COURSE OUTLINE

(1) GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	DEPT. OF PHYSICS		
LEVEL OF STUDIES	Graduate		
COURSE CODE	**M128**	**SEMESTER**	
COURSE TITLE	**Condensed Matter Physics**		

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	7
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, specialized general knowledge, skills development
PREREQUISITE COURSES:	Solid State Physics I (72) Solid State Physics II (205)
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
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*

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 will offer advanced knowledge in current topics of solid state physics and the physics of condensed matter, in general. Upon completion of the course the students would have acquire the following :

Understanding of the atomic and electronic structure of solids (how a crustal is build through the electronic bonding between its atoms).

Hamiltonian of a crystal.
Computational approaches of the electronic structure of a crystal.
Electrons in a periodic potential (Bloch electrons).
Band structure.
Semiconductors (p/n) junction and its relevance in applications.
Magnetic behaviour of a solid.

(3) SYLLABUS

Crystal structure, diffraction and reciprocal lattice, the 7 crystal lattices, the 14 Bravais lattices, the 32 crystallographic point groups and the 230 space groups (in brief).
Bonds of a solid (in brief).
Metal-Insulators-Semiconductors (in brief).
Metallic behaviour (Drude/Sommerfeld models) (in brief).
On particle approximation, free electron theory, Hartree-Fock and Density Functional Theory.
Bloch theorem, Tight Binding approximation, Band structure.
Lattice vibrations (phonons) (in brief).
Semiconductors, the p-n junction and its applications (photodiodes, inorganic and organic photovoltaics, transistors: FET and MOSFET).
Dielectrics and ferroelectrics.
Magnetic behaviour of solids.
Amorphous and non-crystalline solids (examples from inorganic, organic and metallic glasses)

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to Face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Use of distance learning (e-course) to post notes, problem sheets and to facilitate 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	40
Problem solving	12
homework	54
Students study	60
tests	6
exam	3
total	175

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*	(a) Two tests during the semester followed by a final exam testing their problem-solving ability and understanding of basic theory (80%) (b) Homework exercises (20%)

examination of patient, art interpretation, other *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	

(5) ATTACHED BIBLIOGRAPHY

Solid State Physics, Ashcroft and Mermin, ISBN 0-03-049346-3.
Atomic and Electronic Structure of Solids, E. Kaxiras, Cambridge University Press, 2003, ISBN 0521523397