Universitat Autònoma de Barcelona

2023/2024

Control and Instrumentation

Code: 100958
ECTS Credits: 6

Degree	Type	Year	Semester
2500253 Biotechnology	OT	4	2

Contact

Name: Maria Dolors Benaiges Massa

Email: mariadolors.benaiges@uab.cat

Teaching groups languages

You can check it through this link. To consult the language you will need to enter the CODE of the subject.
Please note that this information is provisional until 30 November 2023.

Prerequisites

It is necessary to know Catalan because the classes are in this language.

Also, the following subjects must have completed:

Bioprocesses Engineering Fundamentals

Bioreactors

Objectives and Contextualisation

Know different types of process control. Analysis of dynamic behavior of a process with and without control.
Know different types of instrumentation used in bioprocesses.

Competences

- Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
- Describe the principles behind the design and functioning of bioreactors and calculate, interpret and rationalise the main parameters in transport phenomena and the matter and energy balances in bioindustrial processes.
- Learn new knowledge and techniques autonomously.
- Make an oral, written and visual presentation of one's work to a professional or non-professional audience in English or in one's own language.
- Read specialised texts both in English and one's own language.
- Reason in a critical manner

- Search for and manage information from various sources.
- Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
- Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.
- Think in an integrated manner and approach problems from different perspectives.
- Use ICT for communication, information searching, data processing and calculations.
- Use the fundamental principles of mathematics, physics and chemistry to understand, develop and evaluate a biotechnological process.
- Work individually and in teams

Learning Outcomes

1. Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
2. Calculate the dynamic behaviour of first- and second-order systems.
3. Describe the different types of feedback control and the effects they have on first- and second-order systems.
4. Describe the elements that make up a control loop based on biotechnological systems.
5. Explain the principles behind the instrumentation and monitoring of biotechnological processes.
6. Learn new knowledge and techniques autonomously.
7. Make an oral, written and visual presentation of one's work to a professional or non-professional audience in English or in one's own language.
8. Read specialised texts both in English and one's own language.
9. Reason in a critical manner
10. Search for and manage information from various sources.
11. Solve problems in different key aspects of bioindustrial processes.
12. Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
13. Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.
14. Think in an integrated manner and approach problems from different perspectives.
15. Use ICT for communication, information searching, data processing and calculations.
16. Work individually and in teams

Content

Students will have access to the teaching material of the subject through the Moodle platform.

Lesson 1: Introduction.

Lesson 2: Mathematical models development.

Lesson 3: Analysis of dynamic behavior of a process.

Lesson 4: Feedback control.

Lesson 5: Other control systems.

Lesson 6: Physical elements in a control system.

Methodology

Theory and problems lectures: As you progress in the syllabus, problems of the subject will be considered and resolved.

Oral presentations of instrumentation: At the beginning of the course, instrumentation work will be assigned. The work will be done in groups with an oral presentation towards the end of the course.

Practical case seminar: An intensive seminar to solve problems and / or practical cases will be held.

Process simulation seminar: Three seminars will be held simulating processes using Simulink of the MATLAB software. Subsequently, a work carried out in a group will be presented, with the discussion of the results obtained.

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.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Oral exhibitions of instrumentation	3	0.12	6, 15, 10, 5, 7, 8, 14, 9, 16
Process simulation seminars	9	0.36	6, 15, 14, 9, 16
Seminar on case studies	3	0.12	14, 9, 11, 16
Theory and problems lectures	35	1.4	2, 3, 4, 5, 14, 9, 11
Type: Autonomous			
Preparation oral presentation of instrumentation	10	0.4	6, 15, 10, 5, 7, 8, 14, 9, 16
Process simulation work	6	0.24	6, 15, 14, 9, 16
Study of the basic concepts and resolution of the typical problems of control	82	3.28	6, 15, 10, 2, 3, 4, 5, 8, 14, 9, 11, 16

Assessment

Partial 1: Dynamic Process Behavior.

Partial 2: Dynamic behavior of processes with control. Instrumentation

Oral presentations of instrumentation: It will be evaluated on-site according to some barems that the student will have previously (required assistance).

Simulation work: The work of the discussion of the results obtained in the simulation seminar will be evaluated (required assistance).

Retake exam: If the resultant qualification of the tests carried out is less than 5/10, students can do a second exam of the the partial ones that have not been passed.To participate in the retake exam, the students must have previously been evaluated in a set of activities whose weight equals to a minimum of two thirds of the total grade of the subject. Therefore, students will obtain the "Not Evaluable" qualification when the assessment activities carried out have a weighting of less than 67% in the final grade.

A special distinction (MH) can be given from the 9/10 qualification with the limitation of up to 5% of MH of the total number of students enrolled.

Without prejudice to other disciplinary measures that may be considered appropriate, the irregularities (copy, plagiarism, deception, letting copy, etc.) committed by the students that may lead to a variation of the qualification of an evaluation activity will lead to suspend them with a zero.

The repeating students will have the same system of continuous evaluation.

For each evaluation activity, a place, date and time of review will be indicated. If the student does not appear, it will not be reviewed later.

Single evaluation:

Students who follow this kind of evaluation will have the same evaluation activities that others, with the same percentages. Nevertheless, they can do the partial 1 together partial 2 at the scheduled day and hour for the partial 2.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Oral presentation of instrumentation	15%	0	0	1, 13, 12, 6, 15, 10, 5, 7, 8, 14, 9, 16
Partial test 1	35%	1	0.04	1, 13, 12, 6, 10, 2, 8, 14, 9, 11
Partial test 2	35%	1	0.04	1, 13, 12, 6, 10, 3, 4, 8, 14, 9, 11
Simulation work	15%	0	0	1, 13, 12, 15, 2, 9, 16

Bibliography

Stephanopoulos G.

"Chemical Process Control: An introduction to theory and practice"

Prentice-hall (New Jersey), 1984

https://www.academia.edu/37141836/Chemical_Process_Control_An_Introduction_to_Theory_and_Practice_-_Ge

Ollero de Castro P., Fernández E.

"Control e instrumentación de procesos químicos"

Síntesis (Madrid), 1998

Romagnoli J.A., Palazoglu A.

"Introduction to Process Control"

Taylor & Francis Group (Boca Raton), 2006

Seborg D.E., Edgar T., Mellichamp D.A.

"Process Dynamics and Control"

J. Wiley (NY), 1989

Gòdia F., López-Santín J.

"Ingeniería Bioquímica"

Síntesis (Madrid), 1998

Corriou Jean-Pierre

"Process Control Theory and Applications"

Springer (London), 2018

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Software

MATLAB