught in this module as well as their ability to apply this knowledge to specific problems and situations showing good use of the units system, correct treatment and interpretation of experimental data. Likewise, the student must have good control over the multi-disciplinary focus of the problems to be solved, assessing the correct use of the various nanotech strategies to face the problems in the distinct therapies studied in the module. This knowledge will be assessed on a scale of 1 to 10. Scientific communication skills will also be evaluated through these tests - on a scale of 1 to 10 - and here correct use of scientific language, audiovisual aids, graphics, clarity of presentation, etc. will be expected. Both oral and written exams will take place in the language used for the course: English.

Activities and resources

Course methodology

The learning process that has been designed for this course is based on the following activities:

The learning process created for this subject is based on:

Students will face the real problems in the application of Nanoscience to biochemical and medical problems of interest. They will gain knowledge about the interaction of nanostructured materials, nanoparticles, etc. with living organisms and the environment. They will develop the skills to adapt and apply the methods studied in this and other subjects in the Master's to real problems in diagnosis and curing techniques.

Outline of the Programme

The programme offered to the students to help them achieve the learning results includes the following activities :

- 1:** Each topic area making up the programme for the module will be presented, analysed and discussed by the lecturer through participatory master classes lasting 50 minutes. The lecturers will provide the students with notes, handouts or summaries of class content prior to the beginning of the class along with the recommended reading for more in-depth understanding of the topic.
- 2:** Open forum on the basic concepts, research possibilities and their applications. Comparison with real developments. All the above will take place in participatory 50 minute classes.

Course planning

Calendar of actual sessions and presentation of works

This calendar will be published at the beginning of each academic year in the web site of the Faculty of Science (<https://ciencias.unizar.es/web/horarios.do>). All classes will be in the afternoon.

Bibliographic references of the recommended readings