## **COURSE OUTLINE**

# (1) GENERAL

SCHOOL	School of Science				
ACADEMIC UNIT	Physics				
LEVEL OF STUDIES	Undergraduate				
COURSE CODE	10YK503 SEMESTER 8				
COURSE TITLE	Condensed Matter 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			4		6
<b>COURSE TYPE</b> general background, special background, specialised general knowledge, skills development	Specialized				
PREREQUISITE COURSES:	No (recommended Introduction to Solid state Physics, Solid State Physics I)				
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/PHYS300/				

### (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 a Laboratory practice, covering six different unities related to Solid State Phenomena. Through the laboratory practice and the corresponding theoretical description the student acquires consolidation, deeper understanding as well as enrichment of knowledge on Condensed Matter Physics.

With the completion of the course the student is able to

- Carry out measurement on several physical properties like electrical and thermal conductivity, temperature, frequency, capacity etc.
- Assemble circuits and simple apparatuses and establish appropriate conditions for recording experimental data.
- Acquire knowledge on basic elements of digital collection of experimental data (connection of apparatus to PC).
- Calculate parameters and understand their reliability with the experimental conditions.
- Recognize possible deviations of the experimental data from the respective theoretical description and determine the origin of these deviations.
- Explain the basic ideas and microscopic mechanisms that relate to the investigated phenomena.
- Analyzes and presents experimental data with the help of appropriate software taking into account the corresponding experimental errors.
- Presents with clarity a written report, which is to be delivered on a weekly basis, the experimental apparatus, the data, their properly commented analysis as well as the respective conclusions.
- Construct a presentation according to specific criteria and communicate its content in a relatively wide audience in the framework of a workshop.

#### **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	Project planning and management
information, with the use of the necessary technology	Respect for difference and multiculturalism
Adapting to new situations	Respect for the natural environment
Decision-making	Showing social, professional and ethical responsibility and
Working independently	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

The course has the following general aims:

Search, analyze, synthesize and record of data and/or information Acquire the ability to work both independently and cooperatively as member of a team Motivate and promote free, creative, critical and inductive thinking Motivate and promote analytical and synthetic thinking Management of time Meeting predetermined schedules/deadlines Prepare and present an/a issue/report to a relatively wide audience

## (3) SYLLABUS

- Cycle A: (α) Theory of voltage-current characteristics of the p-n semiconductor junction.
   Experimental apparatus and measuring procedure. (β) Theory of linear lattice vibrations.
   Experimental apparatus and measuring procedure.
- Cycle B: (α) Theory of low-Tc and high-Tc superconductivity. Experimental apparatus and measuring procedure. (β) Theory of thermal and electrical conductivity in metals. Experimental apparatus and measuring procedure.
- Laboratory experiment: The p-n junction.
- Laboratory experiment: Linear lattice vibrations.
- Laboratory experiment: High-temperature superconductors.
- Laboratory experiment: Relationship between electrical and thermal conductivity in metals.
- Laboratory project and presentation.

# (4) TEACHING and LEARNING METHODS - EVALUATION

<b>DELIVERY</b> Face-to-face, Distance learning, etc.	Face-to-face				
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	Yes Computer-aided lectures, eclass platform				
TEACHING METHODS	Activity	Semester workload			
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	Laboratory practice	12weeks x 4h/week = 48			
	Individual Study/ Study and Analysis of bibliography / Preparation	48			
	Writing reports	50			
	Presentation of an/a issue/report	4			
	Course Total	150			
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	<ul> <li>(A) Oral examination during the laboratory practice</li> <li>(B) Written reports</li> <li>(C) Presentation of a report</li> </ul> Information on the content of the course and the respective degree criteria are available at <a href="https://eclass.uoa.gr/courses/PHYS300/">https://eclass.uoa.gr/courses/PHYS300/</a>				

### (5) RECOMENDED BIBLIOGRAPHY

- Laboratory Guide «Laboratory Exercises on Solid State Physics», Athens 2020.
- Specialized bibliography for each experimental exercise is included in the Laboratory Guide (see <a href="https://eclass.uoa.gr/courses/PHYS300/">https://eclass.uoa.gr/courses/PHYS300/</a>).