SCIENZE BIOMEDICHE (TVC111)

1. language

Italian.

2. course contents

Coordinator: Prof. LOREDANA PENNONE

Year Course: 1st

Semester: 1st

UFC: 6

Modules and lecturers:

- BIOLOGIA APPLICATA (TVC02A) - 1 CFU - SSD BIO/13 - Prof. Francesca Uberti
- CHIMICA E BIOCHIMICA (TVC00A) - 2 CFU - SSD BIO/10 - Prof. Francesca Uberti
- FISICA APPLICATA (TVC03A) - 2 CFU - SSD FIS/07 - Prof. Loredana Pennone
- GENETICA MEDICA (TVC01A) - 1 CFU - SSD MED/03 - Prof. Eugenio Sangiorgi

3. BIBLIOGRAPHY

BIOLOGIA APPLICATA – Material provided by the teacher; Bruce Alberts et al *L'essenziale di biologia molecolare della cellula* Zanichelli 2015; *Microbiologia medica* P.R. Murray e Ken Rosenthal – Masson – 2013
CHIMICA E BIOCHIMICA – Lecture handouts and slides; J.R. Amend, B.P. Mundy, M.T. Armold *Chimica Generale, Organica e Biologica* Piccin
FISICA APPLICATA – Lecture handouts and slides; L. Pennone *Esercizi di fisica di base* Giappichelli Editore 2017
GENETICA MEDICA – Giovanni Neri, Maurizio Genuardi *Genetica umana e medica*; any university textbook, published in the last 10 years, on human or medical genetics.

4. LEARNING OBJECTIVES

The course aims to provide students with the knowledge of the specific language of Biology, Chemistry, Physics, Genetics, with reference to applications related to the professional field of the Occupational Therapist. The training course provides students with the methodologies and tools to critically evaluate situations of their future work, as well as to be able to analyse scientific articles in the relevant field.

1. **Knowledge and understanding**. The student must demonstrate a good knowledge of the fundamentals of Biology, Chemistry, Physics and Genetics, as scientific disciplines preparatory to the most characterizing ones of the Occupational Therapist profile.
2. **Applied knowledge and understanding.** The knowledge referred to in the previous point must be applied to the specific experiences related to the profession. As an example, in the recovery of a patient's motor skills, the student must know which physical law justifies the fact that a ball reaches farther if it is thrown with a run-up.
3. **Making judgements.** Based on his/her skills in the disciplines covered by the integrated course, the student must be able to interpret new situations, bringing them back to common bases. For example, knowing how much the genetic heritage of a subject can affect the behaviour he or she implements during a therapeutic session.
4. **Communication skills.** The student must be able to correctly use the technical language of the various doctrines, therefore, if necessary, he must be able to adequately confront a Chemist following a laboratory analysis. However, he must also know how to relate to non-

specialists, such as being able to describe the result of a chemical reaction in simpler terms.

5. **Ability to learn.** Updating and expanding one's preparation independently must become a habitual practice of the student, as in the case of participation in specialized seminars of Biology or in the practice of drawing news directly from scientific texts on the subject.

5. prerequisites

The scholastic foundations that are learned during secondary school are necessary for each of the four courses that make up the integrated course of Biomedical Sciences. A mathematical preparation compatible with a secondary education course is also required.

6. TEACHING METHODS

The course is administered through lectures, together with the use of IT tools; In addition, classroom lessons are delivered considering the purposes illustrated in the training objectives.

7. OTHER INFORMATION

The cooperative learning approach is also actively used.

8. METHODS FOR VERIFYING LEARNING AND FOR EVALUATION

The learning verification exam includes a written test, with possible supplementary oral, for each of the four subjects making up the integrated course. All four tests must be taken in the same session, which takes place in a whole morning (or in an entire afternoon) after scheduling the specific date.
In the event that the teacher of one of the four courses deems it useful, it will also be possible to alternatively opt for the test of the module itself in an exclusively oral mode.
The exam is however aimed at ascertaining the solid and correct knowledge of what has been learned during the lessons in the classroom and through individual study.
The final grade is expressed in thirtieths and is obtained by operating the arithmetic average of the marks obtained in each subject. However, sufficiency (18/30) is required in each of the four tests: failure in even one of them will not allow you to pass the exam and the student will have to retake the exam at a subsequent session, taking the four tests again.
For each doctrine, the student who demonstrates that he has acquired the skills and knowledge provided by the course and who is able to apply the principles learned to concrete cases obtains 30/30. It is also possible to obtain 30/30 laude in one or more specific sectors, if the student's preparation and skills are excellent.

9. program

APPLIED BIOLOGY. Structural organization and functions of the prokaryotic and eukaryotic cell. Cell membranes. Cellular communication, receptors, signal transduction. Cytoskeleton: structure and functional implications. Reproduction of eukaryotic cells and prokaryotic cells. DNA duplication, transcription and translation. Notes on the structure of the nucleus and organization of chromatin. Outline of the functions of the main organelles of the eukaryotic cell. Microorganisms of interest in the medical field. Antibiotics and chemotherapy.

CHEMISTRY AND BIOCHEMISTRY. Basic principles of chemistry. Physical and chemical change and the conservation of matter. Mixtures, compounds and elements. Chemical periodicity and classification of elements. Chemical nomenclature: IUPAC and old nomenclatures still in use. Solutions, colloids and suspensions. Energy from chemical processes. Effect of concentration, temperature, molecular structure and catalysts on reaction rate. Equilibrium constant. Acids and

bases. The pH scale. Nuclear chemistry. Nuclear decay: transmutation and half-life. Interaction between radioactivity and matter. The discovery of radioactivity. Radiation biology and nuclear medicine. Organic chemistry and chemicals for health use. Biochemistry: general principles of nutrition. Carbohydrates, monosaccharides, oligosaccharides and polysaccharides. Lipids: classification of lipids, fatty acids, triglycerides, saponifiable and non-saponifiable lipids, liposomes and membranes. Amino acids, peptides and proteins. Enzymes. Bioenergetics and catabolism, anabolism.

APPLIED PHYSICS. Scientific notation and its use; powers and their properties; approximation of numbers. Physical quantities, units of measurement, International System; fundamental and derived quantities and their units; conversions and inversion of formulas; proportions and percentages. The study of motion, uniform rectilinear motion, uniformly accelerated rectilinear motion, free fall motion. In-depth application 1: parabolic motion, the physics of throwing a ball. Weight force; frictional force; laws of dynamics. In-depth application 2: frictional force and the principle of action and reaction, the physics of walking. In-depth application 3: moment of strength and torque, the physics of cycling. In-depth application 4: simple machines - levers; the levers of the human body.
Work of a force; energy; power. Ideal fluids and real fluids; flow rate of a conduit; continuity and Bernoulli equations; statics of fluids and Stevin's law. Thermal energy and temperature.

MEDICAL GENETICS. Genes and DNA. Structure of chromosomes. Autosomes and sex chromosomes. Chromosomes and the formation of gametes. Meiosis. Mendel's laws: dominance and recessivity. Genes and alleles. The law of segregation. Dominance and recessivity. Segregation of genes in humans: simple Mendelian transmission. Examples of simple Mendelian dominance. Features of autosomal recessive inheritance. Examples: cystic fibrosis. Hereditary X-linked transmission of genes. Examples of X-linked recessive traits: Fragile X syndrome. Chromosomal diseases. Numerical (Down, Edwards, Patau syndrome) and structural abnormalities of the autosomes. Numerical and structural abnormalities of the sex chromosomes (Turner syndrome, Klinefelter syndrome, polysomy X). Prenatal diagnosis and genetic counseling. Analysis of family trees. Genetic disorders of interest to the occupational therapist.