Basic Life Sciences 1 [1205105]

Offerta didattica a.a. 2023/2024

Docenti: GIOVANNI DI PINO, GIORGIO VIVACQUA

Periodo: Primo Ciclo Semestrale

Obiettivi formativi
Students must achieve an adequate knowledge and understanding of the main aspects of cell biophysics, the importance of cell differentiation and specialization in the morpho-functional organization of tissues, in development of the organism and in the physiological interactions between cells. Moreover, they must know the precise anatomical terminology and understand the morphological and topographical organization of the main body regions and the morpho-functional organization of the musculoskeletal system, with a plain comprehension of the quantitative aspects of models and rules determining the functions.

Contenuti del corso
Anatomy:
Overview of the organization of the body. Nomenclature and Anatomical terminology. Superficial Anatomy. Reference planes. General classification of the organs.
Topographic and superficial Anatomy of the body regions: the head and the neck, the thorax, the abdomen and the pelvis. Clinical importance of superficial anatomy.
Locomotor Apparatus: classification of bones: long bones, short bones and flat bones. Classification of joints. Diarthrosis and enarthrosis. Classification of muscles. Nomenclature and classification of movements. The skull: splancnocranium and neurocranium. The jaw. Muscles of the head and the neck. Masticatory muscles. The spine: vertebrae. Joints of the spine. Intervertebral disks and ligaments of the spine. The thorax: ribs and sternum. Muscles of the spine, thorax and abdomen. The inguinal region and the inguinal canal. Bones, joints and muscles of the upper limb. Bones, joints and muscles of the lower limb. Principles of kinematic.

Histology:
Introduction to two-dimensional, three-dimensional and four-dimensional histological methods. Summary of the anatomy of the "theoretic eukaryotic cell". Early stages of development and origin of the adult tissues. Epithelial tissues: classification of epithelia. Lining epithelia: mono-stratified and pluri-stratified lining epithelia, specialized lining epithelia. Squamous epithelia: the skin. Endothelia. Transitional Epithelia. Mesothelia. Glandular epithelia: exocrine and endocrine glands: secretion modalities, neuro-endocrine correlations. Connective tissues: classification. Specialized connective tissues: cartilaginous tissue: intracellular matrix, cartilaginous lacunae, chondrocytes and chondroblasts. Bone tissue: osteocytes and osteoblasts, mechanisms of osteogenesis and mineralization. Bone homeostasis and its clinical implications for aging. Blood: circulating blood cells, serum and plasma. Congenic and acquired anemia and introduction to blood transfusion as a form of cell therapy. Adipose tissues and mechanisms of thermogenesis. Muscular tissue. Skeletal muscle structure: endomysium, perimysium. Skeletal muscular cells: sarcomeres and myofibrils, actine/myosin interactions. Sarcolemma, sarcoplasmic reticulum. Extra-myofibrillar cytoskeletal proteins. Mechanism of muscular contraction. Neuromuscular junction. Cardiac muscular tissue: myocardial cells. Gap junctions and inter- cellular communications. Mechanisms of myocardial contraction. Smooth muscular tissue. Nervous tissue: white matter and grey matter. The Neuron: size, shape and morphology of different neuronal subtypes. The neuronal cytoskeleton: axons, dendrites and axonal transport. Neuronal membrane and its specializations. Principal classes of neurotransmitters ad their receptors. The synapses: morphological classification and ultrastructure. The glial cells: astrocytes, oligodendrocytes, Schwann cells. Formation and constitution of myelin sheets. Microglia and mesenchymal cells of the central nervous system. Ependymal cells. The peripheral nerve: axonal organization, histological classification of neuronal fibers. Myelin sheets, endonervic and perinervic sheets. Unmyelinated peripheral fibers. Embryology: Life cycle stages. Gametogenesis. Development of the gonads. Spermatogenesis. Oogenesis. Fertilization. Embryo implantation. Segmentation. Gastrulation. Cellular and molecular mechanisms of cells differentiation. Germ layers and derivatives. Endoderm and formation of primitive intestine. Mesoderm and mesenchima. Notochord formation. Ectoderm and neuro-ectoderm, neuronal crests. Somites. General development of the fetus. Embryonic appendages.
Stem cells: Pluripotent, multipotent, unipotent stem cells. Pluripotent stem cells: the cells in the gastrula. Multipotent stem cells: cells of the embryonic body, mesenchymal and hematopoietic stem cells. Lineage-specific stem cells: Neuronal and muscle stem cells. The hematopoietic stem cell as a model for tissue differentiation. Clinical applications of the hematopoietic stem cells: autologous and heterologous bone marrow transplantation. Gene therapy and gene editing: example of gene therapy: cure for Beta-thalassemia. Example of gene editing: cure for AIDS. Clinical applications of in vitro derived stem cell progeny: mesenchymal stem cell progeny for cell therapy, tissue repair and 3D organ printing for autologous organ transplantation. Induced pluripotent stem cells and their

clinical application.

Physiology:
Control theory: policies and components of control systems, general rules of modelling, negative and positive feedbacks and feedforward controls (and their examples) and homeostasis.
Biophysics: diffusion and transport of solutes and water through cell membrane; Ion channels, transporters and their kinetics; Basic physics of electricity; Membrane resting potential (Nernst and GHK laws) and action potential (Hodgkin and Huxley experiments and model); Membrane equivalent RC circuit; Conduction of electrical signals in nerve fibers: electrical model of the axon (Kirchhoff laws), electrotonic conduction, space and time constants, point-by-point regeneration, saltatory conduction; Synapses (electrical and chemical), molecular mechanisms of exocytosis and synaptic integration, Hebbian rule and neuroplasticity.
Muscle physiology: The contraction of skeletal muscle; The physiological anatomy of skeletal muscle; The general mechanism of muscle contraction; The molecular mechanism of muscle contraction; The energetics of muscle contraction; The characteristics of whole muscle contraction; The excitation of skeletal muscle: neuromuscular transmission and excitation-contraction coupling; Muscle action potential; Muscle fibers type; Motor units; Smooth muscle contraction; The transmission of Impulses from nerve endings to skeletal muscle fibres; The molecular biology of acetylcholine formation and release; Hill's experiment, setup and model of extra and intrafusal fibers; Biomechanics of the human body.

Metodi didattici
Interactive lectures also with tutor-led small group learning and flipped classroom method.
Interactive practical lessons and exercises.
Seminars will be offered on selected topics and students will also be stimulated to research the scientific literature.

Modalità di verifica dell'apprendimento
The examination of the contents will be an integrated examination of the three modules.

• Assessment criteria of the histology module: The histological part is assessed by pre-test which will include the recognition of a tissue randomly chosen from those discussed during the course by optical microscopy. In this test, the student must prove that he is capable to describe and illustrate the criteria which lead him/her identify the nature of the tissue. The positive result of this test will allow the student to take the written test.
• With regard to the Anatomy part, it consists of a written test consisting of labelling of anatomical and radiological images and 8 multiple-choice questions followed each by a short motivation essay of a maximum 5-10 rows, by which the students must demonstrate an adequate knowledge of anatomy, with particular reference to functional, topographical and clinical anatomy. There will be an optional midterm, which might constitute credit for the final examination, focused on selected topics of cytology, histology and anatomy; the test will also consist of a written test, including short essays or multiple-choice questions.
• Concerning the Physiology part, this is done through a written multiple-choice, true-or-false and open questions test evaluating the acquired knowledge and understanding of homeostasis control, cell biophysics, basis on neuron activity and muscle physiology.

Finally, an integrated oral interview is performed to test the integrated aspects of the course, The ability to apply the knowledge and understanding, reworking them in a reasoned manner, is assessed with open-ended morpho-functional questions. Emphasis is placed on the students' communication skills and their ability to critically reformulate the learnt concepts. Students are also required to graphically represent models and relationships between physiological parameters.
The integrated oral exam evaluates student's communication and problem-solving skills in managing the integrated aspects of the course.
The final score considers the weighted average score of the exams of the three modules, and their performance during the integrated oral exam. This final score can go up to 30 + Laude.

Testi di riferimento
After the lessons covering a section of the program, students will be provided with the related didactic materials.

Anatomy
Susan Standring et al. Grey's Anatomy: The Anatomical Basis of Clinical Practice. 41st Edition. Elsevier;
Friedrich Paulsen et al. Sobotta Atlas of Human Anatomy. 15th edition. Urban & Fisher (Elsevier);
Frank H. Netter. Atlas of Human Anatomy. 7th edition. Elsevier.

Histology
Barbara Young et al. Weather: Histology and Microscopic Anatomy. 6th edition. Elsevier.
James Lowe and Peter Anderson. Stevens and Lowe's Human Histology. 5th edition. Elsevier.
Embryology: Keith Moore and T.V.N Persaud et al. The Developing Human. Clinically oriented Embryology. 11th revisited edition. Elsevier.

Physiology
Biophysics and quantitative aspects:

Joseph Feher, Quantitative Human Physiology: An Introduction, II edition, 2016
Organ Physiology:
Boron and Boulpaep, Medical Physiology, 3th Edition. Elsevier 2016;
Or alternatively:
John Hall, Guyton and Hall. Textbook of Medical Physiology, 14th edition, Elsevier 2020
Neurophysiology:
Kandel/Schwartz/Jessell, Principles of neural science, VI edition, McGraw-Hill Education 2021.

Altre informazioni
At the end of the course, the student should be able to:
• Describe the mechanism of regulation of membrane flow and potential
• Describe and understand the different tissues of the body and their embryological evolution.
• Describe the general organisation of the human body and more in detail of the musculoskeletal system with anatomo-functional bases of movement.
• Being able to model quantitatively the interaction between the investigated physiological parameters, knowing their range of normality, and their assessment methods and technologies.
• Know the main theories behind the investigated physiological functions and their key experimental bases.

L'attività didattica è offerta in:

Facoltà Dipartimentale di Medicina e Chirurgia

Tipo corso	Corso di studio (Ordinamento)	Percorso	Crediti	S.S.D.
Laurea Magistrale Ciclo Unico 6 anni	Medicine and Surgery "MedTech" (2022)	comune	11	BIO/09, BIO/17, BIO/16, BIO/16

Stampa del 04/10/2023

Basic Life Sciences 2 [1205202]

Offerta didattica a.a. 2023/2024

Docenti: GIOVANNI DI PINO, GIORGIO VIVACQUA

Periodo: Primo Ciclo Semestrale

Obiettivi formativi

Building upon the fundamentals of Chemistry, Biology and Physics, students must obtain a proficient knowledge and understanding of the organization of the nervous system and the organs of sense from a morphological and functional point of view.

Additionally, they must know the anatomical taxonomy and spatial relation of different structures of the central and peripheral nervous system.

Exploiting the comprehension of the neural development, students must understand the main functions of neural centres and their interaction, also with reference to their possible disfunction. Particular relevance is devoted to the plain comprehension of the quantitative aspects of models and rules determining the neural functions.

Contenuti del corso

Anatomy:

Neuroanatomy: Development of the central nervous system. Overview of the nervous system: general organization, meninges, CSF circulation and blood supply. Spinal cord. Brainstem and cerebellum. The Reticular formation. Diencephalon. Telencephalon. Cellular and molecular organization of the cerebral cortex. Motor pathways. Basal ganglia and cerebellum. Sensory pathways. Special sensory pathways: visual, auditory, vestibular, olfactory and gustative pathways. Limbic system: memory and emotional circuits. Circumventricular organs. Neuroanatomy of the principal neurotransmitters systems. Elements of Comparative Anatomy and artificial neuronal networks.

The sensory organs: the eye, the ocular annexes and the lacrimal glands. Muscle apparatus of the eye. The retina: cytology and functional anatomy. The ear: external ear, middle ear, internal ear: the cochlea and the Corti's organ: histology and functional anatomy; the vestibular organ. Gustative and olfactory receptor cells. Morphology of the sensory receptors of the skin and of the muscle and tendons receptors.

Peripheral nervous system: the cranial nerves. The nervous plexa: cervicalis, brachialis, lumbar and sacral. The functional distribution of the principal peripheral nerves of the upper and lower limb.

Development of sensory organs and peripheral nervous system. Elements of comparative Anatomy of the sensory systems.

Topographical Anatomy of the head and the neck

Physiology:

Molecular Neurobiology; Spinal Cord, motor and sensory tracts, spinal reflexes and their role in locomotion; Brainstem, cranial nerves and breathing control (respiratory centres and genesis of respiratory rhythm); Hypothalamus and Autonomous Nervous System (peripheral branches and central components of ANS, and their effect on different organs); Neuro Enteric System and Neural Control of Gastrointestinal Tract; Sleep and Vigilance (sleep stages, sleep regulation, associated EEG and sleep disorders); Emotions (theories and neurophysiological substrates).

Peripheral Somatosensory System and Peripheral Pain; Cortical structure, organizations and function (Somatosensory Cortex, Motor cortices); Central elaboration of pain; Basal Ganglia; Cerebellum; Auditory system (inner ear, auditory transduction, vestibular system and auditory central nervous system); Language and Neurophysiology of Music and Creativity; Chemical Senses (smell and taste); Visual system (Eye and optics, visual transduction, visual receptive fields, visual processing and control of gaze); Multisensory integration, body representation, peripersonal space and sensorimotor control and neurophysiology of tool use; Functional neuroimaging (EEG, MEG, fMRI…) and Neural interface, Closed Loop Systems and Neurotechnology; Neglect, Attention and Cognition (Conscious and Unconscious Mental Processes Attention and their disorders e.g., ADHD, Cognition Disorders e.g., Autism); Thought and Volition (and their Disorders e.g., Schizophrenia); Mood and Anxiety (and their Disorders e.g., Depression); Motivation and Addictive States of Nutrition; Learning and Memory and Aging Brain.

Metodi didattici

The aims of the course will be achieved by a combined approach between traditional inductive teaching method, problem based learning and interactive learning, consisting of open-ended problems or tests taken at the end of particularly significant topics to consolidate their learning.

Practical activities and lab simulations will also be employed.
Interactive lectures also with tutor-led small group learning and flipped classroom method.
Seminars will be offered on selected topics and students will also be stimulated to research the scientific literature.

Modalità di verifica dell'apprendimento
The evaluation of the contents will be done through an integrated examination of the two modules.

• For anatomy, the test will consist of an oral examination about: central nervous system, cranial nerves and sensory organs followed by an integrated written test consisting in one essay regarding innovative aspects of neuroanatomy, with integration of clinical neuroanatomy and comparative neuronatomy. The exams will take into account the ability of the students in the description of anatomical specimens, analysis of microscopic preparations and the answer to open questions, about neuroanatomy and topographic anatomy of the head, the neck and the limbs, as well as about innovative aspects of research in neuronatomy and evolution of the nervous system.
• Concerning the Physiology part, the test will evaluate the ability to associate anatomical structures with their main physiological function; Students are also required to understand and model the main neural functions; to comprehend the relation between physiological parameters and to graphically represent such dependencies.

Finally, a comprehensive oral interview is performed to evaluate the ability to integrate skills and knowledge acquired in the two modules. Emphasis is placed on the students' communication skills and their ability to critically reformulate the learnt concepts.
The acquisition of knowledge and skills will be verified through a final exam taking place at the end of the course, in the sessions foreseen by the academic calendar.
The final exam is composed by written and oral tests, and a final integrated oral interview.

The tests are organized as follows:
• The anatomy final mark will be calculated as the mark obtained in the oral examination plus an addition of maximum 3 marks for the written essay. The exam will be considered passed with a minimum mark of 18/30. The Written test will have a not numerical evaluation in which three grades will be considered: Sufficient, Good and Excellent. The oral examination will have a numerical evaluation with a minimum mark of 18 and a maximum mark of 30 in order to pass the exam.
• The physiology written test (30 points) consists of two consecutive steps to be taken in the same day:
o First step (18 points): 18 multiple-choice (each correct answer is worth 1 point) or true-or-false questions (each question is made up of four statements worth 0.25 point each, the whole question awards 1 point if completely correct). The final score is the sum of the correct answers. Wrong answers are worth 0 points as well as unanswered questions. The maximal score that the first step awards is 18 points. The minimum score required to proceed with the second step is 12 points.
o Second step (12 points): 3 open questions, with a maximum word count of 200 each, where the students may discuss a phenomenon. Calculations may be required. Each open question is worth 4 points. The maximal score that the second step awards is 12 points.
The score of the physiology written test (maximal 30 points) is the sum of the score achieved in the two steps. Students achieving a score below 18 do not pass the physiology written exam and are not admitted to the integrated oral exam.

The final oral interview will evaluate the ability to integrate skills and knowledge acquired in the two modules and will award the final grade considering the weighted average score of the exams of the two modules, and the performance during the integrated oral exam. This final score can go up to 30 + Laude.

Testi di riferimento
After the lessons covering a section of the program, students will be provided with the related didactic materials.

Anatomy

David L. Felten et al. Netter's Atlas of Neuroscience. 3rd edition. Elsevier.
Susan Standring et al. Grey's Anatomy: The Anatomical Basis of Clinical Practice. 41st Edition. Elsevier;
Friedrich Paulsen et al. Sobotta Atlas of Human Anatomy. 15th edition. Urban & Fisher (Elsevier);
Frank H. Netter. Atlas of Human Anatomy. 7th edition. Elsevier.
Barbara Young et al., Weather: Histology and Microscopic Anatomy. 6th edition. Elsevier.
Keith Moore and T.V.N Persaud et al. The Developing Human. Clinically oriented Embryology. 11th revisited edition. Elsevier.

Physiology

Main textbook:
Kandel/Schwartz/Jessell, Principles of neural science, VI edition, McGraw-Hill Education 2021.

Biophysics and quantitative aspects:
Joseph Feher, Quantitative Human Physiology: An Introduction, II edition, 2016

Supplementary textbook (useful especially for organ physiology, which is mainly faced during the second semester):
Boron and Boulpaep, Medical Physiology, 3th Edition. Elsevier 2016;
Or alternatively:
John Hall, Guyton and Hall. Textbook of Medical Physiology, 14th edition, Elsevier 2020

Altre informazioni

Students must gain a solid knowledge of the principles characterizing the functional organization and the physiology of the human nervous system, considering the specificity of both central and peripheral structures. Such knowledge will be quantitatively-oriented specifically towards the sensorimotor mechanisms of the nervous system, including perception and sensation, pain, motor control and autonomic responses. Students are also expected to understand the control policies adopted for regulating human behaviours, emotions, sleep-wake cycles and cognitive functions.

More in details, at the end of the course, students should be able to:
• identify, map and label key functional structures and pathways in the brain
• understand the functional principles that govern the nervous system organization;
• understand the link between human nervous systems functions and animal and cell models on a molecular and cellular level in light of research applications;
• distinguish different methods and technologies to investigate human brain from a functional and structural point of view;
• describe different regions of the brain, differentiate their function and evaluate their potential clinical relevance;
• being able to model quantitatively the interaction between the investigated neurophysiological parameters and their assessment methods and technologies.

L'attività didattica è offerta in:

Facoltà Dipartimentale di Medicina e Chirurgia

Tipo corso	Corso di studio (Ordinamento)	Percorso	Crediti	S.S.D.
Laurea Magistrale Ciclo Unico 6 anni	Medicine and Surgery "MedTech" (2022)	comune	13	BIO/16, BIO/09

Stampa del 04/10/2023

Basic Life Sciences 3 [1205205]

Offerta didattica a.a. 2023/2024

Docenti: DOCENTE_FITTIZIO DOCENTE_FITTIZIO

Periodo: Secondo Ciclo Semestrale

Syllabus non pubblicato dal Docente.

L'attività didattica è offerta in:

Facoltà Dipartimentale di Medicina e Chirurgia

Tipo corso	Corso di studio (Ordinamento)	Percorso	Crediti	S.S.D.
Laurea Magistrale Ciclo Unico 6 anni	Medicine and Surgery "MedTech" (2022)	comune	5	FIS/07

Stampa del 04/10/2023

Basic Life Sciences 3 [1205204]

Offerta didattica a.a. 2023/2024

Docenti: GIOVANNI DI PINO, GIORGIO VIVACQUA

Periodo: Secondo Ciclo Semestrale

Syllabus non pubblicato dal Docente.

L'attività didattica è offerta in:

Facoltà Dipartimentale di Medicina e Chirurgia

Tipo corso	Corso di studio (Ordinamento)	Percorso	Crediti	S.S.D.
Laurea Magistrale Ciclo Unico 6 anni	Medicine and Surgery "MedTech" (2022)	comune	12	BIO/16, BIO/09

Stampa del 04/10/2023

Biochemistry [1205203]

Offerta didattica a.a. 2023/2024

Docenti: ALESSANDRO LEUTI, SILVIA ANGELETTI

Periodo: Ciclo Annuale Unico

Obiettivi formativi
The teaching aims at providing the essential knowledge to understand the chemistry behind the main cellular and physiological processes, and the role played by the main organic molecules in these functions. The student will study the structure and function of carbohydrates, lipids, proteins and nucleic acids, and will be introduced to the concept of metabolism and of its regulation in healthy and pathological conditions, while learning the thermodynamics that governs the metabolic fluxes. The course will also feature an application of these concepts to clinical biochemistry, to better understand how these processes are involved in the diagnostic process.

Prerequisiti
A basic knowledge of the cell structure (organelles and compartmentalization) and functions. A basic knowledge of inorganic chemistry concepts such as pH, pKa, solubility, buffer solutions, equilibria, as well as basic concepts of organic chemistry , such as functional groups and species, IUPAC nomenclature and the main reactions of organic molecules.

Contenuti del corso
Biochemistry syllabus

• Water: water structure and properties; hydrogen bonds and other electrostatic interactions; interaction between water and other organic compounds. Colligative properties.
• Amino acids and proteins: structure and function of amino acids. Classification and chemical-physical properties.
• Three-dimensional structure of proteins: primary, secondary, tertiary and quaternary structure of proteins; Ramachandran plot; protein folding.
• Protein Function: collagen, keratin and oxygen-transporting molecules: structure of hemoglobin and myoglobin, saturation, Bohr Effect, homotropic and heterotropic allosteric modulators of hemoglobin.
• Thermodynamics: concept of entropy, enthalpy and Gibbs free energy. - Enzymes: structure and properties of enzymes; catalysis; Michaelis-Menten kinetics; V0, Vmax and Km. Lineweaver-Burk plot. Reversible and irreversible inhibition
• Structure and role of carbohydrates: monosaccharides; oligosaccharides; polysaccharides; O- and N-glycosidic bond; starch; cellulose; glycogen.
• Nucleotides and nucleic acids: structure and functions; DNA and RNA.
• Structure and function of lipids: fatty acids; phospholipids; cholesterol; Eicosanoids and PUFA-derived endogenous signalling lipids.
• Biological membranes and transport.
• Biosignalling:
• Carbohydrate metabolism and its regulation: glycolysis; gluconeogenesis; pentose phosphate pathway; regulation of carbohydrate metabolism; glycogenesis; glycogen breakdown.
• Structural Biology
• Krebs Cycle: the role of pyruvate dehydrogenase, reactions and regulation of Krebs cycle.

• Lipid metabolism: lipoproteins;lipogenesis and lipolysis; beta-oxidation of odd- and even-chain, saturated and unsaturated fatty acids; ketogenesis; biosynthesis of fatty acids, phospholipids and cholesterol; regulation of lipid metabolism.

• Ammino acid metabolism: transamination; oxidative deamination; urea cycle; catabolism of ammino acids;
• Nucleotide metabolism.
• Heme synthesis and catabolism.
• Steroid Hormon biosynthesis
• Water- and fat-soluble vitamins: vitamin B complex and ascorbate, vitamin A, D, E, K; pathologies caused hypovitaminosis.
• Oxidative phosphorylation: chemiosmotic theory; mixed and pure electron transporters; redox loop and proton pump; mitochondrial complexes and ATP-Synthase.
• Examples of metabolic and enzyme-related diseases.
Clinical Biochemistry syllabus

• Biomarkers. Characteristics. Laboratory tests and results interpretation. Laboratory test automation: Total Laboratory Automation (TLA).
• Acid-base balance and blood gas. Definition of acids, bases, pH and buffer solution. pH homeostasis. Pulmonary and renal control of arterial pH. Simple acid-base disorders (metabolic and respiratory acidosis, metabolic and respiratory alkalosis. Anion GAP. Compensation. Mixed acid-base disorders. Blood gas analysis.
• Hydro-electrolyte balance. Fluid balance: body water and its distribution in body compartments. Gibbs-Donnan equilibrium. Osmotic pressure. Body water homeostasis: antidiuretic hormone, aldosterone and natriuretic hormone and related disorders from inappropriate secretion: SIADH, diabetes insipidus, hyperaldosteronism and hypoaldosteronism. Dehydration and overhydration. Electrolyte balance: Natremia, hypernatremia and hyponatremia. Kalaemia, hyperkalaemia and hypokalaemia. Chloremia, hyperchloremia and hypochloremia.
• Non-protein nitrogen. Overview of protein catabolism and nucleic acids. Determination of non-protein nitrogen in blood and urine. Blood urea nitrogen, ammonia, uric acid and creatinine.
• Carbohydrate metabolism. Glucose metabolism and hormonal regulation of glucose metabolism. Diabetes mellitus classification: type 1 diabetes, type 2 diabetes, impaired glucose tolerance, secondary diabetes, gestational diabetes, MODY (Maturity Onset Diabetes of the Young).
• Laboratory tests for the diagnosis and monitoring of the diabetic patient: assessment of fasting plasma glucose level, oral glucose loading curve test (OGTT), HbA1c assay, insulin assay, C-peptide assay, glycated hemoglobin and glycated plasma proteins (fructosamines). Laboratory tests in the acute and chronic complications of diabetes: ketonemia and ketonuria, lactic acid dosage, evaluation of acidosis and variation of the anion GAP, albuminuria dosage in diabetic nephropathy.
• Lipid metabolism. Metabolism, classification and composition of lipoproteins. Role of apoproteins in lipoprotein metabolism: apoA, apo B, apoC, apoE. Evaluation of the level of triglycerides, total cholesterol, HDL-cholesterol, LDL-cholesterol. Dyslipidemia and atherosclerosis.
• Blood cell count. Normal value and results interpretation. Laboratory diagnosis of thalassemia, hemoglobinopathies and anemia. Porphyria: disorders of porphyrins
• Hemostasis principles. Bleeding and thrombotic disorders
• Biomarkers in organ failure. The liver, the heart, the kidney, the pancreas
• Serum protein. Electrophoresis and results interpretation
• DNA technology: Large Probes used to detect copy number variations; Small Probes to detect point mutations; DNA Amplification by Polymerase Chain Reaction; Allelic Heterogeneity in the molecular genetic diagnosis; normal polymorphisms used as genetic markers;DNA Microarrays for genetic screening and gene expression analysis; DNA sequencing and Whole-Genome seuqnecing (WGS).

Metodi didattici
Ex-cathedra lectures. Weekly student counselling.

Modalità di verifica dell'apprendimento
Written test on the topics covered during the lectures
• 2-hours written test, 10 short essays (max 300 words). Each short essay will be worth 0-30 points and the final grade will be the average of all the essays.

Testi di riferimento
• Lehninger Principles of Biochemistry (D.L. Nelson and M.M. Cox) (main text)
• Voet's Principles of Biochemistry (facultative)
The teacher will provide all the slides used in the lectures, as well as learning objectives of each topic covered in class.
• Marshall - Lapsley - Day – Ayling. Clinical Biochemistry: Metabolic and Clinical Aspects - With Expert Consult access, 3rd Edition, Churchill Livingstone.
• Michael L. Bishop, Edward P. Fody, Carleen Van Siclen. Clinical Chemistry: Principles, Techniques, and Correlations. Jones and Bartlett Publishers, Inc, 2022
• Michael J. Murphy, Rajeev Srivastava, Kevin Deans. Clinical Biochemistry. Elsevier, 2023

Altre informazioni
Knowledge and understanding
At the end of the course, the student must be able to describe the structure and general functions of the main organic molecules in human biology, as well as to describe the main pathways that orchestrate the metabolism of carbohydrates, lipids, proteins and nucleic acids, as well as the main elements of clinical biochemistry to which these elements are applied.

Applying knowledge and understanding
At the end of the Course, the student must be able to act to understand the main roles of organic molecules involved in cellular processes, and should be able to describe the connections between different metabolic pathways as they are constantly modulated during cellular homeostasis. He/she/they should be able to apply these concepts to the human pathologies that will be covered during the lectures.

L'attività didattica è offerta in:

Facoltà Dipartimentale di Medicina e Chirurgia

Tipo corso	Corso di studio (Ordinamento)	Percorso	Crediti	S.S.D.
Laurea Magistrale Ciclo Unico 6 anni	Medicine and Surgery "MedTech" (2022)	comune	12	BIO/10, BIO/12

Stampa del 04/10/2023

Biology [1205101]

Offerta didattica a.a. 2023/2024

Docenti: ELENA SANTONICO

Periodo: Primo Ciclo Semestrale

Obiettivi formativi
The objective of this integrated course is to provide students with an understanding of the structural and functional organization of the animal cells, the main cellular processes, and the bases of molecular biology. The Experimental Biology module will provide students with the ability to recognize and describe the characteristics of the main cellular structures and to describe the relationship between structural organization, function, and dysfunction of the main subcellular districts. The Molecular Biology module will focus on the study of the structure, function and regulation of proteins. Essential techniques for structural analysis will be discussed.

Prerequisiti
No prerequisites required.

Contenuti del corso
Experimental Biology module
- The origin of life: organization of the prokaryotic and eukaryotic cell
- Compartmentalization of functions in the eukaryotic cell
- Cell membrane and intracellular membranes
- Morphology and function of the nucleus
- Structural and functional properties of the genetic material
- DNA replication
- Gene expression
- The genetic code and protein synthesis
- Sorting of proteins, endocytosis and secretory pathway
- Cell division: Mitosis and Meiosis
- General principles of cell signaling
Molecular Biology Module
- Structure and function of proteins
- Regulation of protein function, allostery
- Proteases in health and disease
- Techniques for the study of protein structure: X-ray crystallography and cryo-electron microscopy (Cryo-EM).

Metodi didattici
The course comprises lectures and exercises addressing theory and practice of the topics being discussed. Active student participation is expected during the lectures and through working groups to foster interdisciplinary knowledge.

Modalità di verifica dell'apprendimento
The exam will consist of a written test followed by an optional oral exam requiring a passing score in the written test of at least 18/30. The written test will entail:

- multiple choice questions about topics covered in the course
- open-ended questions to assess the ability of elaborate on concepts covered in the course

The optional oral exam will assess acquisition of knowledge and analytical skills on general principles presented in the course. A final score in units up to 30 (plus honors) will combine results from the written test and optional oral exam.

Testi di riferimento
Recommended textbooks:
Molecular Cell Biology (H. Lodish, A. Berk, CA Kaiser, M. Krieger, A. Bretscher, H. Ploegh, KC Martin, M. Yaffe, A. Amon), 9th Edition
Karp's Cell and Molecular Biology (Gerald Karp, Janet Iwasa, Wallace Marshall)
Other: Molecular Biology of the Cell - 7th edition (Bruce Alberts)

Additional material will be provided during the course.

Altre informazioni
At the end of the course students will be able to:

- Know and understand the general principles of biology
- Identify and explain the function of the main structures of an animal cell
- Describe and relate different biological processes
- Understand the structural basis of protein function and relevant techniques

L'attività didattica è offerta in:

Facoltà Dipartimentale di Medicina e Chirurgia

Tipo corso	Corso di studio (Ordinamento)	Percorso	Crediti	S.S.D.
Laurea Magistrale Ciclo Unico 6 anni	Medicine and Surgery "MedTech" (2022)	comune	9	BIO/11, BIO/13

Stampa del 04/10/2023

Physics and Chemistry [1205102]

Offerta didattica a.a. 2023/2024

Docenti: SARA MARIA GIANNITELLI

Periodo: Ciclo Annuale Unico

Obiettivi formativi
The course provides an overview of general inorganic and organic chemistry.

Prerequisiti
Basic notions of mathematics and physics.

Contenuti del corso
Introduction remarks: The Scientific Method, Measurements, Scientific Notation, Density, Temperature, Matter and energy, Chemical vs. Physical Changes.
Atoms and Molecules: Dalton's Theory, Bohr Theory, Modern Atomic Theory, Periodic Table, Electronic Structure of Atoms.
Chemical bond: covalent bond, ionic, metallic, Inorganic Nomenclature, hydrogen bond, Electronegativity, Weak interactions.
Chemical Reactions: Mole Concept, Stoichiometry, Types of Reactions, Oxidation-Reduction.
States of Matter: Gas Laws, Intermolecular Forces, Liquids, Solids, Changes of State.
Solutions: Concentration Terms (%w/w, %w/v, v/v %, M, b, N), Colligative Properties.
Chemical Equilibrium: Law of Chemical Equilibrium, Kp, Kc and Kx, van't Hoff Equation, Le Chatelier's Principle.
Solubility Equilibria: Sparingly Soluble Compounds, Net Ionic Equations, Kps Concept and Calculations.
Chemical Kinetics: Concepts, Rate Equations, First Order, Second Order, Half-Life, Rate Constants, Energy Profile Diagrams, Activation Energy.
Acids and Bases: Definitions (Arrhenius, Brønsted-Lowry, Lewis), Weak vs. Strong, Hydrolysis, Neutralization, pH, titrations, buffers (e.g. bicarbonate and phosphate buffers).
Electrochemistry: Faraday's Law, Galvanic Cells: Concepts, Cell Diagrams, Anode and Cathode, Half-Cell Reactions, Overall Cell Reactions, Nernst Equations and e.m.f.
Nuclear chemistry: radioactivity, decay time, clinical applications.

Organic Chemistry: Functional Groups and their main reaction mechanisms, Nomenclature, Structural or spatial arrangements of organic molecules, Main classes of organic compounds.

Metodi didattici
Face-to-face lectures (75%, approx. 65 hours).
Exercises on the application to specific problems of the knowledge learned in lectures (18%, approx.16 hours).
Laboratory sessions to teach the work in a chemical laboratory, prepare chemical solutions and see the application of written exercises on solubility, pH, titration (7%, approx. 6 hours).

Modalità di verifica dell'apprendimento
Knowledge and skills will be verified by a multiple choice questions test to be carried out on the University's elearning platform. In the test, the Student will have to answer 30 multiple choice questions in 50 minutes. The Student will receive the result of his test as a score expressed in thirtieths.
In the test, the Student will have to answer 30 multiple choice questions in 50 minutes, of which:
- each question will have 4 answers (A, B, C, D) of which only one is corrected;
- only one answer can be selected for each question;
- points are assigned as follows: 1 (one) point for each correct answer; 0 (zero) points for each incorrect or not given answer.
Each student will receive a different test, randomly assigned by the system.
The tests will be evaluated automatically through the e-learning system, on the basis of preloaded correct responses. The test score will be provided only to each individual student. Correct answers will be also provided and the Commission will be available to discuss the test answers.

Minimum passing grade is 18/30. In the event of a full grade (30/30), the student will have the opportunity to try for an honor grade (cum laude) through a satisfactory answer to a single-question oral test, carried out immediately after the written test evaluation. In the event of an unsatisfactory answer, the final grade could be reduced by up to 3

points.

Testi di riferimento
Face-to-face lectures and exercises are carried out on an electronic whiteboard. The saved whiteboards will be uploaded on the e-learning platform at https://elearning.unicampus.it/.
These whiteboards allow the student to review and deepen the topics covered and transform into knowledge what has been learned in class and into skills and competences what has been done during the exercises.
Teaching materials recommended for independent study by the Student interested in learning more about the discipline:
- Whitten, Davis, Peck, Stanley, CHEMISTRY, 10th Edition, Cengage Learning.
Exercises:
P.M. Lausarot, G.A. Vaglio, STECHIOMETRIA PER LA CHIMICA GENERALE, Piccin

Altre informazioni
Knowledge and understanding
The course will transfer the following knowledge and understanding to the student:
• the atomic bases of chemistry for the construction of the periodic table of elements and a reasonable prediction about how and why the atoms react;
• the chemical bond and its correlation with the properties of matter; spontaneity and equilibrium of chemical reactions; the main classes of organic compounds and their reactivity.
The student will: understand the meaning of chemical reaction and perform stoichiometry calculations; describe the properties and structure of gas, liquid and solids; understand the kinetic aspects of the chemical transformations.

Applying knowledge and understanding
At the end of the course the student will be able to:
• make predictions on the reactivity of an element based on its position in the periodic table;
• write a formula of Lewis structure by sorting the compounds on the basis of the chemical bond and properties;
• discuss a chemical balance and the factors that influence the reaction with particular attention to the acid/base balance;
• define a species oxidant and reductant;
• write formulas of organic compounds and use them to synthesize other.
The student must also be able to solve stoichiometric problems of practical utility (e.g., calculation moles, balance reactions, limiting reagent, yield, definition and ways of expressing concentration, preparation of diluted solutions).

L'attività didattica è offerta in:

Facoltà Dipartimentale di Medicina e Chirurgia

Tipo corso	Corso di studio (Ordinamento)	Percorso	Crediti	S.S.D.
Laurea Magistrale Ciclo Unico 6 anni	Medicine and Surgery "MedTech" (2022)	comune	7	CHIM/07

Stampa del 04/10/2023

English Language [1205107]

Offerta didattica a.a. 2023/2024

Docenti: ADAM JAMES MARTIN

Periodo: Ciclo Annuale Unico

Obiettivi formativi
The first semester of the course focuses on consolidating the language at C1 level. In the second semester, the teaching of scientific terminology is deepened, enabling students to prepare documents and presentations of a medical-scientific nature.

Prerequisiti
Students with an initial level equal or higher than C1 CEFR are exempt from the first semester of the course and the language test after verification from a written exam. Students with language certifications of level C1 or higher can obtain exemption from the first semester of the course and the language test by submitting an application to the attention of the University Language Center (cla@unicampus.it).

Contenuti del corso
The curricular course of 4 credits is divided into two parts. The first semester of the course is dedicated to consolidating the language at C1 level. In the second semester, the course focuses on the ability to prepare and present medical topics orally.

Metodi didattici
The entire course is delivered through lectures and classroom exercises. In addition, students will work in groups on preparing projects and presentations.

Modalità di verifica dell'apprendimento
An oral exam based on questions relating to the medical-scientific topics addressed during the course. The final grade is awarded out of thirty and will be attributed by evaluating the linguistic competence in scientific language and the preparation of contents studied during the course.

Testi di riferimento
Textbook: Life, National Geographic Learning; second edition.
The teachers will provide the teaching material during the course

Altre informazioni
At the end of the first semester the student will take a written test to prove they have acquired a C1 CEFR level of general English. At the end of the first year, the student will take an oral exam based on questions relating to the medical-scientific topics addressed during the course.

L'attività didattica è offerta in:

Facoltà Dipartimentale di Medicina e Chirurgia

Tipo corso	Corso di studio (Ordinamento)	Percorso	Crediti	S.S.D.
Laurea Magistrale Ciclo Unico 6 anni	Medicine and Surgery "MedTech" (2022)	comune	4	L-LIN/12

Stampa del 04/10/2023

Fundamentals of Computer Science [1205110]

Offerta didattica a.a. 2023/2024

Docenti: ROSA SICILIA

Periodo: Secondo Ciclo Semestrale

Obiettivi formativi
Introduction to the organization and use of a computing system, with special focus on problem solving through computer programming.

Prerequisiti
Besides the prerequisites required for accessing the Laurea programme, it is requested knowledge about the notions concerning vectors and matrices which is acquired in the course of Mathematics. The ability to use a computer is a prerequisite as well.

Contenuti del corso
Elements of computer architectures. Data representation. Computer arithmetic. Boolean algebra. Structure and components of a computer system. Distributed systems (15 hours)
Operating systems. Structure of operating systems. Elements of process management, memory management, peripherals management. File system and user interface. (15 hours)
The Python language. Structure of a Python program. Built-in basic types and arithmetic/logical operators, statements, input/output, basic control structures/statements. Complex datatypes (sequences) and built-in methods. File formats (csv, json, xml). Data manipulation and visualization. Standard libraries and reusable software components. (25 hours)
Basics of Object-Oriented Programming. Introduction to objects and classes. Methods and attributes. (7.5 hours)

Metodi didattici
Lectures/flipped classrooms, and practical exercises (total of 40 hours, with 30% devoted to present examples and develop exercises).
Laboratory sessions to teach the use of software tools needed for Python programming and to develop exercises (22.5 hours).

Modalità di verifica dell'apprendimento
Knowledge and abilities will be assessed through a practical programming assessment (I.e. Python) and by an oral test focusing on theoretical topics covered by the course programme. The student must also demonstrate that he/she is familiar with and able to adequately apply the methodologies and techniques presented in the course.

The final score is expressed as a fraction of 30. Minimum passing grade is 18 at each of the two tests . The practical assessment and theoretical topics discussion contribute 3/5 and 2/5, respectively, to the final score.

Testi di riferimento
Lecture notes, Powerpoint presentations, exercises, freely distributed in electronic format at http://elearning.unicampus.it/.

The contents of the course can be found in English in the following textbooks:
• J. Hunt, "A Beginners Guide to Python 3 Programming", Springer

Altre informazioni
Knowledge and understanding.
The course will transfer the following knowledge and understanding to the student:
• Knowledge and understanding of basic elements of computer architectures, including distributed systems
• Knowledge of user interfaces for interaction with a computing system
• Knowledge of data representation and storage in computer systems
• Knowledge of one programming language that support modular development and reuse of software

• Knowledge and understanding of basic principles of Object-Oriented Programming

Applying knowledge and understanding.
At the end of the course the student will be able to:
• Manage data and software applications in a standard computing environment
• Understand how to employ reusable software components from available documentation
• Use a programming language to design simple algorithms for data processing
• Develop data processing applications assembling reusable software components

L'attività didattica è offerta in:

Facoltà Dipartimentale di Medicina e Chirurgia

Tipo corso	Corso di studio (Ordinamento)	Percorso	Crediti	S.S.D.
Laurea Magistrale Ciclo Unico 6 anni	Medicine and Surgery "MedTech" (2022)	comune	5	ING-INF/05

Stampa del 04/10/2023

General Physics 1 [1205109]

Offerta didattica a.a. 2023/2024

Docenti: ALESSANDRO LOPPINI

Periodo: Primo Ciclo Semestrale

Obiettivi formativi
The course aims to provide knowledge about the fundamentals of classical mechanics and thermodynamics and give a basic knowledge of physical laws. The primary learning objective is the development of the ability to grasp the essential aspects of physical processes, framing them with coherent descriptive and quantitative mathematical models related to biomedical engineering applications.

Prerequisiti
Precalculus. A basic prior knowledge of calculus is recommended.

Contenuti del corso
- Introduction. The scientific method. Physical quantities, measurement unit systems. (2 hours)
- Kinematics in one and two dimensions. Displacement, velocity, acceleration. Motion at constant acceleration. Falling body. Circular motion. Projectile motion. (4 hours)
- Single particle dynamics: Newton's laws. Inertia principle. Mass and force. The second and third laws of motion. Inertial and non-inertial reference systems. Weight force. Constraints and contact forces. Strings and springs. Friction. Drag forces. (6 hours)
- Work and kinetic energy. Conservative forces and potential. Conservation of mechanical energy. Impulse and linear momentum. Systems of particles. Center of mass. (6 hours)
- Conservation of linear momentum. Kinetic energy of a system. Collisions. (4 hours)
- Rotations and rigid bodies dynamics. Torque. Moment of Inertia. Rotational kinetic energy. Rigid body rotation with fixed axis. Rolling motion. Static equilibrium. Elastic properties of solids. (6 hours)
- Angular momentum and conservation of angular momentum. Newton's law of gravity and gravitational field. Kepler's laws. (2 hours)
- Oscillations. Harmonic motion. Damped oscillations. Driven oscillations and resonance. (4 hours)
- Fluids. Density and pressure. Stevin's law. Buoyant force and Archimedes' principle. Fluids in motion: inviscid fluids and Bernoulli equation. Torricelli's law. Viscid fluids and Poiseuille's law. (4 hours)
- Thermodynamics and thermodynamic systems. Equilibrium states. Temperature and Kinetic theory of gases. Thermal equilibrium and thermometers. Zero law of thermodynamics. Ideal gases. Heat and specific heats. Latent heat. Thermodynamic processes. Work. Joule's experiment and first law of thermodynamics. Internal energy. Transfer of heat. Heat engines and the second law of thermodynamics. Thermodynamic cycles. Carnot engine. Irreversibility and Entropy. (8 hours)
Practical sessions on selected problems will be delivered for a total of 40 hours.

Metodi didattici
Theoretical and practical lectures focused on the topics of the course. Teaching methods involve frontal lectures, slides and whiteboard.

Modalità di verifica dell'apprendimento
The Knowledge will be assessed through one written test focusing on practical problems and theoretical questions. The test will be delivered at the end of the first semester, and it will be focused on Mechanics and Thermodynamics. Students will have to demonstrate their knowledge by specifying every mathematical step involved in solving problems, and the adopted assumptions and calculus must consistently support the final answers. The final grade is based on the results of the written test. To pass the test, a student has to reach the minimum score of 18 (60% of correct answers supported by correct reasoning on the problem).

Testi di riferimento
- Slides and material produced by lecturers and uploaded on the e-learning platform.
- Suggested textbooks: Physics for Scientists and Engineers, Extended Version. 6th Edition, 2020. Paul A. Tipler, Gene Mosca. Macmillan.

Altre informazioni

Knowledge and understanding
Students will achieve an adequate knowledge of physical laws and related mathematical aspects on broad aspects of classical physics, including:
- Kinematics and Newtonian dynamics.
- Fluids.
- Calorimetry and thermodynamics.
Students will learn methodological-operational aspects of Physics to interpret and describe medical and engineering problems.

Applying knowledge and understanding
At the end of the course, students will be able to correctly use theoretical knowledge to solve practical problems and applications. Students will be able to interpret physical laws and apply them in different fields typical of medical and bioengineering applications.

L'attività didattica è offerta in:

Facoltà Dipartimentale di Medicina e Chirurgia

Tipo corso	Corso di studio (Ordinamento)	Percorso	Crediti	S.S.D.
Laurea Magistrale Ciclo Unico 6 anni	Medicine and Surgery "MedTech" (2022)	comune	7	FIS/07

Stampa del 04/10/2023

General Physics 2 [1205108]

Offerta didattica a.a. 2023/2024

Docenti: ALESSANDRO LOPPINI

Periodo: Secondo Ciclo Semestrale

Obiettivi formativi
The course aims to provide the fundamentals of electromagnetism and give a basic knowledge of physical laws. The primary learning objective is the development of the ability to grasp the essential aspects of physical processes, framing them with coherent descriptive and quantitative mathematical models concerning biomedical engineering applications.

Prerequisiti
Precalculus. A basic prior knowledge of calculus is recommended.

Contenuti del corso
- Electric charge. Conductors and insulators. Coulomb's law. Electric field of discrete charge distributions. (3 hours)
- Electric field of continuous charge distributions. Gauss's law. (3 hours)
- Electrostatic potential energy and electric potential. Capacitance and capacitors. Electrical energy. Batteries. Dielectrics. (4 hours)
- Electric current and Direct-Current circuits. Ohm's laws. Kirchhoff's rules. Combination of capacitors and resistors. Joule's effect. RC circuits. (4 hours)
- Magnetic force on moving charged particles, straight current-carrying wires and current elements. Torques on current loops. Hall effect. (2 hours)
- Sources of magnetic field. Biot-Savart law. Gauss's law for magnetism. Ampère's law. (4 hours)
- Magnetic flux. Induced electromotive force and Faraday's law. Len's law. Inductance. Magnetic energy. RL circuits. (4 hours)
- Displacement current and Maxwell-Ampère law. Maxwell's equations in integral and local form. The wave equation for electromagnetic waves. Electromagnetic spectrum. (4 hours)
- Properties of light. Reflection and Refraction. Polarization. (2 hours)
- Geometrical optics: lenses, mirrors, optical systems. (4 hours)
Practical sessions on selected problems will be delivered for a total of 30 hours.

Metodi didattici
Theoretical and practical lectures focused on the topics of the course. Teaching methods involve frontal lectures, slides and whiteboard.

Modalità di verifica dell'apprendimento
The Knowledge will be assessed through one written test, including practical problems and theoretical questions. The test will be delivered at the end of the second semester, and it will be focused on Electromagnetism and Optics. Students will have to demonstrate their knowledge by specifying every mathematical step involved in solving problems, and the adopted assumptions and calculus must consistently support the final answers.
The final grade will consider the score reported in the written test. To pass the test, a student has to reach the minimum score of 18 (60% of correct answers supported by correct reasoning on the problem).

Testi di riferimento
- Slides and material produced by lecturers and uploaded on the e-learning platform.
- Suggested textbooks: Physics for Scientists and Engineers, Extended Version. 6th Edition, 2020. Paul A. Tipler, Gene Mosca. Macmillan.

Altre informazioni
Knowledge and understanding
Students will achieve an adequate knowledge of physical laws and related mathematical aspects on broad aspects of classical physics, including:
- Electromagnetism.
- Geometrical optics.
Students will learn methodological-operational aspects of Physics to interpret and describe medical and engineering

problems.

Applying knowledge and understanding
At the end of the course, students will be able to correctly use theoretical knowledge to solve the practical problems and applications. Students will be able to interpret physical laws and apply them in different fields typical of medical and bioengineering applications. The ability to apply knowledge and understanding to specific problems will be achieved through classroom practical sessions.

L'attività didattica è offerta in:

Facoltà Dipartimentale di Medicina e Chirurgia

Tipo corso	Corso di studio (Ordinamento)	Percorso	Crediti	S.S.D.
Laurea Magistrale Ciclo Unico 6 anni	Medicine and Surgery "MedTech" (2022)	comune	5	FIS/03

Stampa del 04/10/2023

Italian Language [1205106]

Offerta didattica a.a. 2023/2024

Docenti: DOCENTE_FITTIZIO DOCENTE_FITTIZIO

Periodo: Ciclo Annuale Unico

Obiettivi formativi
The first semester of the course is aimed at providing the students basic communication skills in Italian and at achieving level A1. This is done by presenting the language in a variety of authentic contests, in order to work on all four linguistic skills: speaking, listening, reading and writing. During the second the semester students will conitnue working on the communication skills in order to achieve level A2.

Prerequisiti
None.

Contenuti del corso
The curricular course is divided into two parts. The first semester is aimed at achieving level A1. In the second semester the course reinforces what has already been studied, continuing with the learnig of grammar and other linguistic skills, in order to achieve level A2.

Metodi didattici
The course is delivered through lectures and class exercises. Students will often work in groups. Activities will focus on applying real life situations through guided conversation in order to facilitate dialogue between students and practice the language to understand its real use.

Modalità di verifica dell'apprendimento
Written and oral exam based on listening material, where a conversation is held and in turn awareness of grammar and sentences construction. The final grade is awarded out of thirty. The final assessment will be given by evaluating the students' competences in all four linguistic skills: speaking, listening, reading and writing.

Testi di riferimento
Textbook: Maria Balì - Giovanna Rizzo, Nuovo Espresso 1, Alma Edizioni.

Altre informazioni
By the end of the first year, each student will have to take a written test consisting of grammar exercises, text comprehension, and writing. In addition, they will sit a listening and oral test.

L'attività didattica è offerta in:

Facoltà Dipartimentale di Medicina e Chirurgia

Tipo corso	Corso di studio (Ordinamento)	Percorso	Crediti	S.S.D.
Laurea Magistrale Ciclo Unico 6 anni	Medicine and Surgery "MedTech" (2022)	comune	4	L-FIL-LET/12

Stampa del 04/10/2023

Mathematics and Computer Science [1205103]

Offerta didattica a.a. 2023/2024

Docenti: MARTA MENCI

Periodo: Ciclo Annuale Unico

Obiettivi formativi

The course provides the students with the basic mathematical tools needed in engineering and is designed to increase their knowledge and understanding of Mathematical Analysis and Linear Algebra. Students get also acquainted with setting up and solving mathematical problems. By the end of the course, students should successfully tackle and solve nontrivial mathematical exercises, together with a clear understanding of the most important theoretical results discussed in the course.
The course attempts to present mathematics as an organized body of knowledge that will provide students with a sound basis for later use in engineering and applications.

Prerequisiti

Basic algebra, first and second-degree equations and inequalities, rational equations and inequalities, first and second-degree systems of equations and inequalities, equations and inequalities involving logarithms and exponentials, trigonometry, divisions by polynomials, irrational equations and inequalities, sums, set theory, inductive reasoning. Geometry: lines, circles, parabolas, ellipses and hyperbolas.

Contenuti del corso

Linear Algebra (Dr Marta Menci)
Systems of linear equations: Introduction to Systems of Linear Equations. Gauss Elimination and Gauss-Jordan Elimination. Applications of Systems of Linear Equations. Matrices. Operations with Matrices. Properties of matrix operations. The Inverse of a Matrix. Elementary Matrices. More Applications of Matrix Operations. Determinants. The Determinant of a Matrix. Determinants and Elementary Operations. Properties of Determinants. Applications of Determinants. Vector Spaces. Vectors in the Euclidean space. Subspaces of Vector Spaces. Spanning Sets and Linear Independence. Basis and Dimension. Rank of a Matrix and Systems of Linear Equations. Coordinates and Change of Basis.
Calculus and Real Analysis (Dr Marta Menci)
Mathematical models: A catalog of essential functions. New functions from old functions. Exponential functions. Trigonometric functions. Inverse functions and logarithms.
Number and Functions. Properties of Reals Numbers and Inequalities. Basics of Complex Numbers. Functions and Limits. The precise definition of a limit. The limit of a function. Calculating limits using the limit laws. Limit at infinity: Horizontal asymptotes. Continuity of Functions. Basic Properties of Continuous Functions. Derivatives: Derivatives and rates of change. The derivative as a function Differentiation rules: Derivatives of polynomials and exponential functions. The product and quotient rules. Monotonicity, Convexity, and Concavity. Absolute Minimum and Maximum. Local Extrema and Points of Inflection. Integration. The Riemann Integral. Riemann Sums. Integrable Functions. The Fundamental Theorem of Calculus. Indefinite integrals and the net change theorem. The substitution rule. Integration by parts.

Differential calculus for functions of several variables (Prof Marco Papi)
Partial derivatives, tangent plane, directional derivatives. The Hessian matrix. Optimization: local maxima and minima. Constrained extrema.
Ordinary differential equations (Prof Marco Papi)
Linear first and second order equations. Separated variables and Bernoulli differential equations. Existence and uniqueness of the local solution for the first order Cauchy problem. Local and global solutions. Matrix exponential and representation of solutions.

Metodi didattici

- Lessons (100 hours): the course topics and exercises are carried out in order to show the application to specific problems.
- Exercise sessions (25 hours), in classroom, with a weekly planning.

Modalità di verifica dell'apprendimento

Knowledge and skills will be verified by means of a written test including 5 practical open-form exercises and 5 multiple choice questions. The exercises and the questions will focus on the following topics: vector spaces,

matrices, systems of linear equations, functions of one real variable, integration of real functions, Linear Ordinary Differential Equations, functions of several variables.

The choice of the open-form for the exercises is aimed to assess the effective degree of learning and the autonomous elaboration ability of the students, as described in the course objectives. In particular, the written test aims to reward the ability to identify the most important aspects of each topic and to expose them correctly but also in a synthetic fashion. In the theoretical questions students are called to answer to questions mainly related to the theoretical contents of the course program. The written test total score is 32 (maximum) and the time assigned for the test completion is 2.5 hours.

The exam involves an evaluation which is expressed as a grade of out of 30. An exam is deemed to be passed successfully if the grade of written test is equal to or higher than 18/32. If the grade of the written test if higher than 30, the final mark of the exam is 30 cum laude.

Testi di riferimento
[1] D.C. Lay, "Linear Algebra and Its Applications", Addison-Wesley, Fourth Edition.
[2] J. Stewart, "Calculus, Early Transcendentals", Brooks/Cole, Seventh Edition.
[3] Walter Rudin, Principles of Mathematical Analysis, third edition, McGraw-Hill.

Altre informazioni
Knowledge and understanding
The course will transfer the following knowledge and understanding to the students:
- Linear Algebra: vectors, matrices, systems of linear equations;
- Differential and integral calculus: investigation of the main analytical properties of real-valued functions;
- Linear Ordinary Differential Equations.
- Functions of several variables;
- Vector and integral calculus for functions of several variables;
The student will be able to understand the basic concepts of Linear Algebra, including operations on vectors, matrices, and methods for solving systems of linear equations. Moreover, students will acquire knowledge in the field of differential and integral calculus, understanding the main properties of real-valued functions.

Applying knowledge and understanding
At the end of the course the students will be able:
- to investigate the nature of Vector Spaces;
- to discuss the results of Systems of linear equations and Linear Ordinary Differential Equations;
- to study and represent real-valued functions of one or several variables.
The students must also be able to solve problems of practical utility (e.g., on matrices, vectors, limits, integrals, and linear ordinary differential equations).

L'attività didattica è offerta in:

Facoltà Dipartimentale di Medicina e Chirurgia

Tipo corso	Corso di studio (Ordinamento)	Percorso	Crediti	S.S.D.
Laurea Magistrale Ciclo Unico 6 anni	Medicine and Surgery "MedTech" (2022)	comune	10	MAT/05

Stampa del 04/10/2023

Medical Humanities 1 [1205104]

Offerta didattica a.a. 2023/2024

Docenti: GIAMPAOLO GHILARDI, FRANCESCA FIORI

Periodo: Ciclo Annuale Unico

Obiettivi formativi
According to E. Pellegrino, one of the most famous and prominent Medical Humanities experts, fundamentally Medicine is moral. It is neither a natural nor a science although it often depends upon both for its technical and communal progress. Medicine, especially as clinical practise, is moral because the defining element of its practise is the patient-physician relationship, and that relationship is profoundly principled and often based upon ethical rules and duties. The integrated course "Medical Humanities 1" aims to provide students with some essential tools from the humanities (Anthropology, Ethics, and Humanities) necessary to understand the nature of the patient-physician relationship, keeping in mind what William Osler, a pioneer of modern Medicine said: "The good physician treats the disease; the great physician treats the patient who has the disease." In order to be able to reach this goal in their profession, medical students need to know themselves, as well as their future patients as human beings in the context of histories, cultures and values.
The course therefore aims to provide a clear understanding of the rich and large set of values, virtues, and moral characteristics which are connected with medical practice.

Prerequisiti
None.

Contenuti del corso
Anthropology:
Introduction/general overview. What anthropology is. On Truth. Anthropology and Technologies. Homo faber/homo sapiens. Anthropology and industry 4.0. Anthropology and Medicine. Transhumanism. Posthumanism. Humanism and humanities. Leonardo and humanism. Recap of the programme.

Ethics:
Introduction/general overview. What ethics are. Why ethics in medicine. Ethical schools. Free will. Libet's experiments on free will. The trolley dilemma. Utilitarianism and consequentialism. Consciousness. Agency: what does it mean to be a moral agent. Ethics and Rhetoric. The good words. Ethics and communication between doctor and patient. The notion of personhood. Virtues. Epistemic virtues. Happiness and its value in professionalism. Professional virtues. Virtues for science. The good doctor. Precision Medicine or Personalized Medicine. Recap of the programme.

The History of Medicine in Twelve Machines:
1. Introduction. Specula and forceps: to the roots of medicine.
2. The stethoscope and the instrumental diagnostic revolution.
3. The inhaler. When surgery knocked out pain.
4. The ophthalmoscope and the rise of modern ophthalmology.
5. The sphygmograph. Étienne-Jules Marey, the physician who wanted to be an engineer.
6. The X-rays apparatus. Wilhelm Röntgen and the radiological revolution.
7. The negative pressure chamber and the controversial figure of Ernst Ferdinand Sauerbruch.
8. The electrocardiograph. How to cope with a crazy heart.
9. The iron lung and the long battle against polio.
10. The electron microscope and the discovery of the invisible.
11. The heart-lung machine and the taboo of open-heart surgery.
12. The electroconvulsive therapy machine. Just a skeleton in the closet of modern psychiatry?

One hour class will be dedicated to each of these subjects.

Social Psychology
• Introduction, definition, and topics studied by Social Psychology.
• Norms and cultures.
• Social groups
• Social robots
• Social animals and swarm robotics.

• Emotions
• Empathy
• Altruism and helping behavior
• Bias

Metodi didattici

The aims of the class will be achieved by a combined approach involving a traditional inductive teaching method, video projections, and interactive learning. These different teaching approaches will be combined in the same weeks, as well as within the same lectures. The students will always be stimulated and will not be treated as passive learners but will be called to actively participate in the lectures. The teaching methods promote classroom engagement and cooperation. Both the interactive lectures and group activities will entail the active involvement of students.

Modalità di verifica dell'apprendimento

The final exam will take place at the end of each course, in the sessions scheduled by the academic calendar. The exam will be both written (anthropology and Ethics and Social Psychology), involving a combination of multiple choice and short answer questions, and oral (History of Medicine and Social Psychology). The questions will evaluate the students' ability to critically reformulate the learnt concepts and their ability to critically apply the knowledge and understanding. Grading criteria:
The final mark will be in the range of 18-30/30 it will be a weighted average of the final grades in Anthropology (1/4), Ethics (1/4), History of Medicine (1/4), Social Psychology (1/4). The "laude" will be assigned to highlight an optimal integration among the topics of the different modules.

Testi di riferimento

Besides the material uploaded on the E-Learning platform:

Anthropology:
• James. A. Marcum, The virtuous physician, the role of virtue in Medicine, Springer, 2012
• G. Ghilardi, "Analogia Sensuum: The knowing body", in: N. Di Stefano, V. Tambone (eds.), About the living body, Nova science, New York 2016, pp. 15-31
• G. Ghilardi, L. Campanozzi, V. Tambone, "Humanities: Methods for Medical Training", in Journal of Medical Diagnostic Methods, vol. 5, Issue 1, 2016

Ethics:
• J. Seifert, The philosophical diseases of medicine and their cure, philosophy and ethics of medicine, Springer, 2004
• V. Tambone, G. Ghilardi, "An ethical evaluation methodology for clinical cases", Persona y Bioética, 20 (1), 2016, pp. 48-61
• G. Ghilardi, "Epistemological remarks on Libet's experiments on free will", Rivista Internazionale di Filosofia e Psicologia, 6 (1), 2015, pp. 110-119
• V. Tambone, G. Ghilardi, Philosophy and Deontology of Medical Practice, Ethics of the work well done in bio-medical sciences, SEU, Roma 2020

History of medicine:
Powerpoint presentations of each lecture, will be shared through the ELEA platform.

The contents of the course can be found in the following textbooks:
• Luca Borghi, Sense of Humors. The Human Factor in the History of Medicine, KDP Publishing 2022
• Andras Gedeon, Science and technology in medicine: an illustrated account based on ninety-nine landmark publications from five centuries, Springer 2006
• Stanley Joel Reiser, Medicine and the Reign of Technology, Cambridge University Press 1981

Further material will be provided during the course.

Altre informazioni

Outcomes of the integrated course:
- Knowing and understanding what means to be a human being, what human values and virtues are.
- Applying knowledge and understanding and develop ethical reasoning in biomedical sciences.

History of Medicine - Specific learning outcomes

- Knowing and understanding the importance of the "human factor" in the history of the development and use of technical-scientific instruments and their evolution over time.
- Applying knowledge to the discovery and analysis of cases of "cross-fertilization" between different disciplinary areas (Engineering and Medicine).

Social Psychology

- Acquiring the basic knowledge related to the theoretical and methodological aspects of the field of social psychology with a focus on social group functioning.
- being able to apply their knowledge to understand the interaction between groups and the impact of social representations over moral judgements, stereotypes, and discriminative behaviors.
- understand and critically examine the aims of the social psychology research. The course will encourage students to read everyday life events by employing a social psychological point of view, considering all the complexities of the social groups' behavior.

L'attività didattica è offerta in:

Facoltà Dipartimentale di Medicina e Chirurgia

Tipo corso	Corso di studio (Ordinamento)	Percorso	Crediti	S.S.D.
Laurea Magistrale Ciclo Unico 6 anni	Medicine and Surgery "MedTech" (2022)	comune	4	MED/02, M-PSI/05, M-FIL/03

Stampa del 04/10/2023

Medical Humanities II [1205206]

Offerta didattica a.a. 2023/2024

Docenti: FRANCESCO DE MICCO

Periodo: Primo Ciclo Semestrale

Obiettivi formativi
The teaching aims to provide students with: the essential knowledge for understanding the main bioethical issues; the essential conceptual tools to discuss specific clinical cases; conceptual tools for a critical analysis of ethical and anthropological issues raised by the development of science and technology; the basic knowledge to meet the challenges in the biomedical and bio-legal fields of the medical profession.

Prerequisiti
A basic knowledge of Anthropology and Ethics acquired during the first year is required as a prerequisite. According to the Study Manifesto, there is no propaeduticity for this Integrated Course.

Contenuti del corso
Ethical debate in bioethics
Medical deontology and Bio-law
Ethics of Job Well Done
The status of the human embryo
Reproductive technologies
Gen-ethics
Questions at the end of life
Persistent vegetative state
Living will and advance care directives/statements
Palliative care
Ascertainment of death
Organ transplants
Allocation of health care resources and the right to be cured/cared for
Roboethics

Metodi didattici
Ex-cathedra lectures, teamwork.

Modalità di verifica dell'apprendimento
Written examination aimed at testing the actual degree of learning, the ability to critically rework the acquired knowledge and present it in a comprehensible manner, the ability to identify the elements characterising the course topics. The final grade is based on the results of the written test.
- Sixteen multiple-choice questions; each correct answer counting for 2 points;
- either incorrect answer or answer not given count for 0 points; the minimum grade to pass written exam is 18 (9 correct multiple-choice questions);
- the maximum grade is 32 (16 correct multiple-choice questions), which corresponds to 30 cum laude)

Testi di riferimento
- Slides and material produced by lecturers and uploaded on the e-learning platform.
- Vittoradolfo Tambone, Giampaolo Ghilardi. Philosophy and deontology of medical practice. Ethics of the job well done in bio-medical sciences. Società Editrice Universo, Roma, 2020.
- Laura Palazzani. Bioethics and Biolaw: theories and questions. G. Giappichelli Editore, Torino, 2018

Altre informazioni
Knowledge and understanding
At the end of the Course, the student must be able to apply the theoretical knowledge learned in the first-year Anthropology and Ethics course to the specific contexts of the medical profession

Applying knowledge and understanding
At the end of the Course, the student must be able to act to protect the health and good of the patient and the

community, using the available resources of medical science in the interest and respect of the patient as a person, according to the ethics and regulations in force. going beyond simple procedures, with a view to the ethics of a job well done

Making judgements
At the end of the Course, the student must be able to judge clinical practice cases independently according to the ethics of a Job Well Done (making judgements)

L'attività didattica è offerta in:

Facoltà Dipartimentale di Medicina e Chirurgia

Tipo corso	Corso di studio (Ordinamento)	Percorso	Crediti	S.S.D.
Laurea Magistrale Ciclo Unico 6 anni	Medicine and Surgery "MedTech" (2022)	comune	2	MED/43

Stampa del 04/10/2023

Pharmacology and Medical Genetics [1205207]

Offerta didattica a.a. 2023/2024

Docenti: FIORELLA GURRIERI, EMANUELA SALVATORELLI

Periodo: Secondo Ciclo Semestrale

Obiettivi formativi
The course brings together two main branches: Pharmacology and Medical Genetics, strictly connected within the modern concept of precision medicine. In essence, the main objective is to start from the foundations of the two fields and move towards the knowledge of the genetic load in human diseases, the potential for tailored treatments and the opportunities for cause-related rather than disease-related therapies. Basic concepts in human genetics and drug metabolism will be included.

Prerequisiti
The students are requested to have acquired key competences in molecular genetics, biology, methodologies for nucleic acid and protein analysis) according to the program in Biology, and chemistry, biochemistry, physiology, pathophysiology.

Contenuti del corso
Medical Genetics:

• Basics concepts of genetics: from Mendelian inheritance to complex diseases (FG)
• Human Genome Organization (CL)
• Genetic Load in medicine (genetic tests – genetic counselling- clinical genetics) (FG)
• Genetics of fetal diseases (including principles of prenatal diagnosis) (FG)
• Epigenetic diseases (FG and CL)
• Fundamentals of molecular genetics techniques (CL)
• Genetic testing in medical practice (CL)
• Bioinformatic tools in medical genetics (CL)
• Population Genetics (FG)
• Genetics of intellectual disability, neuropsychiatric disorders, neurodegenerative diseases (CL)
• Genetics in oncology (FG)
• Cardiogenetics (FG)
• Genetics and thoracic diseases (FG)
• Genetics and orthopedic diseases (FG)
• Genetics and autoinflammatory disease (FG)
• Principles of Medical GenETHICS (FG)
• Principles of pharmacogenetics (CL)
• The HLA system and multifactorial diseases (FG)
• The concepts of polygenic risk score for diseases (FG)

General Pharmacology:
• Clinically oriented principles of pharmacokinetics, pharmacodynamics and drug metabolism
• Principles of drug development and clinical trials
• Genetically-oriented new methodologies in drug development and clinical trials
• Assessing efficacy and safety
• Using drugs according to regulatory issues (on label, off label, compassionate)

Metodi didattici
The teaching methodology will consist of a combination of traditional platform lessons, class seminars, interactive discussion on selected topics or on topics of interest for the students, practical activities both in the clinics and in the laboratory. The students will be stimulated to select an article from the medical literature and to briefly expose its contents to the whole class. Because the two disciplines of this Course share interests in preclinical and clinical fields, multidisciplinary seminars will be organized and relevant topics will be jointly discussed.

Modalità di verifica dell'apprendimento
At the end of the course the final exam will take place, in agreement with sessions scheduled in the academic

calendar. The knowledge gained and the ability to apply it will be verified by a written test for pharmacology. The written text will include multiple choice questions and open questions. Multiple choice questions will be formulated to assess student capability to move around different topics. For Medical genetics the exam will have a practical part (clinical case discussion) and a written part with theoric, open questions to be answered. Marks of the two modules will be averaged to give a final mark.

Testi di riferimento
Medical Genetics:
Medical Genetics - Jorde Carey Bamshad, 6th edition, Elsevier
Medical Genetics - G. Bradley Schaefer, James N. Thompson Jr. Mc Graw Hill
Clinical cases will be presented and discussed throughout the course. Attendance of the genetic outpatients clinic is strongly recommended as an "hands on" activity.
General Pharmacology:
Bibliography will be suggested ad hoc during classes.

Altre informazioni
 Medical Genetics. Students must achieve an appropriate perception and knowledge of the genetic background of human diseases. Basic concepts of human genetics will be critical. They will know the characteristics of the main genetic conditions. They have to gain knowledge about clinical and molecular methods necessary to reach a correct genetic diagnosis.
They will understand the main principles of modern methodologies for gene-hunting and for disease modelling and precision medicine. They will be exposed to the principles of the 'Omics science'
Pharmacology Students will be introduced to the principles and methodologies of drug development, going from identification of druggable diseases to the main characteristic a potential candidate should have in terms of pharmacokinetics, pharmacodynamics, efficacy and safety. Students should therefore be acquainted with genetic drivers and/or perturbers of efficacy and/or safety and the role that such factors may have in defining pharmacological opportunities in investigational and real life settings.
For both modules students will be exposed to bioethical issues inherent to the preclinical genetic diagnosis, the genetic identity of the patient, the compassionate use of drugs, the management of off target results in genomic analysis.

L'attività didattica è offerta in:

Facoltà Dipartimentale di Medicina e Chirurgia

Tipo corso	Corso di studio (Ordinamento)	Percorso	Crediti	S.S.D.
Laurea Magistrale Ciclo Unico 6 anni	Medicine and Surgery "MedTech" (2022)	comune	6	BIO/14, MED/03

Stampa del 04/10/2023

Probability and Statistic [1205201]

Offerta didattica a.a. 2023/2024

Docenti: MASSIMO CICCOZZI, DOCENTE_FITTIZIO DOCENTE_FITTIZIO

Periodo: Primo Ciclo Semestrale

Obiettivi formativi

Statistics
The course aims to introduce students to statistics, enabling them to read a scientific paper and perform key calculations in the field of epidemiology.
Medical Statistics
In the ever-changing landscape of medicine and surgery, statistics plays a key role in shaping the future of patient care, treatment strategies and medical research. As medical professionals, it is essential to possess a deep understanding of statistical principles and methodologies to interpret complex data, draw meaningful conclusions and guide evidence-based practices.

Our Statistics for Medicine and Surgery program is designed to equip aspiring physicians, surgeons and medical researchers with the statistical tools and knowledge essential to meet the challenges of modern healthcare.

During the course, students will acquire skills in data collection, analysis and interpretation that will enable them to understand and critically analyse the results of modern scientific research in the medical field and contribute significantly to advances in patient care and medical research.

Contenuti del corso

Probability and Statistics
General introduction
• Descriptive statistics: numerical measures and representation.
• Basics of probability
☐ Discrete probability distributions
☐ Continuous probability distributions
☐ Introduction to likelihood
☐ Study of elected distributions
☐ Random variables connected to Normal
Inference:
• Hypothesis testing
• ANOVA
Linear models:
• OLS assumptions
• Properties of OLS estimators
• Regression analysis and model building
Survival analysis
• Essential concepts
• Sample selection
• Survival objects
• Case-control studies
• Kaplan–Meier estimates
• Logistic regression
• Censured data
• The Cox proportional hazards model
Medical Statistics
Lecture 1: Fundamentals of statistics and types of data

Introduction to statistics and its relevance in medicine.
Understanding of data types: quantitative and qualitative data.
Descriptive statistics: measures of central tendency and variability.

Lesson 2: Probability and probability distributions

Fundamentals of probability theory in medical contexts.
Probability distributions: discrete and continuous.

The normal distribution and its applications in medicine.
Calculation of probabilities of medical events.
Application of probability in diagnostic tests and patient outcomes.

Lesson 3: Study design and sampling

Principles of experimental and observational study designs.
Understanding sampling methods and their implications.
Bias, confounding and randomization in medical research.
Sample size determination for trials and clinical studies.
Case studies exploring the impact of study design on medical research outcomes.

Lesson 4: Hypothesis testing and confidence intervals

Formulating null and alternative hypotheses in medical scenarios.
Interpreting p-values and making statistical inferences.
Calculation and interpretation of confidence intervals.
Practical applications in medical research and clinical decision-making.

Lesson 5: Correlation and survival analysis

Introduction to correlation and its importance in medicine.
Understanding linear regression and its application in medical research.
Assessing the strength of correlations in medical data.
Fundamentals of survival analysis and its relevance in medical studies.
Kaplan-Meier survival curves and log-rank tests.

Lecture 6: Practical session with R: Part 1

Introduction to R software, fundamental statistical packages
Learning how to load the excel database and data exploration.
Descriptive statistics with R: measures of central tendency and variability.
Data presentation techniques: tables, graphs and charts.

Lesson 7: Practice session with R: Part 2

Hypothesis testing on R: qualitative variables, the Chi-square test.
Hypothesis testing on R: quantitative variables, the student t-test.
Evaluation of normal distribution on R: the Shapiro-Wilk test.
Correlation test on R: Pearson's (r) test.

Metodi didattici
Probability and Statistics
Lecture hours: 62.5
Laboratory hours: 12.5
In-person lectures complemented by a computer laboratory.
Medical Statistics
Face-to-face lectures supplemented by computer lab
Lecture hours: 12.5

Modalità di verifica dell'apprendimento
Probability and Statistics
Written exam
The assessment of learning involves assigning a final grade on a scale of thirty points. The final grade will be calculated by weighting the grade obtained in relation to the credits of the two modules taught.
Medical Statistics
Written exam
The assessment of learning involves assigning a final grade on a scale of thirty points. The final grade will be calculated by weighting the grade obtained in relation to the credits of the two modules taught.

Testi di riferimento
Probability and Statistics
• The statistical analysis of failure data – Kalbfleisch & Prentice
• Survival analysis: techniques for censured and truncated data – Klein & Moeschbeger

• Statistical inference – Casella & Berger
• Introductory Statistics With R – Peter Daalgard
• Statistica per le decisioni – Domenico Piccolo
• Other material provided by the teacher

Medical Statistics
• "Medical Statistics at a Glance" di Aviva Petrie e Caroline Sabin
• "Basic & Clinical Biostatistics" di Susan White e Douglas F. Zatzick
• "Epidemiology: Beyond the Basics" di Moyses Szklo e F. Javier Nieto.
• "Introduction to the Practice of Statistics in the Health Sciences" di David S. Moore, George P. McCabe e Bruce A. Craig.
• "Practical Statistics for Medical Research" di Douglas G. Altman.

Altre informazioni
Statistics
Learning will be assessed through a written exam during which the student must demonstrate that they have achieved the course objectives.

Medical Statistics
Learning will be assessed through a written exam during which the student must demonstrate that they have achieved the course objectives.

L'attività didattica è offerta in:

Facoltà Dipartimentale di Medicina e Chirurgia

Tipo corso	Corso di studio (Ordinamento)	Percorso	Crediti	S.S.D.
Laurea Magistrale Ciclo Unico 6 anni	Medicine and Surgery "MedTech" (2022)	comune	6	SECS-S/02, MED/01

Stampa del 04/10/2023