COURSE OUTLINE

(1) GENERAL

SCHOOL	School of Sciences		
ACADEMIC UNIT	Department of Physics		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**211**	**SEMESTER**	**6, 8**
COURSE TITLE	MATERIALS SCIENCE		

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**
	4	5
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	special background, specialised general knowledge, skills development
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	http://ecourse.uoi.gr/course/view.php?id=469

(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*

The course provides the students specialised knowledge relative to the structure and physical properties of natural as well as synthetic materials in the solid state (mainly).

In particular after the successful completion of the course the student will be in position to:

- understand the connection between the macroscopic properties of solids and their structure in the atomic level,
- understand the basic atomic periodic structure in space of crystalline solids and their properties, perceive crystalline and amorphous, polycrystalline materials and monocrystals,
- understand and interpret the behaviour of materials according to parameters such as their chemical composition and temperature,

- know and separate materials in different categories according to their structure and physical properties,
- understand, interpret and extract information from equilibrium phase diagrams,
- understand the concepts of metastable phases and states of materials,
- understand and interpret the mechanical properties of materials,
- understand and interpret the structural, electric, thermal, magnetic and optical properties of materials, based in the knowledge of their chemical composition, as well as their crystal and electronic structure and morphology,
- acquire specialised knowledge and skills about the structure and properties of novel nanostructured and hybrid materials, carbon, metallic, ceramic and polymeric materials,
- distinguish polymeric from plastic materials, categorise polymers according to their structure, morphology and mechanical properties and calculate –by first principles– the length of polymeric chains.

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…*
	…….

Search for, analysis and synthesis of data and information, with the use of the necessary technology.
Decision-making.
Working independently.
Working in an interdisciplinary environment.
Production of free, creative and inductive thinking.

(3) SYLLABUS

Atomic and electronic properties of solids, bonds between atoms and ions. Basic crystal structures and lattices, amorphous solids and glasses, polycrystalline materials and monocrystals. Atomic packing. Defects and diffusion in solids. Mechanical properties of solids. Equilibrium phase diagrams. Electrical, thermal, magnetic and optical properties of solids. Metallic materials and alloys, ceramic materials and glasses. Carbon and related materials, nanostructured and hybrid materials. Materials for energy conversion. Polymeric materials (polymers and plastics, polymer categories, chain formation, end-to-end distance calculation).

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face learning.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Use of ICT in teaching, use of electronic projectors in lectures. Direct communication with students on lectures and in laboratories. Additional usage of the Moodle asynchronous e-learning system.
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
Practice/tutorials	13
Educational visits	6
Study and analysis of bibliography	32
Essay writing	6
Non-directed study	26
Exams	3
Course total	***125***

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.*	Examination which refers to developing answers to certain given subject-matters, solving given problems, as well as developing written answers in exercises.

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
- Related academic journals:

- "• "Επιστήμη και Τεχνολογία των Υλικών" 9η Έκδοση, William D. Callister Jr, David G. Rethwisch, Μετάφραση από ομάδα Πανεπιστημιακών, ΕΚΔΟΣΕΙΣ ΤΖΙΟΛΑ 2016.
- "Materials Science and Engineering AN INTRODUCTION", WILLIAM D. CALLISTER, JR. &DAVID G. RETHWISCH, WILEY 2014.
- "The Science and Engineering of Materials", Donald R. Askeland, Pradeep P. Fulay, Wendelin J. Wright, Cengage Learning 2010.

- "Engineering Materials" Vol 1 and 2, Michael F. Ashby & David R. H. Jones Elsevier 2012-13.