COURSE SYLLABUS

University	**Alexandru Ioan Cuza University of Iaşi**	**Course title**	
Faculty	**Physics**	**Introduction to the physics of polymers. Polymer materials with special properties**	
Department	**Physics**		
Domain	**Physics**	**Course category** (FC/SC/CC[1]): SC	**Term** (1-4): 4
Level	**Postgraduate (MA)**	**Course type** (Co/El/F[2]): El	

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**	**C**	**English**
2	**-**	**2**	**-**					

II. Instructors

	Academic degree[4]	Scientific degree	Name and surname	Faculty position (tenure/ associate - organization)
Course	Assoc. Prof.	PhD	Gabriela Borcia	tenure
Seminar	-	-	-	-
Laboratory	Assoc. Prof.	PhD	Gabriela Borcia	tenure

III. Prerequisites

Fundamental knowledge on the physics of atoms and molecules

IV. Course objectives

Learn the fundamental knowledge on the physics of polymer materials, their volume and surface properties; knowledge on polymer materials with special properties, obtained by various physical and chemical methods, and of their performances; ability to use analysis techniques to identify the properties of polymer materials of interest in modern applications; work in a team for solving experimental and technological issues; identify and use bibliographic resources for continuous formation

V. Course content

Course	General notions, classification criteria. Structure of macromolecular compounds. Aggregation and phase states, transition temperatures. Elements of polymerization reaction thermodynamics. Physico-chemical properties of polymer materials of interest in applications. Polymer materials with special properties: intelligent composite materials, interpenetrated polymer networks, liquid crystals in various materials, drug carrier polymers, metalocenes, polymers with biomedical applications, polymer membranes, carbon fibers and carbon fiber composites, conductor and semiconductor polymers, polymer sensors, biodegradable polymers. Techniques for complex polymer materials characterization. Applications in making of polymers with selected surface properties
Seminar	-
Laboratory	Study on the surface chemical modification of polymer materials using Fourier transform infrared spectroscopy (FTIR) Study on the modification, by surface treatment, of the degree of cristallinity of a polymer, using X-ray difractometry (XRD) Polymer characterization by X-ray photoelectron spectroscopy (XPS). Analysis of XPS spectra of complex polymer materials. Study on the surface chemical modification of polymer materials using XPS Study on the modification of polymer morphology, by surface treatment, using atomic force microscopy (AFM) Evaluation of the surface energy and surface energy components of polymer films and fibers, using contact angle measurement

[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

	Evaluation of the surfactant effect on the surface and volume microscopical structure of a biodegradable polymer material Characterization of the surface properties of nanocomposite materials based on biodegradable polymers and clays

VI. Minimal required references

1. S. Dumitrescu, M. Dărângă, Fizica polimerilor, Ed. Institutului Politehnic Iaşi, 1989
2. M. Dărângă, C. Mihăilescu, M. Popa, M. Nicu, N. Bejan, Fizica polimerilor: introducere în ştiinţa materialelor polimerice, Editura Ex Libris, Brăila, 2000
3. Materials Today, revistă Elsevier B.V., 2006 - present, selected relevant papers
4. Progress in Polymer Science, revistă Elsevier B.V., 2006 - present, selected relevant papers

VII. Didactic methods

Lecture, class discussion, laboratory work

VIII. Assessment

Pre-conditions	50% course attendance, 100% laboratory attendance, minimum grade 5 for the project	
Exam dates	**1st Assessment**	8th week
	2nd Assessment	16th week

	Assessment means and methods	**Percentage of the final grade**
Exam/Colloquium	Written exam	60%
Seminar	-	-
Laboratory	Project	40%