COURSE SYLLABUS

University	**Alexandru Ioan Cuza University of Iaşi**	**Course title**	
Faculty	**Physics**	**PHYSICS OF DIELECTRICS**	
Department	**Physics**		
Domain	**Physics**	**Course category** (FC/SC/CC[1]): SC	**Term** (1-4): 2
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	Dr.	Liliana Mitoseriu	tenure
Seminar	Teaching assistant	Dr.	Lavinia Curecheriu	associate
Laboratory	Teaching assistant	Dr.	Lavinia Curecheriu	associate

III. Prerequisites

Electricity and Magnetism, Electronics

IV. Course objectives

Acquiring of knowledge concerning the electrical behaviour of dielectric materials (polar and non-polar). Understanding the field changes induced by dielectrics. Familiarize with the description of real dielectrics by the complex method. Knowledge about the experimental investigation methods of dielectrics.

V. Course content

Course	1. Definitions. Multipole development. Electrical dipole. 2. Electrical field equations in substances. 3. General properties of dielectrics. Polarisation. Fundamental equation of dielectrics. 4. Applications. Plan-parallel dielectric. The image method applied to dielectrics. Dielectric sphere. 5. Energy and forces acting on the dielectrics. Volumic, superficial forces. 6. Local field: Lorentz; Onsager. 7. Polarisation mechanisms in dielectrics: induced, orientational, electronic, ionic, interfacial and lattice polarizations; combined mechanisms. 9. Relaxarea dielectrica. Mecansime microscopice care conduc la o relaxare Debye. 10. Dielectric breakdown. 11. Applications of dielectrics. 12. Ferro, piro, piezo-electricity: phenomenology, theory and applications.
Seminar	1. Calculations of the potential and electrical field created by various dipolar systems 2. Calculations of the electric field in various dielectrics 3. Calculations of permitivities in various systems 4. The complex impedance method, calculations of permittivity and dielectric losses.
Laboratory	1. Measurements of the dielectric constant and tangent loss by bridge methods.

[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

	2. Study of the ferroelectric properties of thin films by using RADIANT-EDU kit. 3. Study of dielectric relaxation phenomena 4. Study of the temperature dependence of permittivity in ferroelectrics 5. Determination of field-dependence of permittivity in ferroelectrics 6. Study of the RLC circuit with nonlinear capacitor 7. Study of the piezoelectric effect by the method of resonance impedance.

VI. Minimal required references

M. H. Choudhury, Electromagnetism, John Wiley & Sons, New York, 1989

I. S. Grant, W. R. Phillips, Electromagnetism, John Wiley & Sons, London, 1975

J. Grindlay, An introduction to the phenomenological theory of ferroelectricity, Pergamon Press, Oxford, 1970

A. Jonsker, Dielectric relaxation in solids, Chelsea Dielectric Press., London, 1983

VII. Didactic methods

Lectures, Power Point presentations, animation, didactic movies, experiments.

VIII. Assessment

Pre-conditions	Attendance at more than 85% of laboratories and seminar activity, attendance of more than 25% courses.	
Exam dates	**1st Assessment**	**March**
	2nd Assessment	**June**

	Assessment means and methods	**Percentage of the final grade**
Exam/Colloquium	Written and oral	75%
Seminar	Homework and active participation	10%
Laboratory	Practical work and laboratory colloquium	15%