

Degree programme	Type	Course
Nanoscience and Nanotechnology	OP	4

Contact lecturer

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Prerequisites

No special requirements

Group languages

You can consult this information at the [end](#) of the document.

Objectives

To provide a global vision of the main metabolic pathways and their applications to the design of new biotechnological and therapeutic tools

Learning outcomes

- CM22 (Identify innovations in nanobiotechnology and their economic and social impact on the field of health.) Identify innovations in nanobiotechnology and their economic and social impact on the field of health.
- CM23 (Identify the ethical and social responsibilities of developing bionanotechnology.) Identify the ethical and social responsibilities of developing bionanotechnology.
- KM39 (Describe the processes of cell division, as well as the principles of gene transmission, expression and regulation.) Describe the processes of cell division, as well as the principles of gene transmission, expression and regulation.
- SM34 (Perform basic genetic engineering and protein engineering procedures.) Perform basic genetic engineering and protein engineering procedures.
- SM35 (Successfully solve problems related to biotechnology.) Successfully solve problems related to biotechnology.

Contents

Topic 1: Overview of metabolic pathways

- Metabolism of carbohydrates, lipids and nitrogenous compounds
- Biosignalling pathways
- Enzyme complexes
- Metabolomics

Topic 2: Adaptation to metabolic conditions

- Integration of metabolism
- Metabolism in health and disease
- Case studies: exercise, cancer, obesity, diets, ageing,...

Topic 3: Biotechnological applications

- Metabolic factories: biocatalysts, industrial fermentations, biofuels,...
- Artificial Photosynthesis,...

Topic 4: Metabolic alterations

- Hereditary diseases
- Diagnostic Markers
- Therapeutic tools

Topic 5: Metabolic Engineering

- De novo synthesis of biomolecules: artificial enzymes, in vitro directed evolution, combinatorial strategies.
- Applications in drug design: antitumorals, antivirals,...

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Seminars	15	0.6	CM22, CM23, KM39, SM34, SM35
Tutoring sessions	2	0.08	CM22, SM35
Individual study	40	1.6	CM22, CM23, SM34, SM35
Practical cases	35	1.4	CM22, CM23, SM35
Seminar preparation	6	0.24	CM22, CM23, SM34, SM35
Theoretical lessons	34	1.36	CM22, SM34
Practical case solving	12	0.48	CM22, SM34, SM35

The subject will consist of theoretical master classes, classes of problems and seminars.

Theory classes

The teacher will explain the content of the syllabus with the support of audiovisual material and corresponding text that will be available of the students on the Virtual Campus of the subject.

Problem Classes

In the problem classes, practical cases will be studied. The collection of statements will be delivered through the subject's Virtual Campus.

During part of the sessions the students will solve the problems with the help of the teacher. Students will be able to bring their home problems prepared in advance. During the class the problems will be discussed together and the teacher will take the resolution of the problems of each of the students for correction. As indicated later in the evaluation section, the correction of these problems will be taken into account in the final grade, in a complementary way to the grade obtained in the individual evaluation.

Seminars

Sessions will be reserved for the exhibition of works by the students, in groups of 2 students. The topics of the seminars will be chosen from an initial proposal by the teacher. Proposals of free choice by the students will also be accepted. The participation in the seminar sessions by the whole class will be scored. The evaluation of the seminars will consist of a percentage of the grade by the teacher and another by the whole class.

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

Continuous assessment activities

Title	Weight	Hours	ECTS	Learning outcomes
Seminar presentation	30	2	0.08	CM22, CM23, KM39, SM34
Theoretical lessons	50	2	0.08	CM22, SM35
Practical cases Exam	20	2	0.08	CM22, SM34, SM35

The evaluation of this subject will be done with 2 partial tests (Theory + Problems).

Global Assessment.

50% Theory + 20% Problems + 30% Seminar

Details of the evaluation of the subject:

To pass the subject, it is necessary to obtain an overall grade equal to or greater than 5 points out of 10 and to obtain a minimum grade of 3.5 in each partial theory test and in the two problem-solving tests.

If in any of these tests the grade is less than 3.5, the student must do the retake exam for the corresponding part.

Students will obtain the grade of "Not Assessed" when the evaluation activities carried out have a weighting of less than 67% in the final grade.

The theory evaluation will be done by multiple-choice exam (60%) + short reasoning questions (40%)

The evaluation of problems will have a grade corresponding to the exam (50%) and another for the delivery of the problems (50%)

The evaluation of the seminar (work) will have a grade by the professor (80%) and another by the whole class (20%)

Note:

For this subject, the use of Artificial Intelligence (AI) technologies is allowed exclusively in support tasks, such as bibliographic or information search, text correction or translations. The student should clearly identify which parts have been generated with this technology, specify the tools used, and include critical reflection on how these have influenced the process and the final outcome of the activity. The non-transparency of the use of AI in this assessable activity will be considered academic dishonesty and may lead to a partial or total penalty in the grade of the activity, or greater sanctions in cases of severity.

Single evaluation.

The single evaluation consists of a single synthesis test that includes the contents of the entire theory program with a weight of 80% and another of questions corresponding to the problems with a weight of 20% of the final grade. The grade obtained in this synthesis test is 100% of the final grade of the subject.

The single assessment test will coincide with the date set in the calendar for the last continuous assessment test (second partial assessment). The same recovery system will be applied as for continuous evaluation.

Bibliography

Books:

- Nelson, D.L. and Cox, M.M. Lehninger-Principles of Biochemistry (2021). 8th edition. Macmillan Learning.
- Jeremy Berg; Gregory Gatto Jr.; Justin Hines; John L. Tymoczko; Lubert Stryer Biochemistry (2023). 10th

edition.

- Frayn, K.N. "Metabolic Regulation- A Human Perspective". 3rd ed. 2010. Ed. Wiley-Blackwell.

Oxford. UK.

- Harper. Bioquímica ilustrada. 32.ª Edición. Peter J. Kennelly. © 2023.

Databases:

- Human Protein Expression Atlas
- The Reactome pathway Browser
- Chemical Entities of Biological Interest
- Human Metabolome database
- Protein Data bank

Software

No need of specific program software

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this [link](#). To access the information, you will need to enter the course CODE

Type of teaching	Group	Language	Semester	Shift
(TE) Theory	1	Catalan	first	morning-mixed

semester				
(PAUL) Classroom practices	1	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	1	Catalan	first semester	afternoon