



University of Verona

**Undergraduate Degree in Motor Activities and Sport
2015-2016**

Biology

Teachers

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Objectives of the Course

The course aims to:

- educate the student to the "critical method" and the discussion by the description of the experiments that are the heritage of the history of biology as well as the culture of all time;
- provide an overview and updated themes and biological issues that are relevant in the profession of sports experts;
- familiarize the student with the modern techniques of biological research that can be used in studies by physical activity and sport.

Course Schedule

At the end of the course the student will learn about the following topics:

1. The characteristics common to all living organisms

2. The observations and experiments that led to the discovery of the genetic material: Griffith's experiments and experiments by Avery, McLeod and McCarty on the identification of DNA; the central dogma of Biology, for which DNA derived from the RNA and protein by RNA; the discovery of the structure of DNA by Erwin Chargaff, Rosalind Franklin, J. Watson and F. Crick and finally to Meselson and Stahl (the semiconservative replication).

3. The morphological and functional differences between viruses, bacteria and eukaryotes including protists.

4. The biology of the cell: the organization of the eukaryotic cell, the nuclear and cytoplasmic compartments. Microscopy and analytical techniques applied to the cell studies.

4.1 Cell membranes: the bilayer of phospholipids, cholesterol and membrane proteins, the relationship between the antigens on the erythrocyte membrane and blood groups. The transport mechanisms

4.2 The functions of the cell organelles.

4.3 The cell aggregates and the extracellular matrix

4.4 *The morphology and function of the epithelial cells*

4.5 *The morphology of the muscle cell and the nerve cell, the neuromuscular junction and neurotransmitters, synapses, and its organization and the enzymes involved. Depolarization of the membrane, the chain of events that leads to the transmission of the signal from synapse to synapse through the axon, Schwann cells and oligodendrocytes; the action potential and muscle contraction. The muscle cell, molecules, enzymes and proteins involved in contraction of the muscle fiber. The muscle fiber types and their characteristics, the growth of muscle mass related to training, the function of satellite cells, the function of myostatin and its inhibitors.*

4.6 *The cells of the connective tissue: diversity and functions*

5. **The cell reproduction:** *the cell cycle and the mechanisms that govern cell division (mitosis) and both male and female gametogenesis (meiosis). The stem cells ,*

6. **The flow of gene expression: transcription and translation.** *The eukaryotic chromosome and gene regulation and expression. Chromatin and chromosomes. The human karyotype. Interpreting the switching on or off of the gene activity in response to an environmental stimulus; interpret the phenomena of differentiation and cell growth through mechanisms such as autocrine, paracrine and endocrine systems. Genetic mutations. The difference between gene mutations and chromosomal abnormalities, spontaneous mutations, mutagens and their action, the test of "fluctuation", the Ames's test, the correlation between mutagenesis and cancer, the relationship between smoking and cancer, damage to UV and repair mechanisms, the Xeroderma Pigmentosum.*

7. **Inheritance of characters:** *the principles of mendelian genetics, the alleles and the concepts of dominance and recessiveness.*

8. **Human genetics:** *interpreting and building family trees, with particular reference to characters such as the blood groups and some of the known genes in human genetic diseases (eg, familial hypercholesterolemia, cystic fibrosis, hemophilia, etc..)*

9. *The principles of population genetics population and the Hardy and Weinberg low.*

10. **The developmental biology:** *embrional layers and their fate. The mechanisms involved in the aging; genetics and environmental factors; the Hayflick's experiments; the role of free radicals, antioxidants;, the shortening of telomeres;the genetic programs that determine the average life span of a species.*

Examination

A written examination with open questions and multiple choice quizzes.

Textsbooks:

Bonaldo et al: Biology and Genetics EdiSES 2013

Campbell and Reece. Biology and genetics. Pearson 2015

Solomon et al. Elements of Biology - 2013 EdiSES

Hillis et al. Elements of biology and genetics 2013 Zanichelli