



## SCIENCE AND MARITIME TECHNOLOGY AREA

### SUBJECTS AVAILABLE FOR EXCHANGE STUDENTS

#### Winter Semester

Code	UC	ECTS
9016202	Applied Physics	6
9014330	Aquaculture	6
9016211	Biochemistry I	6
9014425	Bioinformatics	5
9087304	Biology and Biochemistry	6
9016200	Bioprocesses I	6
9016212	Biostatistics	6
9016200	Biotechnology Laboratories I	6
9087303	Chemistry	6
9014331	Fisheries Biology	6
9014434	Fisheries Technology	6
9016200	Genetic Engineering	6
9014332	Ichthyology	6
9014312	Introduction to Biotechnology	4
9087305	Introduction to Industrial Process	6
9016200	Marine Biotechnology I	6
9087301	Mathematical Analysis I	6
9014311	Statistical Methods and Experimental Design	7
9014402	Zoology	6

 **Note** <sup>1)</sup>: All subjects are teach in **Portuguese**. It depends on each teacher's decision whether to give the class in English or in other language. Students will be given materials in English and evaluation will be in English. Tutorial appointments can be scheduled with each teacher. All subjects **must be approved** on the **theoretical** and on the **practical component**.

 **Note** <sup>2)</sup>: Due to the practical component, some of these subjects have a limited number of enrolments.

# Syllabus Résumé

## **Applied Physics - 6 ECTS**

Understand the main physical laws in the mechanic, thermodynamic and electricity areas

### **Aims:**

Develop sufficient knowledge to, understand, interpret and criticise the information in the technology domain. Deepen the mathematical and logical problem solving applied to real world. Apply the physical methods and tools to the real problem resolution. Know and apply the main concepts in physics, like: Force, Energy, Electrical Current, Heat and Entropy. Know how to measure physical variables, data analysis and the construction of correlations between the variables.

## **Aquaculture - 6 ECTS**

The aim of this subject is to give students a general training of the concepts of aquaculture. Presents the key content in the species selection, nutrition, engineering and economics.

### **Aims:**

To acquire knowledge of the importance of aquaculture thought its implement in the world and in Portugal. To acquire knowledge of aquaculture development history, the actual state of Portugal and World aquaculture production, observing the necessities of different world regions. To obtain theoretical and practical knowledge of aquaculture systems of production, biology and nutrition of aquatic culture species. To acquire knowledge related to species selection and aquaculture nutrition, engineering and economy.

## **Biochemistry I - 6 ECTS**

This curricular unit falls within the second year of the degree course and allows a deeper perspective of the characteristics and properties of the various groups of biomolecules as well as a better understanding of the relationship between structure and function of these biomolecules.

### **Aims:**

Acquire proper biochemistry language. Develop ability to analyse and understand the molecular properties of the main classes of biomolecules: proteins, nucleic acids, lipids and carbohydrates. Perceiving the functional importance of enzymes for the existence of life. Develop theoretical and laboratory capacity to gauge and interpret enzymatic activities. Reproduce several protocols that allow the identification and characterization of the main classes of biomolecules

## **Bioinformatics - 5 ECTS**

The number of DNA and protein sequences available in public databases has increased exponentially over the past few years. The available information on the structure and function of proteins, as well as proteomic and metabolomics analysis has also increased very significantly. For all this, huge amount of information to be analysed and be use in a useful way the knowledge of some basic bioinformatics tools is necessary.

### **Aims:**

Understand the basic concepts of bioinformatics and computational biology; select the appropriate databases. Understand the potential of different experimental methodologies and how to apply them effectively to different situations. Use bioinformatics tools to solve concrete problems.

## **Biology and Biochemistry - 6 ECTS**

To acquire competences in the area of Biology and Biochemistry, relating these concepts with several curricular units of the subsequent semesters. It aims to provide the basis for understanding of cellular organization, structure and metabolic functioning.

### **Aims:**

Identify the different levels of cellular organization. To know the different systems of classification of organisms. Detail structural and functional aspects of cell biology. Identify the major cellular structures. Relate cellular structures to their major metabolic functions. Acquire basic skills in optical microscopy and cytochemistry. Identify the types of biological macromolecules and understand their functions. Know the levels of structural organization of proteins. Recognize the importance of enzymes as catalysts. Distinguish the main types of lipids and carbohydrates. Understand and delineate the processes that allow the transformation of the energy of biomolecules. Calculate energy yields and explain the need for metabolic regulation. To compare the metabolic profile of different organs, integrating the preferred metabolic pathways in each one.

## **Bioprocesses I - 6 ECTS**

Bioprocessing operation involves living cells or enzymes use, with a view to obtain added value products with application in diverse areas such as pharmaceutical and food industry.

### **Aims:**

To recognize the bioreactor as key element of a given bioprocess; to master concepts and mechanisms which are essential to operate and dimension a bioreactor; to gather and process the information needed about stoichiometry and microbial processes kinetics; identify the unit operations needed to apply in the downstream processing of a given product.



### **Biostatistics - 6 ECTS**

In today's society, the quantity of information, both quantitatively and qualitatively, is vast and complex. In this sense, it is necessary to reflect on processes of organization, systematization and summarization of data. Thus, in the course of Biostatistics students will have the opportunity to acquire skills in the analysis of real data, obtained in studies of the observational type as well as in studies with an experimental design.

#### **Aims:**

Development of the ability to identify logical components in the biotechnology research process. Development of the ability to delineate, analyse and interpret experiences in biotechnology using univariate and bivariate analysis techniques. Critical minded development in order to discuss the adequacy of an experiment to a given problem and the interpretation of experimental results. Development of language skills in English through reading scientific articles, computer skills in data analysis, skills in information and communication technologies. Developing the ability to work as a team.

### **Biotechnology Laboratories I - 6 ECTS**

To use techniques within the particular field of Biotechnology, Molecular Biology, Microbiology and Chemical Analysis.

#### **Aims:**

Mastering theoretical concepts in multidisciplinary areas, particularly in Molecular Biology, Microbiology and Analytical Chemistry enabling the perception, interpretation and problem solving related to Biotechnology; Use of laboratory techniques and equipment in the areas of Molecular Biology, Analytical Chemistry, Biochemistry and Microbiology; Acquire ability to develop extensive laboratory work, through a deep understanding of the various experimental techniques available; To be able to, through the knowledge acquired, identify problems, solving them through a practical laboratory approach.

### **Chemistry - 6 ECTS**

The General Chemistry course aims to give students the theoretical and theoretical-practical concepts in chemistry enabling the perception, interpretation and resolution of problems related to the Life Sciences and Food Technology. It also aims to give basic knowledge concerning laboratory techniques in chemistry

#### **Aims:**

It is intended that the student understands the importance and applicability of Chemistry in the areas of Food Technology and Safety and Marine Biology and Biotechnology and acquires the theoretical concepts in Chemistry needed for subsequent courses and further mastery of techniques commonly used in chemistry laboratory areas of Life Sciences and Food Technology. Characterize the intra and intermolecular bonds. Know and characterize the rate of a chemical reaction. Principles of thermochemistry; Characterize the chemical equilibrium. Characterize the acid-base and redox equilibria. Understand the fundamentals of electrochemical. Identify the main functional groups of organic compounds.

### **Fisheries Biology - 6 ECTS**

Fisheries; characterization and identification of the most landed resources.

#### **Aims:**

To identify and characterize, from a bio ecological point, the main fisheries resources; To know the components of catch and methods for identifying stocks; To characterize the main components of populations dynamics from one resource; To know available tools for estimating population dynamics parameters; To know and assess the effects of fishing on marine environments.

### **Fisheries Technology – 6 ECTS**

Fisheries; fleet composition and types of fishing gear.

#### **Aims:**

To identify and characterise the main fishing methods and techniques; to know the classification of fishing techniques; to know the various types of fishing vessels and some of their specifications; to understand the importance of selectivity, as well as factors affecting it and selectivity models used.

### **Genetic Engineering - 6 ECTS**

This course is part of the follow-up to other courses such as Biochemistry II and Molecular Biology, allowing to deepen the knowledge about the structure and function of nucleic acids and the methodologies used in the study of biological processes and functions, and in particular how this knowledge can be applied in solving concrete problems

#### **Aims:**

Know and develop experimental protocols using molecular biology and genetic engineering techniques. Use some of the most frequent laboratory techniques in molecular biology and genetic engineering. Understand the basic techniques for transferring and expressing genes in prokaryotic and eukaryotic organisms. Apply some techniques of DNA analysis and manipulation to solve concrete problems. Understand the potential impact of using genetic engineering.

### **Ichthyology - 6 ECTS**

Ichthyology is the branch of zoology devoted to the study of fishes

#### **Aims:**



To recognise fish classification, anatomy, physiology and distribution. To argue evolutionary history and the morph-physiological adaptations that had determined the appearance of the present great groups. To comprehend fish biology in order to understand the requirements of different species in the environment where they are integrated. To dominate basic vocabulary used in ichthyology. To identify the scientific and common names of the most frequent species, to know how to classify a fish in great groups (many until the family) and to locate and to use the available resources to create a classification until the species

### **Introduction to Biotechnology – 6 ECTS**

The subject fits into the 2nd year of the degree and in a generalist way, seeks to introduce Biotechnology and its different areas of operation.

#### **Aims:**

Developing the capacity to search literature efficiently. Ability to interpret scientific papers and select information according to the objectives; Development of communication skills (preparation and public presentation of scientific work). Recognize the potential of biotechnology as an innovative mean in various fields of knowledge due to its interdisciplinary nature. Recognize the different application areas of biotechnology. Overview of the Biotechnology Market in the European Union.

### **Introduction to Industrial Process - 6 ECTS**

To provide tools to the student for problem solving within the framework of food processes and an integrated view of the quantities, properties and unitary operations involved in food processing.

#### **Aims:**

Gain powers in the analysis of procedural units. Understand and analyse the operation of equipment for different separation processes used in industrial processes in the food sector.

### **Marine Biotechnology I – 6 ECTS**

The Marine Biotechnology curricular unit intends to address the theoretical and practical concepts related to the importance of marine resources for biotechnological purposes.

#### **Aims:**

Recognize the importance of marine resources for biotechnological purposes; Understanding the physiology and genomics associated with marine microorganisms; Master basic techniques applied in marine biotechnology; Describe the biotechnological applications of seaweed and marine microorganisms; Recognizing the usefulness of biotechnological tools in aquaculture.

### **Mathematical Analysis I - 6 ECTS**

Nowadays it is expected that a professional of the area of Biotechnology dominate advanced techniques where Mathematics plays a fundamental role. The domain of such tools allows these professionals to formulate problems involving mathematical concepts, to select and apply convenient techniques, to interpret critically the results obtained and to communicate correctly.

#### **Aims:**

The Curricular Unit intends to endow the students with skills in order to identify definite and improper integrals, to calculate its value and to apply the integral calculus in the determination of surface areas and volumes. To understand the notion of real functions with two real variables, domain and its graphical representation. to use the multivariable differential calculus for solving optimization problems with and without restrictions.

### **Statistical Methods and Experimental Design - 7 ECTS**

In today's society the amount of information, both in the form quantitatively and qualitatively, is huge and complex. In this respect, it is necessary to reflect on the processes of organization, systematization and summarization of data. Thus, in curricular unit of Statistical Methods and Experimental Design the students will have the opportunity to acquire skills in the analysis of biological data, obtained in observational studies as well as in studies with experimental design.

#### **Aims:**

Development of the ability to identify the logical components in research in marine biology. Developing the capacity of outlining, analyse and interpret experiments in marine biology using techniques of univariate and bivariate analysis. Development of critical spirit in order to discuss the adequacy of an experience to a specific biological problem and the interpretation of experimental results; Development of linguistic skills in English (through the reading of scientific articles), in computing (in the analysis of data) and agility in information and communication technologies. Developing the ability to work in team.

### **Zoology - 6 ECTS**

The unit of Zoology conveys the basic knowledge of the different forms of life, in particular, animal organisms. These skills are essential in the formation of a biologist, being the basis of their expertise in performing different tasks and services in their future professional life.

#### **Aims:**

Have a broad perspective of the origin and diversity of life, as well as of the main threats and reasons for its preservation. Distinguish basic criteria from the classification of different life forms. Integrate knowledge on form and function of different levels of biological organization. Understand biological systems and the adaptive animal capacities to the ample variety and functions of environmental conditions. Know the principles of zoological nomenclature, the aspect keys of morphology, anatomy, physiology, systematic, phylogeny, and adaptive radiation, ecological and geographic distribution of the main groups of animals.

