



Study Plan

School: School of Sciences and Technology

Degree: Bachelor

Course: Humana Biology (cód. 537)

1st Year - 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
BIO11460L	Biology and Society	Biological Sciences	3	Semester	78

1st Year - 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
BIO2690L	Molecular Biology	Biology	6	Semester	156
BIO11463L	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
BIO11465L	Genetics	Biological Sciences	6	Semester	156
ENF11466L	Anatomy Physiology I	Medicine	6	Semester	168
ENF1966L	Health and Disease Processes	Health	5	Semester	130
BIO11467L	Human Embryology	Biological Sciences	3	Semester	78
BIO11468L	Human Histology I	Biological Sciences	4	Semester	104
BIO0408L	Microbiology	Biological Sciences	6	Semester	156

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
BIO11471L	Immunology	Biological Sciences	6	Semester	156
BIO11472L	Laboratory of Human Biology	Biological Sciences	6	Semester	156
BIO11473L	Human Histology II	Biological Sciences	2	Semester	52
QUI0358L	Metabolism and Energetics	Biochemistry	6	Semester	156
ENF1969L	Physiology and Anatomy II	Medicine	4	Semester	100

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

Group of 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
QUI0351L	Bromatology and Nutrition	Biochemistry	6	Semester	156
QUI0352L	Enzymology	Biochemistry	6	Semester	156
QUI11483L	Introduction to Clinical Biochemistry	Biochemistry	3	Semester	78
QUI0360L	Techniques of Animal Tissue Culture	Biochemistry	3	Semester	78
QUI1089L	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
FIL11486L	Critical Thinking and Argumentation	Philosophy	6	Semester	156
Group of Free Options					

3rd Year - 6th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
BIO11478L	Seminars in Human Biology	Biological Sciences	3	Semester	78
BIO11477L	Parasitology	Biological Sciences	3	Semester	78
BIO11479L	Project in Human Biology	Biological Sciences	12	Semester	312
BIO11480L	Virology	Biological Sciences	6	Semester	156



3rd Year - 6th Semester

Component code	Name	Scientific Area Field	ECTS	Duration	Hours
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Component code	Name	Scientific Area Field	ECTS	Duration	Hours
BIO11481L	Biotechnological Medicines	Biological Sciences	6	Semester	156
QUI11482L	Cell Biophysics	Biochemistry	6	Semester	156
QUI0351L	Bromatology and Nutrition	Biochemistry	6	Semester	156
QUI0352L	Enzymology	Biochemistry	6	Semester	156
QUI11483L	Introduction to Clinical Biochemistry	Biochemistry	3	Semester	78
QUI0360L	Techniques of Animal Tissue Culture	Biochemistry	3	Semester	78
QUI1089L	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
FIL11486L	Critical Thinking and Argumentation	Philosophy	6	Semester	156
Group of Free Options					

Conditions for obtaining the Degree:

*** TRANSLATE ME: Para obtenção do grau de licenciado em Biologia Humana é necessário a 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

6 UC Obrigatórias num total de 30 ECTS

4º Semestre

6 UC Obrigatórias num total de 30 ECTS

3º Ano

5º Semestre

3 UC Obrigatórias num total de 15 ECTS

UC Optativas de entre as indicadas no quadro das optativas num total 15 ECTS

6º Semestre

4 UC Obrigatórias num total de 24 ECTS

UC Optativas de entre as indicadas no quadro das optativas num total 6 ECTS

Nota: Do quadro de optativas terá que obter aproveitamento a 21 ECTS, dos quais 6 ECTS podem ser uma optativa livre

Program Contents



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Mathematics (MAT11377L)

1. OPERATIONS WITH MATRICES. DETERMINANT AND PROPERTIES. INVERSE MATRIX. SOLVING SYSTEM OF LINEAR EQUATIONS.
2. DEFINITION, GRAPHICAL REPRESENTATION/ CHARACTERIZATION OF REAL FUNCTIONS. INVERSE AND COMPOSITION OF FUNCTIONS. NUMERICAL SUCCESSION. LIMITS AND PROPERTIES. CONTINUITY OF FUNCTIONS. POINT OF DISCONTINUITY. FUNDAMENTAL THEOREMS CONTINUITY.
3. DERIVATIVE AT A POINT AND GEOMETRIC AND PHYSICAL INTERPRETATION. RULES OF DERIVATION. HIGHER ORDER DERIVATIVES. DIFFERENTIAL OF FUNCTION AND ITS APPLICATIONS. THEOREMS OF ROLLE, LAGRANGE AND CAUCHY. RULE OF L'HOPITAL. STUDY OF A FUNCTION. TAYLOR'S FORMULA.
4. PRIMITIVES AND PROPERTIES. EARLY IMMEDIATE, BY SUBSTITUTION AND BY PARTS. PRIMITIVES OF RATIONAL FUNCTIONS. RIEMANN'S INTEGRAL AND PROPERTIES. FUNDAMENTAL THEOREM OF INTEGRAL CALCULUS. INTEGRATION BY SUBSTITUTION AND BY PARTS. APPLICATIONS. IMPROPER INTEGRALS.
5. NUMBER AND POWER SERIES.
6. ORDINARY, AUTONOMOUS AND SEPARABLE DIFFERENTIAL equations. FIRST ORDER LINEAR EQUATIONS. MATHEMATICAL MODELS WITH EDO

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General Chemistry (QUI1090L)

1. Constitution of matter
2. Periodic table
3. Chemical bonding
4. States of aggregation of matter
5. Solutions
6. Chemical thermodynamics
7. Chemical equilibrium
8. Equilibrium in heterogeneous systems
9. Ionic equilibria in homogeneous systems: acid-base
10. Electrochemistry
11. (Optional Chapter)
Chemistry of life
Chemical corrosion
Chemical kinetics

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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)

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

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Cell Biology (BIO10917L)

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

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Biology and Society (BIO11460L)

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)

Introduction. Biochemical reactions. Water and inorganic ions in biology and bio-systems. Bio-distribution of inorganic elements, interaction with biomolecules and its roles in vivo. Functional characteristics of biomolecules. Basic principles of molecular structure.

Glycides: structure and function.

Nucleic acids. Composition, structure and function.

Aminoacids, peptides and proteins. Synthesis and degradation of proteins. Structure-function relationship in protein families. Porfirines and cromoproteins.

Non-covalent interactions in macromolecules.

Structure of proteins associated to nucleic acids. Membrane and immune system proteins. Viral structure. Folding and macromolecule stability. Supra-macromolecular arrangements. Interactions of proteins with other biomolecules. Misfolding and disease (eg. amiloidosis).

Lipids. Lipid-protein aggregates. Plasma lipoproteins. Biomembranes.

Enzymes, catalysis and enzymatic kinetics.

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Statistics (MAT11462L)

1. Descriptive Statistics
 2. Basic Probability Notions
 3. Conditional Probability and Independence
 4. Discrete and Continuous Random Variables
 5. The Most Important Families of Discrete and Continuous Probabilities Distributions
 6. Point and Interval Estimation
 7. Hypothesis testing
 8. Analysis of Variance (one-way)
 9. Non-parametric Tests
 10. Simple Linear Regression
- Use of statistical software.

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Molecular Biology (BIO2690L)

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 (BIO11463L)

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)

Experimental error. Introduction to statistics and calibration methods. Fundamentals of spectrometric methods. Molecular spectroscopy: an introduction to ultraviolet/visible molecular absorption spectrometry, molecular luminescence spectrometry, infrared spectrometry. Applications. Equipments. Atomic spectroscopy. An introduction to optical atomic spectrometry, atomic absorption spectrometry and atomic emission spectrometry. Applications and equipment.

Fundamentals of electroanalytical chemistry. Different types of electrodes: reference, indicator, working electrodes. Potentiometry, conductimetry, coulometry, voltammetry. Applications.

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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 (BIO11465L)

Part I. Basic concepts

Chapter 1 Genetic material

Gene, chromosome, mutation

Chapter 2 Meiosis

Mendel's work with pea

Chromosome linkage

Tetrad analysis

Heterosomes

Cytoplasmic inheritance

Chapter 3 Phenotype

Dominance types

Interactions between non-alleles

Maternal effect

Developmental genetics

Chapter 4 Populations

Gene frequencies

Concept of equilibrium

Evolution forces

Part II. Chromosomes

Chapter 5 Karyotypes

Ploidies

Variations in number

Variations in structure

Infertilities

Chapter 6 Maps

Diploids, haploids, prokaryotes

Genomics

Part III. Genetic analysis

Chapter 7 Mendelian analysis

Study of proportions

Pedigrees

Chi-square test

Chapter 8 Quantitative traits

Polygenes

Components of phenotypic variation

Heritability, artificial selection

QTLs

Part IV: Genetics and Evolution

Chapter 9 Evolution

Polymorphisms

Geographic variation

Speciation

Phylogenies



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Anatomy Physiology I (ENF11466L)

Module I – Organization of the Human body

Cytology – cell and its functions;

Genetic control of protein synthesis and cellular reproduction operation;

Homeostasis.

Module II – Osteology

Topographic anatomy;

Bone tissue: Constitution, vascularization, innervation, ossification and external configuration of the bone;

Axial and appendicular skeleton;

Arthrology: classification and articular elements.

Module III - Myology

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;

Module IV – Functional anatomy

Functional anatomy of the spine;

Functional anatomy of thorax;

Functional anatomy of the upper extremity;

Functional anatomy of the lower extremity;

Posture and gait.

Module V – Blood

Blood tissue: constituents, function and regeneration.

Lymphatic system.

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Health and Disease Processes (ENF1966L)

Module I - The health-disease process (explanatory theories; Process of disease) Module II- General principles of pathology (Concepts; Etiology of injury and disease; reactions of the organism); Module III - General principles of microbiology (Basic Principles of Medical Microbiology; Basic concepts of immune response; Bacteriology; virology; Mycology; Parasitology). Module IV - General Principles of Pharmacology (Pharmacokinetics and Pharmacodynamics , Pharmacology special).



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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 morphogénesis 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 (BIO11468L)

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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Microbiology (BIO0408L)

Theoretical:

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

Foodborne diseases

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

Lab Practice:

Aseptic practice

Observation of bacteria, fungi and protists.

Demonstration of Ubiquity

Preparation and sterilization of culture media.

Isolation of pure culture.

Colonial and cellular morphology. Gram Staining

Microbial counts

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

Anaerobic Culture

Antibiograms

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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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Immunology (BIO11471L)

Theoretical programme:

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

Laboratory programme:

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

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Laboratory of Human Biology (BIO11472L)

This course content will address laboratory classes not possible to develop in other courses, including:

Obtaining cellular fractions and determination of protein content.

Laboratory conditions for manipulating DNA.

Restriction maps and restriction enzymes.

Transformation - inserting plasmid DNA in bacteria

Purification of plasmid DNA by alkaline lysis.

Miniprep DNA.

Determination of DNA concentration and purity.

Induced expression of proteins in bacteria.

The laboratory nature of this course leads to an open program, which can be changed according to research conducted by teachers.

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Human Histology II (BIO11473L)

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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Metabolism and Energetics (QUI0358L)

Theoretical sessions: 1. Concepts and experimentation in the study of metabolism. 2. Bioenergetics. 3. Oxidative phosphorylation. 4. Metabolism of the main nutrients. Reaction mechanisms and energetic balancing. 5. Metabolic integration. 6. Metabolic regulation. 7. Hormonal regulation of the metabolism. 8. Evolution of the metabolic pathways. 9. Introduction to nutrition. Diet, energy balance its implications in metabolism. 10. Fasting and well fed states. Metabolic unbalance and disease: Obesity, diabetes and exercise.

Practical sessions: Redox reactions; determination of the redox state of a molecule. Nernst equation. Bioenergetics: thermodynamic concepts applicable to metabolism. Energy balance: determination of Gibbs free energy and efficiency of metabolic pathways. Lab. sessions: ATP production in glycolysis and its regulation. Determination of mitochondria potential. Determination of specific activity of hexokinase and LDH in muscle, kidney, liver and cerebral tissues.

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Physiology and Anatomy II (ENF1969L)

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 - Circulatory system: Anatomy and functions of the heart; - Circulation and peripheral adjustment - Respiratory system: Anatomy, histology and respiratory functions - 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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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)

Man, Environment and Society - Auto-ecology and ecological-evolutionary models. Pressures, selection and adaptations. Selection and counter-selection. Evolutionary traps. Contemporary changes of pressures. Valuing Nature: the idea of value and criteria for setting value to the natural elements: tangible, instrumental, economic. The Ecological Economics. Environmental valuation methods. Looking at and attitudes towards Nature - paradigms. Evolution of development paradigms in relation to the environment: unrestricted development, deep ecology, environmental protection, resources management, sustainable development. Arguments for Nature conservation. The reappraisal of Nature and Arcadia revisited. Biophilia. Ethics, environmental ethics, ethics of life, liberationism, biocentrism, ecocentrism, speciesism. Aldo Leopold and the Land Ethic, Arne Naess and the Deep Ecology. Environmentalism and radicalism. Nature and the sacred. Religion and environmental ethics: despotism and custodian. Ethics, relativisms, pragmatism.



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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 neuroeffectors 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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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 (QUI0351L)

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 (QUI0352L)

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. 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 (QUI0360L)

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 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 (QUI1089L)

The crime scene.

Collection and handling of evidence.

Analytical techniques used in Forensic Chemistry

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)

Theoretical

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

e. 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 (FIL11486L)

Identification of questions, positions and arguments

Arguments: conclusions and reasons

Implicit premises

Intermediary conclusions

Language: vagueness and ambiguity

Kinds of definitions

Facts and values

Objective and subjective judgements

Representing arguments with diagrams

Does the conclusion follow from the premises?

Probability in the premises

Strong and weak inductions

Principles of rational discussion

Common mistakes in the assessment of premises

Appeals to authority

Mistaking the person for the argument

Disjunctive and conditional claims, and how to deny them

Necessary and sufficient conditions

Reasoning from hypothesis

Contrafactual reasoning

Objecting and refuting

Presenting and assessing counter-examples

Appeals to emotion

Fallacies: formal and with respect to content

Reasoning by analogy

Numbers: graphs and averages

Generalizing: detecting non-representative samples

Generalizing: margin of error and confidence level

Causal reasoning: causes, effects, normal conditions

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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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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, sporozoan, ciliates.

Helminths. Nature of parasitic helminths. Flatworms, Trematodes, Tapeworms, roundworms.

Arthropods, arachnid, insects.



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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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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 a wild bacteriophage