



Universitat de Lleida

DEGREE CURRICULUM  
**INDUSTRIAL APPLICATIONS OF  
BIOTECHNOLOGY**

Coordination: CANELA GARAYOA, RAMON

Academic year 2021-22

## Subject's general information

<b>Subject name</b>	INDUSTRIAL APPLICATIONS OF BIOTECHNOLOGY				
<b>Code</b>	101635				
<b>Semester</b>	1st Q(SEMESTER) CONTINUED EVALUATION				
<b>Typology</b>	<b>Degree</b>	<b>Course</b>	<b>Character</b>	<b>Modality</b>	
	Bachelor's Degree in Biotechnology	4	OPTIONAL	Attendance-based	
<b>Course number of credits (ECTS)</b>	6				
<b>Type of activity, credits, and groups</b>	<b>Activity type</b>	PRACAMP	PRALAB	PRAULA	TEORIA
	<b>Number of credits</b>	0.6	1.2	1.8	2.4
	<b>Number of groups</b>	1	2	1	1
<b>Coordination</b>	CANELA GARAYOA, RAMON				
<b>Department</b>	CHEMISTRY				
<b>Teaching load distribution between lectures and independent student work</b>	56 teaching hours 94 student dedication				
<b>Important information on data processing</b>	Consult <a href="#">this link</a> for more information.				
<b>Language</b>	Català 95% English 5%				

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
CANELA GARAYOA, RAMON	ramon.canela@udl.cat	2,4	
SANS BADIA, ALBERTO	albert.sans@udl.cat	1,2	
TOMAS BADELL, ORIOL	oriol.tomas@udl.cat	1,2	
YARA VARON, EDINSON	edinson.yara@udl.cat	2,4	

## Subject's extra information

Students must bring the following individual protection items (EPI) in the course of laboratory works:

- White lab coat UdL unisex
- Safety glasses
- Chemical protection gloves

The EPI can be purchased at UdL's ÚDELS store

Center for Cultures and Cross-Border Cooperation - Cappont Campus

Carrer de Jaume II, 67 low

25001 Lleida

<http://www.publicacions.udl.cat/>

In any case, the Department of Chemistry will try to put at the disposal of the students glasses and gloves of protection of general use.

### GENERAL SAFETY RULES IN LABORATORY PRACTICES

Maintain the place of performance of clean and tidy practices. The work table must be free of backpacks, folders, coats ...

In the laboratory you can not come with shorts or short skirts.

Bring closed and covered shoes during the performance of the practices.

Bring long hair always collected

Keep the gowns cords to protect against spills and spills of chemical substances.

Do not carry wide bracelets, pendants or sleeves that can be trapped by the equipment, assemblies ...

Avoid wearing contact lenses, since the effect of chemicals is much greater if they are introduced between the contact lens and the cornea.

Do not eat or drink in the laboratory

Smoking is prohibited within laboratories

Wash your hands whenever you have contact with a chemical and before leaving the laboratory.

Follow the teacher's instructions and consult any questions about security.

**All students must follow the exceptional rules indicated to them as a result of the situation created by Covid 19**

## Learning objectives

### The student who passes the subject must know: (Knowledge Objectives)

- What does the concept of biorefinery imply?
- Possible sources of renewable materials
- Type of most important applications
- Methodologies for its transformation into products with economic interest.
- Environmental aspects linked to these processes
- Opportunities and limitations of biomass-based products.

### The student who passes the course must be able to: (Capacity Objectives)

- Make decisions about the opportunity and possibility of obtaining a product based on biomass.
- To be able to advise on possible new opportunities in obtaining products based on biomass.
- To be able to join research groups working in this field.
- To be able to integrate in companies dedicated to the obtaining of products related to the subject matter of the course.
- Understand and be able to analyze scientific articles related to the subject matter.

## Competences

### General competences

The graduate in Biotechnology has to:

- To be able to search and selectively use sources of information necessary to achieve the training objectives.
- To interpret scientific-technical information with a critical sense, and to be able to make presentations based on this information.
- To work as a team, with a multidisciplinary vision and the ability to make a rational and effective distribution of tasks among the members of the team
- To know and use adequately the scientific and technical vocabulary of the different fields of Biotechnology.
- To work in the laboratory applying criteria of quality and good practice.
- To acquire criteria for choosing the most appropriate analytical techniques for each specific practical case.
- To be able to carry out a professional activity in accordance with safety and environmental regulations and ethical criteria.
- To use tools and techniques of information and communication for the analysis of data and the elaboration of oral and written reports and other formative and professional activities.
- To be able to make understandable written and oral reports on the work carried out, with a justification based on the theoretical-practical knowledge reached.

### Specific competences

- Be able to design the protocol of a specific biotechnological process. Fulfil the practical requirements necessary to carry it out and the parameters for its evaluation.
- To know the main areas of application of Biotechnology and acquire basic expertise in some of them.

## Subject contents

## --Topics--

### **Introduction**

Presentation of the subject: evaluation criteria, dates to take into account, introduction to the Horizon Europe program and the bioeconomy (or circular economy).

### **Historical perspective of industries based on the use and transformation of biomass to obtain products and materials.**

From the 19th to the 21st century. Fossil reserves and their depletion. Environmental aspects. Parameters for measuring the impact of a process (the E factor; atomic savings and life cycle analyses). Need to use renewable sources. The three main areas of human consumption of products and materials: as a source of energy, as a source of materials, as a source of bioactive products. Biomass as the main renewable source: problems and challenges. The exploitation of microalgae as an example.

### **Possibilities of using biotechnological tools in the transformation of biomass.**

Traditional fermentation processes. Current tools to improve processes. Biocatalysts. Cellular machines. Applications in the preparation of chemical products. The use of a product such as glycerol.

### **Biofuels**

Main types of biofuels. Distribution of renewable resources. Capacity of biomass to supply us with energy. Second and third generation biofuels. Processes for obtaining them. Market possibilities for biofuels. Environmental aspects to be taken into account.

### **Biopolymers and bioplastics**

Monomers and biopolymers. Characteristics of plastics. Biodegradable plastics. Processes to obtain them. Application of biotechnology in their production. Applications of biopolymers and bioplastics and possible problems.

### **Secondary metabolites as a source of new products.**

Agronomic and pharmaceutical uses of secondary metabolites. The study of ancestral customs for the development of useful products. Medicinal plants as a source of active principles. Isolation and structural modification of secondary metabolites. The search for new secondary bioactive metabolites.

### **Additives**

Flavouring dyes and preservatives. Possible sources of additives. Processes for obtaining them. Application of biotechnology in its production. Glycerol as a source of some additives: mono- and diglycerides. Unicellular proteins: fungus, yeasts and bacteria.

### **New horizons in the use of biomass: biotemplates.**

Biomass as a source of inspiration in the design and preparation of new materials and new technologies. Photocatalytic production of hydrogen. CO<sub>2</sub> reduction. Solar cells. Lithium ion batteries. Photocatalytic degradation. Gas / steam sensors.

## --Practical activities--

## Seminar

Elaborate one writing work to choose between 2 scientific publications proposed by the professors.

Presentation related to the subject within the framework of the Horizon Europe Program. The action must be based on a minimum of two scientific publications and must be defended in public with a duration of 10 min explaining the motivation, rationale and conclusions.

## Laboratory practices

Practice 1: Treatment of biomass by applying sustainable processes.

Practice 2: Applications of biocatalysts for the preparation of compounds with industrial interest.

## Visit:

Visit to industrial plant devoted to recover natural products from algae.

## Methodology

Tipus d'activitat	Descripció	Activitat semipresencial alumne		Activitat no presencial alumne		Avaluació	Temps total
		Objectius	Hores	Treball alumne	Hores	Hores	Hores
<b>Lliçó magistral</b>	Classe magistral (Aula. Grup gran)	Explicació dels principals conceptes	24	Estudi: Conèixer, comprendre i sintetitzar coneixements	32	4	60
<b>Problemes i casos</b>	Classe participativa (Aula. Grup gran )	Resolució de problemes i casos	0	Aprendre a resoldre problemes i casos	0	0	0
<b>Seminari</b>	Classe participativa (Grup mitjà)	Realització d'activitats de discussió o aplicació	8	Resoldre problemes i casos. Discutir	15	0	23
<b>Laboratori</b>	Pràctica de Laboratori (Grup mitjà)	Execució de la pràctica: comprendre fenòmens, mesurar...	12	Estudiar i realitzar Examen	12	0	24
<b>Aula d'informàtica</b>	Pràctica d'aula d'informàtica (Grup mitjà )	Execució de la pràctica: comprendre fenòmens, mesurar...	0	Estudiar i Realitzar memòria	0	0	0
<b>Pràctiques de camp</b>	Pràctica de camp (Grup mitjà )	Execució de la pràctica: comprendre fenòmens, mesurar...	0	Estudiar i Realitzar memòria	0	0	0
<b>Visites</b>	Visita a explotacions o indústries	Realització de la visita	6	Estudiar i Realitzar memòria	9	0	15
<b>Activitats dirigides</b>	Treball de l'alumne (individual o grup)	Orientar a l'alumne en el treball (en horari de tutories)	6	Realitzar un treball bibliogràfic, pràctic, etc.	22	0	28
<b>Altres</b>			0		0	0	0

Totals			56		90	4	150
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## Evaluation

Tests	Practices	Case analysis and problems	Other activities
50	10	0	40

Activity	Description	Number	%
<b>Theory</b>	Written tests (true/false) on the theory of the subject	2	<b>50</b>
<b>Case analysis</b>			
<b>Laboratory</b>	Delivery of memory	1	<b>20</b>
<b>Seminar</b>	Oral presentation	1	<b>15-20</b>
<b>Informatics</b>			
<b>Field practices</b>			
<b>Visit</b>	Delivery of memory	1	<b>5-0</b>
<b>Written activity</b>	critical review of an article. Delivery of memory	2	<b>10</b>
<b>Other</b>			
<b>Total</b>			<b>100</b>

## Bibliography

### Basic references

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