

## LIFE SCIENCES 1 FIELD\_11 ECTS

### Introducing

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### Description

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### Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

### Practical info

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### Location(s)

 Toulouse

## Microbiology

# Introducing

## Description

Section I Microorganisms

I - Reminder of nomenclature rules

II - Principles and methods of classification and identification II.1 Principles of classification; II.2 Identification characteristics and procedures; II.3

Main characteristics and classification of some microorganisms

Section II. Respiration, photosynthesis and microbial growth

Section III Microbial viruses

III.1 Definition and history; II.2 Phage morphology and structural diversity; II.3 Distribution in ecosystems; II.4 Phage infection cycles; II.5 Genetic material and replication/transcription/translation; II.6 The example of T4 and Lambda phages

II.5 Genetic material and replication/transcription/translation; II.6 The example of Phage T4 and Phage Lambda

Section IV Symbioses

IV.1 Definition IV.2 The human intestine IV.3 Corals

etc.). They will also need to understand and apply molecular methods based on nucleic acid analysis (use of nucleic probes, gene amplification, restriction or molecular profiling) or protein profiling.

In a second section, students will be able to independently investigate the reactions involved in respiration and photosynthesis of microorganisms and acquire the tools necessary to calculate average and specific growth rates.

A third section will focus on microbial viruses, and students will be expected to be able to describe their diversity, their ecological niche, and their role in regulating terrestrial and marine microbial biodiversity. They'll also need to know how to analyze and count them. The final section presents examples of symbiosis, human gut microbiota and corals.

## Necessary prerequisites

I2BEBS10 Structural biochemistry of carbohydrates, lipids and proteins.

I2BEMI20 Microbiology

## Objectives

The aim of the microbiology course is to learn the rules of microorganism nomenclature, as well as the principles and methods of classification and identification of microorganisms. Students must know the characteristics and procedures for identifying microorganisms based on traditional techniques (collection of information directly, after culture or based on biochemical methods, antigenic characteristics,

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## Molecular biology

# Introducing

## Description

Molecular biology :

- Structure of nucleic acids
- Replication
- Transcription and operons
- RNA maturation
- Regulatory and other non-coding RNAs
- Translation
- Protein folding, modification, interaction, secretion and degradation
- Examples of prokaryotic and eukaryotic gene regulation

## Objectives

At the end of this module, the student should have understood and be able to explain (main concepts):

Properties of nucleic acids, organisation of genomes and DNA replication. Gene transcription and translation of messenger RNA leading from DNA to proteins. RNA maturation and modification. Protein folding, modifications, interactions, secretion and degradation. Main modes of regulation of gene expression.

The student should be able to:

Define and describe the main molecular elements involved in the organisation and expression of genomes. Explain and analyse data relating to the

regulation of prokaryotic and eukaryotic genome expression.

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## Processes

# Introducing

## Description

Introduction to the concept of process, the way of building it, constraints of the industrial production.  
Representation and estimate of the cost of a process.  
Description of some large production channels.  
Critical analysis of a transformation channel of matter or energy, through a project in group.

## Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):

- the principle of raw materials transformation processes (oil, coal, gas, ore, biomass), of organic and mineral heavy chemistry (refining, petrochemistry,  $\text{NH}_3$ ,  $\text{H}_2\text{SO}_4$ ,  $\text{Na}_2\text{CO}_3$ ,  $\text{NaOH}$ ,  $\text{Cl}_2$ , manure...) and of energy production (thermal, nuclear, biomass)
- the principle of the diagrammatic representation of a process (flowsheet) and associated graphics
- the principles of cost estimation of a process
- the industrial context of the sector

The student will be able to:

- describe a production system
- read, interpret, propose an installation flowsheet
- to write global balances on a process in order to calculate matter and energy flows
- identify of information fluxes
- make an critical analysis of a process
- estimate the cost of a process
- know to work in autonomy starting from a schedule of

conditions to find and analyze scientific documentation.

## Necessary prerequisites

Mineral and organic chemistry, biochemistry  
Thermodynamics  
Chemical kinetics, reactors  
Unit operations of chemical engineering  
Regulation  
Metrology

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# Ecological Transition, GHG Reduction, Responsibility and Environment (EARTH)

## Introducing

### Description

The teaching includes a "2 tonnes" workshop, which provides a fun way of understanding the orders of magnitude linked to the objectives of carbon neutrality in 2050. It also includes assignments on the following topics: housing; electricity production; inequalities and responsibilities; mobility; the climate inaction debate; agriculture and food; and aeronautics. Students also work on a complex problem linked to ecological issues, starting their reflections from an everyday object or service.

### Objectives

At the end of this module, the student will be able to:

- ✂ Be comfortable with the fundamental concepts related to greenhouse gas emissions, and be able to make simple calculations on this subject.
- ✂ Know the order of magnitude of important quantities.
- ✂ Be able to fetch emission values from the ADEME database and use them appropriately.
- ✂ Think about ecological issues in all their complexity and study a specific problem
- ✂ Have an understanding of life cycle analysis and how to apply it
- ✂ Be able to research scientific literature
- ✂ Be able to understand and analyse figures/data
- ✂ Draw political conclusions from scientific facts and one's own values
- ✂ Debate, discuss and confront points of view.

### Necessary prerequisites

Basic knowledge on energy.

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