COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF NATURAL SCIENCES		
ACADEMIC UNIT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	POSTGRADUATE		
COURSE CODE	M147	**SEMESTER**	**2nd**
COURSE TITLE	MAGNETISM		

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, specialised knowledge, skills development
PREREQUISITE COURSES:	Solid State Physics, Quantum Mechanics, Electromagnetism, Atomic Physics
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*

The course aims to give an introductory course in a postgraduate level on magnetism and its applications.

At the end of the course the students should have achieved:

- An understanding of the fundamental questions and principles in magnetism
- The ability to combine knowledge for quantum mechanics, solid state physics, and atomic physics and apply it in the case of magnetic materials
- To acquire a solid grounding in the contemporary research filed in magnetism
- The ability to write a literature review on a subject related to contemporary research in the field.

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.

Working independently.

Production of free, creative and inductive thinking

(3) SYLLABUS

Magnetic moments, ground state of an ion and Hund's rules, magnetic susceptibility, diamagnetism, paramagnetism, Brillouin function, crystal fields, orbital quenching, magnetic order (ferromagnetism, ferrimagnetism, antiferromagnetism), magnetic interactions-exchange interation, origin of the molecular field, magnetic anisotropy, band magnetism, Stoner model, magnetic domains, domain walls-Bloch, Neel, magnetic relaxation, superparamagnetism, nanimagetism (thin film magnetism, multilayers, nanoparticles), magnetoresistance and spintronics (anisotropic AMR, giant magnetoresistance), applications (magnetic memory and recording, magnetic sensors), spin current, spin Hall effect, spin transfer torque, biomagnetism.

(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	

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***
Study	75
Tutorials	30
Lectures	20
Literature review writing	50
Course 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 examination of patient, art interpretation, other

Specifically-defined evaluation criteria are given, and if and where they are accessible to students.

-Problem solving
-Oral examination
-Literature review essay

(5) ATTACHED BIBLIOGRAPHY

- *Suggested bibliography:*
- *«Magnetism and Magnetic Materials», J.M.D. Coey, Μετάφραση-Επιμέλεια: Μ. Αγγελακέρης, Κ.Γ. Ευθυμιάδης, Ο.Καλογήρου, Εκδόσεις C. CITY Publish, 2014, Κωδικός στον Εύδοξο: 33074645*
- *«Μαγνητικά Υλικά», Ι. Παναγιωτόπουλος, Εκδόσεις Α.Γ. Πνευματικός, Αθήνα, 2010, Κωδικός στον Εύδοξο:21495*
- *"introduction to Magnetism and Magnetic Materials', D. Jiles, Chapman & Hall, 1996*
- *'Introduction to Magnetic Materials', B.D. Cullity, C.D. Graham, 2nd Edition, 2011, Wiley-IEEE Press*

- Related academic journals:
- *Nature Materials*
- *Applied Physics Letter*
- *Physical Review B*
- *IEEE Transanction on Magnetism*
- *Journal of Magnetism and Magnetic Materials*
- *Lab on a chip*
- *Biosensors and Biolectronics*