Nanotechnology and Society

Code: 103290
ECTS Credits: 6

2024/2025

Degree	Type	Year
2501922 Nanoscience and Nanotechnology	OT	4
2504235 Science, Technology and Humanities	OT	4

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Teachers

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Teaching groups languages

You can view this information at the end of this document.

Prerequisites

Not required.

Objectives and Contextualisation

This subject provides students with a general overview of nanotechnology, beyond the scientific content developed during the degree. The main goal is to offer a cross-training which will allow students to identify what are the fields of application of nanotechnology, its impact on society, and what will our society look like in the near future. This will enable students to uncover areas in which a nanotechnologist can have a place but have so far been unknown. The subject is organized into five units: 1) Nanotechnology in perspective. 2) Nanotechnology in Europe, Asia and the United States. 3) Scientific and technological development of nanotechnology. 4) Nanotechnology in Spain and Catalonia. 5) Ethical and social aspects. The idea is to explore beyond the science itself so that, after the multiple possibilities nanotechnology fits into society and labour market are disclosed, students become aware that greatest potential for labour market integration happens when the scientific training acquired during the degree couples to transferable skills.

Competences

Nanoscience and Nanotechnology

- Adapt to new situations.

- Apply ethical principles and legislative standards to the field of nanoscience and nanotechnology.
- Be ethically committed.
- Communicate clearly in English.
- Communicate orally and in writing in one's own language.
- Demonstrate knowledge of legislation on intellectual property in the field of knowledge and application of nanoscience and nanotechnology.
- Demonstrate knowledge of the concepts, principles, theories and fundamental facts related with nanoscience and nanotechnology.
- Lead and coordinate work groups.
- Learn autonomously.
- Manage the organisation and planning of tasks.
- Obtain, manage, analyse, synthesise and present information, including the use of digital and computerised media.
- Perform correct evaluations of the environmental and socioeconomic impact of chemicals and nanomaterials.
- Reason in a critical manner
- Recognise the terms used in the fields of physics, chemistry, biology, nanoscience and nanotechnology in the English language and use English effectively in writing and orally in all areas of work.
- Resolve problems and make decisions.
- Show initiative and an enterprising spirit.
- Show sensitivity for environmental issues.
- Work correctly with the formulas, chemical equations and magnitudes used in chemistry.

Learning Outcomes

1. Adapt to new situations.
2. Apply the necessary ethical principles for the experimental and commercial validation of new products derived from nanotechnology that require animal or human experimentation.
3. Be ethically committed.
4. Communicate clearly in English.
5. Communicate orally and in writing in one's own language.
6. Describe from an interdisciplinary and transversal point of view the impact of nanoscience and nanotechnology on society
7. Describe the fundamental aspects of the management and protection of knowledge of scientific and technical results.
8. Describe the legal procedures and options for the protection of marketable results.
9. Describe the main fields of application of nanoscience and nanotechnology and their prospects.
10. Describe the main physical and chemical properties dependent on the size of materials.
11. Draft reports on the subject in English.
12. Identify and know the legislative standards involved in the commercialisation of new products derived from nanotechnology, and for the experimental validation of the same.
13. Identify the main economic, environmental, social and ethical implications and prospects of nanoscience and nanotechnology.
14. Interpret texts and bibliographies in English on each of the techniques, methodologies, tools and instruments used in the subject.
15. Lead and coordinate work groups.
16. Learn autonomously.
17. Manage the organisation and planning of tasks.
18. Obtain, manage, analyse, synthesise and present information, including the use of digital and computerised media.
19. Present brief reports on the subject in English.
20. Reason in a critical manner
21. Recognise the risks to the environment associated to the manipulation of products derived from nanotechnology.
22. Recognise the terms used in topics related to nanoscience, nanotechnology and society.
23. Resolve problems and make decisions.
24. Show initiative and an enterprising spirit.
25. Show sensitivity for environmental issues.

26. Work correctly with the formulas, chemical equations and magnitudes used in chemistry.

Content

1. The nanotechnology in perspective:

Social perception of nanotechnology
Top 10 emerging technologies in the last five years
Knowledge economy
Hype Cycle
Evolution of nanotechnology in the last years
Inversion in nanotechnology

2. Nanotechnology in Europe, Asia and the United States:

The EU Framework Programs: evolution
Horizon 2020 and Horizon Europe
KETs (*Key Enabling Technology*)
Technology Readiness Level (TRL)
Nanotechnology as a KET
The race for the leadership in nanotechnology: China and the United States
The NNI (*National Nanotechnology Initiative*)

3. Scientific and technological development of nanotechnology:

Scientific production: scientific publications and cites. *Publish or perish*
Intellectual protection. Patents
Entrepreneurship. Spin-off versus start-up
Venture capital

4. Nanotechnology in Spain and Catalonia:

The NanoSpain network
National companies of the sector
CERCA centers
ICREA program

5. Ethical and social aspects:

REACH regulation in nanotechnology
Risk management in nanotechnology. FDA and EMEA.
Ethics and nanotechnology
Lessons from history
Science divulgation. Citizen science.
Perspective and dimension of gender in science in general and nanoscience in particular

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
In-class exercises and case	12	0.48	1, 5, 6, 9, 13, 16, 18, 20, 23, 26

studies			
Lectures	30	1.2	6, 8, 9, 13
Oral presentation	15	0.6	2, 3, 5, 6, 7, 8, 9, 12, 13, 14, 15, 16, 17, 18, 20, 21, 22, 24, 25, 26
Seminars	20	0.8	1, 2, 3, 4, 11, 14, 15, 16, 17, 18, 19, 20, 22, 24, 26
Type: Supervised			
Mentoring	18	0.72	2, 3, 6, 9, 12, 13, 17, 20, 21, 22, 24, 25
Type: Autonomous			
Problem solving	5	0.2	1, 3, 4, 15, 16, 18, 20, 23, 24, 25, 26
Reading articles	5	0.2	1, 3, 14, 16, 18, 20
Self-study	25	1	1, 3, 4, 11, 14, 15, 16, 18, 20, 22, 24, 26

Lectures

The teacher will introduce and develop the theoretical contents of the subject using ppt. Supporting material will be delivered to students.

Classroom debates (forums) and exercises

Debates and exercises (in the broadest sense of the word) will serve to consolidate and see how the knowledge acquired during theory classes is put into practice. They will be intercalated with the theory classes to reinforce specific aspects or at the end the thematic units. The debates will be carried out under the guidance of the teacher and with the proactive participation of the students.

Seminars

Seminars will be given by renowned experts in specific areas of nanoscience and nanotechnology to tackle social aspects of nanotechnology. Students are encouraged to actively participate in these sessions, so that they can address the speaker any question they consider appropriate and relevant, in order to trigger a forum around the nano world, ranging from its applications to social and ethical implications.

Group presentations

Oral presentations in small groups will be given at the end of the semester, covering topics from the contents of the subject and beyond.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Essays on manuscript / newspaper article	15%	4	0.16	3, 4, 5, 6, 11, 13, 14, 20
Exams	50%	10	0.4	2, 5, 6, 7, 8, 9, 10, 12, 13, 21, 22, 23
Group oral presentation	35%	6	0.24	1, 2, 3, 4, 5, 6, 9, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20, 22, 24, 25, 26

Essay/s: the student will have to demonstrate critical thinking regarding the contents of the reading material (15% of the mark).

Group oral presentations: they represent 35% of the final mark and will be held by the end of the semester. Oral presentations will be followed by a discussion with the classmates. They are compulsory, as well as attendance at the presentations delivered by the other students. The technical and formal quality of the presentation as well as the answers given during the discussion phase will be considered.

Two exams covering the theory content of the subject and the aspects addressed during the practical sessions and seminars. They account for 50% of the final mark.

Attendance at seminars delivered by experts in the field is also mandatory.

The proactive attitude in the classroom will be taken into account for the final grade of the subject.

Re-assessment for this subject requires the student must previously have done a minimum of two-thirds of the course-assessment items.

In order to pass the course, you must have an overall grade equal to or higher than 5.0. If you fail, but you get a minimum of 3.5 overall in the subject, you will have the right to a written makep-up test covering the entire contents of the subject that will allow you to pass with a maximum mark of 5 over 10.

Bibliography

There is not a dedicated textbook. Relevant works in the field will be indicated in the ppt slides and lecture notes given by the teacher.

Software

Not applicable.

Language list

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	1	Catalan	second semester	morning-mixed
(PAUL) Classroom practices	2	Catalan	second semester	morning-mixed

(TE) Theory	1	Catalan	second semester	morning-mixed