COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF SCIENCES		
ACADEMIC UNIT	PHYSICS DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**212**	**SEMESTER**	**6,8**
COURSE TITLE	STRUCTURAL AND CHEMICAL CHARACTERIZATION OF MATERIALS		

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	4
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 (ENGLISH OPTIONAL)
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	http://ecourse.uoi.gr/course/view.php?id=1264

(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 covers, at an introductory level, the basic experimental techniques for structural-chemical characterisation of materials currently used in research and tech labs. The physical principles & equations underlying each methodology/instrumentation are emphasized and exemplified. Each methodology/instrumentation is detailed in a separate, self-contained, chapter where the basic principles of the method are detailed, the pertinent modern lab instruments are presented. Students are trained via visits to labs and practicums.

The course learning outcomes, specific knowledge, skills and competences reside on

[i] familiarisation of students with modern lab instrumentation,

[ii] training on a research-oriented utilisation of the methods/instruments,

[iii] conceptual integration of the theoretical principles i.e. [quantum physics of mater, solid state physics, thermodynamics, nanoscale materials physics] with the end-use reality in research and technology of materials.

[iv] familiarisation with nanomaterials and nanotechnology.

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*
Team work	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Working in an international environment	*Criticism and self-criticism*
Working in an interdisciplinary environment	*Production of free, creative and inductive thinking*
Production of new research ideas	*……*
	Others…
	…….

Search for, analysis and synthesis of data and information, with the use of the necessary technology
Production of new research ideas
Working in an interdisciplinary environment
Working independently
Adapting to new situations

(3) SYLLABUS

1 – Basics of Solid State Physics
2 – X-Ray diffraction, Neutron Scattering, Electron Scattering
3 – Transmission Electron Microscopy (TEM), Scanning Electron Microscopy (SEM)
4 - X-Ray Photoelectron Spectroscopy, Auger Spectroscopy.
5 – Electron Paramagnetic Resonance Spectroscopy
6 – Nuclear Magnetic Resonance Spectroscopy
7 – Mossbauer Spectroscopy
8 – Magnetic Properties of Materials
9 – SQUID, VSM Magnetometry

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY
Face-to-face, Distance learning, etc.

Face-to-face teaching

USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students

Dropbox is used routinely for tutorial notes' relay to students, practicum instructions and delivery, communication with the 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

Activity	***Semester workload***
Lectures	46
Laboratory Practice	6
Essay writing	12
study and Analysis of Bibliography	12
Homework	21
Exams	3
Course total	***100***

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,

Written essay/reports on practical lab projects.
Written exams at the end of the semester focusing on problem solving.

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.*	

(5) ATTACHED BIBLIOGRAPHY

- Materials Characterization Techniques, Sam Zhang, Lin Li, Ashok Kumar (2008)
- CRC Press.
- Physical Methods for Materials Characterisation, Peter E.J. Flewitt, R.K. Wild (2003) CRC Press.
- Magnetism and Magnetic Materials J. M. D. Coey (2010)
- Cambridge University Press.
- Electron Paramagnetic Resonance of Transition Ions A. Abragam, B. Bleaney (2012) Oxford University Press.
- Transmission Electron Microscopy Physics of Image Formation Reimer, L., Kohl, H., (2008) Springer Series in Optical Sciences.