

## COURSE SYLLABUS

University	<b>Alexandru Ioan Cuza University of Iași</b>	<b>Course title</b>	
Faculty	<b>Physics</b>	<b>Plasma diagnosis</b>	
Department	<b>Physics</b>		
Domain	<b>Physics</b>	<b>Course category (FC/SC/CC<sup>1</sup>): SC</b>	<b>Term (1-4):</b>
Level	<b>Postgraduate (MA)</b>	<b>Course type (Co/EI/F<sup>2</sup>): Co</b>	

### I. Course structure

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

### II. Instructors

	Academic degree <sup>4</sup>	Scientific degree	Name and surname	Faculty position (tenure/associate - organization)
Course	Assoc. Prof.	PhD	Lucel SIRGHI	tenure
Laboratory	Assoc. Prof.	PhD	Lucel SIRGHI	tenure

### III. Prerequisites

mechanics, thermodynamics, electromagnetism, statistical physics, plasma physics, optics and optical spectroscopy

### IV. Course objectives

Acquiring knowledge concerning: 1) plasma parameters in technological devices, laboratory and nature; 2) techniques and methods used for measuring and monitoring plasma parameters in laboratory and technological devices; 3) techniques and experimental methods used for study of plasma in nature; 4) control of plasma used in laboratory and technological devices. Developing of good laboratory practice in the field of plasma physics

### V. Course content

<b>Course</b>	Introduction. Plasma parameters. Classification of plasmas and plasma diagnostics methods. Measuring and monitoring of gas pressure and gas flow in laboratory and technological devices using plasma. Measuring of voltage, current intensity, power and impedance of dc and rf. electrical discharges in gases. Determination of molecular and atomic composition by mass and optical spectroscopy. Spectral measurements of optical adsorption and emission. Plasma potential. Floating potential. Bohm current. Measurement of plasma potential by emissive probe. The capacitive probe. Measurements of electric and magnetic fields in plasma. Measurements of Stark width of optical emission lines. Measurements of Faraday rotation of light polarization in plasma Density and temperature of electrons. Electron and ion currents of Langmuir probe. Microwave methods. Determination of plasma density. Determination of plasma density by measurements of Thomson light scattering. Energy distribution function of electrons. Method of 1 <sup>st</sup> derivative of I-V characteristic of Langmuir probe. Langmuir probe measurements in non stationary plasmas. Radiofrequency and microwave plasmas. Measurements of velocity distribution function. Electrostatic analyzer, directive probes and multi channel probes. Faraday probe. Determination of density and velocity distribution function of ion and neutral atoms by laser induced fluorescence.
<b>Laboratory</b>	<ol style="list-style-type: none"> <li>1) Study of double electrical probe characteristics in a homogenous plasma. Measurement of electron temperature;</li> <li>2) Use of triple electrical probe for measurements of electron temperature in nonstationary plasmas;</li> <li>3) Measuring of plasma potential with an emissive probe;</li> <li>4) Determination of ion energy distribution function by an electrostatic analyzer;</li> <li>5) Determination of density and velocity distribution function of atoms in magnetron plasma by laser induced fluorescence laser resonant absorption;</li> <li>6) Determination of density and velocity distribution function of atoms in magnetron plasma by laser induced fluorescence;</li> <li>7) Colloquium.</li> </ol>

### VI. Minimal required references

<sup>1</sup> FC – fundamental course, SC – specialty course, CC – complementary course

<sup>2</sup> Co – compulsory, EI – elective, F – facultative

<sup>3</sup> C – colloquium, Ex – exam, CE – colloquium AND exam

<sup>4</sup> Professor / Associate professor / Lecturer / Assistant professor / Teaching assistant

G. Popa si L. Sirghi, *Bazele fizicii plasmei*, Ed. Univ. "Al. I. Cuza" 2004  
 I. H. Hutchinson, *Principles of Plasma Diagnostics*, 2nd edition, Cambridge University Press 2002  
 D. L. Flamm, *Plasma Diagnostics*, Ed. Orlando Auciello, Academic Press Inc. San Diego 1989.  
 W. Lochte-Holtgreven, *Plasma Diagnostics*, North-Holland Pub. Comp., Amsterdam 1968.  
 R. H. Huddlestone, *Plasma Diagnostics Techniques*, Acad. Press, NY 1965.

### VII. Didactic methods

exposition, explanation, PC assisted projections, discussions

### VIII. Assessment

<b>Pre-conditions</b>	Pass the laboratory colloquium	
<b>Exam dates</b>	<b>1<sup>st</sup> Assessment</b>	<b>May</b>
	<b>2<sup>nd</sup> Assessment</b>	<b>June</b>

	<b>Assessment means and methods</b>	<b>Percentage of the final grade</b>
Exam/Colloquium	Exam	60%
Laboratory	Colloquium	40%