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 Biochemical 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 Biochemical Engineering	6	Semester	156
QUI12254L	Fermentation Technology	Chemical and Biochemical 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 Biochemical 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 Biochemical 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 Biochemical 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/Engenharia Química e Bioquímica ***	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 Biochemical 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 Biochemical 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 de 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

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Program Contents

Back

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.

Back

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.

Back

Mathematics I (MAT0933L)

1. Topological concepts in R
2. Differential calculus in R

Derivative at a point and physical interpretation. Rules of derivation. Rolle, Lagrange and Cauchy Theorems. Cauchy and L'Hôpital Rules. Monotonicity, concavity and asymptotes

3. Primitives

Primitives. Primitives by parts and by substitution. Primitives of rational functions

4. Integration

Integral of Darboux and Riemann. Properties of the integral. The mean value theorem, fundamental theorem of calculus and formula Barrow. Integration by parts and substitution.

5. Applications of integral calculus

Areas. Length of a line. Volumes and areas of solids of revolution.

6. Improper integrals

Convergence theorems. Absolute Convergence

7. Numerical series

Geometric series and Mengoli series. Nonnegative real series. Alternating series. Absolute convergence

8. Power series

Definitions. Taylor and Mac-Laurin series

9. ODE

Homogeneous non-homogeneous linear ODE of order n. Applications

Back

Lab Techniques and Methods I (QUI11459L)

- Solutions.
- Laboratory Regulations and Safety Procedures.
- Experimental Planning and Production of Reports and Scientific Posters.
- Information Sources.
- Laboratory Techniques and Unit Operations.
- Volumetric Analysis.
- Distillation.
- Sampling.
- Samples preparation.
- Introduction to Chromatography.
- Thin Layer Chromatography and column chromatography.
- High performance liquid chromatography.
- Gas chromatography.

Back

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

Back

Physical Chemistry I (QUI1084L)

The properties of gases: the perfect gas, real gases, equations of state, the principle of corresponding states.
Key concepts in thermodynamics. First law of thermodynamics. Thermochemistry.
Spontaneous change and entropy. The second law of thermodynamics. Gibbs energy. Maxwell equations. Chemical potential. Fugacity. Phase transitions and phase diagram of pure substances.
The properties of mixtures: ideal and real mixtures, the activity, colligative properties, phase diagrams of mixtures.
Application to chemical equilibria. Relationship between the equilibrium composition and the thermodynamic functions. The response of equilibria to the conditions.
Equilibrium electrochemistry. Ionic activities. Debye-Huckel law. Half-reactions and electrodes. The Nernst equation. Standard potentials. Solubility constants.

Back

Organic Chemistry I (QUI1096L)

Classification and nomenclature of organic compounds. The chemical bond in organic molecules. Drawing molecules. Constitutional isomers. Stereoisomers and conformational analysis. Electronic structure of organic molecules. Reactivity of organic molecules. Nucleophilic substitution at saturated carbon. Elimination reactions. Electrophilic addition to alkenes. Electrophilic aromatic substitution reactions.
Accomplishment of laboratory experiments for the application of fundamental techniques of synthesis, extraction, isolation and identification of organic compounds.

Back

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. Biodistribuition of inorganic elements and interaction with biomolecules and specific function in the life.

Back

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 caracteristic polynomial. Algebraic and geometric multiplicities. Inverse matrix calculation. Matrix diagonalization.

II – Differential Calculus in ℝn
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.

Back

Lab Techniques and Methods II (QUI11464L)

Experimental error. Introduction to statistics and calibration methods. Fundamentals of spectrometric methods. Molecular spectroscopy: an introduction to ultraviolet/visible molecular absorption spectrometry, molecular luminescence spectrometry, infrared spectrometry. Applications. Equipments. Atomic spectroscopy. An introduction to optical atomic spectrometry, atomic absorption spectrometry and atomic emission spectrometry. Applications and equipment.
Fundamentals of electroanalytical chemistry. Different types of electrodes: reference, indicator, working electrodes. Potentiometry, condutimetry, coulometry, voltammetry. Applications.

Back

Biochemistry (QUI0348L)

Introduction to the metabolism. Metabolic pathways and their control. Clinical correlations.
Oxidative metabolism. Tricarboxylic acids cycle. Electron transport chain and oxidative phosphorylation.
Carbohydrates metabolism and their control: glycolysis. gluconeogenesis; glicogenolysis and glycogenesis; pentose phosphate pathways. Pyruvic acid degradation pathways.
Photosynthesis and photorespiration.
Lipids metabolism and their control: ?-oxidation and bio-synthesis of fatty acids; Ketone bodies; prostaglandins, thromboxanes and leukotrienes; phospholipids; sphingolipids; cholesterol; plasma lipoproteins.
Aminoacids and Proteins metabolism and their control. Purine and pirimidine metabolism. Iron and heme metabolism.
Fundamentals of genetic information and expression. Acid nucleic biosynthesis. Transcription. Proteins biosynthesis.
Integration of metabolism. Metabolic interrelationship.
Biochemistry of hormones. Metabolic regulation

Back

Microbiology (BIO0408L)

Theoretical:

1. Historical context and Ubiquity
2. Diversity of the Microbial World
3. Microbial Growth and Death
4. Metabolism
5. Basics of Molecular Microbiology: Microbial genetics, Virology, Immunology
6. Microbes and disease; Normal flora, Pathology, infection and disease, Mechanisms of pathogenicity, Principles of epidemiology
7. Food microbiology: Hygiene and concept of indicator. Processing and storage of food.

Foodborne diseases

8. Ecology and environmental microbiology: Soil and water, Biogeochemical cycles, Agricultural applications, Wastewater treatment, Biotechnology applications

Lab Practice:

Aseptic practice

Observation of bacteria, fungi and protists.

Demonstration of Ubiquity

Preparation and sterilization of culture media.

Isolation of pure culture.

Colonial and cellular morphology. Gram Staining

Microbial counts

Environmental conditions for growth (pH, temp., O2)

Anaerobic Culture

Antibiograms

Genetics (BIO11465L)

Part I. Basic concepts
Chapter 1 Genetic material
Gene, chromosome, mutation
Chapter 2 Meiosis
Mendel?s work with pea
Chromosome linkage
Tetrad analysis
Heterosomes
Cytoplasmic inheritance
Chapter 3 Phenotype
Dominance types
Interactions between non-alleles
Maternal effect
Developmental genetics
Chapter 4 Populations
Gene frequencies
Concept of equilibrium
Evolution forces

Part II. Chromosomes
Chapter 5 Karyotypes
Ploidies
Variations in number
Variations in structure
Infertilities
Chapter 6 Maps
Diploids, haploids, prokaryotes
Genomics

Part III. Genetic analysis
Chapter 7 Mendelian analysis
Study of proportions
Pedigrees
Chi-square test
Chapter 8 Quantitative traits
Polygenes
Components of phenotypic variation
Heritability, artificial selection
QTLs
Part IV: Genetics and Evolution
Chapter 9 Evolution
Polymorphisms
Geographic variation
Speciation
Phylogenies

Back

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.

Back

Cell Biology (BIO10917L)

Methods and Techniques used in cell study. Biomolecules. Origin of life. Cells: paradigms and diversity. Cellular organization: cell membrane; membrane-bound organelles; semi-autonomous organelles; cytosol and its inclusions. Cytoskeleton. Extracellular structures: cell wall, extracellular matrix. Transmembrane transport and metabolism: Functional order. Energy: thermodynamics in the cell; redox reactions; energy conversion. Information: genomic information; intercellular and intracellular communication; cell recognition. Cell Reproduction: Mitosis; mitotic chromosomes; the mitotic cycle. Meiosis. Cell proliferation and differentiation: growth factors; mechanisms of differentiation. Cell death (apoptosis). Applications of cell biology.

Back

Microbial Biochemistry (QUI0350L)

Introduction to the Microbial Biochemistry. General aspects of microorganisms. Value-added compounds, obtained from microbial cultures. Importance of microorganisms metabolic diversity. Microorganisms with biotechnological applications. Biochemistry, morphologic and genetic variations.

Nutrition, metabolism and biosynthesis of microorganisms. Principles of microbial metabolism. Cellular transport of nutrients. Metabolic strategies. Respiration and fermentation.

Physiology of cell growth. Batch, continuous and semi-continuous culture. Comparison of different types of culture. Primary and secondary metabolites.

Applications of biomass conversion. Development of new products- Fermentation Biotechnology.

Practical applications: Microbial growth in batch culture: experimental determination of specific growth rates and substrate utilization rates. Study of physiological effects. Product recovery: separation and rupture of cells.

Back

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

Back

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 Phytorhomones;
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.

Back

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.

Back

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. Dyalisis. Reverse osmosis. Ultrafiltration. Microfiltration. Electrdyalisis. Crystalization: principles. Nucleation and growth of crystals. Batch crystalization. Protein crystalization processes. Design and scale−up of crystalysers.

Back

Genetic Engineering and Biotechnology (BIO12239L)

Theoretical programme

1. Introduction
2. Fundaments 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

Back

Enzymes Technology (QUI12253L)

Enzymes properties and kinetics (revision).
Enzyme production: Sources of enzymes; advantages and disadvantages of enzyme production and extraction from microbial strains, plants and animals. Factors affecting enzyme production from microbial sources. Optimization of enzyme production from microbial sources. Enzyme production by fermentation. Submerged and solid state fermentations. Extraction and purification of enzymes. Downstream processing. Removal of cells, purification and final isolation. Chromatographic techniques: Affinity, immunoaffinity, ion-exchange, hydrophobic interaction, gel filtration and immobilized metal affinity chromatography (IMAC).
Chemical modification of proteins. Protein engineering: site−directed mutagenesis of enzyme gene and overproduction of transformed enzymes.
Immobilization of biocatalysts. Methods of immobilization and types of supports for immobilization. Advantages and disadvantages of immobilized enzymes and cells.
Reactors for immobilized and free biocatalysts
Biocatalysis in organic and aqueous solvents. Industrial applications of free and immobilized biocatalysts.

Back

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

Back

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

Back

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

Back

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"

Back

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).

Back

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.

Back

Marketing (GES0792L)

1 - Introduction
1.1. the evolution of the marketing concept
1.2. the role of marketing in organisations strategic planning
2 - Marketing Strategy
2.1. Strategic Planning Stages
2.2. Internal and External Analysis
2.3. Environment, Market and Competition analysis
2.4 SWOT Analysis
3 - Consumer Behaviour
3.1. The buying decision process
3.2. Influences to buying decision process
4 - Segmentation, positioning and brands
4.1. Segmentation process and strategies
4.2. Positioning the offer
4.3. Defining the competition
4.3. Branding
5 - Product
5.1. Product Mix management
5.2. Innovation
6 - Price
6.1. Price determination
6.2. Price Strategies
7 - Place
7.1. Distribution channels
7.2. Distribution circuits definition
8 - Communication
8.1.Comunication mix
8.2. Advertising
8.3. Public relations, sponsorship and patronage
8.4. New tools for marketing communication

Back

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.

Back

Biofuels (QUI12245L)

Energy consume;
Biomass as energy font;
Physics conversion process;
Thermo conversion: combustion;
Thermo conversion: pyrolysis and liquefaction;
Thermo conversion: gasification;
Oxygenates liquids Combustive synthetics;
Microbial conversion
Biogas;
Biodiesel.

Back

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 equilibriums 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.

Back

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 exames, in-situ analytical techniques, microanalysis techniques

Back

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.

Back

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.

Back

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)

1 – Introduction to Bioethics. The relations between Ethics, Moral and Bioethics. Free will as condition of possibility of any Bioethics project. Introduction to a History of Ethics. From Biology to Philosophy: the limits between animal and human. Bioethics and Epistemology.
2 – Bioethics, Deontology and Professional Activities: Teaching, Researching, Paramedical Activities.
3 – Some Contemporary Bioethical Problems: abortion, cloning, euthanasia, animal rights.