COURSE SYLLABUS

University	**Alexandru Ioan Cuza University of Iaşi**	**Course title**	
Faculty	**Physics**	**PREPARATION TECHNIQUES OF ADVANCED MATERIALS. NANOTECHNOLOGIES**	
Department	**Physics**		
Domain	**Physics**	**Course category** (FC/SC/CC[1]): FC	**Term** (1-4): 4
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	Associate professor	Ph. D.	Liviu LEONTIE	tenure
Seminar				
Laboratory	Associate professor	Ph. D.	Liviu LEONTIE	tenure

III. Prerequisites

Basic knowledge of Calculus and Solid State Physics.

IV. Course objectives

To provide students with a comprehensive overview on the fundamentals of thin film preparation and characterization. To enable the students to develop a thorough understanding of how core physics can be used to understand thin film deposition processes. To establish the correlation between processing variables and materials characteristics and performance within the framework of key modern (nano)technologies. To allow students to develop a sense of teamwork, communication skills and research methodologies through team project.

V. Course content

Course	Thin film definition. Crystalline and amorphous films. Choosing a deposition method. Classification of Deposition Technologies. Thin-film nucleation and growth. Thermal vacuum evaporation. Apparatus. Applications. Magnetron sputtering. Apparatus. Applications. Chemical methods. Chemical Vapor Deposition (CVD). Apparatus. Applications. Electrochemical and electroless methods. Molecular beam epitaxy (MBE). Apparatus. Applications. Pulsed laser deposition (PLD). Apparatus. Applications. Thin film applications in nanoelectronics (optoelectronic devices, photodetectors, solar cells, sensors and actuators), nanotechnologies.
Seminar	

[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

Laboratory	Thin metal (Bi, Sn, Zn) film deposition by thermal vacuum evaporation. Preparation of thin oxide films by thermal dry oxidation of as-prepared metallic films. Preparation of thin organic films by solution deposition (immersion method). Preparation of thin organic films by spin coating. Advanced preparation techniques for polymeric materials (thin films, fibers, membranes, etc.- Petru Poni Institute of Macromolecular Chemistry). Structural characterization of as-prepared films and investigation, in function of deposition conditions and subsequent thermal treatments. Investigation of as-prepared films by IR and UV-vis spectroscopy. Applications of metallic and semiconducting films in micro- and nanoelectronics; nanotechnologies.

VI. Minimal required references

1. Peter M. Martin, *Handbook of Deposition Technologies for Films and Coatings, Third Edition: Science, Applications and Technology*, Elsevier, Amsterdam-Boston, 2010.
2. William A. Goddard, III, Donald W. Brenner, Sergey E. Lyshevsky, Gerald J. Iafrate (Eds.), *Handbook of Nanoscience, Engineering, and Technology*, CRC Press, Boca Raton, London, New York, 2007.
3. I. Spînulescu, *Thin Film Physics and Applications*, Scientific Publishing House, Bucharest, 1975 (in Romanian).

VII. Didactic methods

Lectures accompanied by computer mediated presentations (online, DVD, PowerPoint); simulation, modeling.

VIII. Assessment

Pre-conditions	-class (course and Lab) attendance; -active participation to class (course and Lab) activities; -obtaining the minimal grade 5 for each ongoing assessment; -project presentation.	
Exam dates	**1st Assessment**	8th week, April
	2nd Assessment	16th week, June

	Assessment means and methods	**Percentage of the final grade**
Exam/Colloquium	written exam	50
Seminar		
Laboratory	practical work, project	50