COURSE LAYOUT

1. GENERAL

SCHOOL	Animal Biosciences		
DEPARTMENT	Animal Science		
STUDY LEVEL	Undergraduate - Compulsory		
COURSE CODE	3635	**SEMESTER**	1°
COURSE TITLE	Principles of Cellular and Molecular Biology		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS**
Theory: Lectures	3	3
Laboratory training	3	3
		6

COURSE TYPE	Scientific background
PREREQUISITES	
LANGUAGE	Greek
IS THE COURSE OFFERED forERASMUS STUDENTS?	No
COURSE WEB PAGE (URL)	https://oeclass.aua.gr/eclass/courses/768/

2. LEARNING RESULTS

Learning Outcomes

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This is an introductory course aiming to educate students in the relation between cell organization, structure, and function with the underlying molecular mechanisms. It comprises detailed description of cellular structure and function, with emphasis on eukaryotic cells. The basic properties and functions of biomolecules (carbohydrates, lipids, proteins, and nucleic acids) will also be presented. Cells will be presented as systems able to assimilate and transform energy and to process molecular input. Gene expression, cell cycle, protein synthesis, intracellular protein transport and metabolism will be presented. Moreover, applications and methods in contemporary cellular and molecular biology will be also discussed to introduce students to the basic concept of scientific experimentation to exploring cellular and molecular phenomena. Laboratory training will facilitate students comprehend the basic principles underlying lectures.

Upon successful completion of the course students will:
- The properties and functions of major groups of biomolecules.
- The origin of life from abiotic to multicellular organisms.
- The structure and function of cell membrane and cellular organelles of eukaryotes.
- The mechanisms of storing, transporting, and expressing gene coding.
- The inter- and intra-cellular mechanisms of communication.
- The mechanisms of inherited and acquired immunity.

General Competence

- Autonomous work
- Teamwork
- Work in a multidisciplinary environment

- Production of new research ideas
- Decision making
- Search, analysis and synthesis of data and information and the use of the required technologies

3. COURSE CONTENT

- Introduction and history of cellular and molecular biology.
- Prokaryotic and eukaryotic cell. Intracellular space. Cell membrane. Cytoplasm. Subcellular organelles: endoplasmic reticulum, Golgi apparatus, mitochondria, lysosomes, peroxisomes, cellular inclusions, and storage products. Cytoskeleton: structure and organization, centrioles. Nucleus: nuclear membrane, nucleoplasm, nucleolus. Interstitial environment.
- Cellular senescence, apoptosis, necrosis. Mechanisms of cell homeostasis and protein turnover.
- Cellular autophagy, autophagosome biogenesis, lysosome. Cell recognition and communication.
- Cell cycle and mitosis. Meiosis.
- Cell synthesis. Cell energy and thermodynamics.
- Structure and function of proteins. Cell membrane transport systems.
- Macromolecules, biomolecules, and the coded information. Biochemistry of nucleic acids, DNA and RNA structures.
- Introduction to the molecular biology of the cell. Chromosome organization in the nucleus and chromatin structure. Reproduction of genetic information, replication, and DNA repair mechanisms.
- Principles of gene expression. Transcription and its mechanism. Regulation of gene transcription. Gene editing, RNA processing. Genetic code, regulation of protein translation, posttranslational modifications.
- Other control mechanisms in gene expression, epigenetic modification in the cell, methylation, histone modifications. The “Epigenetic code”. Methods for nucleic acid isolation and analysis.
- Cellular and molecular organization of the immune system.
- Techniques for chicken embryo growth, enzymatic tissue degradation, embryonic fibroblast isolation, cell culture, cell counting and viability.

Laboratory training

- Cell preparations and microscopy.
- DNA isoloation, analysis, insertion into plasmids.
- Protein properties.
- Enzyme kinetics.

4. TEACHING AND LEARNING METHODS - Evaluation

TEACHING METHOD	In class, face to face.	
USE OF INFORMATICS and COMMUNICATION TECHNOLOGIES	PowerPoint and video presentations. e-class platform.	
TEACHING ORGANISATION	***Activities***	***Workload per semester (hrs)***
	Lectures	39
	Laboratory practice	39

	Literature search and analysis	72
	Total Course (25 hours workload per credit unit)	150
STUDENTS EVALUATION	Evaluation language: Greek Evaluation method: Written final examination. I. Theory (T): 60% of the final exam with short-answer questions. II. Laboratory (L): 40% of the final exam with multiple choice questions (50%) and microscopy histology slide description (50%). Final score: (T)+(L) = 60+40=100% of the total final score.	

5. BIBLIOGRAPHY

-Proposed Literature:

B. Marmaras. 2013. Cell Biology. A molecular approach. Typorama publishers. 5th edition. Patras.

Benjamin Lewin Genes IX. Κεφάλαια 1-11, 24, 26, 29. Jones and Bartlett Publishers. London

H. Lodish, A. Berk, SL. Zipursky, P. Matsudaira, D. Baltimore, J. Darnell. 2000. Molecular cell Biology. W. H. Freeman editiors, 4th edition, New York.

Related Scientific journals (non-exhaustive list):

Cell
Nature (all reviews)
Science
Gene
PLoS ONE, PLoS Genetics
Trends in Genetics
Journal of Cell Biology
Nature Biotechnology