COURSE OUTLINE

(1) GENERAL

SCHOOL	School of Science		
ACADEMIC UNIT	Physics		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**10YKO05**	**SEMESTER**	**1**
COURSE TITLE	**PHYSICS I 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	2.5	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/PHYS157/

(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*

This course is the first laboratory introduction to the concepts of experimenting, obtaining and processing data to confirm basic laws and principles of Physics. It includes basic concepts of statistical analysis and processing of experimental uncertainties (errors) related to the measurement.

With the successful attendance and completion of the course, the student is in position to:

- Understand the instrumentation and methodology required to run an experiment.
- Choose the physical quantities to be measured for the confirmation of a physical law.
- Recognize the importance and severity of the individual uncertainties (errors) involved in the measurement.

- Carry out basic physics experiments successfully.
- Handle and process the measured data correctly.
- Calculate the uncertainties (errors) of derived physical quantities from the primary data with the error propagation theory.
- Express correctly the typical statistical and systematic uncertainties of the measurement.

- Organize systematically the data obtained from the experiment.
- Graphically plot the measured data and the derived results.
- Critically evaluate and confirm the physical principle of the experiment.

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
Working independently
Team work
Working in an interdisciplinary environment
Project planning and management
Respect for the natural environment
Production of free, creative and inductive thinking
Analytical and synthetic thinking
Critical thinking
Planning

New Technology skills
Creativity
Determination
Flexibility / Adaptability
Problem solving

(3) SYLLABUS

Introductory lectures:

- Experimental uncertainty, mean value, standard deviation and the normal distribution.
- Error propagation, designing and running an experiment. Analysis of experimental data. Least square method and its application to experimental data.
- Introduction to Monte Carlo methodology. Applications and virtual experiment. Demonstration of an experimental measurement and data analysis presentation in the auditorium.

Laboratory exercises:

- The Simple (mathematical) pendulum.
- Measurement of the gravity's acceleration g on an inclined plane with sensors. Photo-gates. Instantaneous and average velocity.
- Electrical circuits – Ohm's and Kirchoff's laws.
- Measurements with a micrometer. Density estimation of materials. Buoyancy and Archimedes' Law.
- Monte Carlo exercise.

(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 video Projectors,
eclass platform, instructors websites</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></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>Seminars</td><td>20</td></tr>
<tr><td>Individual Study/ Study and Analysis of bibliography / Preparation</td><td>60</td></tr>
<tr><td>Laboratory practice</td><td>20</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course Total</td><td>100</td></tr>
</table>
</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 examination.
Written work.
Mid-term written examination.</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography

- **PHYSICS I Laboratory Guide,** Collective Work, Edited by E. Stiliaris, Department of Physics, National & Kapodistrian University of Athens
- Herman J.C. Berendsen: "***Data and Error Analysis, A Student's Guide***", Cambridge University Press (2011)

- Related academic journals:

- American Journal of Physics
- Physics Education
- The Physics Teacher