Physics [562]

COURSE OUTLINE

(1) GENERAL

SCHOOL	ANIMAL BIOSCIENCES		
ACADEMIC UNIT	DEPARTMENT OF ANIMAL SCIENCE		
LEVEL OF STUDIES	Undergraduate [Required]		
COURSE CODE	562	**SEMESTER**	1st
COURSE TITLE	PHYSICS		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS (ECTS)**
Lectures	3	3.4
Practical Exercises	2	1.6
Total	**5**	**5**
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General Background
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS:	No
COURSE WEBSITE (URL):	**Theory:** https://oeclass.aua.gr/eclass/courses/EZPY153/ **Laboratory:** https://oeclass.aua.gr/eclass/courses/2564/

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The course aims to introduce students to the basic concepts of Physics both at the level of experimental techniques and at the level of understanding the basic processes and functions studied by Life Sciences. The concepts of physics are introduced through issues raised by the phenomenon of life and are complemented by many other topics in modern Biophysics and Biology. The selection of the examined topics is based on the needs of the Life Sciences. Some typical topics that are not central to the life sciences are omitted (eg Kepler's laws, special relativity theory, elementary particle physics, astrophysics, etc.). The principles of physics are introduced, where possible, through biology issues whereas life sciences issues are everywhere embedded in the teaching material of this course. This stimulates the students' interest as they examine issues belonging in the core of their studies, from the perspective of Physics. Introductory concepts in measurement and statistical analysis methodologies that are necessary in almost all the sciences are also taught in the practical exercises. Physics course aims to introduce students to the basic concepts upon which many important developments in molecular and cell biology have been based. Moreover, the Physics course provides students with cognitive tools that connect many types of phenomena that are unrelated to each other. Many of these tools are quantitative and can "standardize" a phenomenon to confirm or reject a theoretical hypothesis. Thus, students with this knowledge are called upon to deal with problems they encounter for the first time, using the right tools-laws.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*

Working in an international environment *Working in an interdisciplinary environment* *Production of new research ideas*	*Production of free, creative and inductive thinking* *.....* *Others...* *.....*

By critically studying the fundamental laws of physics, facing the questions by using the given information in the theoretical exercises, and especially the data obtained by measurements in the practical exercises, the students develop skills related to:

- searching, analyzing, synthesizing data and information
- Adaptation to new situations
- Decision making
- Independent and team work
- Exercising criticism and self-criticism

(3) SYLLABUS

I. **Fluid Mechanics:** Fluids at rest, Ideal Fluids, Fluid Dynamics, Intermolecular Forces, Surface Effects, Viscous Fluids, Non-Newtonian fluids - Blood.

II. **Heat:** Calorimetry, Heat Transfer, Kinetic-Molecular Model for Ideal Gas, Heat Capacity, Phase Conversions, 1 st Law of thermodynamics, Basic Thermodynamic processes, Internal Energy, Enthalpy, 2nd Law of thermodynamics, Entropy, Free Energy.

III. **Optics:** Nature of light, Geometric Optics, Lens, The Microscope, Polarized light, Diffraction, resolution limit, Imaging methods.

IV. **Atomic and Nuclear Physics:** Spectroscopy, Electron microscope, Structure of the Core, Radioactivity, Biological Effects of Nuclear Radiation.

V. **Practical Exercises:** Instructions for writing a scientific report, Measurement Errors, Graphical representation of measurements, Emission and absorption spectrum in the visible area. Polarized light -optically active materials, Absorption of γ-radiation from materials, Capillary effect-surface tension, Measurement of viscosity, Special heat of a liquid. Diffraction of Light

(4) TEACHING and LEARNING METHODS - EVALUATION

TEACHING METHOD *Face-to-face, Distance learning, etc.*	In suitably equipped teaching rooms
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	1. Use of powerpoint presentations, videos and simulations in lectures, 2. Use of open eclass platform to inform, educate and communicate with students (teaching material, exercises, assignments, messages, wall etc)
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	I. Theory: Two optional online mid-exams of 1h each to evaluate the progress of the students (up to 30% of the final grade for theory) Written in-person final examination (70 – 100 % of the final grade for theory) comprising - multiple choice questions - critical thinking questions - solving problems related to quantitative data II. Practical exercises: Obligatory presence Tests before each laboratory session (10 % of the final grade for the practical part of the course) Written team assignments on the laboratory exercises (40% of the final grade for the practical part of the course) A final experiment, designed and conducted by each student. Final personal assignment on that (50% of the final grade for the practical part of the course)

Activity	***Semester workload***
Lectures	39
Laboratory exercises	14
Group and/or individual assignments	26
Independent study	42
Two optional online mid-exams	2
Final exam	*2*
Course total (25 h of workload per ECTS)	***125***

	To achieve a pass grade for the course, a grade equal or greater than 5/10 is required in both theory and practical exercises. The final grade of the course is calculated as the average of the theory and the practical exercises final grades.

(5) ATTACHED BIBLIOGRAPHY

Theory:
1. Freedman Roger A., Ruskell Todd G., Kesten Philip R., Tauck David L., Βασικές Αρχές Φυσικής στις Επιστήμες Υγείας, Broken Hill Publishers Ltd, 2019
2. Newman, Jay. Φυσική για τις επιστήμες ζωής, ΔΙΑΥΛΟΣ publishing, 2013
3. Halliday David, Resnick Robert, Walker Jearl, ΦΥΣΙΚΗ, Gutenberg publishing, 2014

Practical Exercises
«Εργαστηριακές Ασκήσεις Φυσικής», AUA publishing, Bethanis K., Karpusas M. and Tzamalis P.