

## Fall Semester / Semester 1

| Courses | Level of studies | Number of hours | Number of ECTS delivered |
|---------|------------------|-----------------|--------------------------|
|---------|------------------|-----------------|--------------------------|

Plant biotechnology

Master

36

3

Practical sessions

1. Plant in vitro culture
2. Genetic transformation of the moss *Physcomitrella patens*
4. Demonstration of the action of gibberelins in barley seeds germination
5. Study of the antibacterial activity of essential oils
6. Analysis of the composition of mint essential oil
7. Plants-microorganism associations
8. Carragenans extraction of a red algae: *Euchema Cottonii*

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Genetic engineering -  
Bioinformatics

Master

38

3

Tools for sequences alignment

Techniques for cloning DNA fragment in bacterial/yeast systems

Experimental techniques of genetic engineering and molecular biology (cloning, PCR, Southern Blot)

Organize and plan an experiment

1. Construction of DNA probes of a gene of interest
2. Cloning of DNA fragments (probes) in plasmids
3. Genomic DNA Extraction
4. Enzymatic digestion with restriction enzymes
5. Probe and Molecular Hybridization (Southern)

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Microbiology

Master

32

2

Standardized methods in microbiology for the detection of bacteria, introduction to the quality insurance (traceability)

Microorganisms at the center of biotechnology - Useful and harmful bacteria.

1. Standards to the application: standardized methods of research and enumeration of major bacteria in food hygiene
2. Use of molecular detection technologies for microorganisms
3. Constraints of work organization in microbiology: holding of a laboratory notebook, traceability

## Spring Semester / Semester 2

| Courses  | Level of studies | Number of hours | Number of ECTS delivered |
|----------|------------------|-----------------|--------------------------|
| Genetics | Master           | 29              | 2                        |

Prokaryotes and eukaryotes genetics for industrial uses Bacterial genetics: contributions / applications in terms of molecular tools and technologies that stem from knowledge of bacterial genetics. Plant genetics: quantitative genetics, genetic breeding, segregation, molecular markers, physical map and genetic map, genetics of association, genomic selection, molecular marker generation and polymorphism study, genetics of association, optimal use of marker-assisted selection.

| Courses       | Level of studies | Number of hours | Number of ECTS delivered |
|---------------|------------------|-----------------|--------------------------|
| Biotechnology | Master           | 67              | 4                        |

Host cell systems for the production of recombinant proteins.  
Acquisition of a global vision of the process from the production to the purification of recombinant proteins.  
Production system in bacteria and yeast.  
Developing autonomy in a lab context

| Courses      | Level of studies | Number of hours | Number of ECTS delivered |
|--------------|------------------|-----------------|--------------------------|
| Microbiology | Master           | 67              | 4                        |

Production and use of microorganisms and / or enzymes in the food industry.  
Separation and purification techniques  
Introduction to Experimental Plans  
Simulation and Modeling

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Immunology

Master

20

1

Acquire the basics in immunology and immunological techniques ; Understanding the mechanisms involved in the immune response ; Knowledge of some major known pathologies and different detection methods

1. Double immuno-diffusion (Ouchterlony)
2. Detection of antigens by the spotting method (Dot blot)
3. Study of the components of a rabbit serum by Western Blot
4. ELISA technique: BSA / anti-BSA system
5. SDS-PAGE Technology

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|---------|------------------|-----------------|--------------------------|

Bioprocesses and  
enzyme immobilization  
biocatalysis

Master

60

4

Give an overview of the nature and economic importance of current industrial biological processes. Development of skills in the field of the application of biocatalysts (microorganisms or isolated enzymes) for the production of molecules of industrial interest. Analysis of the constraints related to the production of molecules of biological interest. Proposed biotechnological solutions.