Universidad Zaragoza

Academic Year/course: 2021/22

66113 - Introduction to Research in Nanosciencie

Syllabus Information

Academic Year: 2021/22
Subject: 66113 - Introduction to Research in Nanosciencie
Faculty / School: 100 - Facultad de Ciencias
Degree: 539 - Master's in Nanostructured Materials for Nanotechnology Applications
ECTS: 5.0
Year: 1
Semester: First semester
Subject Type: Optional
Module:

1. General information

1.1. Aims of the course

This course intends to provide students with necessary tools to efficiently develop their research in the fields of Nanoscience and Nanotechnology. The importance of the communications skills of a scientist will be highlighted and practical examples will be given. In addition, the students will be informed about the key stages of a scientific career in academia and industry. Topics such as how to design and write a grant or a project proposal will be analyzed through practical cases. The importance of intellectual property and how it can be protected will be studied.

These approaches and objectives are aligned with the following Sustainable Development Goals (SDG) of the Agenda 2030 of the United Nations (https://www.un.org/sustainabledevelopment/es/), in such a way that the acquisition of learning outcomes of the subject provides training and competence to contribute to some extent to the achievement of O9. Industry, innovation and infrastructures. More specifically, they will create action to enhance research, foster innovation and upgrade industrial technologies.

1.2. Context and importance of this course in the degree

This course seeks to discuss the main tools for the development of a scientific career.

Students should acquire these tools early in their career, hence why this course is given in the first term of the academic year.

1.3. Recommendations to take this course

The course ?*Introduction to Research in Nanoscience and Nanotechnology*? is an optional module equivalent to 5 ECTS credits or 125 student work hours.

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.

2. Learning goals

2.1. Competences

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

- Demonstrate oral and written communication skills.

- Comprehend the different stages in scientific careers.
- Make use of the scientific method.
- Understand the importance of intellectual property and how it can be protected.
- Perform an effective literature search.
- Use software tools for composing and managing bibliographies.

2.2. Learning goals

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

- Knowledge on the steps of the scientific method.
- Understanding the importance of oral and written communication in science.
- Knowedge and understanding the main stages in a scientist career.
- Capability to conduct an efficient and valid literature search.
- Understanding the basics of intellectual property rights and patents.
- Knowledge on Ethical Issues arising from research in nanoscience.
- Understanding the seriousness of plagiarism.

2.3. Importance of learning goals

In the context of this Masters course, the ?*Introduction to research in Nanoscience and Nanotechnology*? module aims to make the student aware of the relevance of having a wide set of tools to develop his/her career, which include how to design your own research project, analyze the data and report the results, essential oral and written communication skills, effective literature searching, understanding the career stages of a scientist in industry and academia, protection of the intellectual property, etc.

3. Assessment (1st and 2nd call)

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

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

- The students choosing **continuous assessment** (attendance to at least 80% of this module lectures is required) will undertake a project, among those proposed by the lecturers, related to some of the topics included in the module descriptors (100% of the mark).Plagiarism (the illicit copying of another person's work, especially written content, for presentation as one's own) is not allowed. Through this indvividual work, the results of the learning process will be assessed with regard to the abilities required for the module such as bibliographic searching, data interpretation, oral and written communication skills, interaction with colleagues and professionals from other areas, etc. The following are assessed in the oral presentation: i) structure (logical division of content) and good distribution of time; ii) good scientific communication (concise presentation, direct, clear and pedagogical); iii) correct use of audio-visual equipment.

- For students that did not pass the continuous assessment or wish to increase their mark, the **global assessment** will consists of a written test (50% of the mark) and an oral test (50% of the mark) before a board of two-three lecturers from the subject area. In these tests, the student must display knowledge of the topics taught in this module as well as their ability to apply this knowledge to specific problems. Plagiarism (the illicit copying of another person's work, especially written content, for presentation as one's own) is not allowed. This knowledge will be assessed on a scale of 1 to 10. Scientific communication skills will be evaluated - on a scale of 1 to 10 - and here correct use of scientific language, audiovisual techniques, graphics, clarity of presentation, etc. will be expected. Both oral and written exams will take place in the language used for the course: English.

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The aim of this module isto provide students with necessary tools to efficiently develop their scientific research in the fields of

Nanoscience and Nanotechnology.Therefore, following a general examination of these tools through lectures, there will be case and problem analysis
activities where these principles are described, examined in depth, evaluated and clarified.

The methodology followed in this course is oriented towards achievement of the learning objectives. Students are expected to participate actively in the class throught the semester. Classroom materials will be available via Moodle. These include a repository of the lecture notes used in class, the course syllabus, as well as other course-specific learning materials.

Further information regarding the course will be provided by the coordinator of the course on the first day of class.

4.2. Learning tasks

This is a 5 ECTS course organized as follows:

? **Lectures**. Topics will be presented, analysed and discussed through lectures of 50 minutes. The lecturers will provide the students with notes, handouts or summaries of class content prior to the beginning of the class (preferably via Moodle) along with the recommended reading for more in-depth understanding of the topic. Open forum and discussion on the basic concepts and their application. Problem solving and practical case studies. All the above will take place in 50 minute sessions with the essential participation of the students as speakers.

? **Assignment**. Students will prepare a comprehensive report individually on a specific topic provided by the lecturers and submit a written copy at the end of the course and will do an oral presentation.

? **Autonomous work**. Students are expected to spend about 48 hours to study theory, solve problems and work on the assignments.

? **Tutorials.** Teacher?s office hours allow students to solve questions, discuss unclear course contents or doubts related to the assignment. It is advisable to come with clear and specific questions to tutorials.

Note: The teaching and evaluation activities will be carried out in person unless, due to COVID-19, the provisions issued by the competent authorities and by the University of Zaragoza oblige to carry out virtually.

4.3. Syllabus

The course will address the following topics:

- Introduction on how to search for the most relevant academic literature and how to keep up-to-date with the state of the art, including search databases.
- Software tools for: publishing and managing bibliographies, market studies.
- Scrutinity of the research process: the principle of reproducibility of experiments; the nature of scientific hypothesis; the protocols of the scientific method; how to perform data collection and analysis.
- How to analyse experimental and theoretical results: modelling experimental data. Identification of the relevance of the results within the current state of the art.
- Dissemination/publication of results. Definition of a Scientific Paper. The importance of clarity in scientific writing. The English as the language of scientific papers, and the non-native writers. The need of develop oral and written communication for dissemination.
- Peer review methods: direct, single and double blind methods.
- Ethical guidelines and data protection; Faking data & plagiarism.
- Roadmap of the researcher career: grants, how to improve the chance of getting a grant, pre-doctoral grants, research secondment, postdoc period).
- The need for a multidisciplinary curriculum; the basics to become a Nanoengineer or a nanoscientist; Areas of speciality; Nanoscientists and/or Nanotechnologists. Opportunities in academia and industry.
- Intellectual property rights.

4.4. Course planning and calendar

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. Furthermore, the google calendar for this course will be shared with the students for a more efficient and effective communication.

The course starts at the end of course 66100 "Fundamental Properties of Nanostructured Materials" (around the mid of October) and will be taught simultaneously with courses 66111, 66112 and 66106.

Further information concerning the timetable, classroom, assessment dates and other details regarding this course, will be provided on the first day of class by the coordinator of the course.

Additionally, the student can set up regular appointments for office hour consultation.