COURSE LAYOUT

1. GENERAL

SCHOOL	APPLIED BIOLOGY & BIOTECHNOLOGY		
DEPARTMENT	BIOTECHNOLOGY		
STUDY LEVEL	*Undergraduate*		
COURSE CODE	**563**	**SEMESTER**	1st (winter)
COURSE TITLE	PHYSICS		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS**
LECTURES	3	3,4
PRACTICAL EXERCISES	2	1,6
TOTAL		5

COURSE TYPE	General background
PREREQUISITES	Secondary education Physics & Mathematics
LANGUAGE	Greek with English support in terminology
IS THE COURSE OFFERED for ERASMUS STUDENTS?	No
COURSE WEB PAGE	Theory : https://oeclass.aua.gr/eclass/courses/BIOTECH127/ Laboratory: https://oeclass.aua.gr/eclass/courses/2538/

2. LEARNING OUTCOMES

Learning Outcomes

The course is the main University-level introductory course in Physics. The course aims to introduce students to the basic concepts and methodologies of Physics that are necessary background in the study of more advanced subjects such as Physical Chemistry, Biophysics, Biochemistry and in Science in general and its applications. The material focuses on areas of Physics that have not been sufficiently taught in secondary education and are related to Biotechnology such as Fluid mechanics, Thermodynamics, Optics and Modern Physics. It also introduces concepts in measurement methodologies and statistical data analysis that are necessary in almost all sciences.

Upon successful completion of the course the student will be able to
1) understand and describe basic principles of Physics such as principles of Thermodynamics and the principle of Archimedes, various natural phenomena such as refraction and polarization of light and various physical systems such as the hydrogen atom.

2) has developed an understanding of basic quantities of Physics (such as pressure, enthalpy, free energy, focal length, light absorption, light activity, radioactivity, etc.) related to the areas of Physics mentioned, their units of measurement, their usefulness, how they are measured experimentally and how to calculate them using mathematical formulas.

3) is able to construct simple, approximate mathematical models that describe natural phenomena and, at a basic level, to apply calculus in Physics.

4) be familiar with the basic principles of experimental Physics methodologies applied to issues related to biological sciences.

5) collect experimental Physics data and analyze them with basic statistical analysis methods such as the least squares method.

6) can adequately present the results and conclusions of a relevant experimental study.

General Competences

1.Gaining knowledge of terminology and develop skills for correct description.
2.Development of analytical & critical skills.
3.Develop skills for solving problems.
4.Search, analyze and compose data and information, using the necessary technologies.
5.Linking knowledge to real life and applications.
6.Develop skills for decision making, effective teamwork and adaptation to new situations.
7.Demonstration of social, professional and moral responsibility.
8.Respect for the work and natural environment.
9.Promoting free, creative and inductive thinking.

3. COURSE CONTENT

I. Theory:

Introduction. Fluid Mechanics: Fluid Statics and Dynamics. Molecular Forces. Surface Phenomena. Viscosity.
Thermodynamics: Heat and temperature. Expansion and Contraction. Calorimetry. Heat transfer. Kinetic theory. Prosthetic properties. Thermodynamic principles. Enthalpy. Entropy. Free energy.
Optics: Nature of light. Spectroscopy. Polarization. Refraction. Geometric Optics. Lenses. Microscopy. Diffraction. Resolution.
Modern Physics: Simple quantum systems. Electron microscope. Hydrogen atom, Visible / UV/ NMR infrared spectroscopy, Nuclear structure. Radioactivity. Biological effects of radiation.

II. Laboratory:

Measurement errors. Graphical representation of measurements and method of least squares. Analysis of emission and absorption spectra in the visible region. Use of a polarimetry in materials. Capillary action. Measurement of viscosity. Measurement of specific heat of liquid. Light diffraction.

4. TEACHING and LEARNING METHODS - Evaluation

TEACHING METHOD	In suitably equipped teaching rooms
USE OF INFORMATICS and COMMUNICATION TECHNOLOGIES	Use of powerpoint presentations and Phet simulations in lectures, use of e-class website and videos to inform, educate and communicate with students, distribution of educational material, delivery & grading of laboratory exercises, evaluation with tests before laboratory exercises.
TEACHING ORGANISATION	

Activity	*Work Load*
Lectures	39
Laboratory exercises	14
Group and/or individual assignments	26
Independent study	41
12 Optional weekly quiz	3
Final Exam	2

	Course total (25 hours of student work load per ECTS)	***125***
STUDENTS EVALUATION	I. Theory: Written final examination (50%) comprising: multiple choice questions, problem solving and short answer questions. Optional quiz tests (when taken into account they contribute by 12,5% and the final written exam contributes by 37,5%). II. Laboratory: Tests before each laboratory session in order to encourage preparation (5%), written team (2-3 students/team) assignments on the laboratory exercises (25%), final personal assignment (20%).	

5. BIBILIOGRAPHY

1) Newman, Jay. Physics for Life sciences 2013
2) Freedman Roger A., Ruskell Todd G., Kesten Philip R., Tauck David L. College Physics. Εκδόσεις Broken Hill Publishers 2019"