



UNIVERSITY OF L'AQUILA



Department of Health, Life
and Environmental Sciences

2nd Cycle Degree in **HEALTH AND NUTRITION BIOLOGY**

Laurea Magistrale in **BIOLOGIA DELLA SALUTE E DELLA NUTRIZIONE** Course Catalogue

Academic year starts the last week of September and ends the first week of June.

1st Semester - Starting date: last week of September, end date: 3rd week of January

2nd Semester - Starting date: last week of February, end date: 1st week of June

Exams Sessions: I) from last week of January to 3rd week of February, II) from 2nd week of June to end of July, III) from 1st to 3rd week of September.

Comprehensive Scheme of the 2nd Cycle Degree in **HEALTH AND NUTRITION BIOLOGY**

TRACK "BIOHEALTH"

| YE AR | CO DE | COURSE | Credits (ECTS) | Semester |
|------------|----------|--|-------------------|------------|
| I | F0264 | Analytical Chemistry | 6 | 1 |
| | F0212 | Public Health and Hygiene | 6 | 1 |
| | F0537 | Human Anatomy and Physiology | 12 | 1 and 2 |
| | F1018 | Bio-molecular Techniques and Genomics | 12 | 1 and 2 |
| | F0547 | Molecular Cell and Developmental Biology | 6 | 2 |
| | F1034 | Cellular Biotechnologies | 6 | 2 |
| II | F0583 | Biochemical Analysis | 6 | 1 |
| | F0577 | Clinical Pharmacology and Toxicology | 6 | 2 |
| | F1027 | Neurobiology and Applied Neurobiology | 6 | 2 |
| | F1122 | General Pathology and Physiopathology | 6 | 2 |
| | F0103 | Thesis | 27 | 2 |
| I or II | F1159 | <i>Free choice course</i> | 9 | 1 and/or 2 |
| | F0633 | <i>English language level B1</i> | 3 | 1 and/or 2 |
| | F0635 | Internship | 3 | 1 and/or 2 |

TRACK "NUTRITION"

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| I | F0264 | Analytical Chemistry | 6 | 1 |
| | F1022 | Food Microbiology and Mycology | 9 | 1 |
| | F0537 | Human Anatomy and Physiology | 12 | 1 and 2 |
| | F1020 | Public Health, General and Food Hygiene | 9 | 1 and 2 |
| | F1023 | Genetic Engineering and Genomics | 6 | 2 |
| II | F0671 | Applied Dietetic Sciences | 6 | 1 |
| | F1021 | Molecular Plant Biotechnology | 6 | 1 |
| | F1024 | Food Biochemistry | 6 | 2 |
| | F0643 | Food Toxicology | 6 | 2 |
| | F1037 | Drugs and Feeding | 6 | 2 |

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| | F1122 | General Pathology and Physiopathology | 6 | 2 |
| | F0103 | Thesis | 27 | 2 |
| I or II | F1159 | <i>Free choice course</i> | 9 | 1 and/or 2 |
| | F0633 | <i>English language level B1</i> | 3 | 1 and/or 2 |
| | F0635 | Internship | 3 | 1 and/or 2 |

| Programme of “CHIMICA ANALITICA ” “ANALYTICAL CHEMISTRY” | | |
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| F0264, Compulsory 2nd Cycle Degree in HEALTH AND NUTRITION BIOLOGY, TRACKS: BIOHEALTH AND NUTRITION, 1st Year, 1st Semester | | |
| Number of ECTS credits: 6 (workload is 150 hours; 1 credit = 25 hours) | | |
| Teacher: Angelo Antonio D'ARCHIVIO | | |
| 1 | Course objectives and Learning outcomes | <p>The goal of this course is to provide understanding of theory and applications of quantitative chemical analysis. The first part covers basic chemistry of classical volumetric analytical methods based on neutralisation and redox reactions. The second half of the course covers common instrumental techniques based on potentiometric and spectrophotometric methods and an introduction to the chromatographic separations.</p> <p>On successful completion of this module, the student is expected to become familiar with the selected analytical methods, be aware of potential applications to real-world systems, be able to recognize sources of errors, to interpret and critically evaluate analytical results.</p> |
| 2 | Dublin descriptors | <p>Topics of the module include:</p> <ul style="list-style-type: none"> - <u>Basic terms and parameters of the analytical process:</u> aims of analytical chemistry, general steps in a chemical analysis and errors in chemical analysis. - <u>Aqueous solution chemistry:</u> review of chemical equilibrium and equilibrium constants, systematic treatment of acid-base equilibria, overview of redox reactions and electrochemistry - <u>Chemical analytical techniques and their applications:</u> neutralisation titrations in aqueous solutions, volumetric methods based on redox reactions. - <u>Potentiometric methods:</u> potentiometric electrochemical cells, the Nernst equation, reference and indicator electrodes, membrane electrodes, quantitative applications. - <u>Spectroscopic methods:</u> overview of spectroscopy, spectroscopy based on absorption, molecular UV/vis absorption, photoluminescence and chemiluminescence, atomic absorption and emission spectroscopy. - <u>Introduction to chromatographic separations:</u> basic principles of chromatography. Classification of chromatographic methods. Main concepts of chromatography: retention time, resolution, chromatographic efficiency. Qualitative description of band broadening. Principles of gas-chromatography and high-performance liquid-chromatography. <p>On successful completion of this module, the student should</p> <ul style="list-style-type: none"> o have profound knowledge of the selected analytical methods, o have knowledge and understanding of physical and chemical basis of volumetric and instrumental analytical methods, o understand and explain with scientific language the optimal use of the available analytical techniques to characterize matter and systems, o understand the fundamentals of the analytical techniques and |

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| | | <p>be aware of their potential applications to real-world systems,</p> <ul style="list-style-type: none"> o demonstrate skill in proposing possible strategies for quantitative analysis and sample treatment and ability to identify possible sources of errors , o demonstrate capacity to interpret the results of quantitative experiments. |
| 3 | Prerequisites and learning activities | The student must know the basic notions of General Chemistry and Stoichiometry |
| 4 | Teaching methods and language | <p>Lectures.</p> <p>Language: Italian</p> <p>Ref. Text books</p> <p>-D.A. Skoog, D.M. West, F.J. Holler, S.R. Crouch: Fondamenti di Chimica Analitica, Edises. 2010</p> |
| 5 | Assessment methods | Oral exam. |

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| <p>Programme of “IGIENE GENERALE”: “PUBLIC HEALTH AND HYGIENE”</p> | |
| <p>F0212, Compulsory, 2nd Cycle Degree in HEALTH AND NUTRITION BIOLOGY, TRACK: BIOHEALTH, 1st Year, 1st Semester</p> | |
| <p>Number of ECTS credits: 6 (workload is 150 hours; 1 credit=25 hours)</p> | |
| <p>Teacher: Maria SCATIGNA</p> | |
| 1 | <p>Course objectives</p> <p>The goal of this course is to provide the students with rational and scientific bases of the public health and hygiene, that refers to conditions and practices that help to maintain health and prevent the spread of diseases at individual and population level. On successful completion of this module, the student should be aware of holistic approach to health preservation and promotion and of different fields of action and methodologies: surveillance and epidemiology; infectious diseases and their control; life environments and associated risk factors; behavioural impact on health and health education.</p> |

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| <p>2</p> <p>Course content and Learning outcomes (Dublin descriptors)</p> | <p>Topics of the module include:</p> <ul style="list-style-type: none"> - Definition of Health. Natural history of diseases. Communicable and Non Communicable Diseases. Determinants of health/illness. Prevention: objectives and levels. - Definition, scope, and uses of epidemiology. Measuring disease frequency (Incidence and prevalence). Mortality (Death rates; Infant mortality; Maternal mortality rate, Life expectancy). Other summary measures of population health. Comparing disease occurrence (standardization). Observational epidemiology (Descriptive studies, Ecological studies, Ecological fallacy, Cross-sectional studies, Case-control studies, Cohort studies); Experimental epidemiology (Randomized controlled trials; Field trials; Community trials). Metanalysis. Potential errors in epidemiological studies and Confounding. The concept of cause and causation (temporal relationship; plausibility; consistency; strength; dose-response relationship; reversibility). Measure of causality in different study designs (prevalence ratio, odds ratio, relative risk). Judging the evidence. - Communicable diseases. Chain of infection: the epidemiological triangle (infectious agent, host, environment) and way of transmission. Epidemic and endemic disease. Control of Infectious disease: investigation and identifying cases; immunization (vaccines, prophylaxis post-exposition); chemoprophylaxis; disinfection and sterilization. - Secondary prevention of Non Communicable Diseases: Screening (types and criteria for screening). - Environment and Health. Outdoor Air: atmosphere of earth and its layers; the composition and pollution of outdoor air. Indoor environments, health impact and comfort: microclimate and its elements; thermal comfort; indoor air quality. Noise. Illumination. Water, sanitation and health: drinking water (definition, sources, requisites and sanitation treatments). - Health Education and Promotion. The Ottawa Chart and the 5 key actions. The relationship between behaviour and health. Health education and communication process. Health promotion interventions planning and evaluating. <p>On successful completion of this module, the student should:</p> <ul style="list-style-type: none"> o have profound knowledge of different positive and negative determinants of health and prevention levels; o have knowledge and understanding of epidemiology principles and methods; o have knowledge and understanding of public health fields and preventive practices; o demonstrate skills in indentifying risks associated with different environmental dimensions; o understand and explain methods and techniques aimed at controlling biological, physical and chemical health risk factors; o demonstrate capacity for reading and understand other texts on related topics; o demonstrate capacity to be critical and self-critical; o demonstrate concern to health, well-being and safety. |
| <p>3</p> <p>Prerequisites and learning activities</p> | <p>The student must know the basic notions of microbiology, toxicology and statistics.</p> |
| <p>4</p> <p>Teaching methods and language</p> | <p>Lectures.</p> <p>Language: Italian.</p> <p>Ref. text books</p> <ul style="list-style-type: none"> • Meloni C & Pelissero G., "Igiene", Casa Editrice Ambrosiana. 2007 (I ed); • Barbuti S. Fara GM, Giammanco G. et al., "Igiene", Moduzzi Editoriale. 2011 (III ed); <p>Teacher's slides on Univaq @learning platform</p> |

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| 5 | Assessment methods and criteria | Oral exam |
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| Programme of “HUMAN ANATOMY AND PHYSIOLOGY” “ANATOMIA E FISILOGIA UMANA” | | |
| This course is composed of two Modules: 1) Human Physiology, 2) Human Anatomy | | |
| F0537, Compulsory 2nd Cycle Degree in HEALTH AND NUTRITION BIOLOGY, TRACKS: BIOHEALTH AND NUTRITION, 1st year Module <i>Human Physiology</i>, 1st Semester - Module <i>Human Anatomy</i>, 2nd Semester | | |
| Number of ECTS credits: 12 (workload is 300 hours; 1 credit =25 hours) | | |
| 1) HUMAN PHYSIOLOGY (6 ECTS) | | |
| Teacher: Antonella BONFIGLI | | |
| 1 | Course objectives | Aim of this Module is to describe elementary mechanisms of physiology and their integration to the organ and system level. Main objectives are: human system physiology; principles of homeostatic control. |
| 2 | Course content and Learning outcomes (Dublin descriptors) | <p>Topic of the modules include:</p> <ul style="list-style-type: none"> - <u>The Gastrointestinal System:</u> General functions of the digestive system. Nervous control and the enteric nervous system. Digestive hormones. Salivary secretion, mastication and deglutition. Gastric secretion, digestion and motility. Small and large intestine: secretion, digestion, motility and molecular mechanisms for absorption. Pancreatic, biliary and enteric secretion. Energy balance in the body. Nervous and endocrine regulation of energy stores and metabolism. - <u>Physiology of the endocrine system:</u> Introduction to the endocrine system. Hormones of the posterior and anterior pituitary gland and metabolic effect. Anterior pituitary gland: hypothalamic control of anterior pituitary hormone release. Thyroid hormones. Metabolic effects. PTH, vitamin D, calcitonin and Ca²⁺ and PO₄⁻ regulation. Hormones of adrenal cortex and of adrenal medulla. Male and female reproductive system hormones. Endocrine pancreas. - <u>Motor and sensory physiology:</u> General aspects of sensory physiology. Mechanoreceptors. Photoreceptors. Chemoreceptors. Final common pathway: the motor neuron. Cortical and brainstem control of movement. Regulation of movement: the cerebellum (afferent and efferent morphofunctional organization) basal ganglia (morphofunctional organization, direct pathway and indirect pathway). <p>On successful completion of this module the student should</p> <ul style="list-style-type: none"> o have profound knowledge of aspects of organism function in an increasing order of complexity: molecular, cellular, of either organ or apparatus; o have knowledge and understanding of human physiology that allows them to set the discussion of physiological problems in a comprehensive manner; o be able to explain the practical problems of human physiology using appropriate scientific language; o demonstrate skill to evaluate independently and motivated any different opinions about the problematic aspects of human physiology, o demonstrate capacity for reading and understand other texts on related topics; o be able to apply the acquired knowledge to concrete cases as |

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| | | <p>occurring in the professional life;</p> <ul style="list-style-type: none"> o demonstrate concern to health, well-being and safety; o be able to work in team showing commitment to tasks and responsibilities; o demonstrate capacity to be critical and self-critical. |
| 3 | Prerequisites and learning activities | The student must know the basic notion of cellular biology, histology, cellular physiology and biochemistry |
| 4 | Teaching methods and language | <p>Lectures.</p> <p>Language: Italian</p> <p>Ref. Text books</p> <ul style="list-style-type: none"> • R.M. Berne, M.N. Levy, Fisiologia (a cura di, B.R. Koeppen, B.A. Stanton), 6a Edizione, Milano Casa Editrice Ambrosiana, 2010 (ISBN 8808182746). • E.R. Kandel, J.H. Schwartz, T. M. Jessell, Principi di Neuroscienze. Casa Editrice Ambrosiana, Milano. • V. Taglietti, C. Casella Elementi di fisiologia e biofisica della cellula, La Goliardica Pavese, 1991 (ISBN: 8878300853) |
| 5 | Assessment methods and criteria | Oral exam |

2) HUMAN ANATOMY (6 ECTS)

Teacher: **Guido MACCHIARELLI**

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| 1 | Course objectives | <p>Aim of this Module is to provide the students with the knowledge of the general and structural organization of the normal human body from the microscopic to the macroscopic level. They will recognize the shape and structure of organs and identify their location in the regions of the body, will acquire understanding the morpho-functional relationships and the basic anatomy aspects of the human organism and will know how to define the various anatomical and histological structures with special regard to the circulatory, digestive, endocrine apparatuses and nervous system.</p> |
| 2 | Course content and Learning outcomes (Dublin descriptors) | <p>Topic of the modules include:</p> <ul style="list-style-type: none"> - Terminology and Body Planning - Regions and Cavities of the Human Body - General description of the Macroscopic and Microscopic Anatomy of Human Body Systems and Apparatuses. - Morphofunctional correlates of the organs of the circulatory, digestive and neuroendocrine apparatuses. <p>On successful completion of this module the student should</p> <ul style="list-style-type: none"> o have general knowledge the human body morphology and a detailed information on the morphofunctional correlates of the organs of the circulatory, digestive and neuroendocrine apparatuses; o have knowledge and understanding of human anatomy in order to organize a discussion on morphological aspects in a comprehensive manner; o be able to explain the practical problems of human body using appropriate scientific language; o demonstrate skill to evaluate independently and motivated any different opinions about the problematic aspects of human body anatomy; o demonstrate capacity for reading and understand other texts on morphologic related topics; o be able to apply the acquired knowledge to concrete cases as occurring in the professional life; o demonstrate concern to health, well-being and safety; o be able to work in team showing commitment to tasks and responsibilities; o demonstrate capacity to be critical and self-critical |

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| 3 | Prerequisites and learning activities | The student must know the basic notion of cellular biology, histology, cellular physiology and biochemistry |
| 4 | Teaching methods and language | Lectures, seminars, lab Language: Italian, English Ref. Text books • Tazzi - Montagnani: <i>Trattato di Anatomia Umana</i> , Idelson Gnocchi Approfondimento: Anastasi Tacchetti , <i>Anatomia Umana- Atlante</i> , Edi-Ermes |
| 5 | Assessment methods and criteria | Written and oral exam. |

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| Programme of “TECNOLOGIE BIOMOLECOLARI E GENOMICA” “BIOMOLECOLAR TECHNIQUES AND GENOMICS” | | |
| This course is composed of two Modules: 1) Biomolecular Techniques, 2) Genomics | | |
| F0537, Compulsory | | |
| 2nd Cycle Degree in HEALTH AND NUTRITION BIOLOGY, TRACK: BIOHEALTH, 1st year | | |
| Module <i>Biomolecular Techniques</i>, 1st Semester - Module <i>Genomics</i>, 2nd Semester | | |
| Number of ECTS credits: 12 (workload is 300 hours; 1 credit =25 hours) | | |
| 1) BIOMOLECOLAR TECHNIQUES (6 ECTS) | | |
| Teacher: Francesco ANGELUCCI | | |
| 1 | Course objectives | The goal of module of this Module is to provide the students with theoretical and practical knowledge necessary for handling biological macromolecules. At the end of the course students should be aware of the relationship between the structure and function of macromolecules at the molecular level, and how this knowledge is necessary for their in vitro and in vivo characterization through lab methodologies. |
| 2 | Course content and Learning outcomes (Dublin descriptors) | Topics of the modules include: Protein structure. Protein Folding. Structure and function relationships. Theory of Ligand binding. Practical aspects of ligand binding. Theoretical aspects of enzymes. The use of enzymes to titrate metabolite and protein in solution. Principles of Bioinformatic. Theoretical aspects of the determination of structure and function by protein sequence. Handling of DNA. Heterologous expression in bacteria. Protein purification and their characterization in vitro. Experimental determination of the protein 3D structure. Methodologies: UV-Vis, Fluorescence, steady state characterization of enzymes. Bioinformatic tools for protein sequence analysis, PCR, gene cloning. Transformation of bacteria. Chromatography. Tools for 3D structure analysis. On successful completion of this module the student should <ul style="list-style-type: none"> o improve the starting knowledge of biochemistry and molecular biology o acquire either the understanding of the rules governing macromolecules architecture and the knowledge of the methodologies for the in vitro characterization of proteins; o have profound knowledge of basic biochemical and molecular biology techniques; o demonstrate capacity for reading and understand other texts on related topics; o be able to apply the acquired knowledge to concrete cases and to analyse data from each technique studied; o Demonstrate independent thinking to deduce biomolecular structure and interactions; o be able to critically evaluate an experimental outcome. |

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| 3 | Prerequisites and learning activities | The student must know the basic notion of Biochemistry, Molecular Biology and Genetics. |
| 4 | Teaching methods and language | Lectures. Language: Italian Ref. Text books <ul style="list-style-type: none"> • Petsko G.A., Ringe D., "Structure and function of proteins", Editor: Zanichelli.. • Terry A. Brown, "Molecular Biotechnology", Editor: Zanichelli. |
| 5 | Assessment methods and criteria | Oral exam |

2) GENOMICS (6 ECTS)

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| Teacher: Michele MIRANDA | | |
| 1 | Course objectives | The goal of this module is to provide the students with the today profound knowledge of structural, functional and comparative genomics with attention to the use of genomics and recombinant DNA techniques to unveil gene mutation responsible of genetics diseases. |
| 2 | Course content and Learning outcomes (Dublin descriptors) | <p>Topics of the modules include: Recombination DNA, restriction enzymes and genomics, genomics, genomes and organism development. Structure of RNA and DNA genomes. Genetic polymorphism and genome evolution. Transposable elements. Retrovirus and cancer. Functional and comparative genomics-genomics and hereditary diseases.</p> <p>On successful completion of this module the student should</p> <ul style="list-style-type: none"> o have profound knowledge of genetics; o have knowledge and understanding of the major issues of genetic heredity; o be able to explain the acquired knowledge by using the technical language; o be able to define what is meant by recombinant DNA (rDNA), and list the most common laboratory techniques used to generate it; o be able to explain how the polymerase chain reaction can be used to amplify DNA segments, and how it may be used to analyze DNA; o be able to describe how transgenic bacteria, plants, and animals may be used to generate products useful to humans; o demonstrate capacity for reading and understand other texts on related topics; o be able to apply the acquired knowledge to concrete cases such as pedigrees, genetic forecasting; o demonstrate concern to health, well-being and safety; o be able to work in team showing commitment to tasks and responsibilities; o demonstrate capacity to be critical and self-critical. |
| 3 | Prerequisites and learning activities | The student must know the basic notion of Biochemistry, Molecular Biology and Genetics. |
| 4 | Teaching methods and language | Lectures. Language: Italian Ref. Text books <ul style="list-style-type: none"> • J.D. Watson - Biologia molecolare del gene Vol. I e II (Zanichelli) • R.E. Scossiroli; D.L. Palenzona - Manuale di Biometria (Zanichelli) - • M.R. Spiegel - Statistica (Collana Shaum) • Robert J. Brook'er - Genetica (Zanichelli) |

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| | <ul style="list-style-type: none"> • J. F. Griffiths, J.H. Miller, D. T. Suzuki, R. C. Lewontin, W-M Gelbart Genetica Principi di analisi formale (Zanichelli) • Peter Russel' Genetica , EDISES ed. (ultima edizione). • Hartwell, Hood, Goldberg, Reynolds, Silver, Veres. Genetica dall'analisi formale alla genomica, McGraw-Hill |
| 5 | Assessment methods and criteria Oral exam |

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| Programme of “BIOLOGIA MOLECOLARE DELLA CELLULA E DELLO SVILUPPO” “MOLECULAR CELL AND DEVELOPMENTAL BIOLOGY” | |
| F0547, Compulsory 2nd cycle Degree in HEALTH AND NUTRITION BIOLOGY, TRACK: BIOHEALTH, 1st Year, 2nd Semester | |
| Number of ECTS credits: 6 (workload is 150 hours; 1 credit = 25 hours) | |
| Teacher: Mara MASSIMI | |
| 1 | Course objectives The objective of this course is to provide students with an understanding of major molecular mechanisms underlying cell proliferation, migration, differentiation and interactions during development. Emphasis is placed on cell-cell communication and cell signalling pathways in tissue morphogenesis and homeostasis. General and specific aspects of stem cell biology will be also covered. The format of the course includes lectures and discussion of selected significant papers. |
| 2 | Course content and Learning outcomes (Dublin descriptors) Topics of the module include: Mechanisms of communications between cells. Cell-cell and cell-matrix adhesion. Adhesion and morphogenesis. Extracellular matrix and cell migration. Cell migration in development and disease. Collective cell migration. Surface receptors and signal transduction. Nuclear receptors. Induction and competence. Regulation of cell proliferation and cell death. Signaling pathways in development and morphogenesis. Signal pathways in disease. The signal pathways in the regulation of stem cells. Embryonic and adult stem cells: origin, potential and limitations. On successful completion of this module, the student should: <ul style="list-style-type: none"> o have profound knowledge of the main mechanisms involved in embryo development and morphogenesis. o have knowledge and understanding of the major components and signalling pathways regulating cell division, migration and differentiation. o understand and explain the molecular mechanisms guiding the spatial and temporal integration of these signalling pathways into complex cellular processes. o give examples of when and where the different signalling mechanisms act during development. o demonstrate capacity for reading, understanding and discussing significant papers on these topics. |
| 3 | Prerequisites and learning activities The student must have a solid background in basic Cell Biology and Developmental Biology. |
| 4 | Teaching methods and language Lectures. Language: Italian / English Ref. Text books: <ul style="list-style-type: none"> • Alberts et al., Biologia Molecolare della Cellula, V ed., Zanichelli • Alberts et al., Molecular Biology of the Cell, V ed., Garland Science |

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| | | <ul style="list-style-type: none"> • Gilbert, <i>Biologia dello Sviluppo</i>, IV ed., Zanichelli • Gilbert, <i>Developmental Biology</i>, 10th ed, Sinauer Associates, Inc |
| 5 | Assessment methods and criteria | Oral exam. |

| Programme of “BIOTECNOLOGIE CELLULARI” “CELLULAR BIOTECHNOLOGY” | | |
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| F1034, Compulsory 2nd Cycle Degree in HEALTH AND NUTRITION BIOLOGY, TRACK: BIOHEALTH, 1st Year, 2nd Semester | | |
| Number of ECTS credits: 6 (workload is 150 hours; 1 credit=25 hours) | | |
| Teacher: Anna Maria RAGNELLI | | |
| 1 | Course objectives | The goal of this course is to provide the students with rational and scientific bases of some applications of cell cultures in biotechnology. On successful completion of this module, the student should know the basic techniques of cell culture, immunofluorescence, cell fusion, flow cytometry, methods for apoptosis detection and electron microscopy. |
| 2 | Course content and Learning outcomes (Dublin descriptors) | <p>Topics of the module include: Biotechnological applications of cell cultures. Cryopreservation of cells. Determination and control of contamination of cell cultures. Test of viability, cytotoxicity and genotoxicity. Cell fusion in the production of monoclonal antibodies. Immunofluorescence. Flow cytometry. Description of some methods for the monitoring of cell death. Apoptosis: evaluation of DNA damage and methods for the detection of morphological and biochemical characteristics typical of this process of programmed cell death. In situ hybridization. Main techniques of electron microscopy and their applications. Use of cells or products of their metabolism in the food industry.</p> <p>On successful completion of this module the student should</p> <ul style="list-style-type: none"> o have profound knowledge of cell cultures techniques; o have knowledge and understanding of the principal biotechnological applications of cell cultures o be able to explain the relevant techniques using appropriate scientific language; o be able to critically review the strategies and methods used to harness recombinant DNA technology for biomolecule production, o be able to describe and analyse the control of in vitro cellular growth processes demonstrate capacity for reading and understand other texts on related topics. o be able to apply the acquired knowledge to concrete cases as occurring in the professional life; o demonstrate concern to health, well-being and safety; o demonstrate capacity to be critical and self-critical. |
| 3 | Prerequisites and learning activities | The student must know the basic notion of cell biology |
| 4 | Teaching methods and language | <p>Lectures. Language: Italian Ref. Text books</p> <ul style="list-style-type: none"> • Alberts B. <i>et al.</i> <i>“Biologia molecolare della cellula”</i> V edizione. Casa Editrice Zanichelli, 2009 (http://www.zanichelli.it) • Mariottini G.L. <i>et al</i> <i>“Introduzione alle colture cellulari”</i> II edizione. Ed. Tecniche Nuove, 2010 (http://www.tecnichenuove.com). Scientific articles provided by the teacher |

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| 5 | Assessment methods and criteria | Oral exam |
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| Programme of “MICROBIOLOGIA CLINICA E VIROLOGIA” “CLINICAL MICROBIOLOGY AND VIROLOGY” | | |
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| F0567, Compulsory 2nd Cycle Degree in HEALTH AND NUTRITION BIOLOGY, TRACK: BIOHEALTH, 2nd Year, 1st Semester | | |
| Number of ECTS credits: 6 (workload is 150 hours; 1 credit=25 hours) | | |
| Teacher: Valentina SVICHER | | |
| 1 | Course objectives | The goal of this course is to provide the students with rational and scientific bases regarding the structure and pathogenetic mechanisms underlying pathogens infection. On successful completion of this module, the student should be aware of the morphology of bacteria, viruses, fungi involved in human diseases, and the major mechanisms achieved by pathogens to induce damage in human tissues. The students should be also aware of the major diagnostic techniques used to detect pathogens. |
| 2 | Course content and Learning outcomes (Dublin descriptors) | <p>Topics of the module include: <u>Clinical microbiology:</u> (bench rotation, medical, blood culture and surgical consultations, intensive care unit wards rounds, infection control, and virology), infectious diseases / HIV, bone infection, general medicine, and intensive care. <u>Virology:</u> hepatitis clinics, paediatric infectious diseases, genito urinary medicine, or travel medicine.</p> <p>On successful completion of this module the student should</p> <ul style="list-style-type: none"> - have knowledge of the structure of the major pathogens involved in human diseases; - have knowledge and understanding of mechanisms achieved by pathogens to induce damage in human tissues; - have knowledge and understanding of the activity of the commonly used antivirals and antibiotics. - be able to explain the relevant diagnostic procedure to detect human pathogens using appropriate scientific language; - demonstrate capacity for reading and understand other texts on related topics; - demonstrate concern to health, well-being and safety; - demonstrate capacity to be critical and self-critical on topics concerning the relationship between pathogens and human diseases. |
| 3 | Prerequisites and learning activities | The student must know the basic notion of Clinical Microbiology and Virology |
| 4 | Teaching methods and language | <p>Lectures. Language: Italian Ref. Text books</p> <ul style="list-style-type: none"> • Roberto Cevenini <i>Microbiologia clinica</i> ed. PICCIN • Bonaccorsi di Patti M.C., Contestabile R. e Di Salvo M.L. “<i>Metodologie Biochimiche</i>”, Casa Editrice Ambrosiana, (http://www.ceadizioni.it/ita/index.asp). • <i>Manuale di Virologia Medica</i>, Dianzani et al., III edizione 2008 McGraw-Hill |
| 5 | Assessment methods and criteria | Oral exam |

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| Programme of “BIOCHIMICA DI LABORATORIO” |
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| “BIOCHEMICAL ANALYSIS” | | |
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| F0583, Compulsory | | |
| 2nd Cycle Degree in HEALTH AND NUTRITION BIOLOGY, TRACK: BIOHEALTH, 2nd Year, 1st Semester | | |
| Number of ECTS credits: 6 (workload is 150 hours; 1 credit=25 hours) | | |
| Teacher: Francesco GIANANTI | | |
| 1 | Course objectives | The goal of this course is to provide the students with rational and scientific bases of the clinical thought and skills for the application of a correct methodology in the interpretation of clinical tests. On successful completion of this module, the student should be aware of the variables and interfering factors, of the reference values and of the factors that influence the characteristics of the principal tests with special focus on those related to the alterations of the metabolism of the lipids, proteins, iron, hydroelectrolytic equilibrium and acid-base equilibrium. |
| 2 | Course content and Learning outcomes (Dublin descriptors) | <p>Topics of the module include:</p> <ul style="list-style-type: none"> - Basis of the principal analytical techniques used in the laboratory of clinic biochemistry (Spectrophotometry UV-VIS; turbidometry; nephelometry; phluorimetry, chromatography). - Protein Electrophoresis, protidogram, immunoelectrophoresis, immunodiffusion and rocket-electrophoresis. Glucidic metabolism analysis. Lipidic metabolism analysis. Plasmatic enzymes: lactic dehydrogenase, Transaminases (AST and ALT), Cholinesterase, Creatine Phosphokinase, Acid and Alkaline Phosphatases. Tumorous markers (PSA, α1-fetoprotein, CA-15.3, TPA, CYFRA-2, CEA, NSE, CA-125, CA-19.9, CA-50, hCG). - Hydroelectrolytic Equilibrium: Sodium, Chloride and Potassium. Urine examinations: chemical-physical parameters (pH, density), Metabolites (Uric Acid, Aminoacids, Catecholamines), urinary sediment. Analysis of the restriction fragment length polymorphism (RFLPs). Real Time PCR. NASBA (mRNA Amplification). DNA Microarray, diagnostic use of the DNA-Chip (CGH and Mutation arrays), PCR-OLA, PCR-Invader, SSCP, bDNA test. <p>On successful completion of this module the student should</p> <ul style="list-style-type: none"> o have profound knowledge of biochemical and molecular biology techniques; o have knowledge and understanding of the principal biological analyses and their significance; o be able to explain the relevant techniques in diagnostics using appropriate scientific language; o demonstrate skill in analytical evaluation and ability to perform biological tests, o demonstrate capacity for reading and understanding other texts on related topics. o be able to apply the acquired knowledge to concrete cases as occurring in the professional life; o demonstrate concern to health, well-being and safety; o be able to work in team showing commitment to tasks and responsibilities; o demonstrate capacity to be critical and self-critical. |
| 3 | Prerequisites and learning activities | The student must know the basic notion of Biochemistry and Molecular Biology |
| 4 | Teaching methods and language | <p>Lectures.</p> <p>Language: Italian</p> <p>Ref. Text books</p> <ul style="list-style-type: none"> • Keith Wilson, “Biochimica applicata. Le metodologie biochimiche in laboratorio”i, Goulding Kenneth H.Raffaello Cortina Editore (http://www.raffaellocortina.it/). |

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| | <ul style="list-style-type: none"> Bonaccorsi di Patti M.C., Contestabile R. e Di Salvo M.L., “Metodologie Biochimiche”, Casa Editrice Ambrosiana, (http://www.ceaedizioni.it/ita/index.asp). Federici G. et al , “Medicina di Laboratorio”., McGraw-Hill, Milano 2008 (http://www.mcgraw-hill.it/). |
| 5 | Assessment methods and criteria Oral exam |

| Programme of “FARMACOLOGIA E TOSSICOLOGIA CLINICA”: “CLINICAL PHARMACOLOGY AND TOXICOLOGY” | |
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| F0577, Compulsory 2nd Cycle Degree in HEALTH AND NUTRITION BIOLOGY, TRACK: BIOHEALTH, 2nd Year, 2nd Semester | |
| Number of ECTS credits: 6 (workload is 150 hours; 1 credit = 25 hours) | |
| Teacher: Marco CARMIGNANI | |
| 1 | Course objectives This course is aimed to provide the students with integrated scientific bases able to evaluate actions, effects and employment of xenobiotics as therapeutic agents in human diseases and as biological regulators in either physiological or pathological conditions. The course also deals with toxicological effects of therapeutic drugs and of xenobiotics of occupational and environmental origin. The course aims to valorize previous competences ranging from biochemistry and molecular biology to physiology, pathology, genetics and other basic disciplines. |
| 2 | Course content and Learning outcomes (Dublin descriptors) Topics of the module include: General principles of clinical pharmacology and toxicology. Therapeutic monitoring of drugs and analytical determination of toxins. Development, registration procedures and clinical trials of drugs. Adverse reactions, toxic effects and clinical interactions among drugs. Elements of pharmaco-economy, pharmaco-epidemiology and drug prescription. Drugs of the central and autonomic nervous system and of the cardiovascular system. Anti-inflammatory and anti-neoplastic drugs. Drugs of the immune and endocrine systems. Drugs of the blood and hemopoietic system. Drugs of the respiratory and digestive systems. Diuretics and antiparasitary drugs (chemotherapeutical drugs, antibiotics, antiviral drugs). Autacoids and related drugs. Biotechnological drugs and vaccines. Gene therapy. Active principles of dermatologic, cosmetologic and homeopathic interest. Clinical treatment of the most frequent xenobiotic-induced intoxications. Toxins of environmental impact. Organs and systems as selective targets of toxins. Ethics and regulations in pharmacology and toxicology. On successful completion of this module, the student should <ul style="list-style-type: none"> o have profound knowledge of the pharmacological and toxicological methodologies. o have knowledge and understanding of the human pathologies and their pharmacotherapy as well as of the methodological approaches to face toxicological pictures. o have capacity to integrate biological, analytical, physiological, pathological and clinical data in order to rationalize pharmacotherapy and optimize the treatment of intoxications. o be able to apply the acquired knowledge to concrete cases as occurring in the professional life. o demonstrate concern to health, well-being and safety. o be able to work in team showing commitment to tasks and |

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| | | <p>responsibilities.</p> <ul style="list-style-type: none"> o demonstrate capacity to be critical and self-critical. o have ability to act on the basis of ethical reasoning. o have ability to identify, pose and resolve problems. o have ability to search for, process and analyse information from a variety of sources. o have ability to apply knowledge in practical situations. |
| 3 | Prerequisites and learning activities | The student must have knowledge of General Pharmacology and Toxicology. |
| 4 | Teaching methods and language | <p>Lectures. Language: Italian</p> <p>Ref. Text books</p> <ul style="list-style-type: none"> • B.G. Katzung. <i>Farmacologia generale e clinica</i>. Piccin, Padova (last edition). • T.M. Speight, N.H.G. Holford (Eds.). <i>Farmacologia e terapia</i> di Avery. Zanichelli, Bologna (last edition). • L. Annunziato, G. Di Renzo (Eds.). <i>Trattato di Farmacologia</i>, vol. I-II. Idelson-Gnocchi, Napoli (last edition). • Goodman & Gilman's <i>the Pharmacological Basis of Therapeutics</i>. McGraw-Hill, New York (last edition). • C.D. Klaassen (Ed.). Casarett & Doull's <i>Toxicology</i>. McGraw-Hill, New York (last edition). |
| 5 | Assessment methods and criteria | Oral exam |

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| <p>Programme of “NEUROBIOLOGIA E NEUROBIOLOGIA APPLICATA” “NEUROBIOLOGY AND APPLIED NEUROBIOLOGY”</p> | | |
| <p>This course is composed of five Modules: 1) Neurobiology, 2) Applied Neurobiology</p> | | |
| <p>F1027, Compulsory</p> | | |
| <p>2nd Cycle Degree in HEALTH AND NUTRITION BIOLOGY, TRACK: BIOHEALTH, 2nd Year, 2st Semester</p> | | |
| <p>Number of ECTS credits: 6 (workload is 150 hours; 1 credit=25 hours)</p> | | |
| <p>1) NEUROBIOLOGY (3 ECTS)</p> | | |
| <p>Teacher: Annamaria CIMINI</p> | | |
| 1 | Course objectives | <p>The goal of this Module is to provide the students with scientific bases of neurobiology, starting from neuron structure to the complex circuits responsible for behavior, cognition, learning and memory. Also some notions regarding cognitive evolution is provided. On successful completion of this module, the student should be aware of the structure of the Nervous System, of the biology of neuronal actions, of the sensory and motor systems, of the biological fundaments of cognition and emotions.</p> |
| 2 | Course content and Learning outcomes (Dublin descriptors) | <p>Topics of the module include:</p> <p>The Neuron; action potential and resting potential; the synapse; axonal flow; The glial cells; Blood Brain Barrier; The Central and Peripheral Nervous System; Neurotransmitters: dopamine, acetylcholine, glutamate, serotonin; Mood disorders: dopamine and serotonin hypothesis. Hypothalamus and circadian rhythms; Biological control of stress; the sensory system: taste, hearing, balance, sight, smell. The motor system: language (area of language; aphasia) control of movement; Memory and learning; LTP and LTD; glutamate receptors; simple learning and associative learning; intelligence evolution.</p> <p>On successful completion of this module the student should</p> <ul style="list-style-type: none"> o have profound knowledge of nervous system; o have knowledge and understanding of the principal biological fundaments of neurons; |

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| | | <ul style="list-style-type: none"> o be able to explain the biological fundamentals of memory and learning and of cognition; o demonstrate skill in find connections and ability to perform neurobiological tests; o demonstrate their understanding of the nervous system at a variety of levels from behaviour to the molecular mechanisms underlying neural processing; o be able to explain how findings, methods, and concepts from other disciplines e.g. experimental psychology, molecular biology, evolution, the physical sciences, is relevant to the understanding of neuroscience; o be able to explain how structure underpins function in the brain, how the brain modulates behaviour and contributes to conscious experience, and evaluate the experimental techniques used to study the relationship between brain and behavior; o demonstrate knowledge of the current state of research and understanding in Neuroscience; o Be able to access and evaluate Neuroscience information from a variety of sources including the primary literature; o be able to apply the acquired knowledge to concrete cases as occurring in the professional life; o demonstrate concern to health, well-being and safety; o be able to work in team showing commitment to tasks and responsibilities; o demonstrate capacity to be critical and self-critical. |
| 3 | Prerequisites and learning activities | The student must know the basic notion of Cell Biology and Histology of the nervous tissue |
| 4 | Teaching methods and language | <p>Lectures.</p> <p>Language: Italian/English</p> <p>Ref. Text books</p> <p>Neurobiology:</p> <ul style="list-style-type: none"> • Kandel, <i>Fondamenti delle Neuroscienze e del comportamento</i> casa ed. Ambrosiana • Nicholson et al., <i>Dai neuroni al Cervello</i>, casa ed. Zanichelli • Thompson , <i>Neuroscienze</i> casa ed. Zanichelli |
| 5 | Assessment methods and criteria | Oral exam |

2) APPLIED NEUROBIOLOGY (3 ECTS)

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| Teacher: Elisabetta BENEDETTI | | |
| 1 | Course objectives | The goal of this Module is to provide the students with rational and scientific bases of neurobiology methods and skills for designing experiments useful in neuroscience research. On successful completion of this module, the student should be aware to choose the correct model for neurobiology studies, with special focus on those related to <i>in vitro</i> studies of axonal growth, neural differentiation, cerebral tumors behavior, Alzheimer's and Parkinson's disease. |
| 2 | Course content and Learning outcomes (Dublin descriptors) | <p>Topics of the module include:</p> <ul style="list-style-type: none"> - Basis of the cells cultures: growth conditions, cryopreservetion, mycoplasma contamination, types of nerve cell cultures, their advatages and limitations. - Cell lines used in neurobiology: PC12 rat pheochromocytoma cell line, Neuronlike cells derived from p19 embryonal carcionoma and embryonic stem cells, SHSy5y cell line. - Primary neural cell cultures: Rat Hippocampal Neurons culture, Rat Striatal Neurons Culture, Culture of Astrocytes, Oligodendrocytes and O-2A Progenitor Cell. |

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| | | <ul style="list-style-type: none"> - Organotypic slice culture of neuronal tissue, culture methods and applications. - Cerebral tumors: primary cultures and cell lines, culture methods and applications. - Neural Stem Cells: culture methods and applications. <p>On successful completion of this module the student should</p> <ul style="list-style-type: none"> o have profound knowledge of nervous system; o be able to demonstrate their understanding of the nervous system at a variety of levels from behaviour to the molecular mechanisms underlying neural processing. o be able to explain how findings, methods, and concepts from other disciplines e.g. experimental psychology, molecular biology, evolution, the physical sciences, is relevant to the understanding of neuroscience. o be able to explain how animals, including man, extract sensory information from their environment and the way this information is used to modulate behaviour and the development of the brain itself. o be able to plan, execute and present an independent piece of work (e.g. a project) within a supported framework. o Have capacity to demonstrate basic competencies in a range of practical Neuroscience techniques including data collection, and analysis and interpretation of those data and work safely in a laboratory/field environment. |
| 3 | Prerequisites and learning activities | The student must know the basic notion of Cell Biology and Histology of the nervous tissue |
| 4 | Teaching methods and language | Lectures, Seminars, Team work, Laboratory experience. Language: Italian/English Ref. Text books <ul style="list-style-type: none"> • <i>Culturing Nerve Cells</i>, edited by Gary Banker and Kimberly Goslin • Scientific articles provided by the teacher |
| 5 | Assessment methods and criteria | Oral exam |

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| Programme of “PATOLOGIA E FISIOPATOLOGIA GENERALE” “GENERAL PATHOLOGY AND PHYSIOPATHOLOGY” | | |
| F1122, Compulsory 2nd Cycle Degree in HEALTH AND NUTRITION BIOLOGY, TRACKS: BIOHEALTH and NUTRITION, 2nd Year, 2nd Semester | | |
| Number of ECTS credits: 6 (workload is 150 hours; 1 credit=25 hours) | | |
| Teacher: MAURO BOLOGNA | | |
| 1 | Course objectives | The objective of this course is to offer to the students extended and updated concepts of pathology, physiopathology and immunopathology, with particular attention to mammals and humans. On successful completion of this module, the student should be able to elaborate complex logical reasoning on the main mechanisms of disease, of the interplay between different functions and organs in normal and pathologic processes with particular emphasis on the prevention of the most prevalent diseases and the understanding of therapeutic principles of disease. |
| 2 | Course content and Learning outcomes (Dublin descriptors) | Topics of the module include: History of Pathology and of Experimental Medicine. Basic physiopathological mechanisms of the main organs and apparatuses. Diseases of the cardiovascular system, of the pulmonary system, of the gastrointestinal system, of the urinary system. Metabolic diseases. Metabolic syndrome. Diabetes. |

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| | | <p>Obesity. Immunopathology. Allergies. Autoimmune diseases. Vaccinations. Transplants. Clinical aspects of the most prevalent tumoral diseases. Tumour prevention and early detection. Social, nutritional, biological and environmental prevention of the most prevalent human diseases, acute and chronic.</p> <p>On successful completion of this module the student should</p> <ul style="list-style-type: none"> o have extensive and updated knowledge of pathology at the theoretical and experimental level, with clinical elements of diagnosis and therapy principles; o have knowledge and understanding of the principal pathophysiological mechanisms of disease; o be able to explain the major processes underlying the altered functions evident in human diseases using appropriate scientific language; o demonstrate skill in critical analysis of potentially hazardous agents and procedures; o demonstrate capacity for reading and understand other texts on related topics; o demonstrate interest to health, well-being and safety; o demonstrate ability to communicate key information from the Pathology - Immunopathology field to non-experts. o be able to apply and transmit the fundamentals of disease prevention, with particular attention to food and diet . |
| 3 | Prerequisites and learning activities | The student must know the basic notions of Biochemistry, Physiology and Basic Principles of Pathology. |
| 4 | Teaching methods and language | <p>Lectures.</p> <p>Language: Italian. Some themes are illustrated in English with translation and comment of selected synopses of disease descriptions on appropriate publications (provided to all students by the teacher)</p> <p>Ref. Text books</p> <ul style="list-style-type: none"> • ROBBINS COTRAN: <i>Le basi patologiche delle malattie</i>, Patologia Generale, VIII Ed.- 2010 - Elsevier Italia. • RUBIN: <i>Patologia, Fondamenti clinicopatologici in medicina</i>, 2006 - CEA, Milano • Pontieri, Russo, Frati: <i>Patologia Generale</i>, tomo I, Ediz. Piccin, Padova, III ed 2008 • Stevens-Lowe, <i>Patologia</i> 2aEd./ Ediz. CEA, Milano 2001 <p>Selected synopses of disease descriptions in English (from International journals, selected and provided by the teacher).</p> |
| 5 | Assessment methods and criteria | Computer test with randomly chosen multiple response questions (also providing revision suggestions), administered some days before the Oral exam |

**Programme of “MICROBIOLOGIA E MICOLOGIA DEGLI ALIMENTI”:
“FOOD MICROBIOLOGY AND MYCOLOGY”**

This course is composed of two Modules: 1) Food Microbiology, 2) Mycology

F1022 - Compulsory

2nd Cycle Degree in HEALTH AND NUTRITION BIOLOGY, TRACK: NUTRITION, 1st Year, 1st Semester

Number of ECTS credits: 9 (workload is 225 hours; 1 credit=25 hours)

1) FOOD MICROBIOLOGY

| Teacher: Aldo LEPIDI | | |
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| 1 | Course objectives | <p>The objectives of the course are to provide the students with the cultural and professional tools (i.e. technological uses of microbes, bacteria and fungi, in food processing, food safety and quality, food borne pathogens detection) needed in the very complex contest of the present times and foreseeable future.</p> <p>Microbial agents are examined for their relevance on</p> <ul style="list-style-type: none"> - a) plant growing and harvesting, storage, transformation and marketing of plant products (grains, vegetables, fruits) as well as on - b) animal breeding and storage, transformation and marketing of animal products (meat, milk, eggs ...). <p>Students will be able to know and understand food quality and health safety as it applies in the various sectors of the food chain, including food production, processing, storage and transport and as it relates to food systems monitoring within the food industry or other sectors.</p> <p>National and international boundary laws governing food production and safety are evaluated and commented in the framework of the food politics at local and word level (FAO, WFP, FEWS, FDA, EFSA).</p> |
| 2 | Course content and Learning outcomes (Dublin descriptors) | <p>Topics of the module include:</p> <ul style="list-style-type: none"> - microbes in plant growth and animal breeding - microbes in harvesting and slaughtering - microbes in food storage, transformation and marketing (cold chain, food wholesale distribution, fast food- slow food ...) - microbes in food technologies - complexity of the microbial effects on food production and utilization; - cultural and professional utilization of knowledge and research about microbes and food - how do manage with reliable and up-to-date information about topics in food microbiology - national and international agencies dealing with food availability, safe distribution and marketing and utilization - microbial contribution to famine and food shortage <p>Learning expected outcomes are:</p> <ul style="list-style-type: none"> - knowledge and understanding of microbial contribution to food production and safe utilization by humans, - knowledge and understanding of factors affecting life and death of microorganisms in foods, - ability to reach the proper and best bibliographic information concerning food- microbes interrelationships, - awareness of the role of microbiological skill in agro-industries, - ability to identify foods as microbial ecosystems, - capacity to appreciate the role and significance of microorganisms in food, - ability to recognize important microorganisms affecting food quality and safety, - capacity to identify methods of microorganism control to preserve food and make food consumption safe, - ability to project technical interventions to control food borne pathogens, - problem solving skills in the identification of microbial flora and microorganisms of public health importance. |
| 3 | Prerequisites and learning activities | Students are expected to be familiar with basic microbiology and biochemistry |
| 4 | Teaching methods and language | Lectures by the teacher; students are encouraged to contribute a reading on specific arguments of cultural and professional interest. Language: Italian and English |

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| | | <p>Ref. Text books: Students are encouraged to check for the topics of interest both in books, in Italian and in English, having food microbiology in the title and in the scientific papers available open access in our university.</p> |
| 5 | Assessment methods and criteria | Oral examination, student readings are part of the evaluation |
| 2) MYCOLOGY | | |
| Teacher: Giorgio LALLI | | |
| 1 | Course objectives | The objectives of the course are to provide the students with the knowledge in several aspects of mycology and mycotoxicology with special focus on food and food safety. The Module aims to demonstrate and teach classical methods as well as innovative molecular, chemical and immunological systems for rapid, robust and user-friendly identification and quantification of mycotoxins and toxigenic fungi in the food chain. |
| 2 | Course content and Learning outcomes (Dublin descriptors) | <p>Topics of the module include:</p> <ul style="list-style-type: none"> - The impact of climate changes on food security and food safety. - Mycotoxins of major concern and associated fungi: biology, physiology and ecology of fungi and mycotoxin production. - Hurdle technology approaches applied to fungal development and mycotoxin production in foods. - Modelling of fungal growth and mycotoxin production under post-harvest conditions: theory on experimental design. - Classic methods of fungal identification and quantification, and of their toxigenic ability. - Measurement of fungal germination, growth and inactivation. - Modern methods of fungal identification and quantification, and of their toxigenic ability: molecular methods. - Modern methods of fungal identification and quantification: mass spectrometry (MALDI-TOF ICMS). - Sample preparation, extraction, cleanup and detection. <p>Learning expected outcomes are:</p> <ul style="list-style-type: none"> o knowledge and understanding of major mycotoxins and toxigenic fungi present in different foods and food commodities; o understanding of the biology, physiology and ecology of toxigenic fungi, and the ecology of mycotoxin production; o ability to know and apply the various methods for fungal and mycotoxin detection, quantification and identification in foods; o acknowledge of the expected effects of climate changes on fungal ecophysiology and on their toxigenic ability; o awareness of the hurdle technology approach applied to fungal development and mycotoxin production in foods; o ability to understand and develop predictive modelling studies in food mycology and mycotoxicology. |
| 3 | Prerequisites and learning activities | Students are expected to be familiar with basic microbiology and biochemistry |
| 4 | Teaching methods and language | <p>Lectures by the teacher; students are encouraged to contribute a reading on specific arguments of cultural and professional interest.</p> <p>Language: Italian and English</p> <p>Ref. Text book Students are encouraged to check for the topics of interest both in books, in Italian and in English, having food microbiology in the title and in the scientific papers available open access in our university.</p> |
| 5 | Assessment methods and criteria | Oral examination, student readings are part of the evaluation |

**Programme of “IGIENE GENERALE E DEGLI ALIMENTI”
“PUBLIC HEALTH, GENERAL AND FOOD HYGIENE”**

**F1020, Compulsory
2nd Cycle Degree in HEALTH AND NUTRITION BIOLOGY, TRACK: NUTRITION, 1st Year, 1st
and 2nd Semester**

Number of ECTS credits: 9 (workload is 225 hours; 1 credit=25 hours)

Teacher: MARIA SCATIGNA

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| 1 | Course objectives | The goal of this course is to provide the students with rational and scientific bases of the public health and hygiene, that refers to conditions and practices that help to maintain health and prevent the spread of diseases at individual and population level, particularly concerning food and nutritional safety. On successful completion of this module, the student should be aware of holistic approach to health preservation and promotion and of different fields of action and methodologies: surveillance and epidemiology; infectious diseases and their control; life environments and associated risk factors; behavioural impact on health and health education; importance of food hygiene and diet adequacy in the context of public health. Moreover the student should be aware of methodologies for risks assessment and control associated with food production and consumption, and of the role of a biologist in the surveillance and good practices application. |
| 2 | Course content and Learning outcomes (Dublin descriptors) | <p>Topics of the module include: Definition of Health. Natural history of diseases. Communicable and Non Communicable Diseases. Determinants of health/illness. Prevention: objectives and levels. Definition, scope, and uses of epidemiology. Measuring disease frequency (Incidence and prevalence). Mortality (Death rates; Infant mortality; Maternal mortality rate, Life expectancy). Other summary measures of population health. Comparing disease occurrence (standardization). Observational epidemiology (Descriptive studies, Ecological studies, Ecological fallacy, Cross-sectional studies, Case-control studies, Cohort studies); Experimental epidemiology (Randomized controlled trials; Field trials; Community trials). Metanalysis. Potential errors in epidemiological studies and Confounding. The concept of cause and causation (temporal relationship; plausibility; consistency; strength; dose-response relationship; reversibility). Measure of causality in different study designs (prevalence ratio, odds ratio, relative risk). Judging the evidence. Communicable diseases. Chain of infection: the epidemiological triangle (infectious agent, host, environment) and way of transmission. Epidemic and endemic disease. Control of Infectious disease: investigation and identifying cases; immunization (vaccines, prophylaxis post-exposition); chemoprophylaxis; disinfection and sterilization. Secondary prevention of Non Communicable Diseases: Screening (types and criteria for screening). Environment and Health. Outdoor Air: atmosphere of earth and its layers; the composition and pollution of outdoor air. Indoor environments, health impact and comfort: microclimate and its elements; thermal comfort; indoor air quality. Noise. Illumination. Water, sanitation and health: drinking water (definition, sources, requisites and sanitation treatments). Foodborne infectious diseases (Cholera, Typhoid fever, Shigellosis, Virus A Hepatitis, Brucellosis, <i>Salmonellae spp</i>, <i>Staphylococcus aureus</i>, <i>Clostridium Botulinum</i>, <i>Clostridium perfringens</i>, <i>Bacillus cereus</i>, <i>Listeria monocytogenes</i>). Food microbial contamination and influencing factors (activity of water, pH, redox potential, nutritional substrate, food structure, temperature, humidity, atmosphere composition, microbial interactions). Food preservation methods (high temperature treatments - cooking, pasteurization, sterilization; low temperature treatments - refrigeration, freezing; drying, smoking, irradiation, artificial and natural food additives. Food shelf life and packaging). Food chemical</p> |

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| | | <p>contamination (natural sources: fish and shellfish poisoning, mycotoxin, biological amines. Artificial sources: pesticides, heavy metals, polycyclic aromatic hydrocarbons, estrogenic hormones, Polychlorinated biphenyl (PCB) and derivatives, packaging materials). Food safety (definition of hazard, risk, control. Safety prerequisites at different levels: primary products; transportation, and storage, equipment, personnel, sanitation. The Hazard Analysis Critical Control Point method (HACCP). Food traceability and labeling. Good Practice Manuals. Some of the compulsory and voluntary laws and regulation in food safety). Nutritional aspects of food-health relationship (assessment methods for nutritional status and body composition - anthropometric measures and parameters; self-reported diet and eating habits methods - questionnaires; nutritional epidemiology: aims and study design; epidemiological evidences on influence of poor diet - mineral and vitamins deficiencies, protein deficiencies, nutritional excess; Recommended Daily Allowance - RDA - for nutrients, dietary guidelines, health education for healthy and safe diet).</p> <p>Health Education and Promotion. The Ottawa Chart and the 5 key actions. The relationship between behaviour and health. Health education and communication process. Health promotion interventions planning and evaluating.</p> <p>On successful completion of this module, the student should:</p> <ul style="list-style-type: none"> o have profound knowledge of different positive and negative determinants of health and prevention levels and different risk factors associated with food consumption and unhealthy diet; o have knowledge and understanding of epidemiology principles and methods; o have knowledge and understanding of public health fields and preventive practices; o have knowledge and understanding of food safety principles and European and National regulations; o demonstrate skills in identifying risks associated with different environmental dimensions and with a particular food production or related activity; o understand and explain methods and techniques aimed at controlling biological, physical and chemical health risk factors, in particular the food-borne risks; o be able to apply HACCP method and to develop a safe process plan in different steps of the food chain; o demonstrate capacity for reading and understand other texts on related topics; o demonstrate capacity to be critical and self-critical; o demonstrate concern to health, well-being and safety |
| 3 | Prerequisites and learning activities | The student must know the basic notions of microbiology, toxicology and statistics. |
| 4 | Teaching methods and language | <p>Lectures.</p> <p>Language: Italian.</p> <p>Ref. Text Books</p> <ul style="list-style-type: none"> • Meloni C & Pelissero G. Igiene. Casa Editrice Ambrosiana. 2007 (I ed); • Barbuti S. Fara GM, Giammanco G. et al. Igiene. Moduzzi Editoriale. 2011 (III ed); • Roggi C, Turconi G. Igiene degli alimenti e nutrizione umana. EMSI, Roma, 2009 (II ed); Teacher's slides on Univaq @learning platform |
| 5 | Assessment methods and criteria | Oral exam |

**Programme of “INGEGNERIA GENETICA E GENOMICA”
“GENETIC ENGINEERING AND GENOMICS”**

**F 1023, Compulsory
2nd Cycle Degree in HEALTH AND NUTRITION BIOLOGY, TRACK: NUTRITION, 1st Year, 2nd Semester**

Number of ECTS credits: 6 (workload is 150 hours; 1 credit=25 hours)

Teacher: **Michele MIRANDA**

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| 1 | Course objectives | The goal of this course is to provide the students with the today profound knowledges of structural, functional and comparative genomics with attention to the use of genomics and recombinant DNA techniques to nuveil gene mutation responsible of genetics diseases. |
| 2 | Course content and Learning outcomes (Dublin descriptors) | <p>Topics include: Recombination DNA, restriction enzymes and genomics, genomics, genomes and organism development. Structure of RNA and DNA genomes. Genetic polymorphism and genome evolution. Transposable elements. Retrovirus and cancer. Functional and comparative genomics-genomics and hereditary diseases.</p> <p>On successful completion of this module the student should</p> <ul style="list-style-type: none"> o have profound knowledge of genetics; o have knowledge and understanding of the major issues of genetic heredity; o be able to explain the acquired knowledge by using the technical language; o be able to explain the terms 'gene', 'chromosomes' and 'DNA'; o be able to identify how genetic information is passed to offspring; o be able to explain how recessive and dominant genetic characteristics are inherited; o be able to predict the probability of a person being affected by a particular characteristic; o be able to explain two different ways in which cells reproduce; o have the capacity to identify the likely inheritance of genes from a pedigree. o demonstrate capacity for reading and understand other texts on related topics. o be able to apply the acquired knowledge to concrete cases such as pedigrees, genetic forecasting. |
| 3 | Prerequisites and learning activities | The student must know the basic notion of genetics, biochemistry, molecular biology. |
| 4 | Teaching methods and language | <p>Lectures. Language: Italian Ref. Text books</p> <ul style="list-style-type: none"> • J.D. Watson - Biologia molecolare del gene Vol. I e II (Zanichelli) • R.E. Scossiroli; D.L. Palenzona - Manuale di Biometria (Zanichelli) - • M.R. Spiegel - Statistica (Collana Shaum) • Robert J. Brook'er - Genetica (Zanichelli) • J. F. Griffiths, JH. Miller, D. T. Suzuki, R. C. Lewontin, W-M Gelbart Genetica Principi di analisi formale (Zanichelli) - • Peter Russel' Genetica , EDISES ed. (ultima edizione). • Hartwell,Hood,Goldberg,Reynolds,Silver,Veres.Genetica dall'analisi formale alla genomica. McGraw-Hill |
| 5 | Assessment methods and criteria | oral exam |

**Programme of “SCIENZE E TECNICHE DIETETICHE APPLICATE”:
“APPLIED DIETETIC SCIENCES”**

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| FO671, Compulsory 2nd Cycle Degree in HEALTH AND NUTRITION BIOLOGY, TRACK: NUTRITION, 2nd Year, 1st Semester | | |
| Number of ECTS credits: 6 (workload is 150 hours; 1 credit = 25/30 hours) | | |
| Teacher: Elvira AQUILIO | | |
| 1 | Course objectives | Goal of the course is to provide the student with the knowledge of nutrition's basic principles in both physiological and pathological circumstances. The students will -Acquire knowledge about a correct nutrients's intake. -Learn the methods to identify malnutrition's conditions. -Be able to plan a healthy diet in pediatric, adult and elderly patients -Be able to plan an healthy diet in particular physiological condition(pregnancy, sport) -Know basic of food therapy. |
| 2 | Course content and Learning outcomes (Dublin descriptors) | Topics of the module include: - Introduction to Nutrition Science - Mediterranean diet - Food guide pyramid - Food label and RDA - Micro and macronutrients - Nutritional assessment: anthropometric measurements (weight, height, circumference etc.), bioelectrical impedance analysis - Obesity and Weight Management. Anorexia and bulimia. - How to determine individual nutrient needs. Basal metabolic rate, energy balance - Diabetes - Heart diseases (including dietary avenues for the prevention and management of heart disease, hypertriglyceridemia, hypertension and stroke) - Food intolerance, Coeliac disease On successful completion of module the student should o have Knowledge of the fundamentals of nutrition science; o know macro e micronutrients; o be able to use an appropriate scientific language; o demonstrate skills for nutritional assessment; o be able to plan an healthy diet in pediatric, adult and elderly patients and in particular physiological condition(pregnancy, sport); o demonstrate concern to health, well-being and safety; o demonstrate capacity to be critical and self-critical. |
| 3 | Prerequisites and learning activities | Basic knowledge of biochemistry and biology |
| 4 | Teaching methods and language | Lectures. Language: Italian Ref. Text books: • Mary E Barasi. Nurizione e Salute . EMSI Editore • Eastwood. Principles of Human Nutrition . Blackwell Ed. |
| 5 | Assessment methods and criteria | Oral exam |

**Programme of "BIOTECNOLOGIE MOLECOLARI VEGETALI":
"MOLECULAR PLANT BIOTECHNOLOGY"**

F1021, Compulsory
2nd Cycle Degree in HEALTH AND NUTRITION BIOLOGY, TRACK: NUTRITION, 2nd Year, 1st Semester

| Number of ECTS credits: 6 (workload is 150 hours; 1 credit = 25hours) | |
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| Teacher: Laura SPANO' | |
| 1 | Course objectives |
| 2 | Course content and Learning outcomes (Dublin descriptors) |
| 3 | Prerequisites and learning activities |
| 4 | Teaching methods and language |
| 5 | Assessment methods and criteria |

To provide advanced knowledge about cellular molecular and genetic basis of plant genetic engineering and its applications to industry, agriculture and medicine.

Topics of the module include:

- Molecular basis of plant genetic engineering: restriction enzymes and DNA ligase. Vectors and methods for introducing DNA into plant cells: stable and transient transformation. Chloroplasts transformation.
- Transgenes in the plant cells: gene silencing, co-suppression and RNA interference. In vitro cultures of plant cells: morphogenesis and differentiation; plant hormones. First and second generation transgenic plants: examples.
- Agricultural biotechnologies and molecular agriculture.

On successful completion of this module, the student should

- o have profound **knowledge** of the impact and relevance of biotechnology in contemporary research;
- o have **knowledge and understanding of** the benefits and disadvantages of GMO (genetically modified organisms) and GM Plants in particular;
- o **understand and explain** questions dealing with heterologous gene expression;
- o **understand** the methodology of transformation and whole plant regeneration;
- o **demonstrate skill** in practical work and **ability** in communicating/evaluating results;
- o demonstrate **capacity** for reading and understand other texts on related topics;
- o demonstrate **ability** to communicate both orally and through the written word in first language;
- o ability to **plan and manage** time and to **apply knowledge** in practical situations;
- o **ability** to work in a team.

The student must have a good knowledge of molecular biology of the cell and molecular genetics.

Lectures, exercises, report. Language: italian

Ref. Text books

- G.PASQUA et al. **Biologia Cellulare e Biotecnologie Vegetali** Ed. PICCINI (cap.18,19,21,25,26)
- CHRISPPEELS SADAVA **Genetica, Biotecnologie e Agricoltura Sostenibile** ed. IDELSON-GNOCCHI (cap.3,6,14,19)
- GLICK - PASTERNAK **Biotechnologia Molecolare** ZANICHELLI (cap.15, 17,18)
- WATSON, CAUDY, MYERS, WITKOWSKI- **Dna Ricombinante-** 2ed.ZANICHELLI 2008
- PRIMROSE, TWYMAN, OLD- **Ingegneria Genetica principi e tecniche** ZANICHELLI

Written and oral exam, short report.

**Programme of “BIOCHIMICA DELLA NUTRIZIONE E DEL METABOLISMO”
“BIOCHEMISTRY OF NUTRITION AND METABOLISM”**

**F1024, Compulsory,
2nd Cycle Degree in HEALTH AND NUTRITION BIOLOGY, TRACK: NUTRITION, 2nd Year, 2nd Semester**

| Number of ECTS credits: 6 (workload is 150 hours; 1 credit = 25 hours) | | |
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| Teacher: Giuseppina PITARI | | |
| 1 | Course objectives | The main objective of the course is to give the students a thorough understanding of the Biochemical properties of foods. The biochemistry of food is the foundation on which the research and development advances in food biotechnology are built. Laboratory experimentation and exercises complete the Module. |
| 2 | Course content and Learning outcomes (Dublin descriptors) | <p>Topics of this Module include:</p> <ul style="list-style-type: none"> - Carbohydrates and Glycobiology, Lipids, Aminoacids and proteins, vitamins, oligoelements; Chemistry and Biochemistry, Absorption, transport and catabolism. Enzymes in health and disease. Physiological and chemical functions of food components; - Food Composition: Fruits, Vegetables, Cereals, Milk, Meat. Food additives; - <u>Laboratory sections:</u> FOOD ANALYSIS <p>On successful completion of this module, the student should</p> <ul style="list-style-type: none"> o have profound knowledge of food biochemistry; o have knowledge and understanding of the biochemistry and food adsorption; o understand and explain food digestion and composition; o demonstrate skill to integrate the principles of biochemistry into real world of Food Science and nutritional studies; o demonstrate capacity for reading critically other texts and understand health implication. |
| 3 | Prerequisites and learning activities | The student must know cellular biology, general and organic chemistry, biochemistry |
| 4 | Teaching methods and language | Lectures, exercises, home work, experimental. Language: Italian Ref. Text books <ul style="list-style-type: none"> • Nelson David L., Cox Michael M.: Principi di Biochimica • Food Biochemistry http://www.scribd.com/doc/24125134/Food-Biochemistry-and-Food-Processing |
| 5 | Assessment methods and criteria | Oral exam |

| Programme of "TOSSICOLOGIA DEGLI ALIMENTI": "FOOD TOXICOLOGY" | | |
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| F0643, Compulsory 2nd Cycle Degree in HEALTH AND NUTRITION BIOLOGY, TRACK: NUTRITION, 2nd Year, 2nd Semester | | |
| Number of ECTS credits: 6 (workload is 150 hours; 1 credit = 25 hours) | | |
| Teacher: Anna Rita VOLPE | | |
| 1 | Course objectives | This course aims to provide the students with an adequate knowledge of the general problems deriving from the food contamination by xenobiotics of different origin and nature. The course is articulated in order to valorize and integrate the students' competences in basic biological disciplines like Organic Chemistry, Biochemistry, Physiology, Microbiology, Ecology and Pathology. |
| 2 | Course content and Learning outcomes (Dublin descriptors) | <p>Topics of the module include:</p> <p>General principles and definitions. Chemical characteristics of xenobiotics and food chain, toxic effects resulting from the transport of xenobiotics in food chain. Natural and environmental chemical hazard from primary or secondary food production technologies. Added and received (accidental, intentional) pharmaco-toxicological residues in foods. Toxicological risks from intake of residues of xenobiotics in foods: direct risks (toxic, allergic, carcinogenic, mutagenic, teratogenic effects)</p> |

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| | | <p>and indirect risks (bacterial resistance phenomena). Toxic natural substances: bacterial toxins, mycotoxins. Animal and vegetal toxins: marine and fungal toxins and induced syndromes; toxic natural intrinsic factors (anti-nutritionals). Toxic substances from technological processes: Maillard and Strecker products; pyrolysis products of proteins and aminoacids; oxidation products; reactions between aminoacids and polyphenols; effects of alkaline treatments on proteins; reactions of aminoacids with solvents; trans fatty acids. Undesirable substances in foods following the various stages of their processing: nitrosamines, polycyclic aromatic hydrocarbons, oxidation products of fats, contaminants released from packaging materials. Food additives. Unintentional food additives: pesticides, veterinary drugs, heavy metals. Biotechnology in the food service industry: safety of the obtained products. Nutrition and cancer: food fat and excessive caloric intake; toxic compounds in the food: polycyclic aromatic hydrocarbons, heterocyclic aromatic amines, nitrous compounds, acrylamide, acrolein, azo dyes, asbestos and mineral fibers, arsenic, chromium, nickel, dioxins, polychlorinated biphenyls, vinyl chloride, carbon tetrachloride, aflatoxins, cicasine, gyromitrin, safrole, pyrrolizidine alkaloids, gossypol, tannins, quinones. Protective substances in the foods. Toxicological risk assessment of xenobiotics in the diet.</p> <p>On successful completion of this module, the student should</p> <ul style="list-style-type: none"> o have profound knowledge of the food-related toxicological problems. o have knowledge and understanding of nature, origin, mechanisms of action and effects of toxic elements and compounds which may contaminate foods. o understand and explain how food-derived toxic compounds affect human health. o understand the social, environmental and health relevance of food toxicology. o demonstrate skill in evaluating pathological conditions caused by foods contaminants and ability to prevent and face food pollution by toxicants. o demonstrate capacity for reading and understand other texts on related topics. o apply the acquired knowledge to concrete cases as occurring in the professional life. |
| 3 | Prerequisites and learning activities | The student must have adequate knowledge of General Pharmacology and Toxicology. |
| 4 | Teaching methods and language | <p>Lectures.</p> <p>Language: Italian</p> <p>Ref. Text books</p> <ul style="list-style-type: none"> • Capuano, G. Dugo, P. Restani. <i>Tossicologia degli Alimenti</i>. UTET, Torino (last edition). • C.D. Klaassen (Ed.). Casarett & Doull's <i>Toxicology</i>. McGraw-Hill, New York (last edition) |
| 5 | Assessment methods and criteria | Oral exam |

**Programme of "FARMACI ED ALIMENTAZIONE":
"DRUGS AND FEEDING"**

**F1037, Compulsory
2nd Cycle in HEALTH AND NUTRITION BIOLOGY, TRACK: NUTRITION, 2nd Year, 2nd Semester**

| Number of ECTS credits: 6 (workload is 150 hours; 1 credit = 25 hours) | | |
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| Teacher: Marco CARMIGNANI | | |
| 1 | Course objectives | This course is aimed to set the physiological, physiopathological and pharmacological properties of the various food constituents ranging from minerals and vitamins to aminoacids, peptides, proteins, lipids and carbohydrates. Dietary supplements and integrators are treated along with the food-drug interactions and the diet therapy in a series of human diseases. Special attention is devoted to the pharmacotherapy of dietary behaviour alterations and of pathological states such as nervous anorexia and obesity. |
| 2 | Course content and Learning outcomes (Dublin descriptors) | <p>Topics of the module include: Fundamentals of biochemistry, physiopathology and science of feeding. Nutritional requirements and nature of the various nutrients. Nutraceuticals. Vitamins, macrominerals, microelements: physiologic and pharmacological role. Dietetic and botanic supplements. Drugs and biotechnological nutrients. Food-drug interactions. Diet/dietetic therapy and cardiovascular diseases, obesity, diabetes, tumours, dislipidemic and hepatic diseases, pancreatic and renal diseases, diseases of the digestive tract and congenital alterations of the metabolism. Drugs interfering with feeding, nutrition state and dietary behaviour; pharmacotherapy of obesity, anorexia and nervous bulimia. Pharmacological control of bone mineral homeostasis and electrolytic equilibrium. Enteral and parenteral artificial nutrition. Food intoxications and their treatment.</p> <p>On successful completion of this module, the student should</p> <ul style="list-style-type: none"> o have profound knowledge of the biochemical pharmacology. o have knowledge and understanding of the food-related human pathologies and their pharmacotherapy. o have capacity to integrate biological, physiological, pathological and clinical aspects in order to optimize a diet treatment. o be able to apply the acquired knowledge to concrete cases as occurring in the professional life. o demonstrate concern to health, well-being and safety. o be able to work in team showing commitment to tasks and responsibilities. o have ability to identify, pose and resolve problems. |
| 3 | Prerequisites and learning activities | The student must have knowledge of biochemical pharmacology and diet therapy. |
| 4 | Teaching methods and language | Lectures. Language: Italian Ref. Text books <ul style="list-style-type: none"> • C. Galli, E. Gatti, G. Tomassi, F. Visioli. Farmacologia e nutrizione. In: Trattato di farmacologia e terapia (R. Paoletti et al., Eds.), UTET, Torino (last edition). • B.G. Katzung. Farmacologia generale e clinica. Piccin, Padova (last edition). • L. Annunziato, G. Di Renzo (Eds.). Trattato di Farmacologia, vol. I-II. Idelson-Gnocchi, Napoli (last edition). |
| 5 | Assessment methods and criteria | Oral exam |

