ETE706 - Materials for nanostructures, electronics devices and micromachines

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	ETE706	**SEMESTER**	7
COURSE TITLE	Materials for nanostructures, electronics devices and micromachines		

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 and recitation	3	3
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialized general knowledge, skills development*	specialized general knowledge
PREREQUISITE COURSES:	Quantum theory of matter Atomic and electronic structure of matter
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	
COURSE WEBSITE (URL)	

(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*

Knowledge: Students are taught the properties of modern materials used in the manufacturing of the most important electronic devices such as high-frequency transistors, light emitting diodes and high-efficiency solar cells. Understanding of their operating principles

Skills: Calculation of characteristic sizes related to the operation and performance of electronic devices. Recognition, handling and design of different types of materials heterojunctions (types I, II and III).

Competences: Recognition of the operating characteristics of advanced devices such as photodiodes, infrared sensors and biosensors. Comparative analysis of operation and architecture, general design.

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…* *…….*
• Autonomous work • Production of new research ideas • *Promoting free, creative and inductive thinking*

(3) SYLLABUS

Heterostructures of semiconductor materials type I, II and III. Semiconductor materials III-V for the manufacturing of modern electronic devices. Emission of light and infrared detectors. Exercises. Lasers of quantum potential wells. Lasers of quantum dots. Crystalline silicon solar cells. High Frequency Transistors. Infrared Sensors and Light Diodes. Molecular diodes. Microelectronic systems. Biosensors.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	In class, lectures
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	
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*	see table below
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*	LANGUAGE OF EVALUATION: Greek METHOD OF EVALUATION: Written final exam: • Development and explanation of theory • Developing and resolving problems

Activity	***Semester workload***
Lectures	39
Self-study for preparing for final examination	36
Course total	75

to students.	

(5) ATTACHED BIBLIOGRAPHY

- *Suggested bibliography:*
    - Quantum Wells, Wires and Dots , Theoretical and Computational Physics , Paul Harrison , John Wiley and Sons ,ISBN 0-471-98495-7
    - Principles of nanoelectronics , George W. Hanson, Translated in Greek: Nikolaos Kofidis , 2009 TZIOLA Publications , ISBN 978-960-418-165-0