COURSE OUTLINE

(1) GENERAL

SCHOOL	School of Science		
ACADEMIC UNIT	Physics		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**10YKO07**	**SEMESTER**	**3**
COURSE TITLE	**Physics III Basic Laboratory**		

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**
Laboratory practice	3	4

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/PHYS204

(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 offers to the student via a series of laboratory experiments,the necessary knowledgefor the comprehension and deeper understanding of the theory of Thermodynamics, Optics and Wave Mechanics as well as deepen their knowledge about experimental methods and instruments, which will be used in problem solving. Additionally, the university students are teaching the basic principles of Physics at school students.

By successfully attending and completing the course, the student should:

-To use prism and grating spectrometers for the spectral analysis of light and the measurement of light wavelength and the dispersion relation of the glass refraction index.
-Measure the propagation velocity of elastic waves in solid rods and the normal modes - eigenfrequencies (Fourier analysis). Measure the Young modulus.
-Determine the focal length of convex lenses and relevant aberration errors (spherical, chromatic).
-Define and analyze light polarization by using suitable optical elements (polarizers, retardation plates) and measure the Brewster angle and the optical activity of materials. Familiarize with the notions linear, cyclic, elliptical polarized light. Measure the angle of rotation of the polarization plane.
-Use Michelson interferometer for the understanding of optical interference phenomena. Measure the wavelength of monochromatic light, and the refraction index of air and glass.
-Familiarize with notions of Thermodynamics, taking experimental measurements (pressure, temperature, volume) by using computers and Logger Pro software. Study experimentally isothermal compression and expansion and the Otto cycle (adiabatic compression, isochoric heat absorption, adiabatic expansion, isochoric heat dissipation).
-Study wave phenomena by using microwaves (reflection, refraction, polarization, interference, diffraction, standing waves). Familiarize with notions like phase and path difference, near field-Fresnel diffraction and and distant field - Fraunhofer diffraction. Use software to construct plots and compare experiment with theory.
-To study interference and diffraction with laser light on adequate gratings.
-Use software to construct plots.
-Determine the correct physical quantities from the sets of the experimental measurements, based on data reduction and error analysis.

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

With successful completion and examination of the course, the aim is that the student acquires the following general competences and skills:
Analysis and synthesis of data and information, with the use of the necessary technology. Working independently. Team work. Criticism and self-criticism. Time management. Planning. Taking

initiative/responsibility. New Technology skills. Learning software for processing measurements and text like Logger Pro, excel, origin, word, excel. Communication skills. Information management. Self control skills. Meeting Deadlines and Keeping Schedules. Teaching skills

(3) SYLLABUS

- Prism and grating spectrometers.
- Study of isothermal process of a gas and the Otto cycle.
- Measurement of the speed of longitudinal waves and elastic constants in solids.
- Measurement of convex lenses focal distance and relevant aberration errors.
- Study of polarized light. Measurement of rotation capacity by polarimeter.
- Measurements with Michelson interferometer.
- Study of wave phenomena with microwaves (reflection, refraction, polarization, interference, diffraction, standing waves.
- Interference and diffraction using laser light on adequate gratings.
- Preparation, presentation and teaching of laboratory experiments, as well as the basic principles of experimentation in physics, by Physics Department students to other university students and high-school pupils, for the acquisition of pedagogical and educational competence by the students of the Department.

(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.E-class:

https://eclass.uoa.gr/courses/PHYS204</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>Laboratory practice</td><td>30</td></tr>
<tr><td>Individual study. Study and analysis of bibliography. Preparation.</td><td>20</td></tr>
<tr><td>Writing reports / essays</td><td>25</td></tr>
<tr><td>Microteaching</td><td>25</td></tr>
<tr><td>Course Total</td><td>100</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>Oral examinations.
Laboratory reports.
Microteaching (university students teach gymnasium-lyceum students, under staff supervision)

The course consists of 8 laboratory exercises (experiments). For each, there is oral examination during the conduction of the experiments by the students. For each, students have to prepare and submit a laboratory report one week after the experiment. Furthermore, University students present, in form of teaching, to Gymnasium and Lyceum students, some of the didactic aims of one laboratory exercise (experimentalization and teaching). The final grade includes oral examinations and laboratory reports for each experiment as well as microteaching to gymnasium and lyceum students.</td></tr>
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(5) ATTACHED BIBLIOGRAPHY

- *Suggested bibliography*:

- Laboratory Guide: PHYSICS III Laboratory Thermodynamics - Wave mechanics - Optics, NKUA, 2018
- R. Serway, Physics for Scientists and Engineers, ΜετάφρασηΛ. Ρεσβάνη, ΤόμοςIII, Θερμοδυναμική - Κυματική - Οπτική, 1991
- L. Kinsler, A. Frey, A. Coppens, and J. Sanders, Fundamentals of acoustics, John Wiley.
- H. J. Pain, Φυσική των ταλαντώσεων και των κυμάτων, Συμμετρία, Αθήνα, 1991.
- M. Alonso, E. Finn, Θεμελιώδης Πανεπιστημιακή Φυσική, Τόμος II, Πεδία και Κύματα, Μέρος 3 Κύματα, 1979, Εκδόσεις Αναστάσιος Φίλιππας.
- F. A. Jenkins and H. E. White, Principles of Optics, McGraw-Hill, New York, 1976.
- Ν. Παναγέας: Εφαρμογή νέων τεχνολογιών στα εργαστήρια Θερμοδυναμικής, Διπλωματική Εργασία, Αθήνα 2010.
- Χ. Τρικαλινός, Μοριακή Φυσική Θερμοδυναμική, αυτοέκδοση, Αθήνα, 2009.
- K. Kikoin and I. K. Kikoin, Molecular Physics, Mir Publishers, Moscow, 1978.
- N. Matveev, Molecular Physics, Mir Publishers, Moscow, 1985.