



## Study Plan

**School:** School of Sciences and Technology

**Degree:** Bachelor

**Course:** Humana Biology (cód. 672)

### 1st Semester - 1st Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
MAT11377L	Mathematics	Mathematics	6	Semester	156
QUI1090L	General Chemistry	Chemistry	6	Semester	156
FIS11458L	Biophysics	Physics	6	Semester	156
QUI11459L	Lab Techniques and Methods I	Chemistry	3	Semester	78
BIO10917L	Cell Biology	Biological Sciences	6	Semester	156
BIO12341L	Biology and Society	Biological Sciences	3	Semester	78

### 1st Semester - 2nd Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
QUI11461L	Structure and Function of Biomolecules	Biochemistry	6	Semester	156
MAT11462L	Statistics	Mathematics	6	Semester	156
BIO12412L	Molecular Biology	Biological Sciences	6	Semester	156
BIO12358L	Biological Anthropology	Biological Sciences	6	Semester	156
QUI11464L	Lab Techniques and Methods II	Chemistry	3	Semester	78
FIL0637L	Bioethics	Philosophy	3	Semester	78

### 2nd Year - 3rd Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
BIO12408L	Genetics	Biological Sciences	6	Semester	156
ENF12441L	Anatomophysiology I	Health Sciences	6	Semester	156
BIO0408L	Microbiology	Biological Sciences	6	Semester	156
QUI0358L	Metabolism and Energetics	Biochemistry	6	Semester	156
BIO11467L	Human Embryology	Biological Sciences	3	Semester	78
BIO12890L	Human Histology I	Biological Sciences	3	Semester	78

### 2nd Year - 4th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
BIO11469L	Developmental Biology	Biological Sciences	6	Semester	156



### 2nd Year - 4th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
ENF12448L	Anatomophysiology II	Health Sciences	3	Semester	78
BIO12417L	Immunology	Biological Sciences	6	Semester	156
BIO11472L	Laboratory of Human Biology	Biological Sciences	6	Semester	156
BIO12891L	Human Histology II	Biological Sciences	3	Semester	78
BIO12418L	Virology	Biological Sciences	6	Semester	156

### 3rd Year - 5th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
BIO11474L	Human Genetics	Biological Sciences	3	Semester	78
PAO11475L	Human Ecology	Environment and Ecology Sciences	6	Semester	156
QUI11476L	Pharmacology and Toxicology	Biochemistry	6	Semester	156
BIO11478L	Seminars in Human Biology	Biological Sciences	3	Semester	78
BIO11479L	* Project in Human Biology	Biological Sciences	12	Semester	312

### Options

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
BIO11481L	Biotechnological Medicines	Biological Sciences	6	Semester	156
QUI11482L	Cell Biophysics	Biochemistry	6	Semester	156
QUI12243L	Bromatology and Nutrition	Biochemistry	6	Semester	156
QUI12396L	Enzymology	Biochemistry	6	Semester	156
QUI11483L	Introduction to Clinical Biochemistry	Biochemistry	3	Semester	78
QUI12242L	Techniques of Animal Tissue Culture	Chemical and Biochemical Engineering	3	Semester	78
QUI11983L	Forensic Chemistry	Chemistry	6	Semester	156
BIO11484L	Physiology of Feeding Behavior	Biological Sciences	6	Semester	156
BIO11485L	Animal Models	Biological Sciences	6	Semester	156
GES2310L	Entrepreneurship and Innovation	Management	6	Semester	156
DES10655L	Kinanthropometry	Human Kinetics	6	Semester	156
FIL2321L	Critical Thinking and Argumentation	Philosophy	6	Semester	156
ENF12439L	Public Health	Health Sciences	3	Semester	78
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### 3rd Year - 6th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
BIO11477L	Parasitology	Biological Sciences	3	Semester	78
ENF12445L	Health Disease Process	Health Sciences	3	Semester	78
BIO11479L	Project in Human Biology	Biological Sciences	12	Semester	312

### Options

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
BIO11481L	Biotechnological Medicines	Biological Sciences	6	Semester	156
QUI11482L	Cell Biophysics	Biochemistry	6	Semester	156
QUI12243L	Bromatology and Nutrition	Biochemistry	6	Semester	156
QUI12396L	Enzymology	Biochemistry	6	Semester	156
QUI11483L	Introduction to Clinical Biochemistry	Biochemistry	3	Semester	78
QUI12242L	Techniques of Animal Tissue Culture	Chemical and Biochemical Engineering	3	Semester	78
QUI11983L	Forensic Chemistry	Chemistry	6	Semester	156
BIO11484L	Physiology of Feeding Behavior	Biological Sciences	6	Semester	156
BIO11485L	Animal Models	Biological Sciences	6	Semester	156
GES2310L	Entrepreneurship and Innovation	Management	6	Semester	156
DES10655L	Kinanthropometry	Human Kinetics	6	Semester	156
FIL2321L	Critical Thinking and Argumentation	Philosophy	6	Semester	156
ENF12439L	Public Health	Health Sciences	3	Semester	78

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## Conditions for obtaining the Degree:

\*\*\* TRANSLATE ME: Para obtenção do grau de licenciado em Biologia Humana é necessário a aprovação a 156 ECTS em unidades de curriculares obrigatórias e 24 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

6 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 18 ECTS

UC Optativas de entre as indicadas no quadro das optativas num total 12 ECTS

6º Semestre

3 UC Obrigatórias num total de 18 ECTS

UC Optativas de entre as indicadas no quadro das optativas num total 12 ECTS

Nota: Do quadro de optativas terá que obter aproveitamento a 24 ECTS, dos quais 6 ECTS podem ser uma optativa livre

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## Program Contents

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### Mathematics (MAT11377L)

Linear systems. Eliminations of Gauss. Matrices and vectors. Operations with matrices. Determinants. Inverse matrix. Cramer's Rule.

Functions, Limits, and Continuity. Inverse and composite functions. Limits of numerical successions. Continuous functions and their properties.

Differential Calculus and Applications. Derivatives of composite, implicit, and inverse functions. Logarithmic differentiation. Theorems of Fermat, Rolle, Lagrange and Cauchy. Rule of L'Hôpital. Taylor's formula. Numerical differentiation. Applications of derivatives.

Integral Calculus and Applications. Primitives. Methods of primitivation: by substitution and by parts. Primitives of rational functions. Integral. The fundamental theorem of integral calculus. Numerical integration. Applications of integrals. Improper integrals. Power series.

Ordinary Differential Equations. Euler's method. First order separable and linear differential equations. Applications in the natural sciences.



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## General Chemistry (QUI1090L)

Course contents

1. Introduction

1.1 Models of atoms

The principal quantum number

Atomic orbitals

Hydrogen atom

Orbital Energies

Electronic structure of polielectronic atoms

The building-up Principle. The Aufbau rule. Exclusion Principle of Pauli. Hund's rule

1.2 The Periodic Table

Periodic classification of the elements.

Electronic structure and the Periodic Table

Periodic variation in physical properties

Effective nuclear charge

Atomic and ionic Radius

Ionization Energy, Electronegativity and electron Affinity

2. Chemical Bonding

2.1 Lewis structures. Octet Rule.

2.2 Bond types: ionic, covalent and metallic

2.3 The Ionic Bond

Ionic bond formation.

Ions interaction

Lattice energy of ionic compounds

Ionic solids

Polarizability and the ionic character of ionic bonds

2.4 The Covalent Bond

2.4.1 Lewis structure for polyatomic species

The concept of Resonance

Formal charge

Electronegativity and Polar bonds

2.4.2 Covalent bond strength.

The variation of bond strength. Dissociation energy. Bond length.

2.4.3 Exceptions to the Octet Rule: radicals and biradicals; expanded valence shell, incomplete octet

2.4.4 Coordinative covalent bond. Complexes and coordination compounds.

Ligands. Coordination number.

Chelate; bi- and polidentate ligands.

2.4.5 Molecular shape and structure

The VSEPR model

Molecules with lone pairs on the central atom

Valence Bond Theory

Hybridization of orbitals

Hybridization in a more complex molecules

Characteristics of double bonds

Benzene ring and Kekule structures

Polyatomic molecules

Polar molecules

2.5 Metallic bond

Band theory. Conductor and semiconductors.

Metals properties

3. Properties of gases, Liquids and Solids

3.1.1 Properties of gases

Pressure

Boyle's Law. Charles and Gay-Lussac's Law

Avogadro Principle.

3.1.2 The Ideal Gas model. Equation of Ideal Gases.

Gas density

3.1.3 Mixture of gases. Partial Pressure and Dalton's Law

3.1.4 Real Gases. Deviation from linearity.



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### **Biophysics (FIS11458L)**

Mechanics: movement and Newton's laws, work and energy, rotational movement. Physics of continuous media: density, elasticity, and mechanics of fluids.

Thermodynamics: temperature, heat, expansion, heat transfer, diffusion, thermoregulation. Waves physics: mechanical waves, sound and the bioacoustics of the ear, ultrasonic waves. Electricity: the electric field, the electric potential of cellular membranes, electric currents, conduction through nerve cells, physiological effects of currents. Light: the nature of light, the microscope, biophysics of vision. Física atómica e nuclear: nature of the atom, the electron microscope, X-rays and Cat scanners, lasers, radioactivity and radiation therapy, the biological effects of radiation, and magnetic resonance imaging.

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### **Lab Techniques and Methods I (QUI11459L)**

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### **Cell Biology (BIO10917L)**

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### **Biology and Society (BIO12341L)**

1. History of Biology, main landmarks
2. Theories on the origin and diversity of life
3. Science and Religion
4. Biology of cancer
5. Biology of ageing
6. Stem cells and their potential therapeutic use
7. Tissue engineering
8. Bioethics: cloning
9. Impacts and use of genetically modified organisms
10. Medically assisted reproduction and genetic counselling; ethical implications.

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### **Structure and Function of Biomolecules (QUI11461L)**

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### **Statistics (MAT11462L)**



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### **Molecular Biology (BIO12412L)**

#### Part I. DNA REPLICATION

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

#### Part II. GENE EXPRESSION

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

#### Part III. TECHNIQUES AND APPLICATIONS

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

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### **Biological Anthropology (BIO12358L)**

1. Human osteology.
  - 1.1. Bone morphology and identification of anatomical structures of the skeleton.
  - 1.2. Sex diagnosis in adult skeletons.
  - 1.3. Choosing useful parameters to assess age at death estimation. Criteria for age at death estimation in non-adults skeletons. Dental and skeletal indicators in the process of development, growth and maturation.
2. Paleodemography, age and sexual distributions, life expectancy, mortality and birth rates and population size.
3. Growth: endochondral and intramembranous ossifications. Growth disruption.
4. Paleopathology: assessment of health profiles through bone and tooth injuries. Degenerative diseases, traumatic, infectious, oral, metabolic, congenital and neoplastic. Differential diagnosis. Epidemiology.
5. Muscle skeletal markers and reconstitution of physical activity.

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### **Lab Techniques and Methods II (QUI11464L)**

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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.



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**Genetics (BIO12408L)**

Part I. Basic concepts

Chapter 1 Genetical 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 nonalleles

Maternal effect

Developmental genetics

Chapter 4 Populations

Gene frequencies

Concept of equilibrium

Evolutionary 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





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### **Anatomophysiology I (ENF12441L)**

Module I – Organization of the Human body

Topographic anatomy.

Cytology .

Histology.

Integumentary system.

Module II – Osteology and Arthrology

Axial and appendicular skeleton;

Arthrology: classification and articular elements.

Module III – Myology, functional and surface anatomy

Muscle tissue.

Myology of the head.

Myology of the neck.

Myology of the back.

Myology of thorax.

Myology of the abdomen.

Myology of the upper extremity.

Myology of the lower extremity.

Functional anatomy of the spine.

Functional anatomy of thorax.

Functional anatomy of the upper extremity.

Functional anatomy of the lower extremity.

Surface anatomic references of the head, neck, torso and limbs.

Posture and gait.

Module IV – Adjustment and Maintenance Systems

Blood tissue.

Lymphatic system.

Circulatory system.

Respiratory system.

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### **Microbiology (BIO0408L)**

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### **Metabolism and Energetics (QUI0358L)**



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### **Human Embryology (BIO11467L)**

Introduction to the human embryology (developmental periods, significance, historical gleanings, terminology).

The beginning - Gametogenesis and fertilization

Implantation mechanisms, gastrulation and neurulation.

Cellular and molecular mechanisms in morphogenesis and dysmorphogenesis.

Fetal development in the context of fetus as a patient.

Clinical fundamentals in prenatal diagnosis and fetal medicine.

The placenta as an interface materno fetal.

Embryologic development of pharyngeal apparatus and face.

Embryologic development of Nervous System.

Embryologic development of sense organs (Eye and vision, ear and hearing, skin and touch, tongue and taste).

Embryologic development of cardiovascular system

Embryologic development of muscular and skeletal system (locomotor system embryology).

Embryologic development of Urogenital, Digestive and Respiratory systems.

Planning programs of training in investigation centers in the field of Infertility and staminal cells in Portugal.

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### **Human Histology I (BIO12890L)**

#### **THEORY**

1. Introduction to the study of human histology

2. General histology: the animal cell; the four basic tissues - embryonic origin and morpho-functional characteristics and analysis of epithelial, connective, muscle and nervous tissues.

#### **LABORATORY**

1. Methods and techniques used in histology.

2. Histological slides observation and diagnosis of epithelial, connective, blood, muscle and nervous tissues

3. Implementation of the various steps of the routine technique for light microscopy, including different staining methods

4. Realization of the immunohistochemistry techniques on material embedded in paraffin.

5. Histomorphometric analysis.

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### **Developmental Biology (BIO11469L)**

1. Introduction

Review of main concepts

2. Growth

Growth curves, secular trends in postnatal maturation

Cell cycle control, apoptosis. Signal transduction pathways. Promoters, transcription factors, DNA methylation. Chromatin conformation. Monoallelic expression. Senescence

Flow cytometry. Biochemical, genetics and molecular biology approaches. Somatotyping.

3. Cell differentiation

Examples: growth plate of long bones, blood tissue

Signal transduction pathways for cell differentiation

Stem cells, iPS. Cancer theories. Cancer Stem Cells. Metastasis

FACS, clonogenesis, transplants, chimeras, gene introduction, nuclear reprogramming

4. Morphogenesis

Examples: asymmetry left-right, body axes, limb development, odontogenesis.

Mechanisms: intercellular recognition and adhesion, reaction-diffusion, segregation of cellular groups, cellular migration, epithelial-mesenchymal interactions, embryo regionalisation and segmentation Computer simulation



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### **Anatomophysiology II (ENF12448L)**

Module I – Integration and Control Systems

- Central nervous system: brain and spinal cord
- Peripheral nervous system: cranial nerves and spinal
- The senses
- Endocrine system

Module II – Adjustment and Maintenance Systems

- Digestive system:
  - Anatomy and digestive functions
  - Histology of the digestive tract
- Urinary system
  - Anatomy and histology of the kidney
  - Urinary tract Functions

Module III – Reproduction and development

- Female and male reproductive and sexual
  - Anatomy and physiology of the reproductive and sexual systems
- Development, growth, and aging
  - Prenatal development
  - Stages of the cycle of life (birth, adolescence, aging and death)

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### **Immunology (BIO12417L)**

1. Theoretical programme
  - a. Introduction to the immune system. General aspects.
  - b. Components of the immune system
  - c. Antigens and antibodies
  - d. Gene organisation and expression of immunoglobulin's
  - e. Immune responses
  - f. Effector mechanisms of the immune response
  - g. The immune system in the health and disease
  - h. Monoclonal antibodies
  - i. Experimental immunology
2. Laboratory programme
  - a. Introduction. Programming of the course
  - b. Experimental immunisation
  - c. Purification of immunoglobulin's
  - d. Test to the students natural immunity
  - e. Immunoprecipitation techniques
  - f. Observation of blood cells
  - g. ELISA
  - h. Autonomous laboratory work: goat immunisation and its characterisation

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### **Laboratory of Human Biology (BIO11472L)**



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### **Human Histology II (BIO12891L)**

**THEORY:** Special Histology: morpho-functional study of the major organs and systems that constitute the human body. Histology of the body cavities. Cardiovascular system. Immune system and lymphatic organs. Integumentary system: skin and appendages. Muscular-skeletal. Digestive system. Respiratory tract. Urinary tract. Male genital tract. Female genital tract. Endocrine system. Nervous system and sense organs.

**LABORATORY:** Observation through light microscope of histological sections of the various tissues and organs studied in the lectures. Reading, analysis and discussion of research papers.

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### **Virology (BIO12418L)**

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 a wild bacteriophage.

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### **Human Genetics (BIO11474L)**

Characteristics of nuclear and mitochondrial genomes. Populational Genetics. Mechanisms of occurrence of mutations and repair mechanisms. Diseases of the two genomes - mitochondrial cytopathies. Complex diseases, the example of degenerative diseases and autism. Chromosome disorders. Inherited errors of metabolism of amino acids, lipids and carbohydrates. General concepts of nutrigenomics. Nutrigenomics and cellular metabolism. Pharmacogenomics.

Epigenetics. microRNAs. Gene Therapy. Ethics. Legislation. Genetic Counseling.

Theoretical and Practical: Case studies. Analysis of pedigrees. Genetic databases. Biostatistics applied to the genetic Hardy-Weinberg and association studies. Methods of analysis in human genetics. Application of methods of molecular genetics to the study of disease and validation of the pathogenicity of mutations.

Methods of large-scale genome analysis.



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### **Human Ecology (PAO11475L)**

Humans, Environment and Society - Auto-ecology and ecological-evolutionary models. Pressures and adaptations. Selection and counter-selection. Human population ecology. Parameters and rates. Demographic explosion and implosion and their impacts. Demographic transition. World population prospects. Valuing Nature: criteria for setting value; tangible and intangible, economic and non-economic values. Ecological services. Ecological Economics. Valuation methods.

Looking at and attitudes towards Nature - paradigms. Development vs. environment - evolution of paradigms: from unrestricted to sustainable development.

Arguments for Nature conservation. Levels of the experience of Nature. Symbolism and anthropology of landscapes. Arcadia revisited

Biophilia. Environmental ethics, liberationism, ecocentrism, specism. Leopold and Land Ethic, Naess and Deep Ecology. Environmentalism and radicalism. Nature and the sacred. Religion and environmental ethics: despotism and custodian.

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### **Pharmacology and Toxicology (QUI11476L)**

Xenobiotics with pharmacological and toxicological interest

Pharmacological and toxicological kinetics

Absorption, distribution, metabolism and excretion

Pharmacological and toxicological dynamics

Local action and action at a distance

Shape and structural stereochemistry of xenobiotics

Pharmacology

Different classes of drugs

Drugs that act at neuroeffector junctions and peripheral synapses

Drugs with actions on the central nervous system

Autacoids

Drugs affecting renal and cardiovascular functions

Drugs affecting gastrointestinal function

Chemotherapy anti-microbial and anti-parasitic

Chemotherapy of neoplastic diseases

Immunomodulation therapy

Drugs acting on blood and blood forming organs

Hormones and their antagonists

Toxicology

Factors affecting toxic response, metabolism and disposition

Toxic responses of xenobiotics

Biochemical mechanisms of toxicity

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### **Seminars in Human Biology (BIO11478L)**

This course has an open program, according to research areas of faculty and researchers invited to participate. The classes / lectures take the form of seminars where they will address various topics that will highlight recent research in Human Biology and its interdisciplinarity.

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### **Project in Human Biology (BIO11479L)**

Monograph, Project or Work in professional environment in a chosen / offered subject in any area of Human Biology. It consists in an individual project.

Syllabus according to students choice given the Objectives (3.3.4).



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### **Biotechnological Medicines (BIO11481L)**

Theoretical:

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

Practical:

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

"Inventive" program:

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

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### **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.

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### **Bromatology and Nutrition (QUI12243L)**

Diet and human Nutrition. Food Story. Principles of Nutrition. The nutritional needs of the human body. Macro and micronutrients. The nutrition on the various steps of life and on hospital patient. Functional, diet and light foods. Special foods for people with genetic anomalies and another change of metabolism. Characterization of the different groups of nutrients. Physical and chemical methods to preserve foods. Chemical and Biochemical analysis of foods. Food safety. HACCP system and Food Quality Control.



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### **Enzymology (QUI12396L)**

1. Catalytic activity of proteins and RNA. Terminology. Reaction curves, deviation to linearity,  $v_0$ ,  $E_{act}$ , transition state complex.
2. Continuous and discontinuous assays to  $v_0$  determination. Burst and lag phases. Interferences in  $v_0$  determination
3. The Henri-Michaelis-Menten equation. Parameters  $V_{max}$  e  $K_m$ . Effects of  $[E]$ ,  $T$ ,  $pH$ ,  $[I]$   $[A]$ ,  $[S]$ . Failure to obey rectangular hyperbola,  $k_m$  and  $V_{max}$  determination, different 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. Allostery and cooperativity, mathematics models.
7. Extraction, solubilization and purification of enzymes, homogenization, centrifugation, organic solvents, polymers e chromatographic methods.
8. Physico-chemical characterization of enzymes.

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### **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.

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### **Techniques of Animal Tissue Culture (QUI12242L)**

Cell culture: advantages and disadvantages.

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

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

Nonadherent cell cultures: blood cells.

Production and maintenance of cell lines.

Cell culture media composition, supplements, pH buffers,  $O_2$ ,  $CO_2$  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 hybridoma 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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### **Forensic Chemistry (QUI11983L)**

The crime scene.

Collection and handling of evidence.

Analysis of drugs.

Analysis of traces of fuel in arson.

Analysis and processing of fingerprints.

DNA analysis.

Fiber analysis.

Analysis of firing of firearms.

Analysis of traces of paint.

Analysis of explosives.



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### **Physiology of Feeding Behavior (BIO11484L)**

Teoretical

- 1.Introduction to eating behaviour: concepts and evolution of food regimens
- 2.Anatomophysiology of digestion
- 3.Control of energetic metabolism: nervous and endocrine systems
- 4.Hunger, appetite and satiety: the role of neuropeptides and peripheral signals
- 5.Taste physiology and its role in ingestion
- 6.Methods of analysis and animal models in the study of eating behaviour
- 7.Eating behaviour during life: pregnancy and lactation, newborn, childhood and adolescence, elderly
- 8.Eating disorders
- 9.Metabolic diseases: diabetes, obesity.

Practical

- 1.Structures involved in ingestion control: microscopic observation of ingestive and digestive organs; immunostaining of neuropeptides.
- 2.Biochemical evaluation of appetite/satiety signals in different physiological states.
- 3.Ingestive behavior: microstructural analysis studies, instruments for measuring food intake in humans.
- 4.Changes in ingestive behavior in animal models of malnutrition and metabolic diseases.

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### **Animal Models (BIO11485L)**

1. Introduction (Paulo de Oliveira)

Phylogenetics of the human species and levels of comparison with the animal models

Progress of the genomics of animal models and associated bioinformatics resources.

A general perspective of the animal models and their utility

2. Bioethics applied to animal models (Paulo de Oliveira)

Biological foundations of Bioethics, ethical aspects of handling animals utilized in didactical activities and scientific experimentation, study of cases

Special topic: biological materials of human origin

3. Regulations (Joana Reis)

Norms for selection, maintenance, handling and sacrifice of model animals

Special topic: concept of experimental animal

4. Details of relevant models

Murines (Célia Antunes)

Other models (Paulo de Oliveira)

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### **Entrepreneurship and Innovation (GES2310L)**

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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### **Kinanthropometry (DES10655L)**

- I - Growth and Proportionality
- II - Sexual dimorphism
- III - Body composition
- IV - Morphology Typology
- V - Secular trends
- VI - Maturation
- VII - Body composition densitometry
- VIII - Somatotype

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### **Critical Thinking and Argumentation (FIL2321L)**

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### **Public Health (ENF12439L)**

1. Public health: History, scope and methods
  
2. Public health in Portugal.  
The National Health Service
  
3. Organization of public health services  
The Public Health Law
  
4. Epidemiological, environmental and entomological surveillance
  
5. Health indicators
  
6. Public health and health planning  
National Health Plan  
Examples of National Programs (communicable diseases and chronic noncommunicable diseases)
  
7. The determinants of health and inequalities in health
  
8. Health literacy

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### **Parasitology (BIO11477L)**

reservoirs. Evolutionary cycles, pathogenicity and virulence. Parasite-host relationship. Arthropod parasites or disease vectors. Medical problems posed by parasites. Protozoa, cellular organization of protozoan parasites. Classification of protozoan parasites. Amoebae, flagellates, sporozoon, ciliates. Helminths. Nature of parasitic helminths. Flatworms, Trematodes, Tapeworms, roundworms. Arthropods, arachnid, insects.



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### **Health Disease Process (ENF12445L)**

- I. Concepts (Health and Disease)
- II. Epidemiology and Health
- III. Overview of General Pathology
  - a. Cellular responses to stress and toxic insults; Adaptation, Injury and Death
  - b. Inflammation and Repair
  - c. Hemodynamic Disorders, Thromboembolic Disease and Shock
  - d. Genetic Disorders
  - e. Diseases of the Immune System
  - f. Neoplasia
- IV. Infectious Diseases.