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

COURSE TYPE *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 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…*
	…….

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

- High-temperature superconductors: Measurement of electrical resistance of a high Tc superconductor in the region 80-300K. Observation of Meissner effect, magnetic properties of Type I and type II superconductors.
- The p-n junction: I-V characteristic and 'coefficient of fidelity' of the junction. Measurement of the capacity of the junction, voltage barrier, determination of the distribution of the dopant.
- Relationship between electrical and thermal conductivity: Measurement of the electrical and thermal conductivity of metals (Cu, Al) at room temperature. Wiedeman Franz law.
- Linear lattice vibrations: Free and forced oscillation of a system of masses, eigenfrequencies, resonance. Normal oscillation modes, phonons, optical and acoustical branches.

(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

Computer-aided lectures, eclass platform</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>12weeks x 4h/week = 48</td></tr>
<tr><td>Individual Study/ Study and Analysis of bibliography / Preparation</td><td>48</td></tr>
<tr><td>Writing reports</td><td>50</td></tr>
<tr><td>Presentation of an/a issue/report</td><td>4</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course Total</td><td>150</td></tr>
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<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>(A) Oral examination during the laboratory practice
(B) Written reports
(C) Presentation of a report

Information on the content of the course and the respective degree criteria are available at
https://eclass.uoa.gr/courses/PHYS300/</td></tr>
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(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 https://eclass.uoa.gr/courses/PHYS300/*)*.