

69312 - Nano-biomedicine: Fundamentals and applications

Información del Plan Docente

Academic Year	2017/18
Faculty / School	110 - Escuela de Ingeniería y Arquitectura
Degree	547 - Master's in Biomedical Engineering
ECTS	3.0
Year	1
Semester	Second semester
Subject Type	Optional
Module	---

1.General information

1.1.Introduction

1.2.Recommendations to take this course

1.3.Context and importance of this course in the degree

1.4.Activities and key dates

2.Learning goals

2.1.Learning goals

2.2.Importance of learning goals

3.Aims of the course and competences

3.1.Aims of the course

3.2.Competences

4.Assessment (1st and 2nd call)

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

5.Methodology, learning tasks, syllabus and resources

5.1.Methodological overview

The methodology followed in this course is oriented towards achievement of the learning objectives. It is based on the cooperative work between the teacher and the student as well as student participation. It follows the traditional lecture methodology but supported by the active participation of the students and class discussions.

5.2.Learning tasks

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The course includes the following learning tasks:

- **A02 Lectures** (26 hours). The professor will describe the main contents of the course during those lectures. In these sessions, the student will learn through their participation in the attainment of knowledge by gathering information, processing it, solving problems and answering questions that the professor will propose during the lectures. Student attendance is strongly recommended.
- **A01 Autonomous work** (49 hours). It includes assignments, assessment tasks, elaboration of projects, public defenses and study. Those learning tasks will be proposed in order to achieve the learning outcomes and learning skills. The **research project** will have the structure of a scientific paper:
 - o Title
 - o Author
 - o Abstract: With no more than 250 words, the student should summarize the content described in the paper and its implications in the Nanobiomedical field.
 - o Introduction: 1 or 2 paragraphs, between 250 to 750 words defining and describing the topic of the review paper.
 - o Review of the state-of-the-art: There is not length limitation in this section. This section will review the most relevant advances in the field related to the topic, highlighting those that supposed a breakthrough in the area. Future directions and implications for the coming years should also be described.
 - o Conclusions: A summary of the main conclusions of the work. A total of 1 or 2 paragraphs with a maximum of 250-750 words will be required.
 - o Bibliography: Main relevant references used for the preparation of the project.
 - The student will give a talk summarizing the main aspects of his/her work in a public defense.
- **A03 Tutorials.** Tutoring time to discuss with the professor in charge of the course all the contents and aspects related to the course in order to solve any question or doubt that the student might have.
- **A04 Assessment.** A written exam. The relevant information about the exam is described in section 4 (Global evaluation).

5.3.Syllabus

The course will address the following topics:

- Topic 1. Nanoscience overview. Historical background, physics at the nanoscale. Materials manipulation and atomic and molecular scale.
- Topic 2. Synthesis and characterization of nanostructured materials. Physical and chemical synthesis of nanomaterials. Nanomaterials characterization techniques.
- Topic 3. Biochemistry applied in Nanomedicine. Basic concepts in Biology (structure, biomolecules function: DNA beacons, enzymes, antibodies, etc.)
- Topic 4. Main aspects for the correct immobilization of the recognition moiety. The different functionalization protocols for the proper biomolecule attachment will be discussed depending on the biomolecule to be immobilized (i.e., nucleic acids, enzymes, antibodies, etc.) Other aspects including the stoichiometry control will also be discussed.
- Topic 5. Introduction to the therapeutic and diagnostic applications of Nanomedicine.
- Topic 6. Future and social, ethic and environmental aspects of Nanotechnology. Nanotoxicology.

5.4.Course planning and calendar

Deadlines for project presentation or assignment submission will be posted on the virtual platform Moodle (<https://moodle.unizar.es/>) or on the Alfresco server.

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the EINA website and the Master's website (<http://www.masterib.es>).

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5.5. Bibliography and recommended resources

BB Nanobiotechnology Inorganic
Nanoparticles vs Organic Nanoparticles /
Edited by Jesus M. de la Fuente and V.
Grazu Elsevier, 2012

LISTADO DE URLs:

Adv Drug Deliv Rev. 2013 Jan;65(1):49-59.
doi: 10.1016/j.addr.2012.10.014. Epub
2012 Nov 2. Polymer-drug conjugates:
origins, progress to date and future
directions. Kopeček J.
[<http://www.sciencedirect.com/science/article/pii/S0169409X12003614>]
Adv Drug Deliv Rev. 2014 Feb;66:2-25.
doi: 10.1016/j.addr.2013.11.009. Epub
2013 Nov 22. Cancer nanotechnology: the
impact of passive and active targeting in
the era of modern cancer biology. Bertrand
N, Wu J, Xu X, Kamaly N, Farokhzad OC.
[<http://www.sciencedirect.com/science/article/pii/S0169409X13002688>]
Annu Rev Biomed Eng. 2013;15:253-82.
doi:
10.1146/annurev-bioeng-071812-152409.
Epub 2013 Apr 29. Multifunctional
nanoparticles for drug delivery and
molecular imaging. Bao G, Mitragotri S,
Tong S.
[<http://www.annualreviews.org/doi/abs/10.1146/annurev-bioeng-071812-152409>]
Bionanotechnology. Colloidal nanoparticles
as advanced biological sensors. Howes
PD, Chandrawati R, Stevens MM. Science.
2014 Oct 3;346(6205):1247390. doi:
10.1126/science.1247390. Epub 2014 Oct
2. Review.
[<http://science.sciencemag.org/content/346/6205/1247390>]
Nanomedicine. 2013 Jan;9(1):1-14. doi:
10.1016/j.nano.2012.05.013. Epub 2012
Jun 6. The big picture on nanomedicine:
the state of investigational and approved
nanomedicine products. Etheridge ML,
Campbell SA, Erdman AG, Haynes CL,
Wolf SM, McCullough J.
[<http://www.sciencedirect.com/science/article/pii/S1549963412002882>]