COURSE SYLLABUS

University	**Alexandru Ioan Cuza University of Iaşi**	**Course title**	
Faculty	**Physics**	High Temperature Plasma Physics	
Department	**Physics**		
Domain	**Physics**	**Course category** (FC/SC/CC[1]): FC	**Term** (1-4): 4
Level	**Postgraduate (MA) (Plasma Physics, Spectroscopy & Selforganization)**	**Course type** (Co/El/F[2]): Co	

I. Course structure

				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	1	1						

II. Instructors

	Academic degree[4]	Scientific degree	Name and surname	Faculty position (tenure/ associate - organization)
Course	Assoc. Professor	PhD	**Alexandroaei Dumitru**	tenure
Seminar	Assoc. Professor	PhD	**Alexandroaei Dumitru**	tenure
Laboratory	Assoc. Professor	PhD	**Alexandroaei Dumitru**	tenure

III. Prerequisites

Basic knowledge of Mathematics, Electrodynamics and General Plasma Physics

IV. Course objectives

The course has to introduce students to the special problematic of the high temperature plasmas. There are introduced question regarding the characteristics and parameters of these plasmas, phenomenology, their production and devices with special interest to the fusion reactor or the stellar plasmas. Also problems of theoretical and experimental investigation for this kind of plasmas are presented.

V. Course content

Course	High temperature plasmas - generalities. Basic problems of thermodynamics of the hot plasmas. Plasma particles of high energy – motions and methods of acceleration. Cosmic ray. The radiation of plasma. High temperature plasmas in the thermonuclear reactor, the fusion question: i) Magnetic fusion – MHD equilibrium and stability. Devices for magnetic fusion – the tokamak, actual state; ii) Inertial fusion. Principle of inertial fusion – methods and devices – laser fusion; iii) Thermonuclear stellar fusion. Stellar plasmas - physical processes in stellar plasma. Stellar atmosphere. Waves and instabilities in hot plasmas. Diagnosis.
Seminar	Resolving and discussing problems of thermodynamic equilibrium, distributions - Saha equation – examples. Motion of charged particles in electric and magnetic fields, adiabatic invariants, acceleration and heating of the particles of hot plasmas, modeling and simulation. Confinement of hot plasmas in magnetic field - devices, stability. Problems of heating in different fusion devices. Models of stellar atmosphere, star evolutions. Instabilities in high

[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

	temperature plasmas.
Laboratory	Motion of charged particles in different configurations electric field – magnetic field (comparison between modeling and experiment – electrostatic and magnetic lenses). Diffusion coefficient of plasma particles in the presence of the magnetic field. Stellar atmosphere characterization. Pulsed discharges for hot plasmas obtaining – devices and characterization.

VI. Minimal required references

1. F.F.Chen - Introduction to Plasma Physics and Controlled Fusion - Plenum Press, 1974, 1988.
2. K.Miayamoto – Plasma Physics for Nuclear Fusion – Asco Trade Typesett.Ldt.H-Kong,1976
3. M.Clark Jr. – Plasmas and Controll.Fusion- MIT Press, John Wiley&Sons, New-York,London
4. G.Bekefi – Radiation Processes in Plasmas - John Wiley&Sons, New-York, 1966
5. G.K.Parks – Phys. of Space Plasmas – Addison Wesley Publ. Company, Redwood City, 1991
6. G.Schmidt – Physics of High Temperature Plasmas – Acad. Press, New- York, London, 1979
7. I.I.Popescu, I.Iova, E.Toader – Plasma Phys. and Applic.- Editura Stiintifica , Bucuresti, 1981(in rom.).
8. Gh.Popa, L.Sirghi - Basics of Plasma Phys. - Editura Universitatii "Al.I.Cuza" Iasi, 2000 (in rom.)

VII. Didactic methods

Course - oral presentations
Seminars – free exercises concerning course material, home works – documentation papers
Laboratoratory – special practical works

VIII. Assessment

Pre-conditions	Attendance and active participation to class activities, etc.	
Exam dates	1st Assessment	at the half of the 4-th semester
	2nd Assessment	at the final of the 4-th semester

	Assessment means and methods	**Percentage of the final grade**
Exam/Colloquium	final written / oral test	60%
Seminar	hourly class seminar activity	20%
Laboratory	hourly lab activity	20%