

COURSE SYLLABUS

University	Alexandru Ioan Cuza University of Iași	Course title	
Faculty	Physics	INVESTIGATION METHODS OF MATERIALS AT HIGH FREQUENCIES	
Department	Physics		
Domain	Physics	Course category (FC/SC/CC¹):SC	Term (1-4): 4
Level	Postgraduate (MA)	Course type (Co/EI/F²):CE	

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	5	56	56	CE	English
2		2						

II. Instructors

	Academic degree ⁴	Scientific degree	Name and surname	Faculty position (tenure/associate - organization)
Course	Associated professor	PhD	Florin Mihai TUFESCU	tenure
Seminar				
Laboratory	Associated professor	PhD	Florin Mihai TUFESCU	tenure

III. Prerequisites

Solid state physics, Electronics, Electric and electronic measurements, Dielectrics.

IV. Course objectives

To present current research on the properties of matter at high frequencies and the models which explain its behaviour. The course focuses on the essential elements needed for an in-depth understanding of the surveyed topics. Laboratory assignments are designed to foster a rigorous and professional manner of performing measurements and processing data. At the end of the course the student should be able to design and construct the installations required for study in this and related areas of research.

V. Course content

Course	High frequency measurements for power, phase shift, attenuation and impedance. Methods and experimental installations. High frequency generation. Generator types, their functioning, use and performance. Determining the properties of electromagnetic resonators. Obtaining controlled magnetic fields. Methods of measurement. Methods and microwave equipment for measuring the dielectric properties of materials : resonating cavity, short-circuit and open-circuit in waveguide , free space interactions. The study of dielectric properties for high frequencies and microwaves. New materials. Methods and installations for measuring ferromagnetic resonance. Components of RME spectrographs, sensitivity of detection systems, the study of specific equipments. Investigating magnetization processes in glass-covered amorphous wires by measuring ferromagnetic resonance. Implementing systems for the acquisition, transmission and processing of experimental data for extremely high frequencies.
Seminar	-
Laboratory	Measurement for power, frequency, phase shift, impedance and atenuation in X band. Study of Impatt generators. Measurement of dielectric properties of the materials by waveguide techniques. Measurement of magnetic induction with integrated Hall transducers.

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

² Co – compulsory, EI – elective, F – facultative

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

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

	Nondestructive control of dielectric plane samples in the X-band . Investigating magnetization processes in glass-covered amorphous wires by ferromagnetic resonance. FMR Investigation of the amorphous CoFeSiB glass-covered wires in the presence of mechanical tension.
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VI. Minimal required references

- Roberts, S.; von Hippel, A.; *J. Appl. Phys.* 17, **610**, (1946)
- Rulea, G., "Tehnica frecvențelor foarte înalte", Ed. Did. și Ped., București, (1972)
- Sandu, D.D.; "Dispozitive electronice pentru microunde", Ed. St. și Enc., București, (1982)
- Schilz, E.; Schiek, B.; "Microwave Systems for Industrial Measurements", in *Advances in Electronics and Electron Physics Edited by J. Marten and C. Marton, Academic Press, New York, (1981)*
- Roberts, S.,; von Hippel, A.; "Dielectric and Waves", John Wiley, New York, (1959)
- Oliver, B.M.; Cage, J.M.; (Ed.), "Electronic Measurements and Instrumentation", Mc. Graw – Hill, New York, (1971)
- Nicolau,Ed.; (coord.), "Masurari electronice ", Editura tehnica,Bucuresti, (1979)
- Lebedev,I., "Microwave Electronics", MIR Publishers ,Moscow,(1974)
- Cojoc,D., "Amplificatoare de frecventa foarte inalta", Ed.Militara,Bucuresti,(1983)
- Libby, H.L.; "Introduction to Electromagnetic Nondestructive Test Methods", John Wiley, New York, (1971)
- Lebedev, I.V.; "Microwave Electronics", Mir Publishere, Moscow, (1974)
- Tebeanu,T.,Spornic,A., "Oscilatoare de microunde", Ed.Tehnica,Bucuresti (1990)
- Krevelen, D.; "Properties of Polymers. Corelation with Chemical Structure", Amsterdam, Elseveer, (1972)
- Nicula,Al.,Puskas,F., "Dielectrici si feroelectrici", Ed.Scrisul Romanesc, Craiova, (1982)
- Hill Nora.; et. al., "Dielectric Properties and Molecular Behaviour" Van Nostrand, London, (1969)
- Tufescu,Fl.M.,Chiriac,H.,Ovari,T-A.,Stancu,Al., FMR Investigation of the Amorphous CoFeSiB Glass-Covered Wires in the Presence of Mechanical Tension, *Journal of Magnetism and Magnetic Materials, Vol.242-245 Part.1, p.254-256 (2002)*
- Tufescu,Fl.M.,Chiriac,H.,Ovari,T-A.,Stancu,Al.,Stress and Temperature Effect on the FMR Response of Nearly Zero Magnetostrictive Amorphous Microwires., *J. Opt. and Advanced Mat.*, 5(no.1), p.273-277, (2003).
- Tufescu,Fl.M., Chiriac,H.,, Displacement and Proximity Sensors Using $Fe_{77.5}Si_{7.5}B_{15}$, $Fe_{73.5}Cu_{1}Nb_{3}Si_{13.5}B_{9}$, and $Co_{68.25}Fe_{4.5}Si_{12.25}B_{15}$ Amorphous Micro-Ribbons Cores, *Sensors and Actuators A119 (2005) p.305-308*

VII. Didactic methods

Multimedia presentations, practical work, individual projects

VIII. Assessment

Pre-conditions	Attendance, active participation to class activities, obtaining the minimal grade 5 for each ongoing assessment	
Exam dates	1st Assessment	spring term: week 8
	2nd Assessment	spring term: week 16

	Assessment means and methods	Percentage of the final grade
Exam/Colloquium	Colloquium	50%
Seminar		--
Laboratory	Laboratory colloquium,	50%