COURSE LAYOUT

1. GENERAL

SCHOOL	School of Plant Sciences		
DEPARTMENT	Department of Crop Science		
STUDY LEVEL	*Undergraduate – Compulsory*		
COURSE CODE	**561**	**SEMESTER**	2nd
COURSE TITLE	PHYSICS		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS**
LECTURES	3	3.4
PRACTICAL EXERCISES	2	1.6
TOTAL	5	5

COURSE TYPE	General Background
PREREQUISITES	NO
LANGUAGE	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS?	NO
COURSE WEB PAGE	Theory: https://oeclass.aua.gr/eclass/courses/EFP177/ Practical Exercises: https://oeclass.aua.gr/eclass/courses/2563/

2. LEARNING OUTCOMES

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

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, 1st 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	In suitably equipped teaching rooms
USE OF INFORMATICS and COMMUNICATION TECHNOLOGIES	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	

Activity	*Work Load*
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 hours of student work loadper ECTS)	*125*

STUDENTS EVALUATION	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) 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. BIBILIOGRAPHY

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.