COURSE OUTLINE

(1) GENERAL

SCHOOL	School of Science		
ACADEMIC UNIT	Physics		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**10YKO02**	**SEMESTER**	**2**
COURSE TITLE	Physics II		

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**
Lectures (theory and exercises)	6	7

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special background
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes, in the English language for Erasmus students
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/PHYS168/

(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 provides the student with an introduction to the kinetic theory of gases as well as the fundamental principles of thermodynamics. It also provides knowledge related to Geometric optics (reflection, refraction, mirrors, lenses, prisms), oscillations and waves (i.e., wave equation, planar and spherical waves, superposition of waves, interference, diffraction and polarization). In this context, the case of sound waves and the Doppler effect are discussed.

With the completion of the course the student is able to

-Determine the physical quantities that characterize the thermodynamic equilibrium, describe the laws of thermodynamics as well as the basic cyclic processes (e.g., Carnot, Otto, etc.).
Describe and prove the laws of reflection and refraction based on appropriate basic principles (Heron, Fermat, Huygens).
-Describe wave propagation through the wave differential equation and recognize in the case of one dimension (tensioned string) the energy density and momentum density that a wave carries.
-Explain the law of gases based on kinetic theory and calculate the characteristic velocities of the molecules (mean, root mean squared and probable) by the Maxwell-Boltzmann distribution.
-Calculate using geometric optics the path of the rays passing through mirrors, lenses and refractive surfaces.
-Examine the phenomenon of dispersion in waves and to discover the main physical quantities necessary for its description (group and phase velocities, normal or anomalous dispersion).
-Analyze complex problems in physics and determine the basic physical quantities that describe them.
-Organize concepts and physical laws in order to propose solutions to problems of thermodynamics, geometric optics and waves.
-Differentiate the description of physical phenomena from different theories and evaluate their results for the measured physical quantities.

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
Adapting to new situations
Decision-making
Working independently
Team work
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project planning and management
Respect for difference and multiculturalism
Respect for the natural environment
Showing social, professional and ethical responsibility and sensitivity to gender issues
Criticism and self-criticism
Production of free, creative and inductive thinking
……
Others…
…….

The course aims at the following general competences

Search for, analysis and synthesis of data and information, with the use of the necessary technology
Decision-making

Working independently
Production of new research ideas
Respect for the natural environment
Criticism and self-criticism
Production of free, creative and inductive thinking
Analytical and synthetic thinking
Critical thinking
Time management
Planning
Taking initiative/responsibility
New Technology skills
Creativity
Communication skills
Information management
Problem solving

(3) SYLLABUS

Part I: Kinetic theory of gases - Thermodynamics

- Temperature. Heat. First law of Thermodynamics. Thermodynamic potentials.
- Ideal gas. Kinetic theory of gases. Maxwell distribution. Heat capacity.
- Reversible processes. Second law of Thermodynamics. Entropy. Thermal engines.

Part II: Waves-Optics

- Mechanical waves. Wave equation.
- Waves on a string. Different kinds of waves (transverse, longitudinal, plane, spherical).
- Superposition. Interference. Standing waves.
- Reflection. Diffraction. Geometrical optics. Wave polarization.

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Face-to-face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>Yes

Electronic communication with the students using ICT (Information and Communications Technology)
Computer-aided lectures, use of Overhead Projectors, eclass platform</td></tr>
<tr><td>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</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>52</td></tr>
<tr><td>Exercises</td><td>26</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Individual Study/ Study and Analysis of bibliography / Preparation</td><td>97</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course Total</td><td>175</td></tr>
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</td></tr>
<tr><td>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.</td><td>Final written examinations in Greek related to problem solving.
Oral examinations (where required) related to problem solving.
Mid-term written examination dealing with problem solving.

Solutions to the exam problems are accessible to students at the meeting where they are invited to see their papers.</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- Teaching notes (available in the website of the course in eclass).
- Physics (D.Hallidey, R. Resnick, J. Walker) In Greek: Φυσική (Ενιαίο), D.Hallidey, R. Resnick, J. Walker, Κ. Παπανικόλας, Γ. Τζαμτζής, Α. Καραμπαρμπούνης, Σ. Κοέν, Π. Σπυράκης, Ε. Στυλιάρης, Π. Τζανετάκης, ΕΚΔΟΣΕΙΣ Γ. ΔΑΡΔΑΝΟΣ-Κ. ΔΑΡΔΑΝΟΣ Ο.Ε., 2014, Αθήνα (Κωδ. Ευδ. 41959145)
- Physics for Scientists and Engineers (D.C.Giancoli) In Greek: Φυσική για Επιστήμονες και Μηχανικούς, Τόμος Α (4η έκδοση), D.C.Giancoli (Επιμέλεια): Α. Κεχαγιάς, Κ. Σφέτσος, Γ. Τσιπολίτης, ΕΚΔΟΣΕΙΣ Α.ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε, 2011, Αθήνα (Κωδ. Ευδ. 18549052)
- Introduction to Heat and Thermodynamics (I. Grammatikakis) In Greek: Εισαγωγή στη Θερμότητα και τη Θερμοδυναμική, Ι. Γραμματικάκης, LIBERAL BOOKS ΜΟΝΟΠΡΟΣΩΠΗ ΕΠΕ, 2012, Αθήνα (Κωδ. Ευδ. 50659197)
- University Physicswith Modern Physics (H. Young, R. Freedman) In Greek: Πανεπιστημιακή Φυσική με σύγχρονη Φυσική, Τόμος Β΄ (2η έκδοση), H. Young, R. Freedman, ΕΚΔΟΣΕΙΣ ΠΑΠΑΖΗΣΗ, 2010, Αθήνα (Κωδ. Ευδ. 68387930)
- Physics, Vol. A, Mechanics-Thermodynamics (H. Ohanian) In Greek: Φυσική, Τόμος Α' : Μηχανική – Θερμοδυναμική, H. Ohanian, μετάφραση Α. Φίλιππας, ΕΚΔΟΣΕΙΣ Σ. ΑΘΑΝΑΣΟΠΟΥΛΟΣ και ΣΙΑ, 1991, Αθήνα (Κωδ. Ευδ. 45333)
- Physics, Vol. B' (D.Hallidey, R. Resnick, J. Walker) In Greek: Φυσική Τόμος Β', D.Hallidey, R. ResnicK, J. Walker, Κ. Παπανικόλας, (Γενική Επιμέλεια), Γ. Τζαμτζής (συντονισμός), Α.Καραμπαρμπούνης Σ. Κοέν, Π. Σπυράκης, Ε. Στυλιάρης, Π. Τζανετάκης, ΕΚΔΟΣΕΙΣ Γ. ΔΑΡΔΑΝΟΣ-Κ. ΔΑΡΔΑΝΟΣ Ο.Ε., 2013, Αθήνα (Κωδ. Ευδ. 33074361)
- Physics for Scientists and Engineers (R. Serway, J. Jewett) Φυσική για Επιστήμονες και Μηχανικούς: Μηχανική, Ταλαντώσεις και Μηχ. Κύματα, Θερμοδυναμική Σχετικότητα, R. Serway, J. Jewett, ΕΚΔΟΣΕΙΣ ΚΛΕΙΔΑΡΙΘΜΟΣ, 2012, Αθήνα (Κωδ. Ευδ. 22750100)