COURSE SYLLABUS

University	**Alexandru Ioan Cuza University of Iaşi**	**Course title**	
Faculty	**Physics**	**Physics of Magnetic Materials**	
Department	**Physics**		
Domain	**Physics**	**Course category** (FC/SC/CC[1]): SC	**Term** (1-4): **3**
Level	**Postgraduate (MA)**	**Course type** (Co/El/F[2]): Co	

I. Course structure

Number of hours/week				Credits	Total class hours/ semester	Total hours of individual activity	Examination type (C/Ex/CE[3])	Teaching language
Course	Seminar	Lab.	Project	**6**	**56**	**124**	**Ex**	**English**
2		**2**						

II. Instructors

	Academic degree[4]	Scientific degree	Name and surname	Faculty position (tenure/ associate - organization)
Course	Professor	Ph. D	Ovidiu Florin Caltun	tenure
Seminar				
Laboratory	Lecturer	Ph.D	Ioan Dumitru	tenure

III. Prerequisites

IV. Course objectives

The students become familiar with magnetization processes in soft and hard, crystalline and amorphous materials. The students become able to correlate the magnetic properties with the microstructure. The students develop their skills in measuring and characterizing the magnetization processes in different types of magnetic materials. The competences in biographical and experimental research will be emphasized.

V. Course content

Course	The origin of magnetism. Diamagnetism. Paramagnetism. Ferri and Ferromagnetism. Antiferromagnetism. Metamagnetism. Superparamagnetism. Ferromagnetic resonance. Methods in characterization magnetic materials. Soft and hard magnetic materials. Nanoparticulate magnetic media. Thin magnetic films. Magnetic materials applications. Recording media.
Seminar	
Laboratory	Magnetic induction and magnetic fields produced by different distributions of electric currents. Different methods for magnetic materials characterization. Induction methods for magnetic properties characterization. Plotting hysteresis curve. Hysteresis graph. Magnetization curves. Vibrating sample magnetometer. Complex magnetization curves (FORC, SORC). SQUID magnetometer. Blocking, Neel and Curie temperature measurements. Magnetization processes at low, medium and high frequency. Initial permeability and its dependences on temperature and frequency.

VI. Minimal required references

G. Bertotti, Hysteresis in Magnetism (For Physicists, Material Scientists and Engineers) Academic Press Boston, 1998

H. N. Bertram, Theory of magnetic recording, Cambridge University. Press, 1994

R. M. Bozorth, Ferromagnetism IEEE Press, 1993

S. Chikazumi, Magnetismul Editura Ştiinţifică şi Enciclopedică, Bucureşti 1981

D.J. Craik, Magnetism (Principles and Applications) Wiley New York1997

A. Goldman, Handbook of Modern Ferromagnetic Materials Kluwer,1999

[1] FC – fundamental course, SC – specialty course, CC – complementary course

[2] Co – compulsory, El – elective, F – facultative

[3] C – colloquium, Ex – exam, CE – colloquium AND exam

[4] Professor / Associate professor / Lecturer / Assistant professor / Teaching assistant

D. Jiles, Magnetism and Magnetic Materials, Chapman & Hall, New York, 1991
Charles Kittel, Introduction to Solid State Physics, Wiley New York, 1996
E. Purcell Cursul de fizica Berkeley II (Electricitate si magnetism) EDP 1987
Al. Stancu, Magnetization process in particulate ferromagnetic media, Cartea Universitara Bucuresti 2006
S. Vonsovsky, Magnetism of elementary particles Mir Publishers Moscow, 1975
E. P. Wohlfarth, ed., Ferromagnetic Materials North-Holland, 1980

VII. Didactic methods

Lectures, debate, problem based learning, brainstorming, inquiry based methods, experiment

VIII. Assessment

Pre-conditions	Attendance of 12 practical activities, active participation during the lectures, minimal grade 5 for written assessment and accomplishment of personal bibliographic research and project presentation.	
Exam dates	**1st Assessment**	November
	2nd Assessment	January – February

	Assessment means and methods	**Percentage of the final grade**
Exam/Colloquium	Written examination Project presentation	55 25
Seminar		
Laboratory	Practical work	20