Study Plan

School: School of Sciences and Technology
Degree: Bachelor
Course: Biotechnology (cód. 729)

1st Semester - 1st Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
BIO13568L	Cell Biology	Biological Sciences	6	Semester	156
QUI13539L	Principles and Methods of Chemistry	Chemistry	6	Semester	156
MAT11960L	Mathematics I	Mathematics	6	Semester	156
QUI13536L	Laboratory Techniques I	Chemistry	3	Semester	78
FIS13595L	PHYSICS 1	Physics	6	Semester	156
QUI13555L	Data Processing in Biotecnology	Chemistry	3	Semester	78

1st Semester - 2nd Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI01084L	Physical Chemistry I	Chemistry	6	Semester	156
QUI13564L	Organic Chemistry	Chemistry	6	Semester	156
QUI13548L	Principles and Methods of Biochemistry	Biochemistry	6	Semester	156
MAT12237L	Mathematics II	Mathematics	6	Semester	156
QUI13559L	Laboratory Techniques II	Chemistry	3	Semester	78
FIL00637L	Bioethics	Philosophy	3	Semester	78

2nd Year - 3rd Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
MAT11959L	Biostatistics with Computer Software	Mathematics	6	Semester	156
QUI00348L	Biochemistry	Biochemistry	6	Semester	156
BIO13651L	Genetics	Biological Sciences	6	Semester	156
BIO00408L	Microbiology	Biological Sciences	6	Semester	156
QUI13624L	Fundaments of Biologic Engineering	Biochemistry Chemistry	6	Semester	156

2nd Year - 4th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI00350L	Microbial Biochemistry	Biochemistry	6	Semester	156

2nd Year - 4th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
FIT13557L	Plant Biotechnology	Agronomy	6	Semester	156
BIO12412L	Molecular Biology	Biological Sciences	6	Semester	156
QUI13629L	Separation Processes in Biochemistry and Biotechnology	Biochemistry Chemistry	6	Semester	156
QUI13605L	Water and wastewater treatment	Biochemistry Chemistry	6	Semester	156

3rd Year - 5th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
CMS12239L	Genetic Engineering and Biotechnology	Biological Sciences	6	Semester	156
QUI13614L	Enzyme Technology	Biochemistry	6	Semester	156
QUI13628L	Fermentation Technology	Biochemistry	6	Semester	156
QUI13562L	Organic Chemistry applied to Biochemistry	Chemistry	3	Semester	78
QUI13648L	* Internship in Biotechnology	Biochemistry Biological Sciences Chemistry	18	Semester	468

Options

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
CMS12243L	Bromatology and Nutrition	Biochemistry	6	Semester	156
INF11968L	Introduction to Programming	Informatics	6	Semester	156
CMS11481L	Biotechnological Medicines	Biological Sciences	6	Semester	156
QUI11980L	Chemistry Applied to Heritage	Chemistry	6	Semester	156
QUI11983L	Forensic Chemistry	Chemistry	6	Semester	156
QUI13556L	Chemistry of Natural Systems	Chemistry	6	Semester	156
ZOO12381L	Technological Processes and Food Quality	Agricultural and Food Engineering	6	Semester	156
FIT12244L	Wine and Olive Oil Technology	Agronomy	6	Semester	156
BIO12418L	Virology	Biological Sciences	6	Semester	156
QUI13630L	Biofuels	Biochemistry Chemistry	3	Semester	78
QUI11483L	Introduction to Clinical Biochemistry	Biochemistry	3	Semester	78
CMS13653L	Animal Cell and Tissue Culture Technology	Biochemistry	3	Semester	78
Free option					

3rd Year - 6th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI13648L	Internship in Biotechnology	Biochemistry Biological Sciences Chemistry	18	Semester	468

Options

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
CMS12243L	Bromatology and Nutrition	Biochemistry	6	Semester	156
INF11968L	Introduction to Programming	Informatics	6	Semester	156
CMS11481L	Biotechnological Medicines	Biological Sciences	6	Semester	156
QUI11980L	Chemistry Applied to Heritage	Chemistry	6	Semester	156
QUI11983L	Forensic Chemistry	Chemistry	6	Semester	156
QUI13556L	Chemistry of Natural Systems	Chemistry	6	Semester	156
ZOO12381L	Technological Processes and Food Quality	Agricultural and Food Engineering	6	Semester	156
FIT12244L	Wine and Olive Oil Technology	Agronomy	6	Semester	156
BIO12418L	Virology	Biological Sciences	6	Semester	156
QUI13630L	Biofuels	Biochemistry Chemistry	3	Semester	78
QUI11483L	Introduction to Clinical Biochemistry	Biochemistry	3	Semester	78
CMS13653L	Animal Cell and Tissue Culture Technology	Biochemistry	3	Semester	78
Free option					

Conditions for obtaining the Degree:

*** TRANSLATE ME: Para obtenção do grau de licenciado em Biotecnologia é necessário obter aprovação a 159 ECTS em unidades de curriculares obrigatórias e 21 ECTS em unidades curriculares optativas distribuídas da seguinte forma:

1º Ano

1º Semestre:

6 UC Obrigatórias num total de 30 ECTS

2º Semestre

6 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

UC Optativas num total de 21 ECTS conforme quadro de optativas, podendo frequentar optativas livres até ao limite máximo de 6 ECTS

5º Semestre

4 UC Obrigatórias num total de 21 ECTS

6º Semestre

1 UC Obrigatória num total de 18 ECTS

***

Program Contents

Back

Cell Biology (BIO13568L)

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

Principles and Methods of Chemistry (QUI13539L)

Atomic theory. Atomic models. Quantum theory and electronic structure of atoms. Periodic relations between the elements. Basic concepts of chemical bonding. Ionic bonding. Fajans rules. Covalent bonding (Lewis structures, Valence Shell Electron Pair Repulsion model, Valence Bond theory, Molecular Orbital 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 (MAT11960L)

1. Topological concepts in IR
2. Differential calculus in IR: Derivative at a point and physical interpretation. Rules of derivation. Rolle, Lagrange and Cauchy Theorems. L'Hôpital and Cauchy 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 fundamental theorem of calculus and Barrow's formula. 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 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

Laboratory Techniques I (QUI13536L)

- Solutions.
- Laboratory Regulations and Safety Procedures.
- Classification and Labelling of Chemicals (GHS and CLP)
- Principles of Good Laboratory Practice (GLP)
- Information Sources.
- Experimental Planning and Production of Reports and Scientific Posters.
- Laboratory Techniques and Unit Operations.
- Volumetric Analysis.
- Distillation.
- Extraction
- Introduction to Chromatography:
- Thin Layer Chromatography and column chromatography.
- High performance liquid chromatography.
- Gas chromatography

Back

PHYSICS 1 (FIS13595L)

I. Mechanics
- The scientific method. Measurements, units, and dimensions.
- Kinematics and dynamics of mass points. Newton's laws and its applications.
- Work and energy. Collisions and momentum. Conservation laws.
- Systems of many particles. The rigid body. Angular momentum.

II. Electromagnetism
- Electrostatics. Electric charges and forces.
- Electric potential. Capacity and capacitors.
- Electric current. Kirchhoff's rules. RC circuits.
- Reference to Maxwell's equations and electromagnetic waves.

III. Optics
- The nature of light. Geometric optics. Image formation by mirrors and lenses.
- Lasers

IV. The nucleus, nuclear reactions and radioactivity.

Back

Data Processing in Biotecnology (QUI13555L)

The use of computers in science, applied to the chemical and biotechnological processes.
Conventional methods for data processing.
Visualization and description of data.
Unconventional methods for data processing (models inspired by nature and their applications, introduction to intelligent systems, applications to biotechnological processes).
Computer simulation of biotechnological processes.

Back

Physical Chemistry I (QUI01084L)

Back

Organic Chemistry (QUI13564L)

The chemical bond in organic molecules. Classification and nomenclature of organic compounds. Representation of organic molecules. Fischer, perspective and Newman projections. Stereoisomerism and conformations. Electronic structure of molecules. Reactivity of organic molecules. Radical substitution reactions, nucleophilic substitution at saturated and unsaturated carbon, electrophilic aromatic substitution, radical addition, nucleophilic addition, electrophilic addition and elimination. Brief notions about polymerization and transposition reactions. Realization of practical laboratory classes for the application of fundamental techniques of synthesis, extraction, isolation and identification of organic compounds, namely: Synthesis of t-butyl chloride (SN2), Synthesis of cyclohexene by dehydration of an alcohol (E1) and Synthesis of 4-bromoanilline (synthetic strategy). Standard laboratory equipment, Nuclear Magnetic Resonance Spectrometer and Infrared Spectrometer (FTIR).

Back

Principles and Methods of Biochemistry (QUI13548L)

Biochemistry: An Introduction. Methodology and technical approaches used in Biochemistry.
Water and biological systems. Functional characteristics of biomolecules. Carbohydrates: Mono and Polysaccharides. Amino acids, peptides and proteins. Nucleotides and nucleic acids. Lipids and lipoproteins. Structure and properties of biomembranes. Enzymes and enzymatic kinetic. Introduction to bioenergetics and bioelectrochemistry. The role of ATP in metabolic processes. Introduction to the metabolism and to major metabolic pathways.

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

Laboratory Techniques II (QUI13559L)

Fundamentals of spectrometric methods. Molecular spectroscopy: an introduction to ultraviolet/visible molecular absorption spectrometry and molecular luminescence spectrometry. Applications. Equipment. Atomic spectroscopy. An introduction to optical atomic spectrometry, atomic absorption spectrometry and atomic emission spectrometry. Applications and equipment.
Electrochemical methods of analysis: fundamentals and applications. Instrumentation and types of electrodes used in conductometric and potentiometric methods: conductivity, reference and indicator electrodes. Conductometry and conductometric titrations. Potentiometric methods (selective electrodes and measurements, in particular, pH electrode and other ion (e.g., ammonium ion) selective electrode and respective measurements). Calibration methods for quantitative analysis.

Back

Bioethics (FIL00637L)

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.

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

Biochemistry (QUI00348L)

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)

Genetics (BIO13651L)

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

Microbiology (BIO00408L)

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. Staining methods
Microbial counts
Environmental conditions for growth (pH, temp., O2)
Anaerobic Culture
Antibiograms
Microbial spreading simulation
Water and milk analises
Plant symbiosis.

Back

Fundaments of Biologic Engineering (QUI13624L)

Material and 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. 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.

Back

Microbial Biochemistry (QUI00350L)

Back

Plant Biotechnology (FIT13557L)

- 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.

Back

Molecular Biology (BIO12412L)

Theoretical

Part I. DNA, GENES and GENOMES.

1. Genes and Chromosomes;
2. DNA replication;
3. Recombination and transposition;
4. Mutation and repair;
5. Transcription;
6. Translation;
7. Regulation of gene expression;

Part II. TECHNIQUES AND APPLICATIONS.

8. Analytical methods, preparations and techniques in molecular biology;
9. Applications in genetic engineering;
10. Advances in Molecular Biology.

Practical and Laboratory.

1. Comparative Genomics;
3. Main methods of DNA extraction;
4. DNA amplification by PCR;
5. Electrophoresis and Hybridization;
6. Purification of PCR products;
7. Restriction enzyme digestion;
8. DNA cloning;
9. DNA sequencing;
10. Gene Deletion: Applications.

Back

Separation Processes in Biochemistry and Biotechnology (QUI13629L)

Types of separation processes for biological products. 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. Drying: fundamentals. Heat and mass transport in drying of solids. Psychrometry. Types of dryers. Dryer design. Freeze drying. Membrane processes. Materials used in membranes. Types of membranes and modules. Mass transport in membranes. Dialysis. Reverse osmosis. Ultrafiltration. Microfiltration. Electrodyalisis. Crystalization: principles. Protein crystallization. Design and scale-up of batch crystalysers. Cell lysis and flocculation. Chemical and mechanical methods. Flocculation using electrolytes and polymers.

Back

Water and wastewater treatment (QUI13605L)

Introduction to the management of water supply systems.
Quantitative and qualitative characterization of waters. Physical, chemical, microbiological and other parameters;
Water treatment for human consumption: main operations and treatment processes. Filtration, coagulation / flocculation, sedimentation, disinfection. Applicable National and European Legislation;
Wastewater typology. Definition of treatment regimen: coagulation / flocculation; sedimentation; biological treatment; nutrient removal; disinfection. Conventional biological treatment processes: aerobic, anoxic or anaerobic, with suspended or fixed biomass. Wastewater reuse;
Biosolids treatment, reuse and final disposal. Incineration, composting, anaerobic digestion, agricultural use;
Ecotechnologies for biological treatment: lagoonage, constructed wetlands, phyto-WWTP.

Back

Genetic Engineering and Biotechnology (CMS12239L)

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

Enzyme Technology (QUI13614L)

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. 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. Advantages and disadvantages of immobilized enzymes and cells.
Reactors for immobilized and free biocatalysts. Industrial applications of biocatalysts.

Back

Fermentation Technology (QUI13628L)

. 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

Organic Chemistry applied to Biochemistry (QUI13562L)

Secondary metabolites:
- Classification;
- Biological activity.
Derivatization reactions of secondary metabolites.
Separation and isolation techniques of secondary metabolites and their derivatives:
- Chromatography;
- Stationary phases, elution systems and detection modes.
Spectroscopic and spectrometric techniques for structural analysis of organic compounds:
Separation techniques and isolation of organic compounds:
Column chromatography, HPLC and GC.
Stationary phases, eluents and detection methods.
Spectroscopic and spectrometric techniques for structural analysis of organic compounds:
One and two-dimensional of spectrometric techniques of NMR (1H, 13C, DEPT, COSY, HMBC, HMQC, INADEQUATE, NOESY, TOCSY,...).
NMR spectrometry of other important nuclei (15N, 19F, 31P and 29Si).
Infrared spectrometry (FT-IR).
Mass spectrometry.

Back

Internship in Biotechnology (QUI13648L)

Students will develop the work on a topic of their choice in the area of Biotechnology (BIOQ / QUI / CBIO) previously proposed by the several teachers of the study cycle and coordinated by the jury of the Curricular Unit.
The content varies according to the work plan selected by each student, who student must do an individual scientific work and present and defend a final report.

Back

Bromatology and Nutrition (CMS12243L)

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

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

Biotechnological Medicines (CMS11481L)

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

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 Natural Systems (QUI13556L)

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

Technological Processes and Food Quality (ZOO12381L)

Quality: The quality models. The Food Quality. Implementation of a TQM. EEC regulation of food industry (animal products). The sensory requirements of food quality.
HACCP -Definition, Objectives. Principles of HACCP. Stages of the implementation of HACCP. Analysis of the implementation of a HACCP system in a food business. Applicable regulation
Microbial growth. Hygiene in food industry - Food Hygiene. All-purpose and specific hygiene. Applicable regulation (legal controls); Cleaning and disinfection. General Settings. Cleaning and Disinfection (essentials and selection and characteristics of the cleaning and disinfection agent).
Classification of Unit Operations-unit operations according to the objective and the transfer phenomena. Heat treatment of food; Application of the food-cold refrigeration and freezing food.; technological processes and quality control through the whole fresh meat, processed products, fish, eggs, and milk and dairy products chain.

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

Virology (BIO12418L)

Theoretical Programme
1. Introduction and functioning of the course
2. General and Molecular Virology
3. Taxonomy and Sistematics
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

Biofuels (QUI13630L)

1. Biofuels in the European Union
2. The importance and potentiality of biomass.
3. Biofuels and fossil fuels.
4. Biofuel feedstocks: biomass.
5. First generation biofuels: bioethanol, biodiesel, biomethane and biohydrogen.
6. Second and third generation biofuels: chemical / thermochemical synthesis (Fischer-Tropsch, gasification and pyrolysis of biomass).
7. Biorefinery concept.

Back

Introduction to Clinical Biochemistry (QUI11483L)

Basic concepts in Clinical Biochemistry. The problematic of a Clinical Biochemistry Lab. Quality management. Biological specimens. Collection and handling of biological samples. Quality control. Techniques and methods of analysis used individually or in automatic analyzers. Reference values and their clinical significance.
Main biochemical markers used in diagnosis and monitoring of these diseases. Plasmatic proteins.Water and electrolytes balance. Disorders of renal and liver function. Main serum biochemical markers on diagnosis and monitoring of hepatic disease, acute myocardial infarction and pancreatic. Plasmatic lipoproteins metabolism, metabolic disorders and risk factor for cardiovascular diseases.

Back

Animal Cell and Tissue Culture Technology (CMS13653L)

Cell culture: advantages and limitations.
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).