Universidad Zaragoza

Year : 2019/20

69314 - Nano-diagnosis

Syllabus Information

Academic Year: 2019/20
Subject: 69314 - Nano-diagnosis
Faculty / School: 110 -

Degree: 547 - Master's in Biomedical Engineering

ECTS: 3.0
Year: 1
Semester: Second semester
Subject Type: Optional
Module: ---

1.General information

1.1.Aims of the course

1.2.Context and importance of this course in the degree

1.3.Recommendations to take this course

2.Learning goals

2.1.Competences

2.2.Learning goals

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

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

4.Methodology, learning tasks, syllabus and resources

4.1.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.

4.2.Learning tasks

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. The **research project** will have the structure of a scientific paper:
    - Title
    - Author

- Abstract: With no more than 250 words, the student should summarize the content described in the paper and its implications in the Nanobiomedical field.
- Introduction: 1 or 2 paragraphs, between 250 to 750 words defining and describing the topic of the review paper.
- 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.
- 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.
- 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).

- **A05 Practical laboratory assignment.** The student will carry out a practical laboratory assignment entitled: Synthesis of gold nanoparticles and their application in detection. The student will synthesize monodisperse spherical gold nanoparticles stabilized with citrate, with high control of their size (2-100 nm). The surface plasmon dependence on the size will be applied to detect ionic strength changes in solution.

4.3.Syllabus

The following activities are offered to the students in order to achieve the learning process results...

- Topic 1. General concepts on biosensors. Components of a biosensor. Classifications of biosensors. Characteristics of a biosensor: selectivity, sensitivity, reliability, service life, analysis time, etc. Why nano? Advantages of the biosensors based on nanostructured materials and nanoparticles over other stablished biosensors.
- Topic 2. Biosensors base on nanostructured materials. Optical biosensors: Surface plasmon resonance biosensor and interferometric bbiosensor. Electrical biosensors: semiconductor nanowires, nanodevices based on carbon nanotubes. Mechanical nanobiosensors: acoustic nanobiosensors and nanobiosensors based on cantilevers. Physical mechanisms of operation. Integration in microfluidics platforms or in ?lab-on-a-chip?.
- Topic 3. Biosensors based on nanoparticles. Strategies that make use of the physiochemical properties of nanoparticles to improve existing detection methods or develop new ones.
- Topic 4. Application of nanobiosensors in clinical diagnosis: Examples of nanosensors for the fast, precise and sensitive detection of pathogenic microorganisms, disease related biomarkers or single-base mutations in DNA, with extremely low sample requirements.
- Topic 5. Applications of nanobiosensors in environment control. Examples of nanobiosensors capable of detecting diverse classes of organic pollutants such as pesticides, agrochemicals, micotoxines, etc. in diverse media such as water, food, etc. will be introduced.
- Topic 6. Market insights. Nanobiosensors market. Commercially available nanobiosensors and main companies in their production and distribution. Examples of transfer from the lab to the market.

4.4.Course planning and calendar

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

The practical laboratory assignment session will be held in the installations of the Instituto de Nanociencia de Aragón (INA) at the Edificio I+D del Campus del Rio Ebro, calle Mariano Esquillor S/N (lab. 8.1.2). Day and time will be agreed among all the participants without alteration of their participation in other courses.

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).

4.5.Bibliography and recommended resources

http://biblos.unizar.es/br/br_citas.php?codigo=69314&year=2019