



## Information about the subject

**Degree:** Bachelor of Science Degree in Biotechnology

**Faculty:** Faculty of Veterinary Medicine and Experimental Sciences

**Code:** 1100305 **Name:** Biochemical Engineering

**Credits:** 6,00 **ECTS Year:** 3 **Semester:** 1

**Module:** Bioengineering and Biotechnological Processes

**Subject Matter:** Biochemical Engineering **Type:** Compulsory

**Department:** Biotechnology

**Type of learning:** Classroom-based learning

**Languages in which it is taught:** Spanish

### Lecturer/-s:

|       |   |                      |
|-------|---|----------------------|
| 1103  | <u>Angel Serrano Aroca</u> (Responsible Lecturer) | angel.serrano@ucv.es |
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## Module organization

### Bioengineering and Biotechnological Processes

| Subject Matter                          | ECTS | Subject                                 | ECTS | Year/semester |
|---|------|---|------|---------------|
| Genetic Engineering                     | 6,00 | Genetic and Molecular Engineering       | 6,00 | 3/2           |
| Bioreactors                             | 6,00 | Bioreactors                             | 6,00 | 3/2           |
| Biochemical Engineering                 | 6,00 | Biochemical Engineering                 | 6,00 | 3/1           |
| Plant and Animal Biotechnology          | 6,00 | Plant and Animal Biotechnology          | 6,00 | 3/2           |
| Cell Culture                            | 6,00 | Cell Culture                            | 6,00 | 3/2           |
| Biotechnological Processes and Products | 6,00 | Biotechnological Processes and Products | 6,00 | 4/1           |

## Recommended knowledge

Recommended previous courses: Chemistry, Mathematics, Thermodynamics and Kinetics.



## Learning outcomes

At the end of the course, the student must be able to prove that he/she has acquired the following learning outcomes:

- R1 The student has understood and assimilated the contents of the subject.
- R2 The student is able to solve problems or case studies related to the subject contents, by using different resources (bibliographic, IT, etc.)
- R3 The student is able to write an intelligible and organized text on different aspects of the subject.
- R4 The student is able to present and defend his/her work adequately.
- R5 The student seeks bibliographic information from different sources and can analyze it with a critical and constructive spirit.
- R6 The student collaborates with the teacher and his/her peers throughout the learning process; he/she works in a team; treats everyone with respects, is proactive and fulfills the organization rules of the course.



## Competencies

Depending on the learning outcomes, the competencies to which the subject contributes are (please score from 1 to 4, being 4 the highest score):

| BASIC |   | Weighting |   |   |   |
|-------|---|-----------|---|---|---|
|       |   | 1         | 2 | 3 | 4 |
| CB1   | Students acquire and understand knowledge in their field of study based on general secondary education but usually reaching a level that, although supported on advanced text books, also includes aspects involving state-of-the-art knowledge specific to their area. |           |   | X |   |
| CB2   | Students are able to apply knowledge to their work in a professional way and have the competences enabling them to state and defend views and opinions as well as perform problem-solving tasks in their field of study.  |           |   |   | X |
| CB3   | Students are able to collect and interpret relevant data (generally in their field of study) and give opinions that involve reflection on relevant social, scientific or ethical issues.  |           |   | X |   |
| CB4   | Students can communicate information, ideas, problems and solutions to a specialized or non-specialized audience.   |           |   | X |   |
| CB5   | Students develop the necessary learning skills to undertake further studies with a high level of autonomy.  |           | X |   |   |

| GENERAL |                                     | Weighting |   |   |   |
|---------|-------------------------------------|-----------|---|---|---|
|         |                                     | 1         | 2 | 3 | 4 |
| CG01    | Capacity to analyze and synthesize. |           |   |   | X |

| SPECIFIC |   | Weighting |   |   |   |
|----------|---|-----------|---|---|---|
|          |   | 1         | 2 | 3 | 4 |
| CE22     | Knowing and understanding contents, principles and theories related to biotechnology. |           |   | X |   |



|      |   |   |   |   |  |
|------|---|---|---|---|--|
| CE23 | Knowing how to use laboratory equipment and to carry out basic operations for each discipline including: safety measures, handling, waste disposal and activity register. | X |   |   |  |
| CE24 | Knowing basic and instrument laboratory techniques in the different areas of biotechnology.   | X |   |   |  |
| CE25 | Knowing how to analyze and understand scientific data related to biotechnology.   |   |   | X |  |
| CE27 | Knowing and applying action plans and assessment criteria of biotechnology processes.   | X |   |   |  |
| CE28 | Integrating life science and Engineering into processes of development of biotechnological products and applications.   | X |   |   |  |
| CE29 | Contrasting and checking results of biotechnological experimentation.   | X |   |   |  |
| CE30 | Solving and analyzing problems posed by biotechnology.  |   |   | X |  |
| CE31 | Describing and calculating important variables of processes and experiments.  |   |   | X |  |
| CE32 | Knowing how to use different specific operating systems and software packages designed for Biotechnology.   |   | X |   |  |
| CE33 | Knowing and complying with legislation and ethics of biotechnological processes and applications.   |   |   | X |  |
| CE34 | Knowing main characteristics of Molecular biosciences and biotechnology communication.  |   |   | X |  |

## TRANSVERSAL

## Weighting

|      |   | 1 | 2 | 3 | 4 |
|------|---|---|---|---|---|
| CT02 | Capacity to organize and plan.  |   |   |   | X |
| CT03 | Mastering Spanish oral and written communication.   |   |   |   | X |
| CT05 | Knowing and applying Basic ITC skills related to Biotechnology.   |   |   | X |   |
| CT06 | Capacity to manage information (capacity to look for and analyze information coming from different types of sources). |   | X |   |   |
| CT07 | Problem solving.  |   |   |   | X |



|      |   |  |  |   |   |
|------|---|--|--|---|---|
| CT09 | Capacity to work in interdisciplinary and multidisciplinary team. |  |  |   | X |
| CT10 | Interpersonal skills.   |  |  |   | X |
| CT12 | Critical and self-critical capacity.                              |  |  |   | X |
| CT13 | Ethics.   |  |  |   | X |
| CT14 | Capacity to learn   |  |  |   | X |
| CT16 | Capacity to produce new ideas (creativity)                        |  |  |   | X |
| CT17 | Leadership abilities  |  |  | X |   |
| CT18 | Taking initiatives and enterprising spirit                        |  |  | X |   |
| CT19 | Capacity to apply theoretical knowledge                           |  |  | X |   |
| CT20 | Research skills   |  |  | X |   |
| CT21 | Sensitivity to environmental issues                               |  |  | X |   |



## Assessment system for the acquisition of competencies and grading system

| Assessed learning outcomes | Granted percentage | Assessment method    |
|----------------------------|--------------------|----------------------|
| R1, R5, R6                 | 70,00%             | Written test         |
| R2, R3, R4                 | 30,00%             | Submission of papers |

### Observations

According to the general evaluation and qualification regulations, the preferred evaluation system will be by means of continuous evaluation:

Within the submission of papers and additional activities, the problems solved in class by the students will follow a continuous assessment system.

- In order to calculate the average grade with the other assessment tools, a minimum of 5 (from 0 to 10) is required in the written test. In case of obtaining a grade higher than 4,75 and lower than 5, if the professor finds it suitable, during the test review, he may request additional activities or works to complete the deficiencies shown by the student.

- The group work assessment tool will consist of a group work, a presentation and additional activities carried out during the course. The group work will be 25%, the presentation 25% and the additional activities 50% of the final grade for this assessment tool. In order to calculate the average grade with the other assessment tools, a minimum of 5 (from 0 to 10) is required in this part.

\* Students who for duly justified reasons cannot be assessed by this evaluation system, must contact the professor who will study these particular cases.

\* The professor may propose some voluntary work to raise the final grade up to a point.



## MENTION OF DISTINCTION:

In accordance with the regulations governing the assessment and grading of subjects in force at UCV, the distinction of "Matrícula de Honor" (Honours with Distinction) may be awarded to students who have achieved a grade of 9.0 or higher. The number of "Matrículas de Honor" (Honours with Distinction) may not exceed five percent of the students enrolled in the group for the corresponding academic year, unless the number of enrolled students is fewer than 20, in which case a single "Matrícula de Honor" (Honours with 9 Distinction) may be awarded. Exceptionally, these distinctions may be assigned globally across different groups of the same subject. Nevertheless, the total number of distinctions awarded will be the same as if they were assigned by group, but they may be distributed among all students based on a common criterion, regardless of the group to which they belong. The criteria for awarding "Matrícula de Honor" (Honours with Distinction) will be determined according to the guidelines stipulated by the professor responsible for the course, as detailed in the "Observations" section of the evaluation system in the course guide.

## Learning activities

The following methodologies will be used so that the students can achieve the learning outcomes of the subject:

- M1 Teacher presentation of contents, analysis of competences, explanation and in-class display of skills, abilities and knowledge.
- M2 Group work sessions supervised by the professor. Case studies, diagnostic tests, problems, field work, computer room, visits, data search, libraries, on-line, Internet, etc. Meaningful construction of knowledge through interaction and student activity.
- M3 Activities carried out in spaces with specialized equipment.
- M4 Supervised monographic sessions with shared participation..
- M5 Application of multidisciplinary knowledge.
- M6 Personalized and small group attention. Period of instruction and/or guidance carried out by a tutor to review and discuss materials and topics presented in classes, seminars, readings, papers, etc.
- M7 Set of oral and/or written tests used in initial, formative or additive assessment of the student
- M8 Group preparation of readings, essays, problem-solving, seminars, papers, reports, etc. to be presented or submitted in theoretical, practical and/or small-group tutoring sessions. Work done on the university e-learning.





M9 Student's study: Individual preparation of readings, essays, problem-solving, seminars, papers, reports, etc. to be presented or submitted in theoretical, practical and/or small-group tutoring sessions. Work done on the university e-learning platform.

## IN-CLASS LEARNING ACTIVITIES

|   | LEARNING OUTCOMES      | HOURS        | ECTS        |
|---|------------------------|--------------|-------------|
| ON-CAMPUS CLASS<br>M1                   | R1, R2, R3, R4, R6     | 28,00        | 1,12        |
| PRACTICAL CLASSES<br>M2                 | R1, R2, R3, R4, R5, R6 | 20,00        | 0,80        |
| SEMINAR<br>M4                           | R1, R3                 | 5,00         | 0,20        |
| GROUP PRESENTATION OF ASSIGNMENTS<br>M5 | R1, R3, R4             | 2,00         | 0,08        |
| TUTORIAL<br>M6                          | R3, R4, R5, R6         | 3,00         | 0,12        |
| ASSESSMENT<br>M7                        | R1, R2, R3, R4, R5, R6 | 2,00         | 0,08        |
| <b>TOTAL</b>                            |                        | <b>60,00</b> | <b>2,40</b> |

## LEARNING ACTIVITIES OF AUTONOMOUS WORK

|                                  | LEARNING OUTCOMES      | HOURS        | ECTS        |
|----------------------------------|------------------------|--------------|-------------|
| AUTONOMOUS GROUP WORK<br>M8      | R1, R2, R3, R4, R5, R6 | 18,00        | 0,72        |
| AUTONOMOUS INDIVIDUAL WORK<br>M9 | R1, R2, R3, R4, R5, R6 | 72,00        | 2,88        |
| <b>TOTAL</b>                     |                        | <b>90,00</b> | <b>3,60</b> |



## Description of the contents

Description of the necessary contents to acquire the learning outcomes.

### Theoretical contents:

| Content block  | Contents  |
|--|---|
| DIDACTIC UNIT 1 – BALANCES                               | Chapter 1. What is a biochemical engineer?<br>Chapter 2. Mass balance<br>Chapter 3. Energy balance<br>Chapter 4. Unsteady-State mass and energy balance<br>Problems |
| DIDACTIC UNIT 2 – PHYSICAL PROCESSES AND UNIT OPERATIONS | Chapter 5. Introduction to transport phenomena<br>Chapter 6. Basis of heat transfer<br>Chapter 7. Basis of mass transfer<br>Chapter 8. Unit operations              |

### Organization of the practical activities:

|      | Content  | Place        | Hours |
|------|----------|--------------|-------|
| PR1. | Problems | Lecture room | 20,00 |

### Temporary organization of learning:

| Block of content   | Number of sessions | Hours |
|--|--------------------|-------|
| DIDACTIC UNIT 1 – BALANCES                               | 24,00              | 48,00 |
| DIDACTIC UNIT 2 – PHYSICAL PROCESSES AND UNIT OPERATIONS | 6,00               | 12,00 |



## References

- Doran PM (2013) **Bioprocess Engineering Principles**. Second Edition. Ed. Academic Press.
- Shijie Liu (2013) **Bioprocess Engineering. Kinetics, Biosystems, Sustainability, and Reactor Design**. Elsevier.
- Belter PA, Cussler EL, Hu W (1998) **Bioseparations. Downstream Processing for Biotechnology**. Ed. John Wiley and Sons Inc.
- Gòdia Casablanca F y López Santín J (2005) **Ingeniería Bioquímica**. Ed. Síntesis.