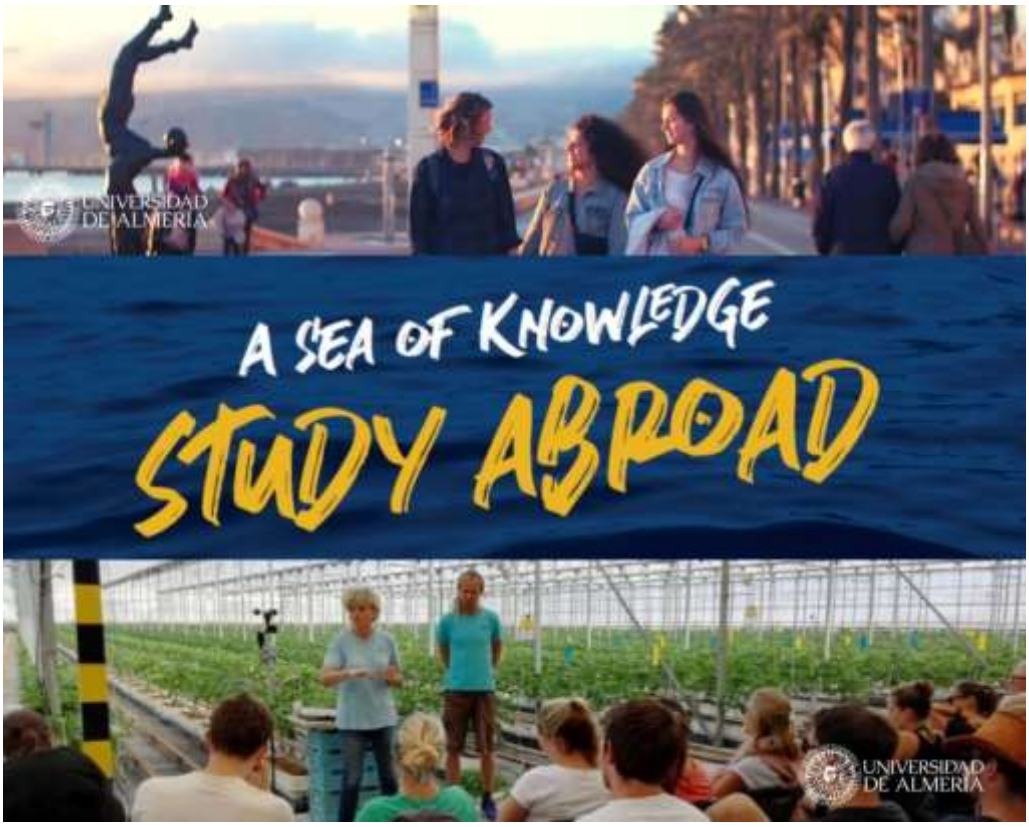

[UAL & SUP'BIOTECH STUDY ABROAD TAILOR MADE PROGRAMME]

Dates: May 30th – July 29th 2022

Teaching hours: 170

Areas of knowledge: Spanish Language & Culture; Microbiology; Biotechnology; Environmental Science; and Chemical Engineering

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SPANISH LANGUAGE & CULTURE

Academic coordinator: Rosario Lisciandro | Teaching hours: 34

INTRODUCTION

The main objective of learning a new language is always **communication**. This communication can take many different forms: it can be written or spoken, it can take place in different contexts, and it can have many different functions. However, the aim is always practical. Therefore, this course is focused on providing students with the necessary tools to communicate effectively with other Spanish speakers.

It is aimed at levels A1-A2, according to the Common European Framework of Reference for Languages (CEFR). At these levels, the student is able to communicate, in everyday situations, with frequently used expressions and using basic vocabulary and grammar.

MAIN GOALS

The main objective is the development of communicative competence in Spanish. The specific objectives are the following:

1. Developing self-learning strategies
2. Acquiring the grammatical, lexical and functional knowledge corresponding to levels A1 and A2, as described in the CEFR and developed in the Cervantes Institute's Curriculum Plan
3. Improving the four communicative skills: oral expression, listening comprehension, written expression and reading comprehension
4. Integration of the different skills
5. Applying the knowledge acquired to real-life situations
6. Developing self-learning strategies

CONTENT

This course consists of one module: **Spanish Language**. This module will be based on the practice of the linguistic functions, as well as the basic contents of the grammar and the lexicon that are necessary to be able to communicate in Spanish in different real-life situations.

The objectives, contents and specific criteria for the group will be developed according to the levels A1 and A2 of CEFR.

The **communicative skills** practice will be focused on providing students with the necessary tools in order to improve their comprehension and expression skills: listening comprehension, reading comprehension, oral expression and writing expression.

COURSE METHODOLOGY

The methodology of the course will combine **theoretical** activities with **practical activities**, such as academic visits.

Moreover, as the communicative method is the fundamental pillar of this program, students will do different activities in which functional, cultural, lexical and grammatical contents will be integrated harmoniously. The main objective is to enable students to establish a **real communication** (both oral and written) with other Spanish speakers.

ACADEMIC VISITS & NETWORKING

These are some of the activities that will be carried out:

- Conducting an **on-campus survey**. This activity will allow students to interact with other people who study or work at the University while practicing the language content studied.
- Practicing **asking for** and **giving directions** on campus.
- **Describing your environment**. Students will practice describing people and places they will see on a tour around the Language Center.
- **Visit to the library**. Students will get to know the facilities, learn about the services and have the opportunity to practice their oral skills with the library staff.
- A **treasure hunt** on campus to practice what has been learned during the course. This activity will allow students to practice a variety of content in a fun and entertaining way with real interactions.

ASSESMENT

Continuous evaluation will be carried out throughout the course through direct observation of the tasks performed by the students in class.

It will be also necessary to **attend 100%** of the **face-to-face lessons** to pass the course and the participation and involvement of the students in class will be assessed positively.

LECTURERS

Professor María del Mar Vique Domene

Degree in Hispanic Philology from the University of Almeria. Master's Degree in Teaching Compulsory Secondary Education and in Teaching Spanish as a Foreign Language. She is an examiner for the Instituto Cervantes, from level A1 to C2. She has also taken several training courses in order to be up to date. She has several years of experience in teaching Spanish as a foreign language.

MICROORGANISMS, BIOTECHNOLOGY AND SUSTAINABILITY: THE POWER OF THE UNSEEN

Academic coordinators: María José López López and Francisca Suárez Estrella | Teaching hours: 84

INTRODUCTION

The importance of **microorganisms** is undeniable. They are the origin of life on Earth; in fact, they constitute the bulk of their biomass, and carry out necessary chemical reactions for higher organisms, to the extent that without them they could not exist, since they also take care of recycling of the fundamental nutrients and the degradation of organic matter.

Biotechnology is closely linked to Microbiology, since the first processes of production of substances of interest to humans (currently encompassed in studies with a biotechnological approach) were developed thanks to prior knowledge about the microbial world. In short, microorganisms play a leading role in this applied branch of science and, especially, in the so-called White Biotechnology, in which microorganisms or products derived from them, like enzymes, are used for their subsequent application in different industries.

Moreover, the term "biotechnology" is attributed to an agronomist, Károly Ereki, who coined it for the first time in a book dedicated to Agri-food production. The fact that the well-known father of Biotechnology is an engineer specialized in the field of agriculture is not random. **Agronomic engineering** and **food technology**, along with other basic and applied sciences, represent two of the pillars in which Biotechnology is based.

The University of Almeria is a world-renowned reference in the development of technologies associated to Agriculture and environment. **Research groups** belonging to this institution, among which we are included, are specialized in the application of **biotechnological tools** for the solution and improvement of environmental and agricultural problems, always from a sustainable point of view. Therefore, this course, with an eminent practical component, is a perfect complement for other disciplines, such as Agricultural Engineering, Environmental Microbiology, Ecology, Biotechnology, and Environmental and Natural Sciences, among others.

MAIN GOALS

1. Studying global climate change and the increase of greenhouse effect, caused by anthropogenic action, through the observation of variations suffered by microbial populations
2. Learning different techniques for the exploitation, reduction and recovery of waste through the use of environmental microorganisms, especially composting because it is a sustainable technique, economically and ecologically

3. Studying the biotechnological potential of environmental microorganisms, in particular, those isolated from composting piles, as potential producers of antibiotics and substances with an interest on agriculture
4. Learning how to obtain microbial products and by-products related to the Agri-food industry

CONTENT

This course is divided in four different modules.

Module A: Environmental microorganisms: allochthonous and autochthonous microorganisms

- Introduction to microbial biotechnology
- Impact of anthropogenic activity on the environment from the microbiological point of view
- Study of the microorganisms involved in the biogeochemical cycles: global climate change and greenhouse effect
- Microorganisms as indicators of environmental pollution: environmental and hygienic-sanitary implications

Module B: Microbial utilization for treatment of contaminated environmental samples and organic waste

- Problems associated to organic waste: environmental impact and European regulations
- Study of the different techniques and processes for the use of organic waste: biomethanization, silage, composting, biofuels, MFC, etc.
- Composting: from tradition to applied biotechnology. Definition, historical context, development of the fundamental stages and the importance of microorganisms in the process

Module C: Biotechnological potential of microorganisms isolated from composting

- Importance of environmental microorganisms in applied Biotechnology
- Searching for new antibiotic producers in environmental samples
- Microorganisms with interest in agriculture and the food industry

Module D: Application of microorganisms in obtaining food or by-products

- Food microbiology: history and new products
- Products and by-products of the Agri-food industry made from microorganisms
- Conservation techniques applied to microorganisms and with feeding origin (lyophilization, cryogenization and alginate)

COURSE METHODOLOGY

The methodology of the course will combine **in-lab sessions**, **company visits**, **lectures**, and **talks**.

The content described in the previous section will be carried out from a **practical approach**. Each session will consist of an explanation with a theoretical basis, necessary for the

understanding of the contents. A series of practical procedures related to the subject taught will be applied afterwards. Moreover, either a company visit or an expert talk will be at least carried out each week.

The first session will consist of a general approach about the peculiarities of **working in a microbiology laboratory**: work in aseptic conditions, sterilization and disinfection techniques, preparation of culture media, techniques of pure cultivation, etc.

The following week, students would try to **characterize** the **autochthonous** microorganisms from an specific environment, making tests that relate them to the cycles of the fundamental elements (C, S, P and N) and **allochthonous**; that is, those that do not belong to that environment and verify the existence of polluting residues (bio-indicators of fecal contamination).

During the next two modules, composting piles at laboratory scale will build up, which will serve as a source of microorganisms. Students will use that microhabitat to isolate the strains, with which we will later undergo a series of **biochemical tests** that will allow them to characterize them as possible producers of substances of biotechnological interest. Later, using those strains that show the best results, an **in-plant test** will be carried out.

Finally, in the last week, **in vitro elaboration** of foods and other products used in the Agri-food industry processed from microorganisms (beer, bread, yogurt, xanthan and SCP) will take place.

ACADEMIC VISITS & NETWORKING

There will be different company visits related to the topics taught in the course, as well as expert talks related to the business sectors.

- Visit to an **organic waste treatment plant** (Ejido Medioambiente), where some of the technologies that will be explained during Module B are carried out, specifically composting treatments
- Visit to a **biological control company** (Koppert), related to the thematic lines explained in Module C
- Visits to **two biotech-based companies** (Kimitec and Microbius Biotech), transversally related to the whole course and more specifically to Module D
- **Expert talks** related to the aforementioned business sectors

ASSESMENT

At the end of the course, students will **summarize** their work including the **results** obtained in the laboratory, with the advice of the teaching staff, so they will acquire the capacity to interpret and discuss results based on the scientific bibliography related to the studied topics. To pass the course, it is required to **attend 100%** of the **classes**.

LECTURERS

The teaching team is composed by several professors and researchers from the University of Almería Biology and Geology Department. You can find some of them listed below:

- María José López López
- Francisca Suárez Estrella
- Juan Antonio López González
- Macarena del Mar Jurado Rodríguez
- María José Estrella González
- María Rosa Martínez Gallardo
- Ana Josefa Toribio Gallardo
- Ana Belén Siles Castellano
- Jesús Salinas Nieto
- Rosario Lerma Móliz
- Víctor Carpena Istán

BIOPROCESS ENGINEERING OF MICROALGAE: FROM THE CELL TO THE FINAL PRODUCT

Academic coordinator: Tania Mazzuca Sobczuk | Teaching hours: 52

INTRODUCTION

The recognized **potential** of the **algae biomass** for the production of diverse high and medium value products, as well as commodities, have caused a **business-related inflection point**, launching thousands of spin-off, medium and large companies worldwide dedicated to microalgae production and microalgae bioprocessing. At this decisive moment, advances in the establishment of more production facilities at industrial scale, disruptive technologies for improving **biomass recovery** and **downstream processes** are critical aspects at cutting down processing costs on a very huge scale. To keep microalgae process efficient on a very huge scale, stakeholders need qualified professionals to satisfy the enterprise prospects.

Therefore, with this course students will be able to acquire the necessary knowledge on **fundamentals of bioprocesses engineering** applied to **algal biotechnology**, while working with professors and researchers belonging to University of Almeria Marine Microalgae Biotechnology Group, with experience in this field since 1987.

MAIN GOALS

1. Gain a comprehensive overview of process for obtaining commercial products from microalgae
2. Examine key elements for culture development such as growth and substrate consumption estimations and application of growth models
3. Discussing strategies for bioreactor selection and the impact this has on the performance of the upstream and downstream process
4. Gain a comprehensive overview of best practices for upstream and downstream process to maximize manufacturing effectiveness and minimize costs for different bioprocesses
5. Integral valuation of microalgae biomass
6. Assessing the usage of microalgae towards the circular economy

CONTENT

This course is composed by 4 different modules.

Module 1: Introduction to upstream processes in Biotechnology of microalgae

Essential for producing microalgae biomass is ensuring a culture medium and appropriate culture system for productivity. In this module students will learn the **fundamentals** of microalgae cultivation and main techniques for producing it.

After this module, students will have prepared the **inoculum** to inoculate the internal bioreactor with Chlorella. Moreover, they will also acquire the necessary knowledge about **algae** culturing applications, bioreactors, and growth kinetics and growth models**.**

Module 2: Obtaining the biomass

Fed-batch, semicontinuous or continuous operation modes usually confer advantages for **microalgae biomass production** due to the increase in productivity. In this module students will identify the pros and cons of the different operation modes, and they will bridge a batch process to a semi-continuous one in the lab.

There are several **challenges** when separating the cells from the liquid medium: to meet the required biomass quality, to save energy, to reduce costs. This module will focus on these challenges as well as their fundamental and best techniques to help overcome them.

After this module, students will have inoculated one small fotobioreactor, daily monitoring important culture parameters. They will get familiar with **centrifugation**, **osmotic dehydration** and **flocculation**. Moreover, they will acquire knowledge about algae harvesting techniques and they will have to select their topics for the final "**micro- project**".

Module 3: Insight in the most important downstream process

In this module you will get familiar with the lab techniques and theoretical considerations for the **obtention** of some products from microalgae such as: **fatty acids**, **biodiesel**, **carotenoids** and **phycobiliproteins**.

With this module, students will be familiar with **lipid** and **pigment extraction methods** as well as its **separation** and **purification** towards the production of high value products. They will also acquire the necessary knowledge about **downstream processes** involving microalgae or some of their components (lipids and pigments).

Module 4: Implementing your knowledge and skills into a process

Within this module, students will be tutored by one member of the research group to develop a **specific application activity** after discussion and agreement with the research group.

In the first session, several topics will be presented to the students, and they will be asked to look for information (by working in small groups) in **scientific databases** to state the importance of each topic. The groups will design their **working plan** for the last week (2 days). The plan will be discussed with their tutors to check its viability (resources, time and scope). For example: the project would

consist in analyzing all the components of a desired biomass, to inoculate an external bioreactor, etc. Last day, students will share their experience by delivering a Power Point **presentation** (assessment activity).

Therefore, with this last module, students will apply techniques methods and knowledge towards the development of one **tutored micro project** and they will be assessed.

COURSE METHODOLOGY

The overall teaching methodology includes several theoretical and practical activities, such as:

- Engaging **sessions with experts** about upmost interesting issues regarding microalgae culture and downstream process with microalgae
- **Lab-work sessions** guided by experts
- Interactive and engaging **seminars** with exercises and discussions
- Guided **visits** to amazing facilities for microalgae culture
- **On-hands training** with direct access to an expert trainer
- **Application activity.** Before the course starts, students will submit their needs analysis and objectives for training by completing a simple online form they will receive by email.

ACADEMIC VISITS & NETWORKING

There will be different company visits related to the topics taught in the course, as well as expert talks and seminars related to the microalgae business sector.

- Visits to the facilities of **Sabana Project** (website). This visits, related to Module 1 and 2, will focus on cultivation of microalgae monitoring of algae growth in a real case, as well as on harvesting techniques.
- **Lab-work sessions** and several **expert talks** related to the 4 different modules

ASSESMENT

To successfully pass the course, students must deliver a **Power Point** presentation (in the last module). Moreover, it would be mandatory to **attend 100%** of the **classes**.

LECTURERS

The teaching team is composed by professor and researchers from the Chemical Engineering Department. You can find some of them listed below:

- Emilio Molina Grima
- Francisco García Camacho
- Asterio Sánchez Mirón
- María José Ibáñez González
- Tania Mazzuca Sobczuk
- María José Jiménez Callejón

- Elvira Navarro López
- Cintia Gómez Serrano
- Ana Sánchez Zurano

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ANNEX I: PROGRAMME SCHEDULE

Classes will run during the morning from 9:00am to 2:00pm Monday-Thursday. There is not class neither on Fridays or in the afternoon, but the cultural activities included (6 in total) will be organized over that time.

The academic schedule for the courses, as well as the final schedule for cultural activities, will be shared with students prior to each course celebration.

Hours	Monday	Tuesday	Wednesday	Thursday	Friday
WEEK 1	**May 30th**	**May 31st**	**June 1st**	**June 2nd**	**June 3rd**
9:00-10:00	Welcome ceremony	Spanish course	Spanish course	Spanish course	Spare time/cultural activities
10:00-11:00		Biology course	Biology course	Biology course	
11:00-12:00					
12:00-13:00					
13:00-14:00					
WEEK 2	**June 6th**	**June 7th**	**June 8th**	**June 9th**	**June 10th**
9:00-10:00	Spanish course	Spanish course	Spanish course	Spanish course	Spare time/cultural activities
10:00-11:00	Biology course	Biology course	Biology course	Biology course	
11:00-12:00					
12:00-13:00					
13:00-14:00					
WEEK 3	**June 13th**	**June 14th**	**June 15th**	**June 16th**	**June 17th**
9:00-10:00	Spanish course	Spanish course	Spanish course	Spanish course	Spare time/cultural activities
10:00-11:00	Biology course	Biology course	Biology course	Biology course	
11:00-12:00					
12:00-13:00					
13:00-14:00					
WEEK 4	**June 20th**	**June 21st**	**June 22nd**	**June 23rd**	**June 24th**
9:00-10:00	Spanish course	Spanish course	Spanish course	Spanish course	Spare time/cultural activities
10:00-11:00	Biology course	Biology course	Biology course	Biology course	
11:00-12:00					
12:00-13:00					
13:00-14:00					

Hours	Monday	Tuesday	Wednesday	Thursday	Friday
WEEK 5	**June 27th**	**June 28th**	**June 29th**	**June 30th**	**July 1st**
9:00-10:00	Spanish course	Spanish course	Spanish course	Spanish course	Spare time/cultural activities
10:00-11:00	Biology course	Biology course	Biology course	Biology course	
11:00-12:00					
12:00-13:00					
13:00-14:00					
WEEK 6	**July 4th**	**July 5th**	**July 6th**	**July 7th**	**July 8th**
9:00-10:00	Spanish course	Spanish course	Spanish course	Spanish course	Spare time/cultural activities
10:00-11:00	Biology course	Biology course	Chemical Engineering Course	Chemical Engineering Course	
11:00-12:00					
12:00-13:00					
13:00-14:00					
WEEK 7	**July 11th**	**July 12th**	**July 13th**	**July 14th**	**July 15th**
9:00-10:00	Spanish course	Spanish course	Spanish course	Spanish course	Spare time/cultural activities
10:00-11:00	Chemical Engineering Course	Chemical Engineering Course	Chemical Engineering Course	Chemical Engineering Course	
11:00-12:00					
12:00-13:00					
13:00-14:00					
WEEK 8	**July 18th**	**July 19th**	**July 20th**	**July 21st**	**July 22nd**
9:00-10:00	Spanish course	Spanish course	Spanish course	Spanish course	Spare time/cultural activities
10:00-11:00	Chemical Engineering Course	Chemical Engineering Course	Chemical Engineering Course	Chemical Engineering Course	
11:00-12:00					
12:00-13:00					
13:00-14:00					
WEEK 9	**July 25th**	**July 26th**	**July 27th**	**July 28th**	**July 29th**
9:00-10:00	Spanish course	Spanish course	Spanish course	Spanish course	Spare time/cultural activities
10:00-11:00	Chemical Engineering Course	Chemical Engineering Course	Chemical Engineering Course	Farewell event	
11:00-12:00					
12:00-13:00					
13:00-14:00					