Study Plan

School: School of Sciences and Technology
Degree: Bachelor
Course: Biochemistry (cód. 644)

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
MAT11960L	Mathematics I	Mathematics	6	Semester	156
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
QUI01084L	Physical Chemistry I	Chemistry	6	Semester	156
QUI11962L	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
QUI00344L	Biochemical Analysis I	Biochemistry	6	Semester	156
QUI12394L	Physical Biochemistry	Biochemistry	6	Semester	156
BIO00408L	Microbiology	Biological Sciences	6	Semester	156
QUI00348L	Biochemistry	Biochemistry	6	Semester	156
BIO10917L	Cell Biology	Biological Sciences	6	Semester	156

2nd Year - 4th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI12395L	Biochemical Analysis II	Biochemistry	6	Semester	156
QUI00350L	Microbial Biochemistry	Biochemistry	6	Semester	156
QUI12396L	Enzymology	Biochemistry	6	Semester	156

2nd Year - 4th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI00347L	Biomembranes	Biochemistry	6	Semester	156
QUI01080L	Chemistry of Natural Products	Chemistry	3	Semester	78
QUI12397L	Organic Chemistry II A	Chemistry	3	Semester	78

3rd Year - 5th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI12253L	Enzymes Technology	Chemical and Biochemical Engineering	6	Semester	156
BIO12411L	Animal Physiology	Biological Sciences	6	Semester	156
QUI12398L	Biochemistry of Nucleic Acids	Biochemistry	3	Semester	78
QUI12399L	Nucleic Acids Biochemistry Lab	Biochemistry	6	Semester	156

3rd Year - 5th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
Options I/II					

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI12402L	Inorganic Biochemistry	Biochemistry	3	Semester	78
QUI11482L	Cell Biophysics	Biochemistry	6	Semester	156
QUI11483L	Introduction to Clinical Biochemistry	Biochemistry	3	Semester	78
QUI12403L	Pharmacognosy	Biochemistry	6	Semester	156
CMS12243L	Bromatology and Nutrition	Biochemistry	6	Semester	156
QUI12254L	Fermentation Technology	Chemical and Biochemical Engineering	6	Semester	156
QUI12404L	Chemistry of Natural Waters	Chemistry	6	Semester	156
QUI11983L	Forensic Chemistry	Chemistry	6	Semester	156
QUI11980L	Chemistry Applied to Heritage	Chemistry	6	Semester	156
BIO11471L	Immunology	Biological Sciences	6	Semester	156
BIO12405L	Human Genetics	Biological Sciences	3	Semester	78
BIO11480L	Virology	Biological Sciences	6	Semester	156
CMS12242L	Techniques of Animal Tissue Culture	Chemical and Biochemical Engineering	3	Semester	78
GES02310L	Entrepreneurship and Innovation	Management	6	Semester	156
INF11968L	Introduction to Programming	Informatics	6	Semester	156
FIL00637L	Bioethics	Philosophy	3	Semester	78
LLT02285L	Foreign Language - English	Languages and Literature	3	Semester	78
Free Option					

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

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI12401L	* Learning in Work Context	Biochemistry	15	Semester	390

3rd Year - 6th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI12400L	Biochemical Toxicology	Biochemistry	6	Semester	156
QUI00358L	Metabolism and Energetics	Biochemistry	6	Semester	156
QUI12401L	Learning in Work Context	Biochemistry	15	Semester	390

3rd Year - 6th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
Options I/II					

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI12402L	Inorganic Biochemistry	Biochemistry	3	Semester	78
QUI11482L	Cell Biophysics	Biochemistry	6	Semester	156
QUI11483L	Introduction to Clinical Biochemistry	Biochemistry	3	Semester	78
QUI12403L	Pharmacognosy	Biochemistry	6	Semester	156
CMS12243L	Bromatology and Nutrition	Biochemistry	6	Semester	156
QUI12254L	Fermentation Technology	Chemical and Biochemical Engineering	6	Semester	156
QUI12404L	Chemistry of Natural Waters	Chemistry	6	Semester	156
QUI11983L	Forensic Chemistry	Chemistry	6	Semester	156
QUI11980L	Chemistry Applied to Heritage	Chemistry	6	Semester	156
BIO11471L	Immunology	Biological Sciences	6	Semester	156
BIO12405L	Human Genetics	Biological Sciences	3	Semester	78
BIO11480L	Virology	Biological Sciences	6	Semester	156
CMS12242L	Techniques of Animal Tissue Culture	Chemical and Biochemical Engineering	3	Semester	78
GES02310L	Entrepreneurship and Innovation	Management	6	Semester	156
INF11968L	Introduction to Programming	Informatics	6	Semester	156
FIL00637L	Bioethics	Philosophy	3	Semester	78
LLT02285L	Foreign Language - English	Languages and Literature	3	Semester	78
Free Option					

Conditions for obtaining the Degree:

*** TRANSLATE ME:

Para obtenção do grau de licenciado em Bioquímica é necessário obter aprovação a 168 ECTS em unidades de curriculares obrigatórias e 12 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

6 UC Obrigatórias num total de 30 ECTS

3º Ano

5º Semestre

4 UC Obrigatórias num total de 21 ECTS

UC Optativas plano do curso do Grupo I / II ou optativa livre num total de 9 ECTS

6º Semestre

2 UC Obrigatórias num total de 12 ECTS

Estágio num total de 15 ECTS

UC Optativas plano do curso do Grupo I / II ou optativa livre num total de 3 ECTS

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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 (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

Lab Techniques and Methods I (QUI11459L)

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 (QUI01084L)

Back

Organic Chemistry I (QUI11962L)

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)

Back

Biochemical Analysis I (QUI00344L)

Back

Physical Biochemistry (QUI12394L)

1. Structure of biomacromolecules.
2. Interactions in aqueous medium and in hydrophobic medium.
3. Notions of symmetry.
4. Fundamentals of Statistical Mechanics and Molecular Thermodynamics.
5. Introduction to Molecular Modeling tools.
6. Thermodynamic aspects of solutions of macromolecules.
7. Fundamentals of non-equilibrium thermodynamics.
8. Characterization of sedimentation phenomena, electrophoresis and transport through membranes.

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

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)

Back

Cell Biology (BIO10917L)

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Biochemical Analysis II (QUI12395L)

Fundamentals, instrumentation, practical aspects and applications in Biochemistry of:
i) Vis/UV atomic spectrometry, with particular emphasis on the introduction to inductively coupled plasma spectroscopies (ICP-AES/OES and ICP-MS);
ii) Raman spectroscopies;
iii) Voltammetric and amperometric electrochemical methods;
iv) Electrochemical Biosensors (including the immunosensors);
v) Mass spectrometry and hyphenation to chromatographic analysis methods (GC-MS e LC-MS);
vi) Immunochemistry, production and analytical application of specific antibodies.
vii) Radiochemistry: Equipment, detection of radioactivity by liquid scintillation, applications. Intelligent data analysis: Data Mining applied to biochemistry databases; Treatment and quality of information; Trust score.
Mono and 2D NMR for structural analysis of biomolecules (1H, 13C, DEPT, COSY, HMBC, HMQC, INADEQUATE, NOESY, TOCSY,...); NMR of other important nuclei (15N, 19F, 31P e 29Si).

Back

Microbial Biochemistry (QUI00350L)

Back

Enzymology (QUI12396L)

1. Catalitic activity of proteins and RNA. Terminology. Reaction curves, deviation to linearity, v0, Eact, transition state complex.
2. Continuous and descontinuous assays to v0 determination. Burst and lag phases. Interferences in v0 determination
3. The Henri-Michaelis-Menten equation. Parameters Vmax e Km. Effects of E, T, pH, I A, S. Failure to obey rectangular hyperbola, km and Vmax determination, differents graphics models.
4. Units and specific activity.
5. Mechanisms of enzymatic reaction, reactions of more than one substrate, enzymatic inhibition.
6. Regulation of enzymatic activity. Post-translation modifications. Alostery and cooperativity, mathematics models.
7. Extraction, solubilization and purification of enzymes, homogenization, centrifugation, organics solvents, polymers e chromatographic methods. 8. Physico-chemical characterization of enzymes.

Back

Biomembranes (QUI00347L)

Lecture component

1. Introduction
fi Objectives of this course
fi Biomembranes: I) introduction to its chemical composition, structure and function; II) review of proposed models of biomembranes structure

2. Membrane lipids
fi Phospholipids, glucolipids and cholesterol
fi Lipid compositional changes among tissues
fi Aspects of macromolecular organization of membrane lipids: Monolayers, micelles and liposomes

3. Physical aspects of biomembranes
fi Fluidity and dynamic of biomembranes
fi Electrical properties of biomembranes

4. Biosynthesis of membrane lipids and biomembranes
fi Synthesis, transport e distribution of membrane lipids
fi Synthesis and insertion of protein into biomembranes
fi Association of lipids and proteins in biomembranes: Lipid protein interactions

5. Membrane-bound enzymes
fi Molecular structure of membrane bound enzymes: Peripheral, anchored and transmembrane enzymes
fi Sidedness and topography of membrane enzymes
fi Consequences of membrane biding: Role of lipid protein interaction (lipid annulus); Substrate compartmentalization; Bidimensional diffusion

6. Transmembrane transport
fi Thermodynamic of the do transport: Passive diffusion and primary and secondary transport
fi Kinetic and mechanism of the transport
fi Diversity of transport in bacteria

7. Ionic Transport
fi Ion pumps, exchangers and channels
fi Ionophores: Structure and mechanism of action

8. Ion channels
fi Structure and function
fi Kinetic properties and regulation

9. Electrical properties of biomembranes
fi Membrane potential and electrical activity
fi Electrophysiological methods

10. Signal transduction across biomembranes
fi Receptors for neurotransmitters: Structure and function
fi Receptors for peptide hormones: Structure and function
fi Intracellular messengers in signal transduction:
o G-proteins and Ras proteins
o cAMP and cGMP in signal transduction;
o Phospholipases and phospholipids in signal transduction;
o Membrane associated protein kinases and phosphatases;
o The role of Ca2+
fi Receptors and the intracellular messenger cascades

11. Intracellular vesicular trafficking
fi Membrane transport: Vesicle formation and transport; Vesicle coating and trafficking; Involvement of microtubules
fi Regulated endocytosis

Back

Chemistry of Natural Products (QUI01080L)

Back

Organic Chemistry II A (QUI12397L)

1. Spectrocopic Methods in Organic Chemistry. Nuclear Magnetic Ressonance (NMR) 1H e 13C, Infra-Red spectroscopy, UV/VIS spectroscopy, Mass spectrometry.
2. Carbonyl Compounds. Aldehydes and ketones, Electronic structure. Reactions: Nucleophilic addition reactions, including the aldol and its significance in biosynthesis. β-dicarbonyl and α.β-unsaturated compounds. Acidity, the malonic ester synthesis, acetoacetic acid synthesis, the Claisen condensation and the Michael addition reaction. Carboxylic acids and their derivatives. Synthesis and interconversion between carboxylic acid derivatives.
4. Heterocyclic aromatic compounds. Synthesis and reactivity of pyridines, pyroles, imidazoles, and pyrazoles, their application in medicinal and pharmaceutical chemistry.

Back

Enzymes Technology (QUI12253L)

Back

Animal Physiology (BIO12411L)

1. Definitions and concepts in animal physiology.
2. Neuron physiology.
3. Information flow between neurons (synapses and neural networks).
4. Sensory physiology.
5. Nervous system.
6. Physiology of muscle contraction.
7. Glands and endocrinology.
8. Circulatory system.
9. Gas exchange and acid-base balance.
10. Ionic and osmotic balances.
11. Feeding, digestion, and energy metabolism.

Simulated virtual experiments on the computer to consolidate knowledge on the following topics: neuron physiology (action potential); synaptic transmission at the neuromuscular junction; regulation of the skeletal muscle contraction; neuroendocrine regulation of the mammalian cardiovascular system.

Back

Biochemistry of Nucleic Acids (QUI12398L)

1. Gene concept, housekeeping and inductive genes.
2. Genetic material in eukaryotes, bacteria and viruses. Structure of DNA and RNA.
3. Restriction and modification systems.
4. DNA sequencing.
5. DNA replication, mutation and repair mechanisms.
6. Localizing and specific identification of genes.
7. Detection and amplifying sequences of DNA by PCR.
8. Transcription. RNA processing and maturation. Reverse transcription.
9. Regulation of gene expression.
10. DNA clonning, vectors. DNA and cDNA libraries.
11. Analysis of gene expression by RT-PCR and microarrays.
12. Functional genomic.
13. Aplications of recombinant DNA technology in bacteria, yeasts, plants and animals.
14. Gene therapy.
15. Translation, genetic code. Chaperones and folding.
16. Oncogenes and tumor-supressor genes.
17. Bioinformatics, homologies, ORFs, metabolic pathways, protein sequence and protein localization.

Back

Nucleic Acids Biochemistry Lab (QUI12399L)

1. Extraction of nucleic acids from different biological materials, viral, bacterial and plasmid DNA, nuclear and organelles DNA; RNA and mRNA .
2. Utilization of restriction endonucleases, DNA ligases and DNA polymerases.
3. Restriction maps and DNA sequencing.
4. Polymophisms detection, RFLP, RAPD and microssatelites.
5. DNA Polymerisation chain reaction (PCR), detection and amplifying of specific sequences. Technical modifications of PCR: RT-PCR, quantitative PCR and real-time PCR.
6. DNA clonning, vectors, host cells, construct and analysis of DNA and cDNA libraries.
7. Gene expression, analysis of genetic expression by northern and western blotting and RT-PCR.
8. Clonning and heterologe expression of gene sequences.
9. OGMs and detection of OGMs in food using PCR.
10. DNA technology in industry, medicine, agriculture and research. Ethic and risks.

Back

Inorganic Biochemistry (QUI12402L)

Introduction to Inorganic Biochemistry: scope and importance.
Fundamentals of chemistry applied to biological systems: the importance of water; fundamental concepts of thermochemistry, thermodynamics and kinetics; the elements and formal oxidation states; redox chemistry; coordination geometry and electronic structures of biologically important metal ions; thermodynamic stability, kinetics and mechanisms of reactions involving metal complexes.
Biochemistry of the elements: essential and toxic elements; occurrence in biological systems; chemical environment and/or structure; relation structure-function in vivo.
Metals with non-redox activity: Na, K, Ca, Zn, Cd.
Metals with redox activity: Fe, Mn, Cu, V, Cr, Mo, W, Ni, Co.
The non-metals with non-redox activity: Si, P, B.
The non-metals with redox activity: S, Se, halogens, As.
Brief reference to the elements in medicine: therapeutic and diagnostic applications.

Back

Cell Biophysics (QUI11482L)

1. Water and electrolytes in biology. 2. Permeability diffusion and across biomembranes. 3. Bioelectricity: electrical phenomena in cells; membrane resistance and capacitance; origin of resting membrane potential. Techniques for the study electrical phenomena in biological systems. 4. Ionic transport: pumps, exchangers and ionophores. Thermodynamic of ionic transport. 5. Ionic channels: structure, function and ionic permeation; Patch-clamp technique. 6. Electrogenesis and cellular excitability; 7. Propagation of electrical signals. 9. Sensorial transduction. 10. Anomalies in ionic transport and related pathologies.

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

Pharmacognosy (QUI12403L)

General concepts, historical development of Pharmacognosy and its relationship with other disciplines
Drugs, pharmaca and medicines of natural origin
Products of primary and secondary metabolism, with medicinal or pharmaceutical interest: biogénese, obtaining, conservation and control
Pharmacokinetics principles applied to drugs of natural origin
Mechanisms of action and toxicity of drugs of natural origin
Research of new drugs of natural origin, its efficacy and safety
Some of common therapeutic uses of drugs and drugs of plant origin and their interactions

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

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

Chemistry of Natural Waters (QUI12404L)

Water history, art and culture
The hydrological cycle
Sources of water
National and European regulation of water industry
Drinking water production
Qualitative and quantitative characterization of water
Chemical and physical properties of water
Chemical equilibriums in natural water
Atmosphere – water – sediments interactions
Cycling, regulation and biological role of trace metals
Regulation of chemical composition of natural water
Water quality modelling

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 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

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

Human Genetics (BIO12405L)

Characteristics of nuclear and mitochondrial genomes. Population genetics. Mechanisms of occurrence of mutations and mechanisms for redress. Two genome diseases - mitochondrial citopathology. Complex diseases, degenerative diseases and the example of autism. Chromosomal diseases. Hereditary errors of metabolism of amino acids, lipids and carbohydrates. General notions of Nutrigenomics. The Nutrigenomics and cellular metabolism. Pharmacogenomics. Epigenetics. microRNAs. Gene Therapy. Ethics. Legislation. Genetic Counseling. Theoretical-practical: Case studies. Heredogramas analysis. Genetic databases. Biostatistics applied genetics to the Hardy-Weinberg equilibrium and association studies. Methods of analysis in human genetics. Application of Molecular genetic methods to the study of pathology and validation of pathogenicity of mutations. Methods of large-scale Genomics analysis

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

Techniques of Animal Tissue Culture (CMS12242L)

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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Entrepreneurship and Innovation (GES02310L)

Module 1 – Introduction to Entrepreneurship and Innovation
a. Definitions and concepts of Entrepreneurship
b. Profile and characteristics of entrepreneurs
c. Social entrepreneurship and intrapreneurship
d. What is innovation? Types of innovation
d. Dynamics of innovation

Module 2 – Conception and Structuring business ideas
a. Process and techniques of generating ideas
b. Design Thinking tool
c. Evaluation of business ideas
d. The process of creating a business idea and firm
e. Simulation games- from ideas to business formation

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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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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.

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Foreign Language - English (LLT02285L)

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Learning in Work Context (QUI12401L)

Choosen / offered subject in any area of biochemical sciences. It consist in an individual project. This students to engage in a complete a laboratory research project or a computer based research project or an extended literature review and associated extension exercise

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Biochemical Toxicology (QUI12400L)

History of Toxicology
Dose-response relationships
Factors afffecting toxic responses
Absoption, distribution, excretion, biotransformation and diposition of toxicants
Factors affecting biotransformation and disposition
Toxic responses to foreign compounds
Biochemical mechanisms of toxicity: Tissue lesions, neurotoxicity, immunotoxicity, teratogenesis, genetic toxicity, chemical carcinogenesis and multi-organ toxicity.
Risks to health and environment associate to toxicants, by-products and radiations
Safety in production, packaging, transportation, storage, dispensing and use of toxicants.
Legislation on toxicants in the EU and in other countries

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Metabolism and Energetics (QUI00358L)