ETE 806 - Nanotechnology

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	ETE 806	**SEMESTER**	10
COURSE TITLE	Nanotechnology		

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:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	http://cmsl.materials.uoi.gr/lidorikis/courses.html

(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 learn the main construction methods of microelectronics and nanoelectronics. They understand the methods of optical lithography, electron beam lithography and nanoimprint lithography.

Skills: Theoretical design for constructing basic electronic devices such as transistors and solar cells.

Competences: Understanding and analyzing the operation of more complex devices, comparative study. To some extent, basic design capabilities for devices such as high-frequency transistors, semi-transparent high-efficiency silicon solar cells, micro-bridges, micro-motors and biosensors.

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

Lithography Techniques. Optical Lithography. Electron-beam lithography. Nano-imprint lithography. X-ray lithography. Thin film deposition techniques. Dry and wet chemical etching techniques. Successive steps to construct a micro-bridge. Flow diagrams of successive steps in manufacturing processes of high frequency transistor using the self-aligning method. Construction of conventional and EWT solar cells. Manufacturing of microheaters and gas sensors. Construction of 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*	Video recording of class lectures in the frame of e-learning and asynchronous education.
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*	

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

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

to students.	

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1) Microsensors, MEMS, and Smart Devices.
Julian W. Gardner, Vijay K. Varadan, Osama O. Awadelkarim
2001 John Wiley and Sons Ltd
ISBN 0-471-86109X
2) HANDBOOK OF Microlithography, Micromachining, and Microfabrication.
Volume 1: Microlithography
Editor: P.Rai-Choudhury
SPIE Optical Engineering Press
ISBN 0-8194-2378 (v.I)
3) Principles of nanoelectronics
George W. Hanson
Translated in Greek: Nikolaos Kofidis
2009 TZIOLA Publications
ISBN 978-960-418-165-0

-Related academic journals: