Course Details

Course Department:	Department of Physics
Course Code:	PHY 302
Course Title:	Advanced Physics Laboratory I
Number of ECTS:	6
Level of Course:	1st Cycle (Bachelor's Degree)
Year of Study (if applicable):	3
Semester/Trimester when the Course Unit is Delivered:	Spring Semester
Name of Lecturer(s):	Andreas Othonos
Lectures/Week:	--
Laboratories/week:	1 (5 hours per lecture)
Tutorials/Week:	--
Course Purpose and Objectives:	The objectives of this course are to provide the means of investigating important physical phenomena and properties of solid state material and in the particular semiconductors using advanced laboratory techniques. Further objective is an in-depth understanding of data acquisition and analysis and reporting of the findings in precise scientific referee peer review Journal format.
Learning Outcomes:	Students will learn: • The use of laboratory techniques and equipment (ie locking amplifier, scanning spectrometers, etc.) • Graphical interface software for data acquisition - LabView • Optical spectroscopy • Sound effect on semiconductors and metals • Photoelectric effect and measurement of the Plank constant • X-ray diffraction and Bragg diffusion of periodic crystalline structure
Prerequisites:	Not Applicable
Co-requisites:	Not Applicable
Course Content:	The course consists of the following experiments: 1. Energy gap of Silicon - Determination of the silicon energy gap using optical spectroscopy. 2. Identify the properties of a focused laser beam with a micron spatial resolution using a lock amplifier technique. 3. Determine the emission from various light emitting diodes using a grating to resolve its spectral content. 4. Measurement of optical coupling in single-mode optical fiber using a He-Ne laser free space coupling. 5. Michelson interferometer and measurements of optical properties in the material.

	6. Electrical conduction and Hall phenomena in Germanium. 7. Photovoltaic phenomena and measurements of the performance of monocrystalline and polycrystalline silicon solar cells 8. Hall Effects on Cu and Zn. 9. The study of photoelectric phenomena and the determination of the Planck constant. 10. The study of X-ray diffraction and the determination of the Planck constant using the Bragg dispersion from crystalline NaCl. 11. The study of electromagnetic phenomena in the microwave area of the spectrum. 12. Study of semiconductor devices and transistors using various electrical circuits.
Teaching Methodology:	Each week a group of two students will perform one of the experiments. A report will be submitted by the end of the week on the findings in the form peer review manuscript.
Bibliography:	1. Optoelectronics: An introduction, John Wilson, John Hawkes 2. Optical Processes in Semiconductors, J. I. Pankove 3. Semiconductor Physics: An Introduction, K. Seeger 4. Solid State Electronic Devices, Ben G. Streetman
Assessment:	20% Measurements and performance of experiments 10% Report of experiments 40% Laboratory test (each student will perform three out of the 12 experiments and will be evaluated) 30% Written final exam on all the material
Language of Instruction:	Greek The course is also offered in English for Erasmus students.
Delivery Mode:	Face-To-Face
Work Placement(s):	Not Applicable