COURSE OUTLINE

(1) GENERAL

SCHOOL	School of Science		
ACADEMIC UNIT	Physics		
LEVEL OF STUDIES	Undergraduate (postgraduate course offered to undergraduate students)		
COURSE CODE	**10EK512**	**SEMESTER**	**8**
COURSE TITLE	**Physics of Semiconductor Devices**		

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**
Lectures (theory and exercises)	4	6

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialised Knowledge
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	eclass: https://eclass.uoa.gr/courses/PHYS182/

(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*

In this course the student acquires the necessary knowledge for the understanding of semiconductor physics and the functionalities of semiconductor devices.

With the completion of the course the student is able to:

- To describe the properties of semiconductors
- To describe transport phenomena under the influence of electric and magnetic fields
- To describe the operation principles of basic semiconductor devices
- To identify the role of the impurities in the conductivity of semiconductors and to understand how the different carrier scattering mechanisms affect conductivity.
- To understand the mechanism of carrier generation and recombination and how these mechanisms affect the conductivity.
- To identify the specific characteristics of semiconductor junctions (p-n, Schottky, MIS, Heterojunction)
- To explain the operational properties of fundamental semiconductor devices (JFET, MESFET, MOSFET) taking into consideration their structural characteristics and the corresponding physical mechanisms
- To compare the different semiconductor devices, to estimate their maximum achievable performance in correlation to their corresponding functionalities and applications.

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
- Analytical and synthetic thinking
- Critical thinking
- Problem solving

(3) SYLLABUS

- The Semiconductor in Equilibrium
- Carrier Transport Phenomena
- Nonequilibrium Excess Carriers in Semiconductors
- The p-n junction.
- Metal-semiconductor junction (Ohmic, Schottky).
- Heterojunctions (formation of quantum well)
- MIS and MOS junctions.
- Field Effect Transistor (JFET, MESFET).
- MOSFET transistor.

(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 Overhead Projectors, 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>Lectures. /exercises</td><td>52</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>Individual Study/ Study and Analysis of bibliography / Preparation</td><td>95,5</td></tr>
<tr><td>Exams</td><td>2,5</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>Final written exams in Greek
Oral examination during the lectures</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography

- Διατάξεις Ημιαγωγών, Φυσική και Τεχνολογία, 3η Έκδοση, Sze Simon, Lee Ming-Kwei **94692386**
- Εισαγωγή στις Διατάξεις Ημιαγωγών, A. Neamen, ΕΚΔΟΣΕΙΣ ΓΡΗΓΟΡΙΟΣ ΧΡΥΣΟΣΤΟΜΟΥ ΦΟΥΝΤΑΣ,2014, Αθήνα, **41956294**
- Φυσική Ημιαγωγών, Γ.Π. Τριμπέρης, LIBERAL BOOKS ΜΟΝΟΠΡΟΣΩΠΗ ΕΠΕ, 2013,Αθήνα, **50659222**

- Related academic journals

- IEEE Journal of Quantum Electronics
- Physical Review
- Physical Review Letters
- Physica Status Solidi
- Journal of Applied Physics
- Applied Physics Letters
- J. Electrochem. Soc.
- International Journal of Nanotechnology,
- Microelectronic Engineering,
- Superlattices and Microstructures
- Semiconductor Science & Technology