

Module Outline of Physics Laboratory ETHEF

1. GENERAL

SCHOOL	SCIENCE AND TECHNOLOGY		
PROGRAMME	Studies in Natural Sciences		
LEVEL OF STUDIES	Level 6 of the Hellenic and European Qualifications Framework		
MODULE CODE	ETHEF (ETHEFI and ETHEFII)	YEAR	ETHEFI: 2nd ETHEFII: 4th
MODULE TITLE	PHYSICS LABORATORY		
INDEPENDENT TEACHING ACTIVITIES <i>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</i>		HOURS	CREDITS
Weekly workload distance learning: 9-10 hours x 26 weeks Weekly workload in person learning: 40 hours x 2 weeks		336 (28hours/ECTS)	12 ECTS
MODULE TYPE <i>Compulsory/Elective/ Mandatory Optional</i>	Compulsory of 2 cycles		
MODULE DESCRIPTION <i>general background, special background, specialised, general knowledge, skills development</i>	general background, skills development		
PREREQUISITE MODULES	For enrollment in ETHEFI, concurrent attendance or prior completion of FYE24 is required, and for enrollment in ETHEFII, concurrent attendance or prior completion of FYE40 is required.		
LANGUAGE OF INSTRUCTION and EXAMINATIONS	Greek		
IS THE MODULE OFFERED TO ERASMUS STUDENTS	No		
MODULE WEBSITE (URL)	ETHEFI: https://www.eap.gr/education/undergraduate/studies-in-physical-sciences/studies-in-physical-sciences-topics/#ethefi ETHEFII: https://www.eap.gr/education/undergraduate/studies-in-physical-sciences/studies-in-physical-sciences-topics/#ethefii The Module has its own space in the digital learning environment of HOU (https://study.eap.gr/login/index.php) with controlled access (using a code) for students and Teaching Staff.		

2. LEARNING OUTCOMES

Learning outcomes

The learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the Module 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

LEARNING OUTCOMES

Knowledge:

Upon successful completion of the Laboratory Course Module, students will be able to:

1. Describe and explain the fundamental principles of the individual subject areas (Mechanics, Electromagnetism, Thermodynamics, Optics, Fluid Mechanics, Waves, Quantum Mechanics, Atomic and Nuclear Physics).
2. Identify and distinguish the main physical quantities and the relationships between them in the corresponding laboratory exercises.
3. Explain the operating principles of basic laboratory instruments (power supplies, oscilloscopes, lasers, photosensors, photomultipliers, etc.).
4. Describe and analyze the concepts of statistical data analysis, signal processing, and experimental errors.

Skills:

Upon successful completion of the Laboratory Course Module, students will be able to:

1. Design and assemble experimental setups for the study of physical phenomena.
2. Operate safely and accurately modern laboratory instruments (power supplies, oscilloscopes, lasers, photodetectors, etc.).
3. Adjust and calibrate measuring instruments.
4. Collect, acquire, and organize experimental data.
5. Apply statistical analysis methods to determine physical quantities.
6. Calculate and estimate statistical and systematic uncertainties.
7. Process signals and derive quantitative conclusions.
8. Compare experimental results with theoretical predictions.
9. Document results through a structured scientific report.

Competences:

Upon successful completion of the Laboratory Course Module, students will be able to:

1. Evaluate the reliability and validity of experimental measurements, taking into account statistical and systematic errors.
2. Select an appropriate experimental methodology for the study of a specific physical phenomenon.
3. Identify sources of uncertainty and propose improvements to the experimental setup or measurement procedure.
4. Relate theoretical models to experimental data and formulate well-supported scientific conclusions.
5. Work independently and responsibly in a laboratory environment.
6. Collaborate effectively within a team for the design and implementation of experimental procedures.

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 Module aim?

<i>Search for, analysis and synthesis of data and information, with the use of the necessary technology</i>	<i>Project planning and management</i>
<i>Adapting to new situations</i>	<i>Respect for difference and multiculturalism</i>
<i>Decision-making</i>	<i>Respect for the natural environment</i>
<i>Working independently</i>	<i>Showing social, professional and ethical responsibility and sensitivity to gender issues</i>
<i>Team work</i>	<i>Criticism and self-criticism</i>
<i>Working in an international environment</i>	<i>Production of free, creative and inductive thinking</i>
<i>Working in an interdisciplinary environment</i>	
<i>Production of new research ideas</i>	

The general skills that the students will acquire are:

Search for, analysis and synthesis of data and information, with the use of the necessary technology
Adapting to new situations
Decision-making
Working independently
Production of free, creative and inductive thinking

3. SYLLABUS**Purpose of Module**

The purpose of the Laboratory Course Module is to provide laboratory training to students of the program in the principles, experimental methods, instrumentation, and applications of Classical and Modern Physics.

It aims at the substantive engagement with topics through the use of laboratory and experimental equipment related to the above subject areas, at its proper and effective use, and at the application of methods for processing and analyzing experimental data. Furthermore, it aims at fostering the understanding of fundamental principles, concepts, and phenomena of Physics through the experimental process, and at highlighting experimental methodology as a means for the verification or refutation of theories and hypotheses.

Subjects covered

1. Classical Physics
2. Modern Physics

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY <i>Face-to-face, Distance learning, etc.</i>	Distance teaching and learning: Students participate in five (5) Group Counseling Meetings (GCMs) per cycle during the academic year. 5-day in-person laboratory training with eight hours of daily laboratory practice per laboratory cycle (I and II). Personal communication and feedback (advisory role of Adjunct Faculty members).												
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY <i>Use of ICT in teaching, laboratory education, communication with students</i>	During GCMs and teaching, the following are used: • Remote meeting tools (Webex, Teams), • Presentation software (PowerPoint, educational videos – animations, etc.). • Specialized software/databases for the subjects under study (e.g. tools for statistical processing of data, creation of graphs, etc.). In addition, students - use office automation tools, web browsers and e-reader for digital books. - watch electronic educational material (webcasts and experiment videos) which are posted on the educational platform Communication with students is supported by: • The digital platform of HOU (https://study.eap.gr/login/index.php) (course information, educational material uploads, announcements, messages, examination results, user groups, discussion forums, etc.). • Electronic mail (e-mail).												
TEACHING METHODS <i>The manner and methods of teaching are described in detail.</i> <i>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.</i> <i>The student's study hours for each learning activity are given as well as</i>	<table border="1"> <thead> <tr> <th>Activity</th><th>Year Workload</th></tr> </thead> <tbody> <tr> <td>10 GCMs (x 2 hours)</td><td>20</td></tr> <tr> <td>10 in-person laboratory sessions (x 8 hours)</td><td>80</td></tr> <tr> <td>Completion of activities (10 × 10 hours).</td><td>100</td></tr> <tr> <td>Individual Study time</td><td>136</td></tr> <tr> <td>Total Workload</td><td>336</td></tr> </tbody> </table>	Activity	Year Workload	10 GCMs (x 2 hours)	20	10 in-person laboratory sessions (x 8 hours)	80	Completion of activities (10 × 10 hours).	100	Individual Study time	136	Total Workload	336
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Total Workload	336												

the hours of non-directed study according to the principles of the ECTS	
STUDENT PERFORMANCE EVALUATION <i>Description of the evaluation procedure</i> <i>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</i> <i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i>	Students' evaluation – Grade assessment of a Module: a. Five (5) Activities (Multiple-Choice Questions and a Written Assignment) per cycle, each contributing 6% to the final grade of the Course Module. In total, the activities account for 30% of the final grade. b. In-person laboratory training at the end of the academic year. The average grade obtained in the in-person laboratory exercises contributes to the final grade of the Course Module with a weighting factor of 70%. The score of the Qs is activated only with an average score equal to or above the base (≥ 5) and provided that more than half of the Qs per laboratory cycle have been completed. The Final Grade of the module is obtained as the average of the final grades of the two cycles of the module. The detailed evaluation method is posted in the Laboratory Regulation in the module website. Language of evaluation: Greek

5. ATTACHED BIBLIOGRAPHY

- Recommended Bibliography:

Laboratory Guide I, Hellenic Open University (HOU), Patras, 2025.

Laboratory Guide II, Hellenic Open University (HOU), Patras, 2025.

Laboratory Guide III, Hellenic Open University (HOU), Patras, 2025.

Young, H.D., Freedman, R.A., *University Physics with Modern Physics*, Volumes A and B, 2nd Greek Edition, Papazisis Publications, Athens, 2010.

Kibble, T.W.B., Berkshire, F.H., *Classical Mechanics*, translated and edited by P. Litsas & D. Sardelis, Crete University Press, 2012.

Griffiths, J.D., *Introduction to Electrodynamics*, 2nd edition, Crete University Press.

Hecht, E., *Optics*, translated by I. Spyridelis, S. Spyrideli, A. Kapnidou, ESPI Publishing Co., 1979.

Trachanas, S., *Quantum Mechanics I: Fundamental Principles, Simple Systems, Structure of Matter*, Crete University Press, 2005 (2011).

Cottingham, W.N., Greenwood, D.A., *Introduction to Nuclear Physics*, translated by K. Sarigiannis, Typothito Publications, 1996.

New Physics Leaflets for Colleges and Universities, Volume 1, 1st edition, Leybold-Heraeus GMBH, Germany, 1986.

Haber-Schaim, Dodge, Walter, *PSSC Physics*, 6th edition, D.C. Heath and Company, Lexington, Toronto, 1985.

Melissinos, A.C., Napolitano, J., *Experiments in Modern Physics*, 2nd edition, Academic Press, New York, 2003.

Atkins, P.W., Friedman, R.S., *Molecular Quantum Mechanics*, 3rd edition, Oxford University Press, United States, 1983.

Enge, H.A., *Introduction to Nuclear Physics*, Addison-Wesley, USA, 1966.

Additional supplementary and alternative instructional material (webcasts) is available on the HOU Physics Laboratory website (<http://physicslab.eap.gr>) and on the educational platform (study.eap.gr).

