



Study Plan

School: School of Sciences and Technology

Degree: Bachelor

Course: Biotechnology (cód. 634)

1st Year - 1st Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
MAT11959L	Biostatistics with Computer Software	Mathematics	6	Semester	156
QUI11958L	Principles and Methods in Chemistry	Chemistry	9	Semester	234
MAT0933L	Mathematics I	Mathematics	6	Semester	162
QUI11459L	Lab Techniques and Methods I	Chemistry	3	Semester	78
FIS11961L	Physics 1.1	Physics	6	Semester	156

1st Year - 2nd Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI1084L	Physical Chemistry I	Chemistry	6	Semester	156
QUI1096L	Organic Chemistry I	Chemistry	6	Semester	156
QUI11963L	Principles and Methods in Biochemistry and Bioinorganics	Biochemistry	9	Semester	234
MAT12237L	Mathematics II	Mathematics	6	Semester	156
QUI11464L	Lab Techniques and Methods II	Chemistry	3	Semester	78

2nd Year - 3rd Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI0348L	Biochemistry	Biochemistry	6	Semester	156
BIO0408L	Microbiology	Biological Sciences	6	Semester	156
BIO11465L	Genetics	Biological Sciences	6	Semester	156
QUI12250L	Fundamentals of Biological Engineering	Chemical and Biochemical Engineering	6	Semester	156
BIO10917L	Cell Biology	Biological Sciences	6	Semester	156

2nd Year - 4th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI0350L	Microbial Biochemistry	Biochemistry	6	Semester	156
INF11968L	Introduction to Programming	Informatics	6	Semester	156
BIO12238L	Plant Developmental Physiology	Biological Sciences	6	Semester	156
BIO12251L	Molecular Biology	Biological Sciences	6	Semester	156



2nd Year - 4th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI12252L	Separation Processes in Biochemistry and Biotechnology	Chemical and Bio-chemical Engineering	6	Semester	156

3rd Year - 5th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
BIO12239L	Genetic Engineering and Biotechnology	Biological Sciences	6	Semester	156
QUI12253L	Enzymes Technology	Chemical and Bio-chemical Engineering	6	Semester	156
QUI12254L	Fermentation Technology	Chemical and Bio-chemical Engineering	6	Semester	156

Options

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
BIO11471L	Immunology	Biological Sciences	6	Semester	156
BIO11480L	Virology	Biological Sciences	6	Semester	156
BIO11481L	Biotechnological Medicines	Biological Sciences	6	Semester	156
QUI12242L	Techniques of Animal Tissue Culture	Chemical and Bio-chemical Engineering	3	Semester	78
QUI12243L	Bromatology and Nutrition	Biochemistry	6	Semester	156
GES0792L	Marketing	Management	6	Semester	156
FIT12244L	Wine and Olive Oil Technology	Agronomy	6	Semester	156
QUI12245L	Biofuels	Chemical and Bio-chemical Engineering	3	Semester	78
QUI11982L	Chemistry of Natural Systems	Chemistry	6	Semester	156
QUI11980L	Chemistry Applied to Heritage	Chemistry	6	Semester	156
QUI11983L	Forensic Chemistry	Chemistry	6	Semester	156
QUI11981L	Chemistry of Materials	Chemistry	6	Semester	156

*** TRANSLATE ME:UC's do 3º Ano de recuperação no 5º semestre ***

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI12255L	* Project/Internship in Biotechnology	*** TRANSLATE ME: Ciências Biológicas/Bioquímica/Química e Bioquímica ***	12	Semester	312



3rd Year - 6th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI11979L	Water Treatment and Wastewater	Chemical and Bio-chemical Engineering	3	Semester	78
FIT12241L	Plant Biotechnology	Agronomy	6	Semester	156
FIL0637L	Bioethics	Philosophy	3	Semester	78
QUI12255L	Project/Internship in Biotechnology	*** TRANSLATE ME: Ciências Biológicas/Bioquímica/ Química e Bi- oquímica ***	12	Semester	312

Options

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
BIO11471L	Immunology	Biological Sciences	6	Semester	156
BIO11480L	Virology	Biological Sciences	6	Semester	156
BIO11481L	Biotechnological Medicines	Biological Sciences	6	Semester	156
QUI12242L	Techniques of Animal Tissue Culture	Chemical and Bio-chemical Engineering	3	Semester	78
QUI12243L	Bromatology and Nutrition	Biochemistry	6	Semester	156
GES0792L	Marketing	Management	6	Semester	156
FIT12244L	Wine and Olive Oil Technology	Agronomy	6	Semester	156
QUI12245L	Biofuels	Chemical and Bio-chemical Engineering	3	Semester	78
QUI11982L	Chemistry of Natural Systems	Chemistry	6	Semester	156
QUI11980L	Chemistry Applied to Heritage	Chemistry	6	Semester	156
QUI11983L	Forensic Chemistry	Chemistry	6	Semester	156
QUI11981L	Chemistry of Materials	Chemistry	6	Semester	156



Conditions for obtaining the Degree:

*** TRANSLATE ME: Para obtenção do grau de licenciado em Biotecnologia é necessário obter aprovação a 162 ECTS em unidades curriculares obrigatórias e 18 ECTS em unidades curriculares optativas

distribuídas da seguinte forma:

1º Ano

1º Semestre:

5 UC Obrigatórias num total de 30 ECTS

2º Semestre

5 UC Obrigatórias num total de 30 ECTS

2º Ano

3º Semestre

5 UC Obrigatórias num total de 30 ECTS

4º Semestre

5 UC Obrigatórias num total de 30 ECTS

3º Ano

5º Semestre

3 UC Obrigatórias num total de 18 ECTS

UC Optativas num total de 12 ECTS conforme quadro de optativas

6º Semestre

4 UC Obrigatória num total de 24 ECTS

UC Optativas num total de 6 ECTS conforme quadro de optativas

Program Contents

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Biostatistics with Computer Software (MAT11959L)

One-dimensional and two-dimensional descriptive statistics.

Probability topics. Random variables. Distribution function.

Discrete and continuous probability distributions.

Sampling. Sampling distributions.

Point estimation and confidence intervals

Tests for the mean, variance, proportion, comparison of means (independent samples and paired samples),

comparison of variances and comparison of proportions. Analysis of variance. Nonparametric tests.

Use of programs on the MS Windows. MS Excel. SPSS statistical software.

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Principles and Methods in Chemistry (QUI11958L)

Atomic theory and evolution of the atomic models. Quantum theory and electronic structure of atoms.

Periodic relations between the elements. Basic concepts of chemical bonding. Ionic bonding. Covalent

bonding (Lewis structures, VSEPR model, VB theory, MO theory). Molecular interactions. States of aggregation. Gas equations. Perfect gas mixtures. Chemical thermodynamics. Phase equilibrium.

Properties of solutions. General aspects of chemical equilibrium in ideal systems. Acid-base, solubility,

complexation and oxidation-reduction equilibria. Electrochemistry. Chemical kinetics.

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Mathematics I (MAT0933L)



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Lab Techniques and Methods I (QUI11459L)

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Physics 1.1 (FIS11961L)

Introduction ; Physics and measurements; Vectors

Trajectory; velocity and acceleration.

Force and mass; Newton's dynamic laws; Momentum and momentum conservation; Work; Principle of conservation of energy.

Rotation; Angular displacement, angular velocity, angular acceleration; Torque about an axis. Kinetic energy of rotation; Angular momentum; conservation of angular momentum. Gravity

Temperature and heat; thermal expansion; Heat and internal energy; State changes; The transfer of heat;

The ideal gas law and kinetic theory; The first law of thermodynamics; The second law of thermodynamics.

Electromagnetic waves; properties of light; Optical images

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Physical Chemistry I (QUI1084L)

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Organic Chemistry I (QUI1096L)

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Principles and Methods in Biochemistry and Bioinorganics (QUI11963L)

Biochemistry: Living Organisms: structure of prokaryotic and eukaryotic cells. Methodology and technical approaches used in Biochemistry. Water: the medium of life. Inorganic ions in biologic systems.

Physiologic buffers. Functional characteristics of biomolecules. Carbohydrates, Aminoacids, peptides and proteins

Classification of metallic biomolecules. Main biochemical functions of metal ions. Nucleotides and nucleic acids.

Lipids, and lipoproteins. Structure and properties of biomembranes. Enzymes and enzymatic kinetic.

Bioenergetics and Bioelectrochemistry. The role of ATP in biological processes. Introduction to the metabolism.

Anabolic and biosynthesis processes. The major metabolic pathways. Some applications of bioinorganic biochemistry.

The role of inorganic elements in the life: essential elements, toxic elements

and their use in therapeutic and diagnostic practices. Biodistribution of inorganic elements and interaction

with biomolecules and specific function in the life.



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Mathematics II (MAT12237L)

I – Linear Algebra

1. Vector spaces
2. Linear functions
3. Matrices and Linear Systems of Equations .
4. Determinants – Permutations.
5. Eigenvalues and eigenvectors– Definitions. The characteristic polynomial. Algebraic and geometric multiplicities. Inverse matrix calculation. Matrix diagonalization.

II – Differential Calculus in \mathbb{R}^n

1. Dot Product – Dot product. Euclidean spaces. Cauchy-Schwarz inequality. Orthogonal bases. Projections. Gram-Schmidt orthogonalization process. Cross and mixed products properties and geometrical applications
2. Topology & Scalar and Vector Fields - Notions of topology. Scalar and vector fields. Domain and range. Graphical representation. Level sets of scalar fields.
3. Limits and Continuity - Limit in scalar and vector fields. Branching limits. Properties of limits. Continuity and continuity prolongation.
4. Differential calculus -Differentiability of scalar and vector fields.

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Lab Techniques and Methods II (QUI11464L)

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Biochemistry (QUI0348L)

I – Lectures Program

- 1) Introduction to the metabolism. Metabolic pathways and their control. Clinical correlations.
- 2) Carbohydrate metabolism and their control: glycolysis. gluconeogenesis; glicogenolysis and glycogenesis; pentose phosphate pathways. Piruvic acid degradation.
- 3) Acetil Co-A pathways. Tricarboxylic acids cycle and their regulation.
- 4) Electron transport chain and oxidative phosphorylation.
- 5) Glyoxilic acid cycle. Photosynthesis and photorespiration.
- 6) Lipid metabolism and their control: Beta-oxidation and bio-synthesis of fatty acids; Ketone bodies; prostaglandins, thromboxanes and leukotrienes; phospholipids; sphingolipids; cholesterol; plasma lipoproteins.
- 7) Aminoacid metabolism and their control. Purine and pirimidine metabolism. Iron and heme metabolism.
- 8) Fundamentals of genetic information and expression. Acid nucleic biosynthesis. Transcription. Proteins biosynthesis.
- 9) Integration of metabolism. Metabolic interrelationships and their control. Role of hormones in Biochemistry.
- 10) Main metabolic correlations.

II - Laboratorial works:

- 1- Presentation. The Objectives and avaliationof laboratorial component.
- 2- Research and administration of Information in Biochemistry
- 3- Study of phosphate compounds hidrólise
- 4- Electron transport in thylakoid membrane and proton gradient
- 5- Oxydative Phosphorilation - Part I
- 6- Oxydative Phosphorilation - Part II
- 7- Biomembrane permebilization (Study of metabolic pathways in situ)



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Microbiology (BIO0408L)

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Genetics (BIO11465L)

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Fundamentals of Biological Engineering (QUI12250L)

Material Balances. Energy Balances. Fluid flow and mixing. Viscosity. Momentum transfer. Non Newtonian fluids. Viscosity measurement. Rheological properties of Fermentation broths. Factors affecting broth viscosity. Mechanism of mixing. Power requirement for mixing. Improving mixing in fermenters. Role of shear in stirred fermenters. Heat transfer. Bioreactors. Mechanism of heat transfer. Conduction. Heat transfer between fluids. Design equations for heat transfer systems. Applications of design equations. Relationship between heat transfer, cell concentration and stirring conditions. Mass transfer. Molecular diffusion. Theory of diffusion. Analogy between Mass, Heat and Momentum transfer. Role of diffusion in bioprocessing. Film theory. Convective mass transfer. Liquid-liquid mass transfer. Oxygen uptake in cell cultures. Efficiency oxygen transfer in fermenters. Measuring dissolved oxygen concentrations. Mass transfer correlations. Measurement of kLa. Oxygen.

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Cell Biology (BIO10917L)

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Microbial Biochemistry (QUI0350L)

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Introduction to Programming (INF11968L)

Introduction to Programming with Python language

Use of interpreter in script and interactive modes

Variables, expressions and statements

Defining and Using Functions

Control structures

Native data structures

Sequential data structures: lists, tuples and strings.

Associative data structures: dictionaries.

Basics of input / output (I / O)

File manipulation

Graphic interface

Use of libraries

Libraries with advanced functionality for scientific calculation

Program development



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Plant Developmental Physiology (BIO12238L)

Theoretical Part:

I. Introduction Plant Physiology:

1. Water Relations;
2. Mineral Nutrition;
3. Photosynthesis
4. Phloem Transport;

II. Introduction to Plant Development:

1. Basic Concepts in Plant Development
2. Signal transduction
3. Plant Phytohormones;
4. Secondary Metabolism;
5. Photomorphogenic Pigments;
6. Photoperiodism and Flowering;

Practical Part:

I. Introduction to Plant Anatomy and Morphology:

Root; Stem; Leaves; Flowers and Fruits

II. Topics on Advanced Plant Physiology:

Phytorremediation; Plant Cell Death; Movements; Plant-Plant Interactions; Plant-Animal Interactions; The non pathogenic Plant-Microbe Interactions; Plant Immunology; Plant Behaviour.

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Molecular Biology (BIO12251L)

Part I. DNA REPLICATION

1. Genes and chromosomes
2. Replication of DNA
3. Recombination and transposition
4. Mutation and repair mechanisms

Part II. GENE EXPRESSION

5. Transcription
6. Translation
7. Regulation of gene expression

Part III. TECHNIQUES AND APPLICATIONS

8. Analytical and preparative methods in Molecular Biology
9. Techniques in molecular biology. Recombinant DNA techniques. Bioinformatics.
10. Applications in genetic engineering.

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Separation Processes in Biochemistry and Biotechnology (QUI12252L)

Biological products. Types of separation processes for biological products. Selection criteria for separation and purification processes. Sedimentation and centrifugation: fundamentals. Settlers. Types of centrifuges. Centrifuge scale−up. Ultracentrifugation. Filtration: fundamentals. Filtration media. Design and scale−up of filtration systems. Liquid−liquid extraction: fundamentals. Countercurrent multi−stage liquid extraction. Extractors scale−up and design. Liquid extraction using two aqueous phases and micelles. Drying: fundamentals. Heat and mass transport in drying of solids. Psychrometrics. Types of dryers. Dryer design. Lyophilization. Membrane processes. Materials used in membranes. Types of membranes and modules. Mass transport in membranes. Dialysis. Reverse osmosis. Ultrafiltration. Microfiltration. Electrdialysis. Crystalization: principles. Nucleation and growth of crystals. Batch crystalization. Protein crystalization processes. Design and scale−up of crystalysers.



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Genetic Engineering and Biotechnology (BIO12239L)

Theoretical programme

1. Introduction
2. Fundamentals of Molecular Cloning and DNA analysis
3. Microbial Systems in Genetic Engineering
4. Eukaryotic Systems in Genetic Engineering
5. Applications of Genetic Engineering for the development of new products and services
6. Official Regulation

Laboratorial programme

1. Training on pipeting. Solutions and dilutions.
2. Plasmidic DNA extraction (MiniPrep)
3. Restriction digestion of plasmidic DNA
4. Agarose gel electrophoresis
5. Preparation of competent bacteria
6. Transformation of competent bacteria
7. Screening of recombinants
8. Autonomous laboratorial work: Identification of unknown DNA sample

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Enzymes Technology (QUI12253L)

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Fermentation Technology (QUI12254L)

1. Introduction to fermentation technology
2. Microorganisms and culture media for industrial applications
3. Cleaning procedures
 - 3.1. Sterilization
4. Design of bioreactors
 - 4.1. Bioreactor classification
 - 4.2. Bioreactor scale-up and scale-down
 - 4.3. Aeration and agitation
 - 4.4. Bioreactor configuration. Reactor size. Mode operation.
5. Fermentation process
 - 5.1- Kinetics of fermentation processes
 - 5.2. Fermentation control, monitoring and modelling
6. Downstream processes (recovery and purification of fermentation products)
7. Examples of the most important industrial fermentation processes



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Immunology (BIO11471L)

Theoretical programme:

1. Introduction to the immune system. General aspects.
2. Components of the immune system
3. Antigens and antibodies
4. Gene organisation and expression of immunoglobulin's
5. Immune responses
6. Effector mechanisms of the immune response
7. The immune system in the health and disease
8. Monoclonal antibodies
9. Experimental immunology

Laboratory programme:

1. Introduction. Programming of the course
2. Experimental immunisation
3. Purification of immunoglobulin's
4. Test to the students natural immunity
5. Immunoprecipitation techniques
6. Observation of blood cells
7. ELISA
8. Autonomous laboratory work: goat immunisation and its characterisation

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Virology (BIO11480L)

Theoretical Programme

1. Introduction and functioning of the course
2. General and Molecular Virology
3. Taxonomy and Systematics
4. Infection and infectious agents
5. Immunology of viral infections
6. Epidemiology of viral diseases
7. Treatment and prevention of viral diseases
8. Diagnostic of viruses
9. Biotechnological applications of virus

Laboratory Programme

1. Theoretical introduction. Biosafety in the laboratory.
2. Experimental study of virus
3. Plant viral Infection (tobacco)
4. Bacterial growth curve
5. Preparation of an elevated titre virus
6. Dosing of virus - Plaque forming assay
7. Dosing of virus - Limiting dilutions
8. Autonomous laboratory work: isolation and characterisation of an wild bacteriophage



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Biotechnological Medicines (BIO11481L)

Theoretical:

1. Introduction.Molecular Biotechnology and Medicine;
2. Monoclonal antibodies as medicinal products;
3. New medicinal products from recombinant DNA;
4. Preparation of medicinal products using biotechnology techniques;
5. Quality,Safety and Efficacy of biotechnological and monoclonal antibody products;
6. Biosimilar Medicines
7. Regulamentar issues on biotechnological medicinal products and monoclonal antibodies

Practical:

1. Culture of host bacteria and competent cells;
2. Competent cell transformation with expression plasmids;
3. Selection of recombinants by restriction analysis;
4. Selection of recombinants by expressed products;
5. Characterization of the recombinant cell;
6. Optimization of cell expression;
7. Cell Bank;
8. Purification and characterization of the recombinant product;
9. Critical reports on the laboratorial experimentation.

"Inventive" program:

1. Identification of a new molecular entity for therapeutic uses;
2. Discussion of the working plan for the production of the "new medicine"

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Techniques of Animal Tissue Culture (QUI12242L)

Cell culture: advantages and disadvantages.

Type of cell culture: embryonic and adult tissue. Primary or tumor cell culture.

Adherent cell cultures: Epithelium, fibroblasts, neuroendocrine and neuronal cells.

Nonadherent cell cultures: blood cells.

Production and maintenance of cell lines.

Cell culture media composition, supplements, pH buffers, O₂, CO₂ and saline solutions and indicators;

Chemical defined media; Enzymes.

Normal cell culture procedures: separation, purification and identification.

Culture cell lines procedures and preservation methods.

Viability of cells maintained in culture.

Safety aspects of handling cells.

Transfection and hybridome production.

Applications of cell cultures for research purposes (biomedicine and cellular biology) and in biotechnological industry (production of valuable compounds using cell cultures).

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Bromatology and Nutrition (QUI12243L)

Diet and human Nutrition. Food Story. Principles of Nutrition. The nutritional needs of the human body.

Macro and micronutrients. The nutrition on the various steps of life and on hospital patient. Functional, diet

and light foods. Special foods for people with genetic anomalies and another change of metabolism.

Characterization of the different groups of nutrients. Physical and chemical methods to preserve foods.

Chemical and Biochemical analysis of foods. Food safety. HACCP system and Food Quality Control.



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Marketing (GES0792L)

1 – Introduction 1.1. Marketing Concept, its evolution and its place in the organizations - Relational Marketing and the e-marketing- Global marketing 1.2. The Attitude, the techniques and the Marketing models 2 – Marketing Plan 2.1. Analysis of situation diagnosis 2.2. The setting of Marketing objectives 2.3. The Marketing strategy 2.4. Marketing mix 2.5. Nature and Content of the Marketing plan 3 – The Market 3.1. The market concept 3.2. The Market studies 3.3. The Competition 3.4. The Consumers Behavior 3.5. The Segmentation and the Positioning 4 - Distribution 4.1 Distribution Functions 4.2 Organization Forms of the distribution channels 4.3 Evaluation and selection of a distribution channel 4.4. Conflicts between producers and deliverers and the marketing politics of the deliverers 4.5 The sales force 5 – Price 5.1 Price Functions 5.2 Methods of price determination 5.3 The price decisions 6 - Product 6.1 Product price 6.2 The product cycle of life 6.3 I&D of new Product-mix 6.4 Marketing 6.5 Packaging 6.6 Associate Services 7 - Communication 7.1 Concept and functions of Communication 7.2 Communication - Mix 7.2.1. Advertising 7.2.2. Sales Promotion and Merchandising 7.2.3. Public relations 7.2.4. The sales Force 7. Sponsorship and Patronage

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Wine and Olive Oil Technology (FIT12244L)

Grape maturation. Chemical composition of grapes and wines. Wine technologies, red, white and rose wines. Corrections to be made in grape must and wine. Alcoholic and malolactic fermentation. Clarification and stabilization of wines. Wine aging. The use of wood and barrels in enology. Chemical analysis in grapes and wines.

Perspectives of olive tree and olive oil production. The influence of agronomic techniques in olive oil quality. Olive and olive oil composition. Technical aspects of olive oil production. Effluent treatment. Classification and sensorial and nutritional characteristics of virgin olive oil. Technology of olive-pomace oil and refined olive oil production. Technology of olives for human consumption.

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Biofuels (QUI12245L)

Energy consumption;
Biomass as energy source;
Physics conversion process;
Thermo conversion: combustion;
Thermo conversion: pyrolysis and liquefaction;
Thermo conversion: gasification;
Oxygenated liquids Combustive synthetics;
Microbial conversion
Biogas;
Biodiesel.

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Chemistry of Natural Systems (QUI11982L)

Chemistry of atmosphere – Chemical composition, structure and function; chemical reactions and photochemistry reactions; anthropogenic action and its effects; air quality.
Chemistry of water – physical and chemical properties of water; sources of water; water quality control; chemical equilibria in natural waters; atmosphere – water – sediments interaction; water quality modelling.
Chemistry of soil – Geochemistry of surface; soil composition; plants growth and trace elements; soil pollution.



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Chemistry Applied to Heritage (QUI11980L)

Introduction and background (Art and Heritage, Conservation and the Charter of Venice, Heritage Science vs Heritage and Science). Color: physical, chemical and physiological properties. Pigments: history of its use, physical and chemical properties. Binders, varnishes, consolidants and glues. Easel painting - production techniques and conservation. Mortar and stone materials - classification, pathologies and conservation. Metals - classification, corrosion and conservation. Glass and ceramics - classification, production, pathologies and conservation. Textile and dyes – classification and conservation. Documents - classification, pathologies and conservation. Photography - chemistry of photographic processes, pathologies and conservation. Techniques of physical and chemical analysis of cultural and artistic artifacts - area exams, in-situ analytical techniques, microanalysis techniques

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Forensic Chemistry (QUI11983L)

The crime scene.
Collection and handling of evidence.
Analysis of drugs.
Analysis of traces of fuel in arson.
Analysis and processing of fingerprints.
DNA analysis.
Fiber analysis.
Analysis of firing of firearms.
Analysis of traces of paint.
Analysis of explosives.

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Chemistry of Materials (QUI11981L)

1: Introduction to Polymers. 2: Polymer Molecular Structure. 3: Polymerisation Mechanisms. 4: Polymer Properties. 5: Liquid Crystals. 6: Polymer Processing. 7: Elastomers and Gels. 8: Network Polymers. 9: Natural Polymers. 10: Sol-Gel Syntheses. 11: Inorganic Gels. 12: Characterisation Techniques. 13: Biomaterials. 14: Other new Materials.
+ 14 practical and problems classes.

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Project/Internship in Biotechnology (QUI12255L)

Theme to choose in the area of Biotechnology (BIOQ/Quim/EQ/CB).
It consist in an individual project.



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Water Treatment and Wastewater (QUI11979L)

1. Introduction to the management of water supply systems.
 - 1.1 Water supply systems.
2. Qualitative and quantitative characterization of water.
 - 2.1 Physical parameters, chemical, microbiological and others.
 - 2.2 Treatment of water for human consumption.
3. National and European legislation applicable.
4. Quantitative and qualitative characterization of effluents.
 - 4.1 Loads pollutants typical in municipal wastewater
 - 4.1.1 Organic matter and solids
 - 4.1.2 Nitrogen and phosphorus
 - 4.1.3 Metals
 - 4.1.4 Pathogenic Microorganisms
 - 4.1.5 Emerging Pollutants
5. Revision of concepts
 - 5.1 Suspended solids, dissolved, fixed and volatile
 - 5.2 Chemical Oxygen Demand (COD)
 - 5.3 Biochemical Oxygen Demand (BOD)
 - 5.4 Total Organic Carbon (TOC)
6. Broad outline of the biological treatment of an effluent
7. Treatment systems. Activated sludge processes
8. Removal of nutrients.
 - 8.1 Nitrogen;
 - 8.2 Phosphorous;
9. Removal of xenobiotic compounds
10. Case studies

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Plant Biotechnology (FIT12241L)

- Plant Biotechnology: Theoretical definition, main proposes and basic concepts.
- Laboratory infrastructures and equipment: Special details of a plant biotechnology laboratory; Main equipment and its use.
- In vitro culture techniques: Micropropagation; Haploidization; Somatic Embryogenesis; Suspension Cells Culture; Protoplast Culture.
- Genetic Transformation: Genetically Modified Organisms; Notion of genetically modified organism; Gene transfer methods; Selection of transformed plants; Stability of the transferred gene; Ethical aspects of the recombinant DNA technique.
- Genetic and Molecular Markers; Kinds of markers and its use; Singularity of the DNA-markers.

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Bioethics (FIL0637L)