"Alexandru Ioan Cuza"

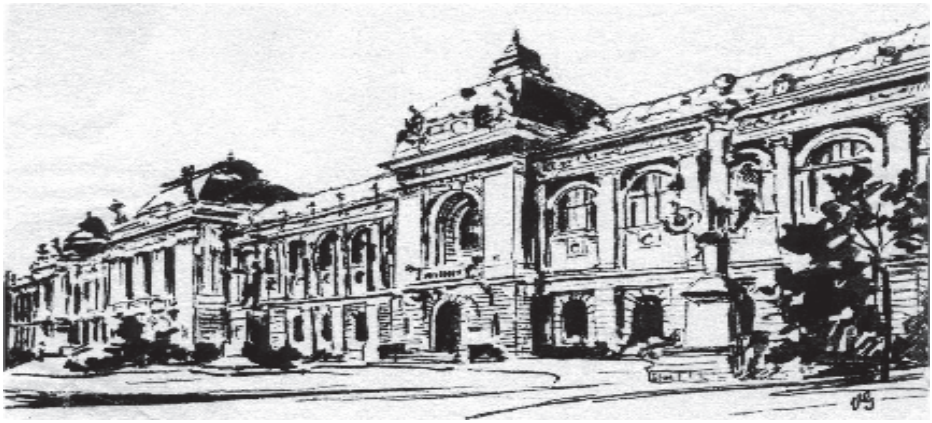
University

IAŞI

Faculty of PHYSICS

Undergraduate and graduate

Study guide



2009

FACULTY OF PHYSICS
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FACULTY OF PHYSICS – GENERAL INFORMATIONS

Short history

The study of physics in Iaşi has a tradition of over a century and a half. The beginnings of this education should be sought in the Academia Mihăileana (1835) where there was a strong current concerning the study natural of sciences. After the inauguration of the first modern institution of higher education in Romania, "Al. I. Cuza" University (1860), where the first physics professor was Stephen Micle (1820-1879), were created and developed Schools of Physics under the guidance of strong personalities like Peter Bogdan, Dragomir Hurmuzescu Horia Hulubei, Th.V. Ionescu, Ştefan Procopiu, Serban Titeica, Constantin Mihul, TT Vescan, Ilie Bursuc.

Thanks to these great personalities of physics and their followers - Tutovan Vasile Mircea Sanduloviciu Constantin Papusoi, Mardarie Sorohan, Ioan Gottlieb - Faculty of Physics,was established as stand-alone unit in 1962, marking a continuous development.

Today, the Faculty of Physics, through the specializations available to students by the youth and the quality of its teachers is one of the leading colleges of "Al. I. Cuza ". University It is known in the country and abroad through educational and research programs that are developed and the quality of its graduates.

The Faculty of Physics proposed mission is to carry out the task of teaching and research, on the basis of established academic values and society needs in terms of promoting quality and efficiency.

Faculty of Physics has a teaching staff composed of 59 teachers (professors, associate professors, lecturers, teaching assistants, research assistants) and 40 associated professors 90% of them possessing a PhD in Physics

Research groups inside the faculty (teachers and students) are in contact with the scientific world from abroad. These contacts have been intensified and developed in recent years, through joint research projects with the prestigious research groups from France, Germany, England, Netherlands, Austria, Japan, USA, Greece, Czech Republic, Portugal, Spain, Belgium, Switzerland, Bulgaria. Joint projects are focused on fundamental research, but also with a wide the opening to applications in various interdisciplinary fields.

Annually, over 50% of teachers go for research stages in Universities from Europe, USA, Asia, Australia. Young PhD owners are receiving Postdoctoral fellowships or are employed as researchers for a limited period. A large number of teachers are invited to the international scientific events, or are getting invited teachers positions to prestigious Universities from France, England, USA, Japan, Canada.

Fields of license studies. Specializations

Facuty of Physics offers the possibility of study in five specialisations: Physics, Technological Physics, Medical Physics, Biophysics and Physics & Informatics. Each of these specialisations is realized through optional courses in the Ist cycle of Bologna system - Bachelor studies, followed by special courses in the IInd cycle - master studies. Finally the scientific training can be continued in the IIIrd cycle – doctoral studies.

In all specialties it is emphasizes the study of physics as a fundamental discipline, the knowledge will be applied in interdisciplinary areas such as nanotechnologies and materials science (Physics, Technological Physics), medicine and biotechnologies (Medical Physics, Biophysics), information and communications technology (Physics & Informatics).

- **Physics** specialization builds competencies to graduates for the insertion of training in research institutions, national agencies and units of production.
- **Technological Physics** specialization aims studies on the applicative side of physics. Graduates of this specialization have the opportunity to work in design and technological development in high tech industries, in research institutes and higher education.
- **Medical Physics** specialization prepares graduates who can apply concepts and methods of physics in diagnostic techniques and treatment of human diseases, using modern means: computerized tomography, nuclear magnetic resonance, thermography, digital x-ray radiography, radio-immunology, nuclear cardiology, high energy radiation, laser beams surgery. Graduates of this specialization can work in clinics and hospitals, and scientific research.
- **Biophysics** is a specialization that prepares graduates to apply their physics knowledge in biology and biotechnology. Biophysics is one of the most dynamic natural sciences and with great expectations. Graduates of this specialization may work in research institutes, in groups consisting of physicists, biologists, chemists, doctors, engineers.
- **Physics & Informatics** specialization is addressed to young people with a passion for physics who wish to apply computer science in the study in physics phenomena. Meanwhile, graduates can become specialists in information technology, data processing, scientific and educational software, multimedia, etc.. They can also work in banking or public services.

The curricula have a flexible structure so that students have the opportunity to transfer from one specialization to another and follow consecutively or simultaneously two or more specialization. Areas in which graduates can work are not restrictively bounded.

Faculty of Physics graduates from all specialisations can be employed in secondary schools if they graduate the psycho-pedagogical module (psychology, pedagogy, physics teaching methodology, teaching practice). To practice in high schools they must follow a special master and the second module offered by the Department of Training for Educational Staff.

Management

Dean: Prof. PhD Mihai TOMA – tel. 201025; mtoma@uaic.ro
Vice-dean: Prof. PhD Ovidiu Florin CĂLȚUN – tel. 201176; caltun@uaic.ro

Academic and research

- ***Physics Departament***

Head of departament: Assoc. prof. PhD Vasile ȚURA – tel. 201193; vasile.tura@uaic.ro

- ***Research Departament***

Head of departament: Prof. PhD. Dumitru LUCA - tel: 201179; dluca@uaic.ro

"Center for Applied Research in Physics and Advanced Technologies CARPATH"
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"Research Center in Condensed Matter Physics"
Director: Prof. PhD Gheorghe RUSU - tel 201165; e-mail: girusu@uaic.ro

- ***Doctoral School***

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Executive Director: Prof. PhD Violeta GEORGESCU – tel. 201172; vgeor@uaic.ro

Administrative staff

Chief administrator: Ec. Sergiu DONCILĂ – tel. 201051; doncilas@uaic.ro

Secretaries

Chief Secretary: Fiz. Livia IONESCU – tel 201050; livia.ionescu@uaic.ro
Secretary: Ing. Cristina Daniela ȚUCĂ – tel: 201150; dana@uaic.ro
Secretar: yIng. Carmen LUCA – luca@uaic.ro

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Structure of academic year anului 2009 – 2010

Ist Semester		IInd Semester	
Sept.30	Official opening	Feb. 15– May 23	14 weeks didactic activity
Oct. 1– Dec.17	12 weeks didactic activity	May 24 – June 6	Summer examination session
Dec. 18– Jan.3	Winter break	June 7– June 27	Practice
Jan. 4– Jan.17	2 weeks didactic activity	7 June – 18 July	D.P.P.D. activities
Jan.18– Jan.31	Winter examination session	28 June – 1 Oct.	Holiday
Feb. 1– Feb.14	Holiday		

- Between 1 feb. – 14 feb. an reexamination session may be organized (7 days).
- No classes will be held during Easter Holidays. Classes in the third day of Easter Holiday will be delayed to another day, which the students will be informed about.
- Between 7 iunie – 27 iunie an reexamination session may be organized (7 days).
- Scholar situation for academic year 2009- 2010 will be closed at July 1.

Degree programs - Overview

Ist cycle undergraduate

A. Main field of study: *Science*

1. Bachelor's degree: **Physics**
2. Title conferred: **Bachelor's degree in PHYSICS**
3. Specializations: 180 ECTS credits* (3 years)
    - **Physics**
    - **Medical Physics**
    - **Biofizică**
    - **Physics & Informatics**
4. Specialization will be recorded in **"Diploma supplement"**

B. Main field of study: *Engineering*

1. Bachelor's degree: **Engineering**
2. Title conferred: **Bachelor's Degree in Engineering**
3. Specializations: 240 ECTS credits* (4 years)
    - **Technological Physics**
4. Specialization will be recorded in **"Diploma supplement"**

Trasee academice ce pot fi urmate de către studenți

Admission in Ist cycle in academic year 2009-2010 is organized in two main fields of study: **Physics (3 years)** and **Technological Physics (4 years)**.

The first year of study is a joint program for all specialties. Depending on the enrollment and school results obtained at the end of the year students will be assigned to specialization.

From the second year of study, but especially in the third year, the education package provides optional courses which gives the specialization, that will be developed in the second cycle - master.

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* The **credit** is a conventional unit of measuring the volume of work demanded to a student in all its forms (attendance at lectures, seminars, labs, practice, exams, projects, individual study). The purpose of introducing the European Credit Transfer System (ECTS) is to evaluate the quality of instruction and the importance to be granted for student work. Credit points are allocated on the discipline of study and student won this points through by graduating these disciplines. The credits do not replace the assessment of student through notes. The amount of credits for a semester is 30. For 3 (or 4) years of study are allocated a total of 180 (240) credits [6 (8) semester credits x 30]. Students may register in the next academic year if at least 20 credits in the current academic year are obtained. To promote academic year, students must obtain a minimum number of points determined by the faculty. The number is the sum of the products obtained at the exam grade and the number of credits allocated to the respective disciplines.

IInd cycle master

After 3 (4) years of study, students obtain a Bachelor's degree (and an additional Diploma supplement), having the opportunity to join, within the second cycle of studies (Master lasting 2 years).

The Master specializations offered by the Faculty of Physics are:

Scientific Masters

- **PLASMA PHYSICS, SPECTROSCOPY AND SELFORGANISATION (4 sem.)**
- **ADVANCED MATERIALS. NANOTECHNOLOGIES. (4 sem.)**
- **MODELLING AND SIMULATION (4 sem)**
- **BIOPHYSICS AND MEDICAL PHYSICS (4 sem.)**

Professional Masters

- **PHYSICS AND ENVIROMENTAL PROTECTION (4 sem.)**
- **PHYSICS AND DIDACTICS (4 sem.)**
- **PHYSICAL METHODS APLLIED IN KINESIOTHERAPY MEDICAL RECOVERY (4 sem.)**

Graduates of IInd cycle of study obtain a **master's degree** and may choose for an academic, teaching or scientific career.

IIIrd cycle doctoral studies

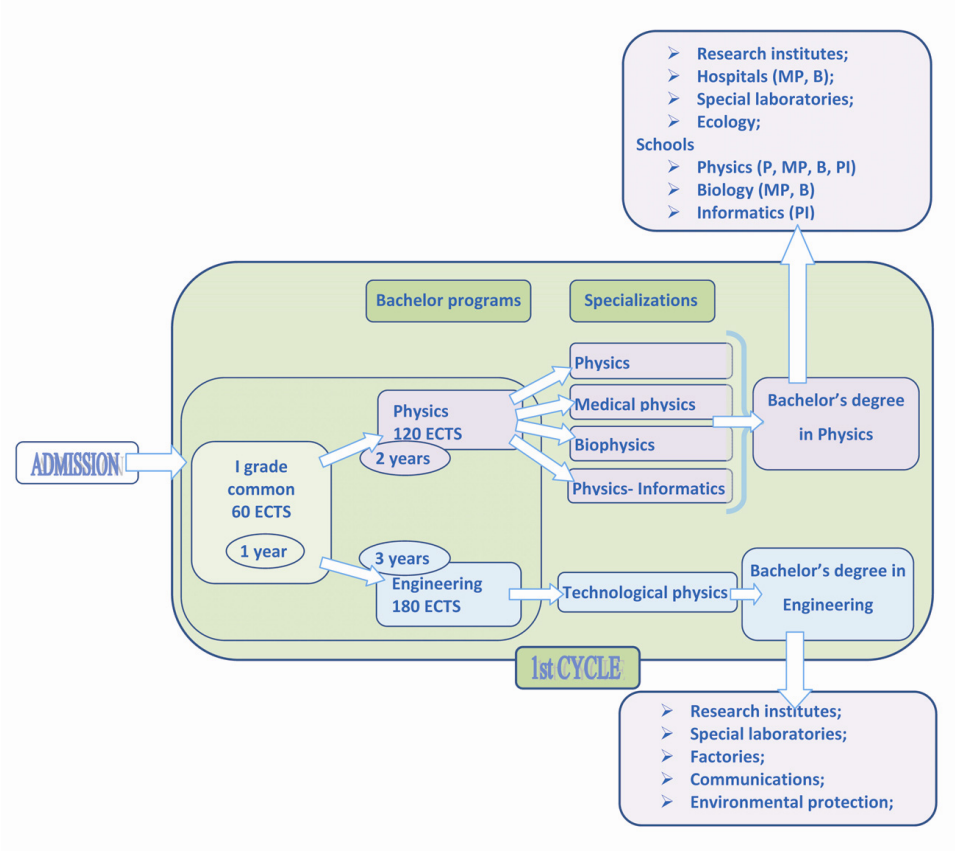
Graduates of the IInd cycle are able to improve their scientific knowledge through **doctoral studies** in the desired field. "Al. I. Cuza " University is recognized both national and international as institution organizing doctoral studies.

Within Faculty of Physics operates **Doctoral School** with 20 PhD supervisors. Doctoral School opens its doors to all master graduates with a good scientific training and scientific inclinations towards research in modern and highly specialized topics.

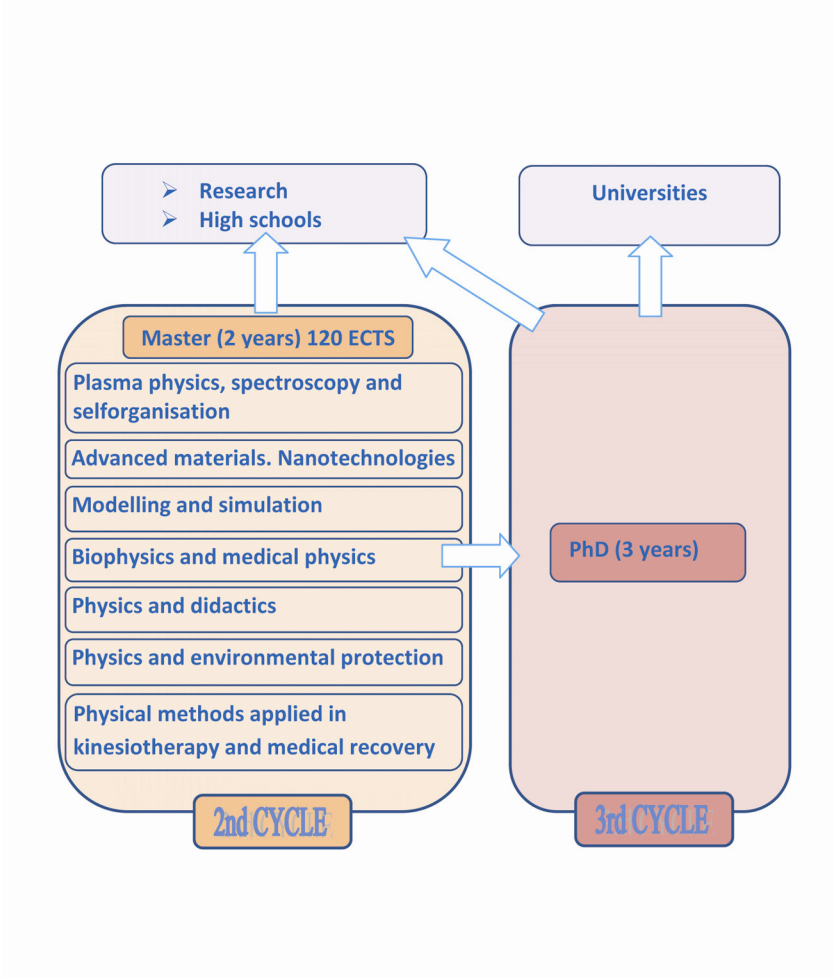
Students admitted into the DoctoralSchool follow a program of 3 years. In the first year Doctoral School organizes 2 semesters of specialized and optional. In second and third years PhD student pursue a training and research program in the field of doctoral thesis topic. Doctoral program is completed with the support of PhD thesis.

Romania's EU integration requires the harmonization of scientific research and to prepare graduates for their rapid adaptation to the professional standards of quality operating at European level.

BOLOGNA PROGRAM - FACULTY OF PHYSICS



“AL. I. CUZA” UNIVERSITY IASI



Academic Staff

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prof. Dumitru LUCA, PhD
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prof. Tudor LUCHIAN, PhD
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prof. Dacia Felicia IACOMI, PhD
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prof. Aura Marina DARIESCU, PhD
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Assoc. prof. Dumitru ALEXANDROAEI, PhD
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Assoc. prof. Viorel MELNIG, PhD
Assoc. prof. Lucel SIRGHI, PhD
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Assoc. prof. Laurentiu STOLERIU, PhD

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lect. Paul GASNER, PhD
lect. Iordana ASTEFANOAEI, PhD
lect. Ionut DUMITRU, PhD
lect. Ovidiu Gabriel AVADANEI, PhD
lect. Cristian ENACHESCU, PhD
Teach. assist. Dorin CIMPOESU, PhD
Teach. assist. Radu TANASA, PhD
Teach. assist. Petronel POSTOLACHE, PhD
Teach. assist. Serban FILOTE, PhD
Teach. assist. Bogdan MUNTEANU , PhD
Teach. assist. Radu APETREI
Res. assist. Alina CHIPER, PhD
Res. assist. Loredana MEREUTA
Res. assist. Valentin NICA
Res. assist. Ionut TOPALA, PhD

Ist cycle

Undergraduate

Curricula and

Course Informations

I[st] Year **All specialisations** **2009-2010**

No. crt.	Discipline	1st Semester					2nd Semester				
		Course	Sem.	Lab.	Ex.	Credits	Course	Sem.	Lab.	Ex.	Credits
1	General Physics	2	2	-	C	5	-	-	-	-	-
2	Classical Mecahnics	3	2	2	E	5	-	-	-	-	-
3	Molecular and Thermal Physics	3	2	2	E	5	-	-	-	-	-
4	Informational Technologies	2	-	2	E	5	-	-	-	-	-
5	Mathematical Analysis	2	2	-	C	5	-	-	-	-	-
6	Foreign Language	1	1	-	C	5	1	1	-	C	5
7	Electricity and Magnetism	-	-	-	-	-	3	2	2	E	5
8	Oscilations and Waves	-	-	-	-	-	2	-	2	E	5
9	Programming Languages	-	-	-	-	-	2	-	2	C	5
10	Algebra and Elements of Geometry	-	-	-	-	-	2	2	-	E	5
11	Laboratory Practice	-	-	-	-	-	-	4	-	C	5
12	Facultative Course	-	-	-	-	-	2	-	2	C	5
13	Physical Education - facultative	-	2	-	-	-	-	2	-	-	5
14	Courses pertaining to the DPPD	-	-	-	-	-	-	-	-	-	-
Total		**13**	**9+2**	**6**	**3E+3C**		**10+2**	**5+4+2**	**6+2**	**3E+4C**	
General total		**28 + 2**				**30**	**21 + 6 + 4**				**30+10**

II[nd] Year **Physics, Technological Physics** **2010-2011**

No. crt.	Discipline	1st Semester					2nd Semester				
		Course	Sem.	Lab.	Ex.	Credits	Course	Sem.	Lab.	Ex.	Credits
1	Differential equations and mathematical physics equations	2	2	-	E	5	-	-	-	-	-
2	Optics	3	2	2	E	5	-	-	-	-	-
3	Fundaments of chemistry	2	-	2	C	5	-	-	-	-	-
4	Theoretical mechanics	2	2	-	E	5	-	-	-	-	-
5	Data processing in physics	2	-	2	C	5	-	-	-	-	-
6	Foreign Language	1	1	-	C	5	1	1	-	C	5
7	Electronics	-	-	-	-	-	3	2	2	E	5
8	Electrodynamics and theory of relativity	-	-	-	-	-	3	2	-	E	5
9	Quantum Mechanics	-	-	-	-	-	3	2	-	E	5
10	Physics of atoms	-	-	-	-	-	2	1	2	E	5
11	Specialized practice	-	-	-	-	-	-	4	-	C	5
12	Physical education - facultative	-	2	-	-	-	-	2	-	C	5
13	Courses pertaining to the DPPD										
Total		**12**	**7+2**	**6**	**3E+3C**		**12**	**8+2+4**	**4**	**4E+3C**	
General total		**25 + 2**				**30**	**24 + 2 + 4**				**30+5**

II[nd] Year **Medical Physics, Biophysics** **2010-2011**

No. crt.	Discipline	1st Semester					2nd Semester				
		Course	Sem.	Lab.	Ex.	Credits	Course	Sem.	Lab.	Ex.	Credits
1	Differential equations and mathematical physics equations	2	2	-	E	5	-	-	-	-	-
2	Optics	3	2	2	E	5	-	-	-	-	-
3	Electrodynamics	2	2	-	E	5	-	-	-	-	-
4	Theoretical mechanics	2	2	-	E	5	-	-	-	-	-
5	Data processing in physics	2	-	2	C	5	-	-	-	-	-
6	Foreign Language	1	1	-	C	5	1	1	-	C	5
7	Electronics	-	-	-	-	-	3	2	2	E	5
8	Quantum Mechanics	-	-	-	-	-	3	2	-	E	5
9	General Biophysics	-	-	-	-	-	2	-	2	E	5
10	Physics of atoms & molecules	-	-	-	-	-	3	2	2	E	5
11	Specialized practice	-	-	-	-	-	-	4	-	C	5
12	Physical education - facultative	-	2	-	-	-	-	2	-	C	5
13	Courses pertaining to the DPPD										
Total		**12**	**9+2**	**4**	**4E+2C**		**12**	**7+2+4**	**6**	**4E+3C**	
General total		**25 + 2**				**30**	**24 + 2 + 4**				**30+5**

II[nd] Year **Physics Informatics** **2010-2011**

No. crt.	Discipline	1st Semester					2nd Semester				
		Course	Sem.	Lab.	Ex.	Credits	Course	Sem.	Lab.	Ex.	Credits
1	Differential equations and mathematical physics equations	2	2	-	E	5	-	-	-	-	-
2	Optics	3	2	2	E	5	-	-	-	-	-
3	Numerical methods and simulation in physics	2	-	2	C	5	-	-	-	-	-
4	Theoretical mechanics	2	2	-	E	5	-	-	-	-	-
5	Operating systems (Windows, UNIX)	2	-	2	E	5	-	-	-	-	-
6	Foreign Language	1	1	-	C	5	1	1	-	C	5
7	Electrodynamics and theory of relativity	-	-	-	-	-	3	2	-	E	5
8	Electronics	-	-	-	-	-	3	2	2	E	5
9	Quantum Physics	-	-	-	-	-	3	2	-	E	5
10	Physics of Atoms	-	-	-	-	-	2	1	2	E	5
11	Specialized practice	-	-	-	-	-	-	4	-	C	5
12	Physical education - facultative	-	2	-	-	-	-	2	-	C	5
13	Courses pertaining to the DPPD										
Total		**12**	**7+2**	**6**	**4E+2C**		**12**	**8+2+4**	**4**	**4E+3C**	
General total		**25 + 2**				**30**	**24 + 2 + 4**				**30+5**

IIIrd Year **Physics** **2011-2012**

No. crt.	Discipline	1st Semester					2nd Semester				
		Course	Sem.	Lab.	Ex.	Credits	Course	Sem.	Lab.	Ex.	Credits
1	Physics of molecules	2	-	2	E	5	-	-	-	-	-
2	Plasma Physics	3	-	2	E	5	-	-	-	-	-
3	Solid State Physics	2	-	2	E	5	-	-	-	-	-
4	Thermodynamics and statistical physics	2	2	-	C	5	-	-	-	-	-
5	Projection and technical designing elements	2	-	2	C	5	-	-	-	-	-
6	Optional (1)	2	-	2	C	5	-	-	-	-	-
7	Physics of semiconductors	-	-	-	-	-	2	-	2	E	5
8	Spectroscopy and lasers	-	-	-	-	-	2	-	2	E	5
9	Physics of nucleus and elementary particle physics	-	-	-	-	-	3	2	2	E	5
10	Optional (2)	-	-	-	-	-	2	-	2	C	5
11	Optional (3)	-	-	-	-	-	2	-	2	C	5
12	Optional (4)	-	-	-	-	-	2	-	2	C	5
13	History of physics (facultative)	-	-	-	-	-	2	-	-	C	5
14	Courses pertaining to the DPPD										
15	Licence										5
Total		**13**	**2**	**10**	**3E+3C**		**13+2**	**2**	**12**	**3E+4C**	
General total		**25**				**30**	**25 + 2**				**30+5**

III[rd] Year **Medical Physics** **2011-2012**

No. crt.	Discipline	1st Semester					2nd Semester				
		Course	Sem.	Lab.	Ex.	Credits	Course	Sem.	Lab.	Ex.	Credits
1	Biochemistry	2	-	2	E	5	-	-	-	-	-
2	Physics of nucleus	2	-	2	E	5	-	-	-	-	-
3	Detectors, dosimetry and radio-protection	2	-	2	E	5	-	-	-	-	-
4	Thermodynamics and statistical physics	2	2	-	E	5	-	-	-	-	-
5	Numeric and analogical modelling of biological processes	2	-	2	C	5	-	-	-	-	-
6	Optional (1)	2	-	2	C	5	-	-	-	-	-
7	Radiology and medical imagistics	-	-	-	-	-	2	-	2	E	5
8	Electronic and medical instrumentation	-	-	-	-	-	2	-	2	E	5
9	Human anatomy and physiology	-	-	-	-	-	2	-	2	E	5
10	Optional (2)	-	-	-	-	-	2	-	2	C	5
11	Optional (3)	-	-	-	-	-	2	-	2	C	5
12	Optional (4)	-	-	-	-	-	2	-	2	C	5
13	Courses pertaining to the DPPD										
14	Licence										5
Total		**12**	**2**	**10**	**4E+2C**		**12**	**0**	**12**	**3E+3C**	
General total		**24**				**30**	**24**				**30+5**

III[rd] Year **Biophysics** **2011-2012**

No. crt.	Discipline	1st Semester					2nd Semester				
		Course	Sem.	Lab.	Ex.	Credits	Course	Sem.	Lab.	Ex.	Credits
1	Biochemistry	2	-	2	E	5	-	-	-	-	-
2	Solid state physics and semiconductor	2	-	2	E	5	-	-	-	-	-
3	Physics of nucleus	2	-	2	E	5	-	-	-	-	-
4	Thermodynamics and statistical physics	2	2	-	E	5	-	-	-	-	-
5	Numeric and analogical modelling of biological processes	2	-	2	C	5	-	-	-	-	-
6	Optional (1)	2	-	2	C	5	-	-	-	-	-
7	Molecular and cellular biology. Elements of genetics	-	-	-	-	-	2	-	2	E	5
8	Human anatomy and physiology	-	-	-	-	-	2	-	2	E	5
9	Elements of biostructure						2	-	2	E	5
10	Optional (2)	-	-	-	-	-	2	-	2	C	5
11	Optional (3)	-	-	-	-	-	2	-	2	C	5
12	Optional (4)	-	-	-	-	-	2	-	2	C	5
13	Courses pertaining to the DPPD										
14	Licence										5
Total		**12**	**2**	**10**	**4E+2C**		**12**	**0**	**12**	**3E+3C**	
General total		**24**				**30**	**24**				**30+5**

IIIrd Year **Technological Physics** **2011-2012**

No. crt.	Discipline	1st Semester					2nd Semester				
		Course	Sem.	Lab.	Ex.	Credits	Course	Sem.	Lab.	Ex.	Credits
1	Physics of molecules	2	-	2	E	5	-	-	-	-	-
2	Plasma Physics	3	-	2	E	5	-	-	-	-	-
3	Solid State Physics	2	-	2	E	5	-	-	-	-	-
4	Projection and technical designing elements	2	-	2	C	5	-	-	-	-	-
5	Computer networks and administration	2	-	2	C	5					
6	Thermodynamics and statistical physics	2	2	-	C	5	-	-	-	-	-
7	Physics of semiconductors	-	-	-	-	-	2	-	2	E	5
8	Spectroscopy and lasers	-	-	-	-	-	2	-	2	E	5
9	Physics of nucleus and elementary particle physics	-	-	-	-	-	3	2	2	E	5
10	Technological application of plasma physics	-	-	-	-	-	2	-	3	C	5
11	Modern study methods in solid state structure	-	-	-	-	-	2	-	2	C	5
12	Technological practice	-	-	-	-	-	-	4	-	C	5
13	Courses pertaining to the DPPD										
Total		**13**	**2**	**10**	**3E+3C**		**11**	**2+4**	**11**	**3E+3C**	
General total		**25**				**30**	**24+4**				**30+5**

III[rd] Year — Physics Informatics — 2011-2012

No. crt.	Discipline	1st Semester					2nd Semester				
		Course	Sem.	Lab.	Ex.	Credits	Course	Sem.	Lab.	Ex.	Credits
1	Data Bases	2	-	2	C	5	-	-	-	-	-
2	Physics of molecules	2	-	2	E	5	-	-	-	-	-
3	Plasma Physics	3	-	2	E	5	-	-	-	-	-
4	Solid State Physics	2	-	2	E	5	-	-	-	-	-
5	Thermodynamics and statistical physics	2	2	-	C	5	-	-	-	-	-
6	Optional (1)	2	-	2	C	5	-	-	-	-	-
7	Computer programming (C, C++)	-	-	-	-	-	2	-	2	C	5
8	Computer networks and administration	-	-	-	-	-	2	-	2	E	5
9	Physics of nucleus and elementary particle physics	-	-	-	-	-	3	2	2	E	5
10	Optional (2)	-	-	-	-	-	2	-	2	C	5
11	Optional (3)	-	-	-	-	-	2	-	2	C	5
12	Optional (4)	-	-	-	-	-	2	-	2	C	5
13	History of physics (facultative)	-	-	-	-	-	2	-	-	C	
14	Courses pertaining to the DPPD										
15	Licence										5
Total		**13**	**2**	**10**	**3E+3C**		**13+2**	**2**	**12**	**2E+5C**	
General total		**25**				**30**	**27+2**				**30+5**

IVth Year **Technological Physics** **2012-2013**

No. crt.	Discipline	1st Semester					2nd Semester				
		Course	Sem.	Lab.	Ex.	Credits	Course	Sem.	Lab.	Ex.	Credits
1	Non-destructive physical measurement and control methods	2	-	2	E	5	-	-	-	-	-
2	Microwave physics. Applications	2	-	2	E	5	-	-	-	-	-
3	Physics and technology of polarized media	2	-	2	E	5	-	-	-	-	-
4	Data storage technologies and materials	2	-	2	C	5	-	-	-	-	-
5	Technology transference	2	-	2	C	5	-	-	-	-	-
6	Optional (1)	2	-	2	C	5	-	-	-	-	-
7	Physics of partially ordered systems	-	-	-	-	-	2	-	2	E	5
8	Laser physics and technological applications	-	-	-	-	-	2	-	2	E	5
9	Physics and technology of magnetic materials	-	-	-	-	-	2	-	2	E	5
10	Optional (2)	-	-	-	-	-	2	-	2	C	5
11	Optional (3)	-	-	-	-	-	2	-	2	C	5
12	Optional (4)	-	-	-	-	-	2	-	2	C	5
13	Licence	-	-	-	-	-	-	-	-	-	5
Total		**12**	**0**	**12**	**3E+3C**		**12**	**0**	**12**	**3E+3C**	
General total		**24**				**30**	**24**				**30+5**

Course title: *General Physics*

Type of course: compulsory **Level of course:** undergraduate

Year of study: I **Semester** : 1 **ECTS credits:** 5

Name of lecturer: Prof. dr. Mihai TOMA

Objectives:

This course is a liberal arts course in the fundamental principles of physics. Units include measurement, kinematics, mechanics, rotational motion, fluids, temperature and heat, and waves and sound. The objective of the course is to strength the student's understanding of the concepts and principles through a broad coverage of interesting applications to the real world in the areas sciences. The student is expected to obtain a systematic, independent and creative way of thinking in physics.

Prerequisites: basic high-school knowledge in physics

Course content:

1. Motion: mechanical motion, thermal motion, liquids flow, motion of charged particles in electric and magnetic field; 2. Forces: Newton's laws, forces of gravity and weight, friction forces, elastic forces, forces of inertia, pressure, surface tension, electric forces, magnetic forces; 3. Work, energy, power: work, conservative forces, kinetic and potential energy, laws of conservation, mean energy of a molecule, electric field energy, magnetic field energy, power; 4. Oscillations and waves: mechanical oscillations, electrical oscillations, elastic waves, electromagnetic waves.

Reccomended reading:

M.A. Oncescu – *Fizica, nivel postliceal*, vol I, II, Ed. did. şi ped., Bucureşti, 1975
F.W. Sears, M.W. Zemansky, H.D. Young – *Fizica*, Ed. did. şi ped., Bucureşti, 1983
D. Holliday, R.Resnick – *Fizica*, vol I, II, Ed. did. şi ped., Bucureşti, 1975
R. Koch – *Cum rezolvăm o problemă de fizică?* Ed. did. şi ped., Bucureşti, 1971
T. Crețu – *Probleme şi ...greşeli în fizică*, Ed. Tehnică., Bucureşti, 1992
S. Mihail – *Probleme de performanță în fizică*, Ed. Tehnică, Bucureşti, 1992

Teaching methods: lecture, class discussion, brainstorming.

Assessment methods: periodical evaluation, final exam, portfolio

Language of instruction: Romanian

Course title: *Classical Mechanics*

Type of course: compulsory **Level of course:** undergraduate

Year of study: I **Semester** : 1 **ECTS credits:** 5

Name of lecturer: Prof. dr. Dumitru LUCA

Objectives:

(a) Acquiring basic and applied knowledge in Newtonian mechanics; (b) Developing abilities to integrate this knowledge in the framework of classical and modern physics; (c) Developing team-working abilities through lab experiments and small-group research projects; (d) Developing the skills in problems solving and individual study

Prerequisites: basic high-school knowledge in physics

Course content:

This is done by a system-based approach following the path from simple to complex. Leaving from particle mechanics and continuing with discrete systems and continua, the main physical laws are introduced and the implication of the theory in the real life is analyzed. The study of more complex models, such as deformable bodies and flow in viscous media conclude the taught topics. A large number of lecture life demonstration experiments, as well as hands-on devices in the lab complete the experiments, which are performed throughout the semester in two-hours sessions. Integration of computer-assisted experiments in the laboratory is an additional major concern of the teaching staff. Course textbook, experiments description, references for individual lecture, useful Internet resources and other media support for further study are available on the site of the laboratory (http://newton.phys.uaic.ro)..

Reccomended reading:

D. Luca, C. Stan, *Mecanica fizica, Partea I: Mecanica punctului material*, Tehnopres, Iaşi, 2004;
D. Luca, C. Stan, *Mecanica fizica, Partea a II-a: Mecanica mediilor continui*, Stef, Iaşi, 2006.
A. Arya, *Introduction to Classical Mechanics*, Prentice Hall, 1990 (1-st ed.) and 1998 (2-nd ed).
F.W. Sears, M. Zemanski, *Fizica* generala, EDP 1983.
D. Halliday, R. Resnick, *Fizica* vol I, Bucuresti, EDP, 1972.
M. Sanduloviciu, *Mecanica*, UAIC Press, Iasi, 1982.
Ch. Kittel, *Mecanica (vol. I Cursul de fizica Berkeley)*, ET Bucuresti, 1984.
A. Hristev, *Mecanica si acustica*, EDP, Bucuresti, 1982.
C. Plăviţu et al, *Probleme de mecanică fizică şi acustică*, EDP Bucureşti, 1981.

Teaching methods: lecture, class discussion

Assessment methods: periodical evaluation, final exam

Language of instruction: Romanian

Course title: *Molecular Physics and Heat*

Type of course: compulsory **Level of course:** undergraduate

Year of study: I **Semester** : 1 **ECTS credits:** 5

Name of lecturer: Prof. Dr. Violeta GEORGESCU

Objectives:

Students should learn about classical thermodynamics, statistical physics and thermal phenomena.

Prerequisites: elementary knowledge of Mathematics and Physics at the level of high school

Course content:

Introductory notions of thermodynamics. Temperature and thermometry. Zeros principle of thermodynamics. Heat and calorimetry. First principle of thermodynamics with applications to ideal gas. Second principle of thermodynamics. Entropy. Third principle. Fundamental equation of thermodynamics. Thermodynamic potentials: internal energy, enthalpy, free energy, free enthalpy. Elements of kinetic theory of gases. Boltzmann and Maxwell distributions. Kinetic theory of heats. Collisions between molecules. Transport phenomena. Real gases: Van der Waals equation. General properties of liquids. Surface tension, capillarity. Phase transitions. Clausius-Clapeyron equation. Applications.

Reccomended reading:

Violeta Georgescu, Liviu Leontie, Mardarie Sorohan, *Fizică moleculară şi Termodinamică*, Ed. Univ. Al. I. Cuza Iaşi, 2006

Violeta Georgescu, M. Sorohan, *Fizica moleculară*, Ed. Univ. Al. I. Cuza Iaşi, 1996

C. N. Plăviţu, *Fizica fenomenelor termice*, vol. I-III, Ed. Hyperion, Bucureşti, 1992-1994

Teaching methods: lecture, class discussion

Assessment methods: periodical evaluation, final exam

Language of instruction: Romanian

Course title: *Information Technology*

Type of course: compulsory **Level of course:** undergraduate

Year of study: I **Semester** : 1 **ECTS credits:** 5

Name of lecturer: Lect. Dr. Cristian ENĂCHESCU

Objectives:

The main objectives of this course are the presentation of the most important elements of the information technology, including concepts and base vocabulary, operating systems, materials, programs, computer's architecture and functions. The students will learn how to use the Office programs commonly used: Microsoft Word, Excel and Powerpoint. An introduction to the graphics facilities provided by computers will be presented. The students will learn also about the efficient use of the Internet, with an accent on scientific information search and will be able to compose simple Internet sites. The course contains a section concerning the copyrights.

Prerequisites: none

Course content:

Computer architecture. Components and function. Windows operating system: main features. Organizing files and folders (saving, copying, deleting etc.).CD-DVD burning. Creating documents in Microsoft Word. Creating presentations in Microsoft PowerPoint. Calculus in Microsoft Excel. Data treatment in Microcal Origin. Searching on the web. Web design:HTML, Frontpage. Multimedia use of computers. Legal problems in information technology. Copyrights.

Reccomended reading:

Chris Fehily *WINDOWS XP. Ghid vizual*, Editura Teora, Bucureşti, 2005
Nathan J. Muller *Enciclopedia Internet*, Editura Tehnica, 2004
Gilbert Held, *Comunicații de date*, Editura Teora, Bucureşti, 1998
Microsoft Press, *Curs rapid Microsoft Office*, Editura Teora, Bucureşti, 2007
Teodora Gugoiu, *HTML prin exemple*, Editura Teora, Bucureşti, 2001

Teaching methods: Presentations using video projector

Assessment methods: Written and Oral Exams (practical exam on computer)

Language of instruction: Romanian

Course title: *Mathematical Analysis*

Type of course: compulsory **Level of course:** undergraduate

Year of study: I **Semester** : 1 **ECTS credits:** 5

Name of lecturer: Conf. Dr. Monica FRUNZĂ

Objectives:

The students should obtain knowledges of theoretical fundamentals and of practical methods of differential and integral calculus.

Prerequisites: none

Course content:

Convergent sequences and series; tests of convergence and divergence. Operations on series. Limits of functions and continuity. Properties of continuous functions. Differentiation of functions. The operations on differentiable functions. Derivatives of elementary functions. Derivatives of higher orders, Partial differentiation, differentiation of composite functions, higher order derivatives and differentials. Integrability. Indefinite integrals. Integration by substitution and by parts, integration of rational functions. Integration of irrational and trigonometric functions. Definite integrals. Methods of integration. The areas of plane figures, the arc length of a curve, the area of a surface of revolution, centres of gravity. Integrals with parameters. Improper integrals, improper integrals with parameters. Line integrals, the independence of path, exact differentials. Applications in mechanics and thermodynamics. Multiple integrals. Double and triple integrals, iterated intergrals, change of variables in integrals, spherical and cylindrical coordinates. Green's formula. The center of mass of a body, the moment of inertia. Surface integrals.

Reccomended reading:

Aramă, L., Morozan, T., *Culegere de probleme de calcul diferenţial şi integral*, Ed.Tehnică, Bucureşti, 1978
Boas,M.L., *Mathematical methods in the physical sciences (second edition*), John Wiley & Sons, New York, Chichester, Brisbane, Toronto, Singapore, 1983
Bucur, Gh., Câmpu, E., Găină, S., *Culegere de probleme de calcul diferenţial şi integral*, vol.II, III, Ed.Tehnică, Bucureşti, 1978.
Demidovich, B., *Problems in Mathematical Analysis*, Mir Publishers, Moscow, 1977.
Fihtenhol', G.M., *Curs de calcul diferenţial şi integral*, vol.I, II, III, Ed.Tehnică, Bucureşti, 1964, 1965.
Frunză, Şt., *Analiză matematică*, p. a-II-a, vol.I, II, U. "Al. I. Cuza" Iaşi, 1987, 1992.

Teaching methods: lecture, class discussion

Assessment methods: Written and Oral Exams

Language of instruction: Romanian

Course title: *Electricity and Magnetism*

Type of course: compulsory **Level of course:** undergraduate

Year of study: I **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Prof. dr. Alexandru STANCU

Objectives:

Students should obtain knowledge of fundamentals laws of electrostatic, magnetostatic, electromagnetic phenomena, and of electrical circuits laws.

Prerequisites: Mathematical Analysis, Classical Mechanics

Course content:

Electrostatic interactions in vacuum. Coulomb's law. Field and potential of electrostatic distribution of charges. Gauss' theorem. Field lines and equipotential surfaces. Dipole moment. Poisson and Laplace's equations. Conductors in electrostatic equilibrium. Properties of electric field in the vicinity and in vacuum between conductors. Coulomb's theorem. Capacitance. Condensers. Electric field in dielectrics. Polarisation. Displcement. Permittivity and susceptibility. Boundary conditions. Effective field in dielectrics. Polarizability. Polarization processes of non polar and polar dielectrics. Ferroelectrics. Electrostatic energy. Volume density of energy. Relations between force, moment of force and energy. Direct current. Current density vector. Conductivity. Ohm's law (local and integral). Resistance. Joule's law (local and integral). Electric power. Linear circuits. Kirchhoff's laws. Lorentz force, magnetic field in vacuum. Biot-Savart-Laplace's law. Ampère's theorem. Vector potential.. Magnetic field in matter. Magnetization vector. Magnetic field strength.. Permeability and susceptibility. Classical theories of diamagnetism, paramagnetism and ferromagnetism. Variable regimes. Electromgnetic induction. Lenz's law. Faraday's law (integral and differential). Mutual and self induction. Eddy currents. Magnetic energy. Quasistationary A.C. circuits. Work and power of alternating current. Transformers. Mxwell's equations. Displacement current. Propagtion of electromgnetic waves. Propagtion of electromagnetic energy. Poynting's theorem.

Reccomended reading:

C. Papusoi, A. Stancu, *Tratat de electricitate si magnetism*, partea I, Ed. Cartea Universitara, 2006
E.M.Purcell, *Electricitate si magnetism* , Cursul de Fizica Berkeley, vol II Ed. Did.&Ped., 1982.
Vasile Tutovan, *Electricitate si magnetism*, vol. I Editura Tehnica Bucuresti 1986
Web resources. Power Point Presentations

Teaching methods: lecture, class discussion, presentations using video projector

Assessment methods: Written and Oral Exams

Language of instruction: Romanian

Course title: *Vibrations and Waves*

Type of course: compulsory **Level of course:** undergraduate

Year of study: I **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Prof. dr. Dumitru LUCA

Objectives:

(a) Acquiring basic and applied knowledge in the field of spatially and temporally periodicphenomena; (b) Developing abilities to integrate this knowledge in the framework of classical and modern physics; (c) Developing team working abilities through lab experiments and small-group research projects; (d) Developing the skills in problems solving and individual study.

Prerequisites: Classical Mechanics, Mathematical Analysis, Electricity and Magnetism

Course content:

This is done by a system-based approach following an analysis path leaving from simple to complex physical systems that undergo periodic changes of some of their parameters. Leaving from free (harmonic and/or damped) vibrations in mechanical, electrical and magnetic systems, the study advances towards forced vibrations of the systems, by focusing on general framework and patterns of the processes, such as transients, energy transfer and resonance. Fourier analysis is introduced here as a means to investigate nonlinear oscillations. The second part of the course deals with propagatory phenomena in elastic media. The specific elastic wave propagation phenomena are introduced and their similarity in terms of general features with the ones encountered in electro-dynamics and optics is discussed. A particular stress is always done on the implication of the theory in the real life. A large number of life demonstration experiments during each lecture, as well as hands-on devices in the lab complete the experiments performed throughout the semester in twohours sessions. Integration of computer-assisted experiments in the laboratory work and lecture demonstration is an additional major concern of course. Course textbook, experiments description, references for individual lecture, useful Internet resources and other media support for further study are available on the site of the laboratory (http://newton.phys.uaic.ro).

Reccomended reading:

D. Luca, C. Stan, *Mecanica punctului material*, Tehnopres, Iaşi, 2004;
D. Luca, C. Stan, *Mecanica mediilor continui*, Stef, Iaşi, 2006.
A. Arya, *Introduction to Classical Mechanics*, Prentice Hall, 1990,1998.
F.W. Sears, M. Zemanski, *Fizica generala*, EDP 1983.
D. Halliday, R. Resnick, *Fizica vol I*, Bucuresti, EDP, 1972.
A. Hristev, *Mecanica si acustica*, EDP, Bucuresti, 1982.
C. Plăviţu et al, *Probleme de mecanică fizică şi acustică*, EDP Bucureşti, 1981.
S. Popescu, *Oscilaţii mecanice, unde elastice şi acustică*, Matrix Rom, Buc., 2003.

Teaching methods: lecture, class discussion

Assessment methods: periodical evaluation, final exam

Language of instruction: Romanian

Course title: *Programming Languages*

Type of course: compulsory **Level of course:** undergraduate

Year of study: I **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Conf. dr. Laurentiu STOLERIU

Objectives:

Developing the students' capacity of using C programming language in practical situations like the case of simple calculus problems with applications in physics. Introducing the idea of procedural programming. Learning programming techniques for small and medium applications. Learning basic techniques in programming design.

Prerequisites: Mathematics at high school level

Course content:

Stages of producing software. First steps in C language. Syntax. Fundamental data types. Keywords. Input / Output. Representation of data in memory. Bit operators. Functions. Arrays and pointers. Operating with pointers. Initialization of 1D arrays. 2D arrays. Dynamic allocation of memory. Working with strings.

Reccomended reading:

http://stoner.phys.uaic.ro/moodle/
Liviu Negrescu, *Limbajele C şi C++ pentru începători*, Ed. Microinformatica, 1996.
Brian Kernighan, Dennis Ritchie, *Limbajul de programare C*, Ed. Teora, 2001.
Kris Jamsa, Lars Klander, *Totul despre C şi C++,* Ed. Teora, 2002.
Microsoft MSDN Library.

Teaching methods: Lecture, debate

Assessment methods: two tests and practical applications 50%, final exam 50%

Language of instruction: Romanian

Course title: *Algebra and Elements of Geometry*

Type of course: compulsory **Level of course:** undergraduate

Year of study: I **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Conf. Dr. Ioan BUCATARU

Objectives:

Students should obtain knowledge on vectorial spaces and linear transformations with their applications in analytical geometry and in the geometry of curves and surfaces. The theory will be trained in seminars.

Prerequisites: Mathematics at high school level

Course content:

Linear spaces; Linear and multi-linear transformations; Tensorial calculus; Inner product. Euclidean vector spaces; Applications of linear algebra in analytical geometry; Orthogonal transformations in plane and in space; The problems on line and space; Conics and quadrics. Classifications; Plane and space curves. Surfaces. Curves on surfaces; The first and the second fundamental forms.

Reccomended reading:

I. Pop, Gh. Neagu, *Algebra liniara si geometrie analitica în plan si spatiu*, Ed. Plumb, Bacau, 1996.
M. Craioveanu, I.D. Albu, *Elemente de geometrie afina si euclidiana*, Ed. Facla, Timisoara, 1982.
L.Raileanu, *Prin algebra spre geometrie*, Ed. Alexandru Myller, Iasi, 2005.

Teaching methods: Lecture, debate

Assessment methods: written and oral exams

Language of instruction: Romanian

Course title: *Foreign Language*

Type of course: compulsory **Level of course:** undergraduate

Year of study: I and II **Semester** : 1-4 **ECTS credits:** 5

Name of lecturer:

English: Lect. dr. Lucretia CARLOANTA

French: Conf.dr. Oana POPARDA, Conf. dr. Magda CIOPRAGA

German: Asist. Dr. Delia ESIAN, Asist. dr. Ana-Maria PALIMARIU

Objectives:

Cursul se adreseaza studentilor din anii I si II, aflati la un nivel mediu de limba si îsi propune, ca obiectiv general, pregatirea studentilor pentru a functiona eficient într-o limba straina în viitoarea lor profesie. El se constituie ca o prima etapa de consolidare a cunostintelor gramaticale. Se pune accent pe dezvoltarea acelor deprinderi de limba folosite în viata cotidiana. Continutul textelor acopera o gama variata de situatii obisnuite de viata si are scopul de a expune studentii la practicarea limbajului (si a functiilor sale) în contexte reale. Cursul pune accent pe însusirea, îmbogatirea, ordonarea, sistematizarea, consolidarea si folosirea practica a cunostintelor privitoare la lexicul limbii (straine) contemporane vorbite. Chestiunile gramaticale vor fi ilustrate de texte de actualitate din diferite domenii (stiinta, tehnica, psihologie, sport etc.).

Metode de predare: Metoda comunicativa, Expunere interactiva, argumentatie, joc de roluri, citire / traducere / redactare texte

Evaluare: Examen scris, Evaluare continua pe parcursul semestrului

Limba de predare: engleza, franceza, germana

Course title: ***Differential Equations and Mathematical Physics Equations***

Type of course: compulsory **Level of course:** undergraduate

Year of study: II **Semester** : 1 **ECTS credits:** 5

Name of lecturer: Prof. dr. Gheorghe ANICULAESEI

Objectives:

The aim of the course is to understand the main mathematical models described by differential and partial differential equations and the classical techniques used to solve them

Prerequisites: Mathematical Analysis

Course content:

Elementary differential equations. Cauchy- picard local existence and uniqueness theorem for first-order differential equations. Linear differential equations of higher order. The Laplace transform. Systems of linear differential equations. Homogeneous and nonhomogeneous systems- variation of constants method. Liapunov-stability for first order differential systems, linear and nonlinear. Partial differential equations: a brief description of heat, wave and Laplace's equations

Reccomended reading:

Gh. Aniculaesei, *Ecuatii diferentiale si ecuatiile fizicii matematice*, Editura Universitatii Al I. Cuza, Iasi, 2003
Gh Aniculaesei & S Anita, *Ecuatii cu derivate partiale. Culegere de probleme*, Editura Universitatii Al I. Cuza, Iasi, 2001
V Barbu, *Ecuatii diferentiale*, Editura Junimea, Iasi, 1985.
Gh Morosanu, *Ecuatii diferentiale. Aplicatii*, Biblioteca profesorului de matematica, Editura Academiei R.S.R., 1989
I. I. Vrabie, *Ecuatii diferentiale*, Editura MATRIX ROM, Bucuresti, 1999
V. Barbu, *Probleme la limita pentru ecuatii cu derivate partiale*, Editura Academiei Romane, 1993.
A. Haimovici, *Ecuatiile fizicii matematice*, EDP, Bucuresti, 1966.

Metode de predare: Exposition

Evaluare: Two written tests during the semester. The final exam consists in a written test from the last third of the course.

Language of instruction: Romanian

Course title: *Optics*

Type of course: compulsory **Level of course:** undergraduate

Year of study: II **Semester** : 1 **ECTS credits:** 5

Name of lecturer: Prof. dr. Maria NEAGU

Objectives:

Imparting knowledge concerning: the optical radiation characteristics and the phenomena in which they are involved, radiation propagation in substance, functional principles of the optical and spectral devices.

Prerequisites: Electricity and magnetism, Oscillations and waves, Mathematical concepts

Course content:

1. Optical electromagnetic waves (Electromagnetic wave propagation in vacuum; Structure of the optical electromagnetic waves generated by atomic systems; The energy law of the electromagnetic wave; Optical radiations generated by a punctiform source; Polarization state of the optical radiations; Propagation of plane harmonic optical electromagnetic waves in the substance; Induced anisotropy; Diffusion of the optical radiation; Absorbtion and dispersion of the optical radiation). 2. Optical phenomena produced in the vicinity of the separation surface between two substances (Reflection and refraction of optical radiation). 3. The action of a substance layer on the optical radiations . 4. Geometrical optics (Basic principles; Dioptre; Mirrors; Centered optical systems; Lenses; Centered optical systems made of two thin lenses; Defects of the centered optical systems).5. Optical prisms (Isotropic and anisotropic optical prisms). 6. Sources and detectors for optical radiations. Radiometry. Photometry (Sources of optical radiations; Optical radiation detectors; Radiometry and Photometry). 7. Interference of the optical radiations. Diffraction of the optical radiations. 9. Optical devices (Microscope, Telescope)

Reccomended reading:

V. Pop, *Bazele opticii*, Intreprinderea Poligrafica Iasi (1988)
M. Delibaş, *Curs de optică*, Ed. Univ. “Al. I. Cuza”, Iaşi (1998)
M. Klein, *Optics*, John Wiley & Sons Inc., New York (1970)
G. Moisil, E. Curatu, *Optică teorie şi aplicații*, Ed. Tehnică, Bucureşti (1986)
M. Delibaş, D. Dorohoi, *Lucrări practice de optică*, Ed. Univ. “Al. I. Cuza”, Iaşi (1999)
S. Gurlui, M. Delibas, *Optica, Exerciții şi probleme*, Ed. Tehnopress, Iaşi (2005)
G. Singurel, M. Strat, D. Dorohoi, A. Bradu, *Probleme de optica*, Ed. Univ. “Al. I. Cuza”, Iaşi (2001)
M. Neagu, *Elipsometrie. Magneto-optică*, Editura Stef, Iaşi (2007)

Teaching methods: Lecturing. Experiments during the lectures. Laboratory experiments. Seminary

Assessment methods: Written and oral exam (50%). Laboratory and seminary works evaluation (50%)

Language of instruction: Romanian

Course title: ***Fundaments of Chemistry***

Type of course: compulsory **Level of course:** undergraduate

Year of study: II **Semester** : 1 **ECTS credits:** 5

Name of lecturer: Conf.Dr. Maria ALEXANDROAEI

Objectives:

Students should obtain knowledge of theoretical fundamentals and of practice methods in general chemistry

Prerequisites: Mathematics at high school level

Course content:

Introduction. Chemical evolution: nucleosynthesis. Matter and Energy. The structure of atoms, molecules and ions. Chemical bonds. Forces between atoms, ions and molecules: states of matter. Acids and Bases. Ionic equilibrium solutions. Colloids. Chemical reactions: general characterization. The relationship between the type of chemical bond and some chemical and physical properties. Organic chemistry: general remarks.

Bibliografie:

C.D.Nenițescu, *Chimie generală*, Ed.Did. şi Pedagogică, Bucureşti, 1972;
L.Pauling, *Chimie generală*, Ed.Ştiințifică, Bucureşti, 1972;
A.Batca, *Chimie generală pe înțelesul tuturor*, EDP, Bucureşti, 1995;
G.Parlea, *Chimie generală, îndrumător de lucrări practice*, Ed.MIRTON, Timişoara, 2003
A.Turtureanu, *Chimie generală*, Ed.Univ."L.Blaga" Sibiu, 2004;
G.E.Badea, *Chimie generală*, Ed.Universității Oraddea, 2003,
A.Stoian, *Chimie generală, lucrări practice*, Ed.Univ."Dunărea de Jos" Galați, 1998.

Teaching methods: Lecture, debate

Assessment methods: written and oral exams

Language of instruction: Romanian

Course title: *Theoretical Mechanics*

Type of course: compulsory **Level of course:** undergraduate

Year of study: II **Semester** : 1 **ECTS credits:** 5

Name of lecturer: Lect. Dr. Iordana ASTEFANOAIEI

Objectives:

The main objective of this course is to introduce to the students the analithycal methods of the mechanics that allows the solving of the wide and concrete physics applications. This course offers the various models for application of different theoretical formalisms in the various fields of physics. By his content, the mechanics course helps the students of physics faculty at the understanding and deepening of the physics knowledge.

Prerequisites: Classical Mechanics, Diferential Ecuations, General Physics

Course content:

I. Short history. Newtonian Classic Principles. Fundamental elements (notions and general teorems) for the mechanics of material point and the sistem of material points. II. Analithycal mechanics principles; Lagrangean and Hamiltonian Formalism; III. Aplications of the analithycal mechanics methods for the study of discrete systems of the particles IV. Mechanics of the continuu deformable media. V. The study of the continuu deformable media models.

Reccomended reading:

I. Mercheş, L. Burlacu, *Mecanică analitică şi a mediilor deformabile*, Ed. Didactică şi Pedagogică, Bucureşti, 1983.
I. Mercheş, L. Burlacu, *Applied Analytical Mechanics*, “The Voice of Bucovina” Press, Iaşi, 1995.
L. Dragoş, *Principiile mecanicii analitice*, Ed. Tehnică, Bucureşti, 1976.
T.C. Bradbury, *Theoretical Mechanics*, J. Wiley & Sons, Inc., New-York, London, Sydney, 1968.

Teaching methods: Highway lecture, Discussion, Demonstration at the blackboard.

Assessment methods: written and oral exams

Language of instruction: Romanian

Course title: ***Data Processing in Physics***

Type of course: compulsory **Level of course:** undergraduate

Year of study: II **Semester** : 1 **ECTS credits:** 5

Name of lecturer: Lect. Dr. Catalin AGHIORGHIESEI

Objectives:

Experimental data processing in physics. Algorithms in numerical computation. Using programming languages for algorithms applications. Solving problems in physics using numerical methods.

Prerequisites: Programming Languages, General Physics, Mathematical Analysis

Course content:

Approximate numbers and errors. Solving nonlinear equations. Numerical methods for linear equations systems. Polynomial interpolation. Numerical derivation of real functions. Numerical integration. Numerical methods for ordinary differential equations.

Reccomended reading:

Catalin Agheorghiesei, *Notite de curs*, www.plasma.uaic.ro
Adrian Bradu, *Analiza numerica. Exercitii si probleme*, Univ. "Al. I. Cuza" Iasi, 2001.
Titus Adrian Beu, *Calcul numeric în C*, Microinformatica, Cluj, 2000.
Titus Adrian Beu, *Analiza numerica în Pascal*, Microinformatica, Cluj, 1998.
W. H. Press, S. A. Teukolsky, W. T. Vetterling, B. P. Flannery. *Numerical Recipes in C The Art of Scientific Computing*. Cambridge University Press, Cambridge, New York, second edition, 1997

Teaching methods: observation, algorithm, explanation, problems

Assessment methods: 50% practical works, 50% final test

Language of instruction: Romanian

Course title: *Electronics*

Type of course: compulsory **Level of course:** undergraduate

Year of study: II **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Conf. dr. Florin Mihai TUFESCU

Objectives:

To analyse and exemplify the functioning of the main types of semiconductor devices and to introduce important applications. To study the principles and to analyse the functioning of the main types of electronic circuits and of their applications. To enable students to acquire the skils needed to develop creative solutions to new problems in this constantly growing field of research. To introduce new devices and circuits and to discuss their functions and potential use in installations and equipments, with direct reference to the physicist's own areas of interest.

Prerequisites: Electricity and Magnetism, Mathematics

Course content:

Passive components such as resistors, capacitors, coils, transformers. The pn junction. Diodes, applications. Bipolar transistors, coefficients and characteristics of bipolar transistors, polarizations, applications. Field effect transistors (FET): MOSFET and JFET. Amplification. Feedback in amplifiers. Operational amplifiers. Sinusoidal oscillators. Switching circuits and digital circuits. Analogue to digital conversion. Data acquisition systems. Integrated circuits.

Reccomended reading:

V.M.Cătuneanu (coord), *Materiale pentru electronică*, ed.did.şi ped.Bucureşti 1982
Dumitru D.Sandu, *Dispozitive şi circuite electronice*, Ed. did.şi ped.Buc.1975
D. D.Sandu, *Electronica fizică si aplicată, Vol.I*, Ed. univ. "Al.I.Cuza", Iasi,1994
F.M.Tufescu, *Dispozitive şi circuite electronice, p. I*, Ed.univ.Al.I.Cuza" Iaşi 2002
A.Nicula, *Fizica semiconductorilor şi aplicații*, Ed. did. şi ped., Bucureşti 1975.
D.Dascălu, ş.a., *Dispozitive şi circuite electronice*, Ed.did şi ped. Bucureşti 1982.
F.M.Tufescu, *Dispozitive şi circuite electronice, p 2*, Ed.univ.Al.I.Cuza" Iaşi 2005
O.G.Avadanei,F.M.Tufescu, *Electronica Culegere de probleme*, Al.I.Cuza,Iasi, 2008

Teaching methods: multimedia - enhanced lectures, debate, examples

Assessment methods: oral presentations and discussion of laboratory assignments, tests, written and oral exam

Language of instruction: Romanian

Course title: ***Electrodynamics and the Theory of relativity***

Type of course: compulsory **Level of course:** undergraduate

Year of study: II **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Lect. Dr. Gabriela CIOBANU

Objectives:

The present course offers an unitary explanation of the fundamental elements belonging to classic and relativistic electrodynamics dwelling on models and techniques of working, imperative for approaching new ways of research. Through its content (including of course, the seminar activity), the course is useful in grounding different students' skills as, for example, the analysis of the electromagnetic phenomenon on the macroscopic level, the access to fundamental theories of modern physics, the right way of using the new mathematical language, the penchant for applications in science and technique

Prerequisites: Electricity and Magnetism; Theoretical Mechanics, Mathematical Analysis

Course content:

The classical theory of the electromagnetic field: the electrostatic field in vacuum; the magnetic field of stationary currents; the electromagnetic field; the electromagnetic waves; The theory of special relativity: the experimental basics of the theory of the special relativity; Einstein's postulates; The consequences of Lorentz- Einstein transformations; the Minkowski universe; elements of relative mechanics; The relativistic theory of the electromagnetic field; Elements of general relativity: the principals of general relativity; the equations of electrodynamics in the context of gravitational field; Einstein's equations.

Reccomended reading:

Cursul de fizică Berkeley, vol.3, Unde, Ed.Didactică şi pedagogică, Bucureşti, 1983
J.D.Jackson, *Electrodinamica clasică*, Ed.tehnică, Bucureşti, 1991
L.Landau, E.Lifchitz, *Theorie des champs*, Mir, Moscou, 1970
C.Vrejoiu, *Electrodinamica şi teoria relativității*, EDP, Bucureşti, 1993
I.Mercheş, D.Radu, *Electrodinamică*, Ed.Universității"Al.I.Cuza", Iaşi, 2002
D.N.Vulcanov, *Curs de electrodinamică şi teoria relativității*, Mirton, Timişoara,1995.

Teaching methods: lecture, heuristic conversation; debate; step by step discover; explanation

Assessment methods: Written and oral examination and seminar activity

Language of instruction: Romanian

Course title: *Quantum Mechanics*

Type of course: compulsory **Level of course:** undergraduate

Year of study: II **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Prof. dr. Aura-Marina DARIESCU

Objectives:

Due to its fundamental use in many theoretical and experimental disciplines, students should deal with the most important chapters of Quantum Mechanics, in order to obtain a good knowledge in modern Physics.

Prerequisites: Algebra, Mathematical Physics Equations, Functional Analysis, Electrodynamics

Course content:

Historical development: Planck energy quantization, blackbody radiation, photoelectric effect, Bohr model of atom and the Franck-Hertz experiment; De Broglie hypothesis. Schrodinger's equation and applications: free particle, tunnelling, harmonic oscillator, hydrogen atom; Linear Space of Wave Functions, Abstract Linear Space of State Vectors, Mean values and observable dynamics; Quantum Theory of momentum operators: Orbital Angular Momentum, Spin and the total momentum, Time-Independent Perturbation Theory. Applications.

Reccomended reading:

P.J.E.Peebles, *Quantum Mechanics* (Princeton Univ., Press, New Jersey, 1992).
C.Dariescu, Marina-Aura Dariescu, I. Gottlieb, *Capitole de baza in Mecanica Cuantica. Microparticule si Campuri* (Ed. Venus, Iasi, 2007).
B.H. Bransden, C.J. Joachain. *Introducere in Mecanica Cuantica*. (Ed. Tehnica, Bucuresti, 1985).
Cohen-Tannoudji et al. *Mécanique Quantique*, Tome I. (Ed. Herman, Paris, 1977).

Teaching methods: Lectures, Thematic debates

Assessment methods: Written examination (50 %) and seminar activity (50 %).

Language of instruction: Romanian

Course title: *Atomic physics*

Type of course: compulsory **Level of course:** undergraduate

Year of study: II **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Lect. Dr. Ioana RUSU

Objectives:

The student became familiar with the fundamental theories of the atomic structure, emission and absorption of radiation, atoms in external fields, quantum theory, wave-particle duality.

Prerequisites: Differential equations and physics mathematical equations, Electricity and Magnetism, Electrodynamics

Course content:

1.The atomic nature of matter and electricity. 2. Planck's constant. Quantum theory. 3. Wave-particle duality. 4. Classical and semi-classical atomic models. 5 Quantum mechanics and Schrödinger equation. 6. Atoms in external fields. 7. Emission and absorption of radiation

Reccomended reading:

Traian I. Cretu, ş.a., *Fizica atomului*, Ed. st. si enciclop., Bucureşti, 1985
Margareta Tibu, *Fizica atomului si moleculei*, *P.I, fasc.I si fasc.II, P.II-a*, Centru de multiplicare al Universității Iaşi, 1985
Ştefan Muscalu, *Fizica atomica*, Ed. did. şi ped. Bucureşti, 1980
Max Born, *Fizica atomica*, Ed.st., Bucureşti, 1973
x x x , *Cursul de fizica Berkeley, Vol.IV, Fizica cuantica*, EDP., Bucureşti, 1983
A.Mesiah, *Mecanica cuantica, Vol.I şi II*, Ed. ştiințifică, Bucureşti, 1983
Ion M. Popescu, *Fizica, Vol.II*, Ed.did. şi ped. Bucureşti, 1981
Emil Luca şi alții, *Fizică generală*, Ed. Did. şi Ped. Bucureşti, 1975
Radu Țiteica, I. Popescu, *Fizica, Vol.III*, Ed. Tehnică, Bucureşti, 1975
M. A. Eliasevici, *Spectroscopia atomică şi moleculară*, Ed. Acad. României, Bucureşti, 1966
Ioan Ursu, *Rezonanță electronică de spin*, Ed. Acad. României, 1965
B.H. Bransden, C.J. Joachain, *Fizica atomului şi a moleculei*, Ed. Tehnică, Bucureşti, 1998
M. Toma, *Fizica atomului, www.plasma.uaic.ro/cursFAM*

Teaching methods: lecture, class discussion, brainstorming

Assessment methods: Written final exam (oral and written examinations), lab report

Language of instruction: Romanian

Course title: *General Biophysics*

Type of course: compulsory **Level of course:** undergraduate

Year of study: II **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Prof. dr. Tudor LUCHIAN

Objectives:

The layout of essential physical, chemical and biological concepts and paradigsm which underlie the structure and function of living organism. A major emphasis will be placed in the molecular description and mechanistic understanding of principles and concepts which underlie the essence of living cells functioning, and integrative communication inside a living organism. The presentation of essential techniques used to investigating physical and chemical manifestations of macromolecular architectures present inside a cell.

Prerequisites: General Physics, Mathematical Analysis, Electricity and Magnetism, Biochemistry

Course content:

Biochemical description of essential bio-macromolecules; Born energy; Physical interactions manifested among bio-macromolecules; Ion hydration; Debye-Huckel theory; Essentials of neurobiophysics; The structure and function of biological membranes; Essentials of structure and functions of ion channels, and their role in the electric manifestation of cells; Basic knowledge about cellular physical and chemical communication; Physical principles of matter transport and energy transduction in living cells

Reccomended reading:

T. Luchian, *Introducere in biofizica moleculara si celulara*, 'Alexandru I. Cuza' University Publishing House, Iasi, 2001
Molecular Cell Biology (3rd edition), Lodish, H., Baltimore, D., Berk, A., Zipursky, S. L., Matsudaira, P., Darnell, J. W. H. Freeman and Company, New York, 1995.
M.B. Jackson, *Molecular and Cellular Biophysics*, Cambridge University Press2006
Hille, B., *Ionic Channels of Excitable Membranes*, Sinauer Associates, Inc. 1992.
T. Luchian, *Electrofiziologie moleculara. Teorie si Aplicatii*, Sedcom Libris, Iasi,2006

Teaching methods: Direct lecturing, demonstration, observation

Assessment methods: written, written şi oral, oral, periodic testing, testing of lab skills, others

Language of instruction: Romanian

Course title: *Physics of Atoms & Molecules*

Type of course: compulsory **Level of course:** undergraduate

Year of study: II **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Conf. dr. Gabriela BORCIA

Objectives:

Learn the fundamental knowledge on the physics of atomic systems and related experimental methods. Capability to apply this knowledge in practice, to explain physical phenomena which show the discontinuous nature of matter and the quantization of energy in atomic systems, to analyze atomic and molecular spectra, electric and magnetic properties of substance. Ability to work in a team to solve theoretical and practical problems.

Prerequisites: Mechanics, Electricity and magnetism, Molecular physics, Oscilations and waves, Optics, Differential equations and mathematical physics equations

Course content:

Discontinuous nature of matter: corpuscular nature of substance and electricity, corpuscular nature of radiation, experimental demonstration on the corpuscular nature of electromagnetic radiation; Classical and semiclassical atomic models; Quantum model of the atom; Atoms in electric and magnetic field; Interaction of quantum systems with radiation; Many-electron atoms; Chemical bond. Structure of molecules; Movements in molecules, molecule spectra; Electric and magnetic properties of molecules

Reccomended reading:

G. Borcia, *Fizica atomului şi moleculei: note de curs şi aplicații*, Sedcom Libris,2006
G. Borcia, *Introducere în teoria cuantică a atomului şi moleculei*, Sedcom Libris, 2006
M. Țibu, *Fizica atomului şi moleculei*, Univ. "Al. I. Cuza" Iaşi, 1985
V. Grecu, *Fizica moleculei*, Ed. Univ. Bucureşti, 1986
E. Spolschi, *Fizica atomică*, Ed. Tehnică, Bucureşti, 1974
M. Toma ş.a., *Lucrări practice de fizica atomului. Modele atomice*, Ed. Univ. Iaşi, 1996
M. Tibu ş.a., *Fizica atomului şi moleculei, Lucrări practice*, Ed. Univ. Iaşi, 1985

Teaching methods: lecture, class discussion, laboratory work

Assessment methods: final exam, lab report and portfolio

Language of instruction: Romanian

Course title: *Numerical Methods and Simulation in Physics*

Type of course: compulsory **Level of course:** undergraduate

Year of study: II **Semester** : 1 **ECTS credits:** 5

Name of lecturer: Prof. dr. Ovidiu Florin CALTUN

Objectives:

Capacity to develop numerical algorithms in C and C++ programming language; Capacity to search, use and analyze information from different programming libraries; Capacity to ensemble numerical methods into a simulation program for a process or a physic phenomenon; Ability to work into a project team for solving numerical problems and to develop original algorithms; Capacity to formulate critics on the utility of a program sequence and to appreciate the errors sources; Capacity to use and adapt programs used in numerical computation;

Prerequisites: programming language

Course content:

Introduction to numerical methods. The numbers representation and numerical precision. Approximation of Functions of a Real Variable (polynomial, Cebisev, spline interpolation). Continuous and discrete least-squares approximation. Derivation and numerical integration. Elements of linear algebra. Basic matrix operations, the determinant. Linear equation systems. Nonlinear equations and polynom roots. Iterative methods. Numerical interpolation and experimental data fitting. Eigen function and eigen value. Optimization methods. Algorithms for solving nonlinear systems of equations. Algorithms for differential equations solving. Solving the partial differential equations.

Reccomended reading:

Alejandro L. Garcia, *Numerical Methods for Physics* (Prentice Hall, 1994)
J.M. Thijssen. *Computational Physics*. Springer Verlag, 1999.
S.E. Koonin and D. Meredith. *Computational Physics*. Addison Wesley, 1990.
J. Gibbs. *Computational Physics*. World Scientific, 1994.
B. Giordano. *Computational Physics*. Preston, 2005.
R. Sedgewick, *Algorithms in C Parts 1-4: Fundamentals, Data Structures, Sorting, Searching*, 3rd Edition, Addison Wesley Professional
C. Berbente, S. Mitran, S. Zancu, *Metode Numerice*, Editura Tehnica, 1997. 304

Teaching methods: Presentation, discussions, proving experiment, guided discovery

Assessment methods: Laboratory colloquium

Language of instruction: Romanian

Course title: ***Operating Systems (Windows, UNIX)***

Type of course: compulsory **Level of course:** undergraduate

Year of study: II **Semester** : 1 **ECTS credits:** 5

Name of lecturer: Lect. Dr. Octavian RUSU

Objectives:

Prerequisites:

Course content:

Reccomended reading:

A. Tanenbaum, *Modern Operating Systems*, Second Edition, Prenitence Hall, 2003
A. Silberschatz, J. Peterson, P. Galvin: *Operating System Concepts*, Addison Wesley, 1992.
http://www.linux.org/ Linux Users Guide

Teaching methods:

Assessment methods:

Language of instruction: Romanian

Course title: ***Physics of Molecules***

Type of course: compulsory **Level of course:** undergraduate

Year of study: III **Semester** : 1 **ECTS credits:** 5

Name of lecturer: Conf. dr. Gabriela BORCIA

Objectives:

Learn the fundamental knowledge on the physics of complex atomic systems, from two-electron atom to many-electron atoms and molecules. Capability to apply this knowledge in practice, to analyze complex spectra of atoms and molecules, to use spectroscopic methods to study molecular structure and dynamics, to analyze valence of elements in chemical combinations and correlation to spatial structure, to analyze electric and magnetic properties of substance. Ability to work in a team to solve theoretical and practical problems.

Prerequisites: Theoretical mechanics, Electrodynamics and relativity, Quantum mechanics

Course content:

Interaction of quantum systems with radiation: emission and absorption of radiation, transition rates, selection rules, Einstein coefficients. Many-elecvtron atoms, Hartree theory, self-consistent field method, fundamental states of many-electron atoms and the periodic table of elements. Chemical bond, structure of molecules, Born-Oppenheimer approximation, LCAO method, valence bond method, the valence of chemical elements, hybridization, multiple bonds, spatial structure of molecules. Movements in molecules, molecule spectra. Electric and magnetic properties of molecules, electric dipole moment and polarization, electric dipole moment and molecule structure, magnetic moment and magnetic susceptibility, diamagnetic molecules, paramagnetic molecules

Reccomended reading:

G. Borcia, Fizica atomului şi moleculei: note de curs şi aplicaţii, Sedcom Libris,2006
G. Borcia,Introducere în teoria cuantică a atomului şi moleculei,Sedcom Libris,2006
M. Ţibu, Fizica atomului şi moleculei, Univ. “Al. I. Cuza” Iaşi, 1985
V. Grecu, Fizica moleculei, Ed. Univ. Bucureşti, 1986
E. Spolschi, Fizica atomică, Ed. Tehnică, Bucureşti, 1974
M. Toma ş.a.,Lucrări practice de fizica atomului.Modele atomice, Ed.Univ. Iaşi,1996
M. Tibu ş.a., Fizica atomului şi moleculei, Lucrări practice, Ed. Univ. Iaşi, 1985

Teaching methods: lecture, class discussion, laboratory work

Assessment methods: final exam, lab report and portfolio

Language of instruction: Romanian

Course title: *Plasma Physics*

Type of course: compulsory **Level of course:** undergraduate

Year of study: III **Semester** : 1 **ECTS credits:** 5

Name of lecturer: Prof. dr. Gheorghe POPA

Objectives:

Student should obtain a good theoretical and practical knowledge on the basic characteristics and applications of the plasma. Through problem solving and experiments performed in the lab, students should be able to apply this knowledge to analyse and design plasma devices under different circumstances

Prerequisites: Mathematics and General Physics

Course content:

Plasma – definition and occurrence; parameters, characteristics and basic phenomena. Individual motion of the particles in plasma; elementary processes. Kinetic and fluid description of plasmas. Transport phenomena. Waves and instabilities. Experimental methods in plasma physics - plasma diagnostics and fundamental applications.

Reccomended reading:

G.Popa, L. Sîrghi, *Bazele fizicii plasmei*, Ed. Universitatii Iasi, 2000
G. Popa, D. Alexandroaei, *Îndrumar de lucrari practice pentru fizica plasmei*, Ed. Universitatii Iasi, 1991
M. Toma, *Cinetica si dinamica plasmei*, Ed. Universitatii Iasi, 1991
D. Ciubotariu, I.I.Popescu, *Bazele fizicii plasmei*, Ed, tehnica, 1987
R.Titeica, I,.I.Popescu, *Fizica generala*, Vol.III, Ed.tehn. 1975
E.Badarau, I.I.Popescu, *Fizica descarcarilor in gaze*, Ed.tehn. 1965
I.I.Popescu, I.Iova, E.Toader, *Fizica plasmei si aplicatii*, Ed.st. si enciclopedica,1981
F.F. Chen, *Introduction to plasma physics, Plenum Press*, 1985

Teaching methods:

Assessment methods:

Language of instruction: Romanian

Course title: *Solid State Physics*

Type of course: compulsory **Level of course:** undergraduate

Year of study: III **Semester** : 1 **ECTS credits:** 5

Name of lecturer:

Objectives:

To know structural and energetic, energetic, magnetic, optical and thermal properties of solid bodies under action of mechanical stress, temperature gradients, field gradients, under action of electromagnetic radiation or high and low level energy particles. Knowledge and understanding of building function and using of multiple devices based on solid state materials.

Prerequisites: basic physics courses and special mathematics

Course content:

Structural states. Crystalline solids. Amorphous solids. Classification of solid state. Crystalline lattices and periodical structures. Elements of symmetry, Bravais lattices. Real crystals. Defects of structure. Experimental methods in structure investigation. Classification. Laue equation. X-ray diffraction. Crystalline bonding. Thermal properties of crystalline lattice-phonons, specific heat, Einstein model, Debye model. Transport phenomena. Boltzmann equation. Energy levels in free electrons model, energy states density, relaxation time. Energy structure of solid state. Energy bands. Classification of solids: metals, insulators, dielectrics. Fermi surface. Magnetic properties of solid state. Diamagnetism. Paramagnetism. Ferromagnetism.

Reccomended reading:

I. D. Bursuc, N. D. Sulițanu, *Solidul. Fenomene. Teorii. Aplicații*, Ed. Ştiințifică, Bucureşti, 1991.
N. Sulițanu, *Fizica Suprafetei Solide*, Ed. Univ. “AL.I.Cuza” Iasi, 1997
I. I. Nicolaescu, *Introducere în fizica corpului solid*, Ed. Cultura, Piteşti, 1997.
I. Licea, *Fizica metalelor*, Ed. Şt. Encilpd, Bucureşti, 1986.
Gh. I. Rusu, *Introducere în fizica semiconductorilor*, Ed. Univ. Bacău, 1998.
J.M. Ziman, *Theory of Solids*, Cambridge, University Press, 1972.
I. Bunget, M. Popescu, *Fizica dielectricilor*, Ed. Şt. Encilpd., Bucureşti, 1986.
C. Kittel, *Introduction to Solid State Physics*, 8th ed., New York, John Wiley, 2004.
M. Marder, *Condensed Matter Physics*, New York, John Wiley, 2000.

Teaching methods: oral conference

Assessment methods: final examination, 75%, writed/oral, laboratory activity 25%.

Language of instruction: Romanian

Course title: *Thermodynamics & Statistical Physics*

Type of course: compulsory **Level of course:** undergraduate

Year of study: III **Semester** : 1 **ECTS credits:** 5

Name of lecturer: Lect. Dr. Daniel RADU

Objectives:

To offer to the students the possibility of understanding the interdisciplinary importance of this chapter of Physics and to give them the necessary tools for approaching concrete problems specific to other chapters of Physics like: Solid State Physics, Electricity and Magnetism etc.

Prerequisites: Analytical Mechanics, Quantum Mechanics, Molecular Physics, Electrodynamics, Electricity and Magnetism, Solid State Physics.

Course content:

Thermodynamics of equilibrium processes. Fundamental notions and the Principles of Thermodynamics. Applications of axiomatics to the closed thermodynamic systems: characteristic funtions and thermodynamic potentials. Systems containing a variable number of particles. Chemical potential. Statistical Physics. The study object of the statistical physics. The axiomatics of statistical physics. Phase space. Liouville theorem. Density matrix and the statistical distribution function in quantum statistical physics. The entropy and temperature in quantum statistical physics. Statistical Equilibrium Physics: Gibbs statistical ensembles theory. Statistical distributions: microcanonical, canonical (Gibbs) and grand canonical. Maxwell and Boltzmann distributions. Classical theory of specific heat capacities. Fermi-Dirac and Bose-Einstein distributions. Fermi-Dirac and Bose-Einstein gases of elementary particles. Electronic degenerate gase and Bose-Einstein condensate. Thermal radiation. Statistical theory of solid state. Debye interpolation formula.

Reccomended reading:

Gherman O., Saliu L., *Fizică statistică*, Bucureşti, 1976.
Landau L.D., Lifshitz E.M., *Statistical Physics*, Pergamon Press, London, 1980.
Bazarov I.P., Ghevorklean E.V., Nicolaev P.N., *Termodinamică şi fizică statistică*, Moscova, 1986.
Plischke M., Bergersen B., *Equilibrium Statistical Physics*, World Scientific, 1994.
Margareta Ignat, *Întrebări şi exerciţii de temodinamică şi fizică statistică*, Editura Ştiinţifică şi Enciclopedică, Bucureşti, 1981.

Teaching methods: Lecture, debate, the demonstration to the blackboard

Assessment methods: Exam (written and oral, for Biophysics and Medical Physics sections) and Colloquium (for Physics, Technological Physics and Informatics Physics sections)

Language of instruction: Romanian

Course title: ***Designing Elements and Technical Drawings***

Type of course: compulsory **Level of course:** undergraduate

Year of study: III **Semester** : 1 **ECTS credits:** 5

Name of lecturer: Lect. Dr. Valentin POHOATA

Objectives:

Learning the representation elements in technical drawing, the general standards and recommendations applied in technical drawing. Getting the abilities in drawing of equipment spare parts, devices and experimental set-up.

Prerequisites: Descriptive geometry

Course content:

General rules technical drawing. Type of draws, line styles, text, indicators, tables. Drawing objects, annotations. Orthographic projection. Geometric constructions, intersections, axonometric projections. Cross section and hatch's. Simple objects representations. Shape and position's errors. Types of dimensioning in technical drawing. Representatives objects: axle, flange – socket, shim, screw threads, pins, bolt, slot, springs, ball bearings, sprockets & chain wheels, gearings, welded or rivet splices. Building technical drawing. Electrical Drawings. CAD software: settings, saving, opening, import export documents.

Reccomended reading:

Păunescu, R., *Desen Tehnic şi Informatică*, Ed. Univ. Transilvania, Brasov, 2006
Dolga, L., ş.a., *Desen tehnic pentru electrotehnică*, Ed. Politehnică, Timişoara 2002
Popa, Constantin, ş.a., *Desen tehnic*, Editura „Gh.Asachi", Iaşi, 1996
Vasilescu, E., ş.a., *Desen tehnic industrial. Elemente de proiectare*, Editura Tehnică, Bucureşti, 1994

Teaching methods: Course exposure following practical examples and applications

Assessment methods: Practical application 50%, laboratory activity 50%

Language of instruction: Romanian

Course title: *Semiconductor Physics*

Type of course: compulsory **Level of course:** undergraduate

Year of study: III **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Conf. dr. George-Mihail RUSU

Objectives:

At the end, the students must know the most important theoretical aspects of semiconductor physics and physical principles involved in function of the semiconducting devices.

Prerequisites: Solid State Physics, Statistical Physics

Course content:

Main characteristics of the energy spectra of the electrons in semiconductors. Charge carrier statistics in intrinsic and extrinsic semiconductors. Fermi level calculation. Charge carriers mobility (scattering mechanisms, influence of the temperature). Electrical conductivity of semiconductors. Temperature dependence of the electrical conductivity of semiconductors. Magneto-electrical effects in semiconductors. Hall effect. Applications. Thermoelectric effects in semiconductors. Seebeck and Peltier effects. Optical absorption in semiconductors. Photoconductive effect. Photovoltaic effect in semiconductors. Applications.

Reccomended reading:

G.I. Rusu, G.G. Rusu, *Bazele fizicii semiconductorilor*, Ed. Tehnica St. si Did. CERMI, Iasi, 2005
I.Dima, I. Licea, *Fenomene fotoelectrice în semiconductori şi aplicații*, Ed. Acad. R. S. R., Bucureşti, 1980.
V. Dolocan, *Fizica electronică a stării solide*, Ed. Acad. R. S. R., Bucureşti, 1984.
G. I. Rusu, I. Rusu, M. Stamate, *Introducere în fizica semiconductorilor*, Ed. Plumb, Bacău, 1997.
I.D. Bursuc, N. Sulițanu, *Solidul.Teorii.Fenomene.Aplicații*., Ed. Şt., Bucureşti, 1991.
G. Ciobanu, C. Constantinescu, *Fizica stării solide*, I, Ed. Tehnică, Bucureşti, 1981.
I.I.Nicolaescu,V.Canțer,*Introducere în Fizica corpului solid*,Ed. Cultura,Piteşti, 1998.
V. Dolocan, *Fizica joncțiunilor cu semiconductoare*, Ed. Academiei, Bucureşti, 1982.
V. Dolocan, *Fizica dispozitivelor cu corp solid*, Ed. Acad. R. S. R., Bucureşti, 978.

Teaching methods: didactical demonstration, systemic exposure, conversation

Assessment methods: writing examination

Language of instruction: Romanian

Course title: *Spectroscopy & Lasers*

Type of course: compulsory **Level of course:** undergraduate

Year of study: III **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Conf. dr. Silviu GURLUI

Objectives:

Presentation of the spectral properties of atomic systems in different conditions of temperature and state of aggregation. Knowledge by students of the basic and fundamental phenomena of electronic spectra of atoms and molecules. Understanding of the vibration spectra of diatomic and polyatomic molecules. Presentation of general principles underlying the operation of laser facilities. Understanding of the spectral composition of laser radiation and the radiation characteristics.Laser applications in physics, industry, medicine, etc.

Prerequisites: optics, quantum mechanics, mathematical analysis

Course content:

General characteristics of the energy levels; Equilibrium configuration of atomic systems and their properties of symmetry; Vibration spectra of polyatomic molecules; Molecular electronic spectra; Lasers. General Notions; Multi photonics Spectroscopy; Optogalvanic Spectroscopy; Nonlinear effects studied by spectral methods

Reccomended reading:

M. A. Eliasevici, *Spectroscopie atomică şi moleculară*, Ed. Acad. Române, Bucureşti, 1966;
I. Iova, *Spectroscopie şi laseri*, Ed. Univ. Bucureşti, 1984;
M. Strat, *Spectroscopie şi laseri*, Ed. Univ. "Al. I. Cuza" Iaşi, 1988;
M. Strat, *Introducere în spectroscopia mediilor condensate*, Ed. Tehnica, Bucuresti, 1985;
M. Strat, *Analiza structurală prin metode fizice*, Ed. Academiei Române, 1985;
G. Singurel, *Fizica laserilor*, Ed. Univ. Iaşi, 1995;
G. Singurel, *Spectroscopie. Probleme practice*. Ed. Univ. Iasi, 1996;
M. Strat, *Spectroscopie şi laseri. Fundamente. Teorie şi Experiment.* Ed. Univ. "Al. I. Cuza" Iaşi, 2001;
S. Stratulat, S. Gurlui, *Aplicații medicale ale luminii liniar polarizate, spectrul Vis/IRapropiat*, Ed. Tehnopress, Iaşi, 2003;
S. Gurlui, M. Delibas, *Optica*. Exerciții şi probleme, Ed. Tehnopress, Iaşi, 2005

Teaching methods: Courses printed, drawings, multimedia

Assessment methods: written & oral examination

Language of instruction: Romanian

Course title: ***Physics of Nucleus & Elementary Particle Physics***

Type of course: compulsory **Level of course:** undergraduate

Year of study: III **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Lect. Dr. Catalin BORCIA

Objectives:

Learn of fundamental knowledge of radiation and nuclear physics. Apply this knowledge to solve theoretical or practical problems. Ability to work in a team. Use of simulation software for nuclear physics applications. Identify and use bibliographic resources for continuous formation.

Prerequisites: Electricity and magnetism, Atomic and molecular physics, Statistical physics, Quantum mechanics

Course content:

Basic properties of atomic nucleus; Radioactivity; Interaction of nuclear radiations with matter; Nuclear radiation detection; Nuclear models; Nuclear forces; Nuclear reactions; Types of disintegrations: alpha, beta and gamma. Nuclear reactions as energy sources. Particle accelerators.

Reccomended reading:

Erzilia Lozneanu, *Fizică nucleară*, Ed. Universității “Al. I. Cuza” Iaşi (2003)
D. Mihailescu, E.Lozneanu, *Lucrări practice de fizică nucleară*, Editura Universității "Al. I. Cuza" Iaşi (2003)
Emilio Segre, *Nuclei and Particles*, Ed. W.A. Benjamin, Inc. (1977)
Glenn Knoll, *Radiation Detection and Measurement*, Ed.John Wiley & Sons, New-York (1989).
P. Marmier, E. Sheldon, *Physics of Nuclei and Particles*, Academic Press, New-York, (1969).

Teaching methods: lecture, class discussion, laboratory work

Assessment methods: final exam, lab report and portfolio

Language of instruction: Romanian

Course title: *History of Physics*

Type of course: facultative **Level of course:** undergraduate

Year of study: III **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Lect. Dr. Sorin TALASMAN

Objectives:

Prerequisites:

Course content:

Reccomended reading:

Bălan S. (ş.a.), *Istoria ştiinţei şi tehnicii în România*, Ed.Acad. Buc.1985
Born M., *Fizica în concepţia generaţiei mele*, Ed.Şt.Buc.1969
Hutten E., *Ideile fundamentale ale fizicii*, Ed.Acad.Buc. 1979
Laue Max von, *Istoria fizicii*, Ed.Şt.Buc.1965
Neuman C, Nicolau Ed., *Istoria sumară a dezvoltării ştiinţei*, Ed.Pol Buc.1983
Novacu V, *Istoria fizicii*, EDP Buc.1966
Novacu V, *Dialectica dezvoltarii fizicii contemporane*, Ed.Acad., Buc.198
Ştefan I. Nicolau E., *Scurtă istorie a creaţiei ştiinţifice româneşti*, Ed.Albatros Buc.1981
Taton R.(coord.), *Istoria generală a ştiinţei*, (4 vol.) Ed.Şt.Buc. 1977

Teaching methods:

Assessment methods:

Language of instruction: Romanian

Course title: ***Electric & Electronic Measurement Methods & Instruments***

Type of course: optional **Level of course:** undergraduate

Year of study: III **Semester** : 1 **ECTS credits:** 5

Name of lecturer: Lect. Dr. Ovidiu AVADANEI

Objectives:

This course treats different problems that would be encounter in physical measurements. There are treated the measurements of different physics quantities with transducers and adequate measurements instruments. There are also presented the methods used in signal amplification, processing, and the interpretation of physical results. All this problems are studied in function of the studied physical phenomenon. There are analyzed a series of methods and laboratory and industrial measurements instruments used in physics measurements. There are also treated the fundaments of analog to digital converters and the numerical signal acquisition and treatment. This course is useful for physicist working in research but also for physicist working in quality control and non destructive analyze laboratory, and also help the teachers to develop a better understanding on the existing possibilities on the study of physic phenomena

Prerequisites: Electricity, Magnetism, Electronics

Course content:

Physical measurements. Physical quantities, dimensions, measurement units. Measurement methods, fundamentals. Measurement equipment. The structure of analogical and numerical instruments. Instruments metrology. Errors, error sources. Error evaluations, measurements results interpretation. Transducers. General classification, static and dynamic characteristics. Transducers for geometrical, mechanical, thermal, magnetic quantities, and for radiating signals. Examples and applications. The electronics associated with analogical measurement instruments. Amplifiers, basic configuration, frequency response, amplification tuning, offset. Impedance adapters, insulated amplifier. Signal modulators and detectors. Modulation detection amplifiers. Analogical – numerical and numerical – analogical converters. Main parameters: resolution, quantify error, conversion codes. Measurement of modulated signals. Electromagnetic field power measurements.

Reccomended reading:

Ionescu,Gabriel, *Masurari si traductoare*, EDP, Bucuresti , 1985
Manolescu P, Ionescu, Golovanov C, *Masurari electrice si electronice*, Bucuresti,1980.
Nicolau E, *Masurari electronice*, Editura Tehnica, Bucuresti, 1979
Pop,E.,Stoica,V.,*Principii si metode de masurare numerica*, Editura Facla,1977.

Teaching methods: Lecture, Debate, experiment, guided discovery, guided experiment, project, problem solving

Assessment methods: Colloquium 50%, individual project 50%

Language of instruction: Romanian

Course title: ***Introduction to Environmental Physics and Ecology***

Type of course: optional **Level of course:** undergraduate

Year of study: III **Semester** : 1 **ECTS credits:** 5

Name of lecturer: Prof. dr. Diana MARDARE

Objectives:

The students should obtain knowledge about the global ecological problems in order to prevent, as they can, the destruction of the planet by pollution. That is way, they should consolidate their knowledge about the physical phenomena that take place in the nature.

Prerequisites: Elementary ecological and physical knowledge

Course content:

General properties of biological systems. Environment. Ecological factors such as geographical, mechanical, physical and chemical: geographical position on Earth regular winds (trade winds) and irregular winds (cyclone, anticyclone, tornado, hurricane), properties of the water and also of the sea water, El Nino, theory of waves and tides, interaction air-sea, humidity, solar energy, ozone formation and destruction, the greenhouse effect, temperature, the energetic of the ecosystems, ionic composition of the medium, etc. Environmental polluttion and protection

Reccomended reading:

F.W. Taylor, *Elementary Climate Physics*, , Oxford Univ.Press,UK, 2007
Harold V. Thurman, *Introductory Oceanography*, Merrill Publish., S. U. A., 1988
Diana Mardare, *Introducere în fizica mediului şi ecologie*, Ed. "Politehnium", Iaşi-2005

Teaching methods: Lectures supported by slides and video

Assessment methods: Colloquy

Language of instruction: Romanian

Course title: *Atmospheric Physics & Meteorology*

Type of course: optional **Level of course:** undergraduate

Year of study: III **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Conf. dr. Liviu LEONTIE

Objectives:

Students should learn the key concepts of the atmospheric physics and meteorology, the physical foundation of meteorological phenomena and of the weather forecasting. They should be able to work on meteorological applications. They should be able to develop a sense of teamwork and communication skills. They are to promote an environment-friendly behavior.

Prerequisites: basic knowledge of Calculus and Physics

Course content:

Structure and composition of the atmosphere; Atmospheric statics; Thermal processes in the atmosphere; Solar radiation and the Earth-atmosphere system, radiation processes in atmosphere, heat transfer in atmosphere, temperature of atmosphere; Water cycle; Air movements; selected topics on Optical and Electrical phenomena in the atmosphere. Basic concepts of meteorology and applications.

Reccomended reading:

Liviu Leontie, *Fizica Atmosferei*, Ed. Politehnium, Iaşi, 2004;
Liviu Leontie, *Introducere în Fizica Atmosferei (partea I),* Ed. Gh. Asachi, Iaşi, 2002;
Elena Erhan, *Meteorologie şi Climatologie Practică*, Ed. Univ. "Al. I. Cuza", Iaşi, 1999;
James R. Holton, *Introducere în Meteorologia Dinamică* (trad. l. engl.), Ed. Tehnică, Bucureşti, 1996;
S. Ciulache, N. Ionac, *Meteorologie grafică*, Vol. I, Ed. Univ. Bucureşti, 1995;
Gh. Pop, *Introducere în meteorologie şi climatologie*, Ed. Şt. şi Encicl., Bucureşti, 1988;
I. Drăghici, *Dinamica atmosferei*, Ed. Tehnică, Bucureşti, 1988;
S. Gîju, *Electricitatea atmosferică*, Ed. Acad. R. S. R., Bucureşti, 1984;
D. Borşan, *Fizica atmosferei*, Curs multiplicat, Univ. Bucureşti, Fac. Fizică, 1981;
C. Stoica, N. Cristea, *Meteorologia generală*, Ed. Tehnică, Bucureşti, 1971;
internet: ww2010.atmos.uiuc.edu, www.wmo.int, www.meteoromania.ro, Wikipedia.

Teaching methods: Problem method, debate, discussion, discovery techniques, project, excursion

Assessment methods: discussion, oral examination

Language of instruction: Romanian

Course title: ***Data Acquisitions and Processing Systems***

Type of course: optional **Level of course:** undergraduate

Year of study: III **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Lect. Dr. Ioan DUMITRU

Objectives:

Capacity to describe data acquisition systems and to identify the characteristic parameters of these; Capacity to use system of data acquisition to extract data from physic measurements; Capacity to describe the specialized interfaces used for acquisition and data transfer; Capacity to use specialized programs (LabView) to manage system of data acquisitions;Capacity to use specific instrument drivers for realizing complex application from acquisition and data storage.

Prerequisites: programming language

Course content:

Analog and digital signals. Binary representation of signals; manipulation of binary signals. Analog-digital conversion. Transmission of the digital signals. Interfaces used for signal transmission: serial and parallel ports, Ethernet. GPIB - specialized interface user for communication with instruments; IEEE 488 standard. Dedicated programs used for acquisition, transmission and data manipulation (LabView, MathLAB).

Reccomended reading:

LabView User Manual – National Instruments
LabView Basics Course Manual – National Instruments
Introduction to LabVIEW Six-Hour Course – National Instrument
http://www.ni.com

Teaching methods: Presentation, discussions, proving experiment, guided discovery

Assessment methods: Laboratory colloquium

Language of instruction: Romanian

Course title: ***Introduction to Modelling of Physical Processes***

Type of course: optional **Level of course:** undergraduate

Year of study: III **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Asist.dr. Petronel POSTOLACHE

Objectives:

Introducing students to the numerical approach to modeling and simulation in physics. At the end of the course the students will be able to solve a practical modeling problem.

Prerequisites: Basic undergraduate courses in mathematics and physics

Course content:

Generalities. Systems, models and simulations. Verification, approximation and validation. Errors in numerical calculus. Using computer in physics. Experimental physics, theoretical physics and computational physics. Errors in numerical calculus. Maple programming platform. Graphical applications in 2D and 3D. Animation in Maple. Graphical representation of 2 and 3 variables functions. Graphical representation of electric and magnetic fields lines. Solving transcendent equation. Applications. Ordinary differential equations. LCR circuits. Random numbers. Statistical analysis. Distributions. Programming in Maple. Applications.

Reccomended reading:

http://stoner.phys.uaic.ro/moodle/
W. Press et al, *Numerical Recipes*, Cambridge University Press, 1992
Burden R. et al, *Numerical analysis*, PWS-KENT Publishing Company, Boston, 1985
M. Kalos and Paula Whitlock, *Monte Carlo methods. Vol. I Basics*, John Wiley and Sons, New York, 1986
G.L. Baker, J.P.Gollub, *Chaotic dynamics. An introduction*, Cambridge University Press, 1990
Blachman N.R. et al, *Maple V - quick reference*, Brooks/Cole Publishing Company, Pacific Grove, California, 1994.

Teaching methods: Lecture, debate, exemplification

Assessment methods: evaluation of practical work and a project 50%, final exam 50%

Language of instruction: Romanian

Course title: ***Physics & Technique of Electrical Discharges in Gases***

Type of course: optional **Level of course:** undergraduate

Year of study: III **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Lect. Dr. Claudiu COSTIN

Objectives:

Introduction to the study of electrical discharges in gases; analysis of the mechanisms that generate and sustain an electrical discharge; different types of electrical discharges and their applications.

Prerequisites: Electricity and Magnetism, Molecular Physics and Heat

Course content:

Introduction. Physical units in the study of electrical discharges. Gas flow regimes. Vacuum systems. Electrical currents in gases Gases electrical conductivity. Current-voltage characteristic of an electrical discharge. Townsend discharge. Townsend coefficients. Electrical discharge breakdown. Paschen's law. Similarity principle. Glow discharge General characteristics. Discharge mechanism. Discharge regions. Cathode fall theory. Positive column diffusion theory (Schottky). Gas breakdown at high pressures Spark discharge. Streamers theory. Corona discharge Breakdown and sustaining of the Corona discharge. Electric field and potential in a Corona discharge. Magnetised plasmas Stationary plasma diamagnetism. Magnetic susceptibility of a plasma. Magnetron discharge Generalities. Current-voltage characteristic. Different geometries of magnetron discharges. Applications. AC discharges Gas breakdown in alternative current. High and low frequency discharges. Inductive discharge. Capacitive discharge. Torch discharge. Experimental devices and applications of electrical discharges Double plasma device (DP). Vacuum electronic components. Ion and electron beam devices. Light and X-ray sources. Thin film deposition.

Reccomended reading:

E. Bădărău, *Fizica descărcărilor în gaze*, Ed. Academiei, 1957
G. Marin, *Tehnica vidului şi aplicaţiile ei în industrie*, Ed. Tehnică, Bucureşti,1983
I. I. Popescu, I. Iova, E. Toader, *Fizica plasmei şi aplicaţii*, Ed. Ştiinţifică şi Enciclopedică, Bucureşti, 1981
G.Popa, M.Gheorghiu, *Aplicaţii tehnologice ale plasmei*, Univ. Al. I. Cuza, Iaşi, 1998
Kapţov, *Fenomene electrice în gaze şi vid*, Ed. Tehnică, Bucureşti, 1955
N. Dumitraşcu, *Introducere în fizica plasmei*, Ed. Junimea, Iaşi, 1999

Teaching methods: Free explaining. Computer assisted explaining. Demonstrating. Collaborating. Case study

Assessment methods: oral (70% final colloquium, 30% laboratory activity)

Language of instruction: Romanian

Course title: *Fiber-optic Communications*

Type of course: optional **Level of course:** undergraduate

Year of study: III **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Lect. Dr. Catalin AGHIORGHIESEI

Objectives:

Optical radiation propagation in optical wave guides concepts. Characterization of fiber optic. Principles of optical networks. Applications in problems and numerical simulation.

Prerequisites: General Physics, Optics, Data physics manipulation

Course content:

Light propagation in optical wave guides:planar waveguidesradiation coupling in waveguides. Optical fibers: with refractive index step; with gradient refractive index. Fiber optics in telecommunications: telecommunication lines components; modulation, multiplexing and signal coupling.

Reccomended reading:

Cătălin Agheorghiesei , *Transmiterea informațiilor prin fibre optice, Notițe de curs: www.plasma.uaic.ro*, 2004.
V. Diaconu, M Pârvulescu, *Transmisiuni prin fibre optice*, Ed. militară, Bucureşti, 1994.
S. Şişianu, T. Şişianu şi O. Lupan. *Comunicații prin fibre optice*. Editura "Tehnica Info", Chişinău, 2003.
E.A. Bahaa Saleh and Carl Teich Malvin. *Fundamentals of photonics*. Wiley series in pure and applied optics. John Wiley and Sons, Inc, New York, 1991

Teaching methods: observation, algorithm, explanation, problems

Assessment methods: 50% practical works, 50% final test

Language of instruction: Romanian

Course title: *Astrophysics & Cosmology*

Type of course: optional **Level of course:** undergraduate

Year of study: III **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Prof. dr. Aura-Marina DARIESCU

Objectives:

The main objective of the present course is to initiate the students with a minimum knowledge in physics with basics of astronomy, astrophysics and cosmology.

Prerequisites: Mechanics, Thermodynamics and Statistical Physics, Optics and Spectroscopy, Plasma Physics.

Course content:

General Astronomy. Planetology. Basic Concepts of Galactic Astronomy. Astrophysical Objects and Large Scale Structures. Historical Evolution of the Ideas about the Universe. Introduction in Cosmology.

Reccomended reading:

V. Ureche, *Universul. Astronomie*, Ed. Dacia, Cluj, 1982.
E. Toma, *Introducere in astrofizica*, Ed. Tehnica, Bucuresti, 1980.
N. Straumann, *General Relativity and Relativistic Astrophysics*, Springer-Verlag, 1984.
S. Gottlober, *Early Evolution of the Universe and Formation of Structure*, Akademie Verlag, Berlin, 1990.

Teaching methods: Lectures, Thematic debates, Prepared talks and computer applications

Assessment methods: Oral examination (50 %) and seminar activity (50 %).

Language of instruction: Romanian

Course title: ***Computer Networks and Administration***

Type of course: compulsory **Level of course:** undergraduate

Year of study: III **Semester** : 1 **ECTS credits:** 5

Name of lecturer: Lect. Dr. Octavian RUSU

Objectives:

Prerequisites:

Course content:

Reccomended reading:

A. Tanenbaum, *Retele de Calculatoare*, Editura Agora 2004
V. T. Dadârlat, *Retele de Calculatoare – de la cablare la interconectare*, Editura Albastra, 2002
W. Stallings*, Local Networks. Hand book of Computer Communications*, Macmillan Publishing Co., NZ 1988

Teaching methods:

Assessment methods:

Language of instruction: Romanian

Course title: *Technological Application of Plasma Physics*

Type of course: compulsory **Level of course:** undergraduate

Year of study: III **Semester** : 2 **ECTS credits:** 5

Name of lecturer: prep. Dr. Alina CHIPER

Objectives:

To present methods and devices for obtaining plasmas with high applicative resource; to familiarize students with the newest technology and efficient applications of plasma; to expose the knowledge necessary for students to design and use technological plasma devices

Prerequisites: mechanics, physics of atom and molecules, optics, spectroscopy, plasma physics, technical drawing

Course content:

Types of discharges used in applications. Plasma deposition of films. Plasma polymerization. Surface Treatments by plasma. Plasma cutting and plasma welding. Plasma and environment. Biomedical applications of plasma

Reccomended reading:

Reece Roth, *Industrial Plasma Engineering Volumul 1: Principles*, Institute of Physics Publishing, Bristol and Phyladelphia, 1995
H. V. Boenig, *Plasma Science and Technology*, Cornell University Press, 1982
Plasmas froids, Directeur de publication Agness Granier, Publications de l'Universite de Saint-Etienne, 2006
Plasma Technology. Fundamentals and Applications, Edited by Mario Capitelli and Claudine Gorse, Plenum Press, New York, 1992
I.I. Popescu, I.I. Iova, E. Toader, *Fizica Plasmei si Aplicatii*, Editura Stiintifica si Enciclopedica, Bucuresti, 1981
G. Popa si M. Gheorghiu, *Aplicatii tehnologice ale plasmei*, Editura Univ. "Al. I. Cuza" Iasi, 1998

Teaching methods: (course): lecture, debate; (laboratory): experiment, discovery learning

Assessment methods: (course): written and oral examination, (laboratory): presentation

Language of instruction: Romanian

Course title: ***Modern Study Methods in Solid State Structure***

Type of course: compulsory **Level of course:** undergraduate

Year of study: III **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Prof. dr. Felicia IACOMI

Objectives:

Some methods and theoretical models useful in the study of the structure, electrical, magnetic and optical properties of solid state are introdused. Some modern experimental methods used in the structure of solid state are presented.

Prerequisites: Electricity and magnetism, optics, quantum mechanics, solid state physics

Course content:

Diffraction methods in the study of crystalline structure (XRD, ED techniques. Direct methods. High resolution methods). Microscopical methods for the study of crystalline phases, morphology and surface roughness (SEM, TEM, AFM). Spectroscopical methods for the study of the structure and properties of solid state (X-ray photoelectron spectroscopy- XPS. Vibrationale spectroscopy-FTIR, Raman. Optical spectroscopy-transmittance, reflectance, absorption, emission. Magnetic resonance methods-ESR, FR, NMR)

Reccomended reading:

I.Pop, V. Niculescu, *Metode experimentale in studiul corpului solid*, Ed.Acad. Bucuresti, 1971
V.Pop. I.Chicinas, N. Jumate, *Fizica materialelor. Metode experimentale*, Presa Universitara Clujeana, 2001
F. Iacomi, *Zeolitii naturali. Structura. Proprietati. Utilizari*, Ed. Universitatii A. Vlaicu Arad, 2001
P.E.J. Flewitt, R.K.Wild, *Physical Methods for Material Characterization*, IOP Publishing Ltd. 1994 London
F.Iacomi, *Spectroscopia vibrationala a materialelor zeolitice*, Ed, Stef 2007 L.David, C.Craciun, O.Cozar, V.Chis, *Rezonanta Electronica de Spin. Principii. Metode. Aplicatii*. Presa Universitara Clujeana, Cluj-Napoca,2001
Al.Nicula, *Rezonanta magnetica*, Ed.didactica si pedagogica, Bucuresti, 198

Teaching methods: exposal, discutions, lab work

Assessment methods: tests, experimental application

Language of instruction: Romanian

Course title: *Biochemistry*

Type of course: compulsory **Level of course:** undergraduate

Year of study: III **Semester** : 1 **ECTS credits:** 5

Name of lecturer:

Objectives:

Prerequisites:

Course content:

Reccomended reading:

Teaching methods:

Assessment methods:

Language of instruction: Romanian

Course title: *Solid State Physics and Semiconductors*

Type of course: compulsory **Level of course:** undergraduate

Year of study: III **Semester** : 1 **ECTS credits:** 5

Name of lecturer: Conf. dr. Florin BRINZA

Objectives:

Creating a knowledge base containing structural, mechanical, electrical, optical and magnetic properties of solid state and his experimental and theoretical methods of study. Study of solid state related to biophysics and medical physics. Knowledge of structure and function of main devices based on solid materials.

Prerequisites: Molecular Physics, Mechanics, Electricity and Magnetism, Quantum physics

Course content:

1. General properties of solid state. Bravais lattices. Reciprocal lattice. Particular lattices of semiconductors. Amorphous solids. Methods for structure investigation. 2. Mechanical and thermal properties of crystalline lattice. 3. Energy bands in solid state – theoretical models and experimental results. 4. Electrical properties of solids. Electrical conductivity of metals, semiconductors and dielectrics. Superconductivity. Application of electric properties for devices used in biophysics and medical physics. 5. Optical properties of solids. Photoconductibility of semiconductors. 6. Magnetic properties of solids. Diamagnetism. Paramagnetism. Ferromagnetism. 7. Solid state investigation methods applied in biophysics and medical physics: X-rays, NMR, computer-assisted tomography, and ultrasonic investigation.

Reccomended reading:

I.D. Bursuc, N. Sulitanu, *Solidul. Fenomene, teorie, aplicații*. Ed. Şt. şi Enc., Buc.
G.I.Rusu, G. G. Rusu, *Fizica semiconductorilor*, p.I, Ed. Univ. „Al.I.Cuza" Iasi, 2005.
N. Suliţanu, *Fizica suprafeței solide*, Ed. , Ed. Univ. „Al.I.Cuza" Iasi, 2005
C. Kitel, *Introducere în fizica corpului solid*, Ed. Tehnică, Bucureşti, 1972.
I.D.Bursuc, F.Brînză, N.Sulitanu, *Dinamica electronilor de conducție*, Ed. Univ. „Al.I.Cuza", 2006
E. Burzo, *Fizica fenomenelor magnetice vol I-III*, Editura Academiei Bucureşti,1979

Teaching methods: multimedia-assisted conference, Demonstrative experiment

Assessment methods: two tests from 1, 2 and 3 topics, final examination, written

Language of instruction: Romanian

Course title: *Physics of Nucleus*

Type of course: compulsory **Level of course:** undergraduate

Year of study: III **Semester** : 1 **ECTS credits:** 5

Name of lecturer: Lect. dr. Dan MIHAILESCU

Objectives:

Students should learn the basic concepts in nuclear physics, properties and structure of the mater at nuclear level, theoretical and experimental techniques in nuclear physics.

Prerequisites: basic knowledge of Atom Physics and Quantum Mechanics

Course content:

(1) General properties of the atomic nuclei; (2) Nuclear Forces; (3) Nuclear models; (4) Radioactivity; (5) Radiation detectors; (6) Nuclear reactions; (7) Nuclear fission, nuclear fusion and nuclear energy; (8) Particle accelerators.

Reccomended reading:

Yn.A. Shirokov, N.P.Yudin, *Nuclear Physics vol.I si II*, Ed.Mir Publishers, Moscow, 1982.
E. Lozneanu, *Fizică nucleara*, Ed. Univ. "Al. I. Cuza" Iasi, 2003.
D. Mihăilescu, E. Lozneanu, *Lucări practice de fizică nucleară*, Ed. Universității "Al.I.Cuza", Iași, 2003.
K.N.Muhin, *Fizica nucleara experimentala, vol.I si II*, Ed.tehnica, Bucuresti, 1982
I.G.Murgulescu, J.Paun, *Introducere in chimia fizica, vol.I,3: Nucleul atomic, reactii nucleare, particule elementare*, Ed.Academiei, Bucuresti, 1982

Teaching methods: lecture, class discussion, brainstorming

Assessment methods: 50% by class tests and practical assessment; 50% by final exam

Language of instruction: Romanian

Course title: ***Numeric and Analogical Modelling of Biological Processes***

Type of course: compulsory **Level of course:** undergraduate

Year of study: III **Semester** : 1 **ECTS credits:** 5

Name of lecturer: Lect. Dr. Catalin AGHIORGHIESEI

Objectives:

Statistical concepts in biophysics and medical physics; Description of different kind of statistical distributions; Biomembrane modeling; Numerical and analogical modeling of ions movement in biomembrane using statistical concepts .

Prerequisites: Biophysics, Programming Languages, General Physics, Mathematical Analysis

Course content:

Statistical description of data in physics. Stationary and non-stationary stochastic and ergotic processes. Normal, chi2, Gauss, exponential distribution. Autocorrelation, cross-correlation, Fourier and Laplace transformation. Langevin equation and applications in biological systems. Biomembrane modeling using passive circuits elements.

Reccomended reading:

T. Luchian, *Introducere in biofizica moleculara si celulara*, 'Al.I. Cuza' University Iasi, 2001
N. G. Van Kampen, *Stochastic processes in physics and chemistry*, North-Holland, 1992
Christopher P. Fall Eric S. Marland John M. Wagner John J. Tyson,*Computational Cell Biolog*' Springer-Verlag, 2002.

Teaching methods: observation, algorithm, explanation, problems

Assessment methods: 50% practical works, 50% final test

Language of instruction: Romanian

Course title: *Molecular and Cellular biology. Elements of Genetics.*

Type of course: compulsory **Level of course:** undergraduate

Year of study: III **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Prof. asociat CS I dr. Pincu ROTINBERG

Objectives:

The development of the knowledge about molecular, subcell and cell structures, their functional implications in the bacterial, fungal, vegetal and animal cells, as well as the physical, biochemical and behavioural transmission of the genetic hereditary informations to descendents is an inherent consequence of the theoretical and practical capitalization, by biologists, of the physics and biophysics data. In counterparty, the new achievements in the molecular and cell biology, as well as in the genetics, supply new informations and suggest new directions in physical and biophysical research.

Prerequisites: Chemistry, Biochemistry, Cytology, Anatomy and Physiology

Course content:

Introduction in the study of molecular and cell biology, as well as of genetics. General notions about cell. Chimical composition of the cells. Instrumental analysis of the cells. Plasmatic membrane (plasmalema) and cell signaling. Extracell matrix and intercell. Cytoplasmatic matrix. Structural and functional characteristics of the cell organelles. Nucleus, the headquarter of the genetic control of cells. Cell proliferation. Expression and transmission of the genetic information. Genetic cod transduction in cell proteinsynthesis, the final expression of genes. Cell diferentiation, aging and programmed death. Disorders of the cell control genetic mechanisms and the human pathology

Reccomended reading:

N.Voiculet, L.Puiu, *Biologia Moleculara a Celulei*, Ed.All 1997
P.Raicu, *Genetica generala si umana*, Ed.Humanitas1997
Alberts B.,Johnson, Lewis J., Raft M., Roberts K., Walter P., *Essential cell Biology*, Garland Publishing Inc., New York& London, l998
I.Neacsu, C.S.Campeanu, *El. de biofizica si Biologie Celulara*, Ed.Cermi, Iasi. 2000
Alberts B.,Johnson, Lewis J., Raft M., Roberts K., Walter P., *Molecular Biology of the cell*, 4th Edition, Garland Publishing Inc., New York& London2002
S.P.Langdon, *Cancer cell culture methods and protocols*, Humana Press Inc, 2003
T.Craciun, L.Jensen, *Genetica si viitorul omenirii*, Ed.Albatros,Bucuresti. 2004
M.Costache, *Biologie celulara*,MEC, Bucuresti 2005
M.E.Cadar, *Biologie Celulara*, Ed. Academic Pres, Cluj-Napoca, 2006
E.V.Gorduza, *Compendiu de genetica umana si medicala*,Ed.Tehnopress, Iasi 2007

Teaching methods: Lecture, debate, heuristic conversation

Assessment methods: written test

Language of instruction: Romanian

Course title: *Human Anatomy and Physiology*

Type of course: compulsory **Level of course:** undergraduate

Year of study: III **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Lector dr. Lucian HRITCU

Objectives:

Students should obtain knowledge of theoretical fundamentals and practical methods concerning the Anatomy and Physiology of the main systems of the human body.

Prerequisites: The Human Anatomy and Physiology, and Biochemistry from high school.

Course content:

Organisation of the Nervous System. Basic functions of Synapses and Transmitter substances; The Anatomy and Physiology of the locomotor system. Smooth Muscle.The Anatomy and Physiology of the Special Senses: The Tactile and Position Senses; Pain and Thermal sensations; Vision; Hearing; The Vestibulary System;Taste and Smell; The Anatomy and Physiology of the Spinal Cord. Cortical and Brain Stem control of the Motor Function; The Cerebellum and Basal Ganglia; Intellectual Functions of the Brain; Learning and Memory; The Autonomic Nervous System; The Endocrinology and Reproduction: The Pituitary gland; The Thyroid; Parathyroids; The Endocrine Pancreas; Adrenal Glands; Epiphysis; Reproductive and Hormonal Functions of the Male and Female; The Anatomy and Physiology of the Alimentary Tract; Respiration; The Heart and the Circulation; Kidney and Micturition; The Blood Cells, Immunity and Clood Clotting; Energetics and Metabolic Rate; Dietary Balance; Thermoregulation

Reccomended reading:

Melnic, B., Hefco V., Crivoi A., *Fiziologia omului si animalelor*.Ed.St,Chisinau, 1993.
Strungaru Gr., Pop M., Hefco V., *Fiziologia animala*. Ed.Did.Ped.Bucuresti, 1983
Hefco V.P., *Fiziologia animalelor si a omului*.Ed.Did.Ped.Bucuresti, 1997
Hefco V., *Fiziologia animalelor si a omului. Functiile de relatie*. Ed.Univ.Iasi, 1989
Hefco V., *Fiziologie experimentala.Vol.I-III* , Ed.Univ.Iasi 1975-1977
L. Hritcu, Hefco V. *Elemente de fiziologia animalelor si a omului. Functii de relatie*. Ed. PIM, Iasi, 2007
I.B. Levitan, L.K. Kaczmarek. *The neuron. Cell and molecular biology*. Oxford University Press, 2002
D. Purves. *Neuroscience*. Sinauer Associates, Inc., 2004

Teaching methods:

Assessment methods:

Language of instruction: Romanian

Course title: *Elements of Biostructure*

Type of course: compulsory **Level of course:** undergraduate

Year of study: III **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Profdr. Viorel MELNIG

Objectives:

The capacity of apprehend the relations structure – functionality (reactivity, affinity, etc.), of the main classes of biopolymers (proteins, nucleic acids, lipids, polysaccharides) which assures morphological structure and the functions of the cells and the supracellular structures from the animals and vegetal organisms. The capacity to prospect, process and analyse information from variety of bibliographic sources and report elaboration (work laboratory). Team skill worked for solving experimental and technological problems. Personal and group's projects successfully capacity for initiated and administered; determination and sedulous in the realization of the tasks and of the responsibility.

Prerequisites: General Chemistry, General Biophysics, Cellular and Molecular Biology

Course content:

The chemical character of the living systems; The properties of organic compounds from the biologic systems. The reactions of condensation and hydrolyse concerned in biopolymers synthesis/cleavage; The week physical interactions nature in biologic aqua media; The biopolymers stability and equilibrium; Structure and the properties of the proteins; Fibrous and globular proteins - specific properties; The structures and properties of nucleic acids; Polysaharides structure and properties; Lipids; Phospholipids supramolecular assemblage. The membrane cells structure.

Reccomended reading:

L. Lehniner, *Biochimie*, Ed. Tehnică, Bucureşti 1987;
Pullan, Wendy, *Structure* Cambridge: Cambridge University Press (2000).
R. Contor, P. R. Schimmel, *Biophysical Chemistry – The behaviour of biological macromolecules*, Ed. W. H. Freeman &, New York, 1980;
Viorel Melnig, Laura Ailoaie, *Lucrări de Laborator de Biofizică Generală*. Partea I, Ed. Univ. "Al. I. Cuza", Iaşi, 2002;
Viorel Melnig, Ana Garlea, Laura Obreja, *Lucrari de laborator de Biostructura. Partea I: Proprietatile solutiilor apoase*, Al. Ioan Cuza University Press, Iasi, 2008

Teaching methods: magisterial lecture; debate; problematization; frontal experiment; conducted revelation

Assessment methods: exam (45%), colloquium (35%), laboratory (work laboratory reports 20%)

Language of instruction: Romanian

Course title: *Radiobiology*

Type of course: optional **Level of course:** undergraduate

Year of study: III **Semester** : 1 **ECTS credits:** 5

Name of lecturer: Prof. dr. Dorina CREANGA

Objectives:

To help students in understanding specific action of ionizing and ultraviolet radiation in living matter, from both qualitatively and quantitatively view.

Prerequisites: Biophysics, Nuclear Physics, Dosymetry

Course content:

Chronology of physical, chemical and biological effects of ionizing radiation. Classification of primary processes of ionizing radiation interaction with living matter. Corpuscular radiation action in living matter: linear energy transfer to complex biological medium, Bragg-Bragg relation. Electromagnetic radiation absorption: linear attenuation coefficients and cross sections in different types of biological tissues. Direct and indirect action of ionizing radiation upon bio-molecules. Water radiolysis, free radical reactions, hydrated electron. ESR methods for revealing fee radicals formation under radiation action. Target theory and Poisson distribution. Main types of survival curves. Irradiation quasi-threshold. Selective irradiation in biomedical applications. DNA and protein synthesis under radiation action. Delayed mitoses, cellular death. Cell damage restoration. Radiosensitivity and radioprotection. The radiosensitivity scale of Bergonier-Tribondeau. Neutrons interaction with living matter. Tissues activation by neutron beam utilization. Whole body irradiation and lethal syndromes. Cancerization and genetic effects of radiations. Ultraviolet radiation biological effects. DNA damages. Action spectra: E.coli lethal effect, skin pigmentation, photoprotection and photorestauration.

Reccomended reading:

D. Creanga, *Elemente de radiobiofizica*, Ed. Cermi, 2005
Tubiana, M., et al, *Introduction to radiobiology*, Taylor&Francis, 1990
D. Creanga, *Lucrari de laborator de radiobiologie*, Ed. Univ. Al. I. Cuza Iasi, 2003
*Radiobiology in Radiological Scienc*e, RAD 7060, Lecture Notes
Gremy, F., Perrin, J., *Elements de biophysique*, Flammarion, 1971,
Curry, T.S., et al., *Physics of diagnostic radiology*, Ed. Univ. Patras, 1995
Anderson, D.W., *Absorption of ionizing radiation*, Univ. Park Press, Baltimore, 1983

Teaching methods:

Assessment methods:

Language of instruction: Romanian

Course title: ***Lasers. Applications to Medicine.***

Type of course: optional **Level of course:** undergraduate

Year of study: III **Semester** : 1 **ECTS credits:** 5

Name of lecturer: Lect. Dr. Adeline CIOCAN

Objectives:

The main goals of the course is to briefly presents the principles of the lasers and than to describe different types of lasers, especially those used in medical and biological applications. At the same time it is presented the laser-tissue interaction and what are the problems for the laser treatment of living materials. The final goal of this course is to present to the students from Biophysics and Medical Physics specializations, an overview of lasers and their medical and biological applications and the laser-living matter interactions.

Prerequisites: Optics, Atomic and Molecular Physics, Quantum Mechanics

Course content:

Absorption, Spontaneous Emission and Stimulated Emission. The relations between Einstein coefficients; Amplification and inversion of population; Atomic systems with three energy levels and the calculus for the threshold power; Fabry – Perrot etalon and its modes; Resonators and the stability conditions; Broadening spectral line mechanisms; Longitudinal and transversal laser cavity modes. Q-switching and mode locking processes. Lasers utilized in medicin; The laser-matter interaction; Photochemical, thermal and electro-mechanical effects for laser-tissue interaction; Laser ablation. Bio-heat equation; Safety and risks in the utilization of the lasers in medical applications; Lasers in diagnosis and medical techniques.

Reccomended reading:

Catalin Agheorghiesei, *Laseri, Aplicatii in medicina* ,Notite de curs, 2004, http://www.plasma.uaic.ro;
Gh.N.Singurel, *Fizica laserilor*, Ed. Univ. "Al.I.Cuza", Iasi, 2001;
Dan C. Dumitras, *Biofotonica. Bazele fizice ale aplicatiilor laserilor in medicina si biologie*, Ed. All Educational, Bucuresti, 1999;
Dan. C. Dumitras, *Laseri cu gaz*, Ed. Academiei RSR, Bucuresti, 1982 ;
Wolfgang Demtroeder, *Laser Spectroscopy – Basic Concepts and Instrumentation*, Springer – Verlag Berlin Heidelberg, 1996 ;
L.V.Tarasov, *Laserii. Realitate si speranta* , Ed. Tehnica, Buc., 1990;
Dr. Ing. N.Popescu si Ing. M.Opran, *Laseri si aplicatii*, Ed. Militara, Buc., 1979 ;
Ion M.Popescu, *Fizica si ingineria laserelor*, Ed. Tehnica, Buc., 2000 ;
Gh. Singurel, *Laseri si Optica neliniara*, Ed. Univ. "Al.I.Cuza " – Iasi, 1975;
Dan C. Dumitras, *Tehnici laser si aplicatii*, Ed. Univ. Buc., 2006.

Teaching methods: Exposure and dialogue

Assessment methods: Written evaluation

Language of instruction: Romanian

Course title: *Ultrasound Techniques of Diagnoses and Treatment*

Type of course: optional **Level of course:** undergraduate

Year of study: III **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Lect. Dr. Viorel ANITA

Objectives:

This is an elective course for medical and biophysical students. The goals are to provide fundamental understanding of ultrasonic systems to prepare students to take jobs involving the use of ultrasonic techniques or to conduct research in area of ultraacoustics. A particular emphasis is placed on understanding of medical imaging and treatments systems.

Prerequisites: Mechanics and acoustics, mathematics, electronics

Course content:

General information concerning ultrasound. Propagation of ultrasound in gases, liquids, solids and biological media. Characterization of ultrasound field. Interference, refraction, attenuation and cavitation. Ultrasound generation and coupling to different media. Ultrasound generators. Instruments for ultrasound diagnosis and treatments. Echography – application for diagnosis in cardiology, urology, obstetrics, ophthalmology, etc.. Doppler echography - clinical applications. Treatments with ultrasound. Ultrasonic technologies for prosthetic material fabrication and pharmaceutical technology.

Reccomended reading:

J. D. Wicks, K. S. Howe, *Fundamentals of Ultrasonographic Technique*, Year Book Medical Publishers, Inc., 1983.
L. E. Kinsler, Austin R. Frey, *Fundamentals of Acustics*, John Wiley&Sons, 1962
G. Amza, D. Barb, F. Constantinescu, *Sisteme Ultraacustice*, Ed. Tehnica, 1988.
C C. Tudose, *Ultrasunete*, Editura Stiintifica, 1997
T.Pop et al., *Ecografia clinica*, Ed. Medicala, 1998
M.Toma et al., *Tehnici biofizice pentru diagnostic si terapie*, Ed. Univ “Al.I.Cuza” Iasi, 2003
H. Gavrila, H. Chiriac, P. Ciureanu, V. Ionita, A. Yelon, *Magnetism tehnic si aplicat*, Editura Academiei Române 2004
E. Purcell, *Cursul de fizica Berkeley II* (Electricitate si magnetism) EDP,1987
Al. Stancu, *Tratat de Electricitatea si magnetism*, Cartea Universitara Bucuresti
Ilie Diaconu, D. Dorohoi, *Ultrasunete.Aplicatii in medicina*, Iasi, 2006

Teaching methods: Presentation, discussions, experiments

Assessment methods: written test

Language of instruction: Romanian

Course title: B*ioenergetics*

Type of course: optional **Level of course:** undergraduate

Year of study: III **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Prof. dr. Viorel MELNIG

Objectives:

Oneself and applies ability of the knowledge's referring the problematic bioconversion of the energy in the metabolic process. On the spontaneous natural process evolution base criteria, they are entered in rigorously way, the notions of passive and active transport, the two or more coupling process of different nature, the coupled reaction process stoichiometry, the degree of coupling, etc. Bioconversions process types: oxidation/reduction reactions, phosphorylation /hydrolyse of the inorganic phosphate units, respectively. Are studied the main energy conversion processes: oxidative phosphorylation, photosynthesis, mitochondrial breathing chain, glycolysis, etc. The capacity to prospect, process and analyse information from variety of bibliographic sources and report elaboration (work laboratory). Team skill worked for solving experimental and technological problems. Personal and group's projects successfully capacity for initiated and administered; determination and sedulous in the realization of the tasks and of the responsibility.

Prerequisites: General Chemistry, Elements of Biostructure, General Biophysics

Course content:

Spontaneous evolution of biologic process conditions: the independent processes evolution; the passive transport energetic; the evolution of coupled process; the active transport energetic. The chemiosmotic theory of protons circuit: the protons' electrochemical potential measurement; the reactions involves the transfers of protons stoichiometry. The bioenergetics complex process thermodynamics: the reduction-oxidation process thermodynamics; reduction-oxidation processes in biologic systems; the oxidative phosphorylation; photosynthesis; glycolysis. Bioenergetics processes regulations.

Reccomended reading:

L. Lehniner, Biochimie, Ed. Tehnică, Bucureşti 1987;
D. E. Metzler, Biochemistry – The chemichal reactions of living cells, Ed. Academic Press, New York, San Francisco, London, 1977.
G. Federico, Theory of Energy Transfer and Conversions, Ed. John Wieley & Sons, New York – London - Sydney, 1967.
David G. Nicholls, Bioenergetics, Ed. Academic Press, New York – London - Sydney, 1982.Al. Stancu, *Tratat de Electricitatea si magnetism*, Cartea Universitara Bucuresti
Ilie Diaconu, D. Dorohoi, *Ultrasunete.Aplicatii in medicina*, Iasi, 2006

Teaching methods: magisterial lecture; debate; problematization; frontal experiment; conducted revelation.

Assessment methods: colloquium (70%), laboratory (work laboratory reports 30%)

Language of instruction: Romanian

Course title: ***Elements of Plasma Physics. Plasma Interactions with Bioactive Materials***

Type of course: optional **Level of course:** undergraduate

Year of study: III **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Prof. dr. Nicoleta DUMITRASCU

Objectives:

Knowledge of fundamentals in plasma phyics; competences and practical abilities in obtaining and diagnosis of plasmas; basic guidelines related to the materials used in medicine and biology; capability to draw up a synopsis about an imposed subject.

Prerequisites: Electricity and magnetism, Physics of atoms and molecules, Elements of molecular biology

Course content:

Parameters and classification of plasmas. Spatial and temporal dimensions in plasma physics (Debye length and Langmuir oscillations). Double layers in plasma (Bohm criterion). Processes in the plasma volume and interactions with the surface. Plasma diagnosis (optical and electrical methods). Theoretical models in plasma physics (MHD and kinetic models). Medical applications of plasmas. Effects of plasma upon the surface of materials. Interactions plasma-bioactive molecules.

Reccomended reading:

E. Badarau, I. I. Popescu, *Gaze ionizate*, Vol.I si II, Ed. Tehnica, 1965
Gh. Bratescu, *Fizica Plasmei*, Ed. Didactica si Pedagogica, Bucuresti, 1970
G. Popa, *Fizica plasmei*, Univ. Iasi, 1985 si 1999
I. I. Popescu, D.Ciubotaru, *Bazele fizicii plasmei*, Ed.tehnica, 1987
F. F. Chen, *Plasma Physics and Controlled Fusion*, Vol.1, Plasma Physcs Plenum Press, New York, London, 1974 and 1983
P. A. Styrrok, *Plasma Physics*, Cambridge Univ. Press, 1994
G. Popa, D. Alexandroaei, *Indrumar de lucrari practicede fizica plasmei*, Univ. Iasi, 1991
Biomaterials Science, *An intoduction to materials in medicine*, Eds. B. D. Ratner and A. S. Hoffman, Academic Press, New York, 1996

Teaching methods: lecture, class discussion, brainstorming

Assessment methods: final exam (oral and written examinations), lab report

Language of instruction: Romanian

Course title: ***Elements of Kinetics and Dynamics of Biological Systems***

Type of course: optional **Level of course:** undergraduate

Year of study: III **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Prof. dr. Viorel MELNIG

Objectives:

Knew and applies ability the knowledges from the area of formal kinetics which have the applicability in some areas of biological sciences and especially in the area of metabolic process. Are oneself the two distinctly contour onsets of the enzymatic kinetics systems: The Enzyme Kinetics in "Steady State" Approximation; Dynamic Analysis of Enzyme Systems. The first approach is specific to in vitro enzyme reactions, offering the possibility of investigation and the specific parameters which size the characteristics of biologic process kinetics. The second, Dynamic Analyses, is relegating to the in vivo catalytic enzyme processes. The capacity to prospect, process and analyse information from variety of bibliographic sources and report elaboration (work laboratory). Team skill worked for solving experimental and technological problems. Personal and group's projects successfully capacity for initiated and administered; determination and sedulous in the realization of the tasks and of the responsibility.

Prerequisites: General Chemistry, Elements of Biostructure, General Biophysics

Course content:

Proteins in solution. General properties of the enzymes; Enzyme catalysis chemical mechanisms. Kinetics of the enzyme reactions in the "Steady State" Approximation: Michaelis - Menten kinetics type; Allosteric kinetics type; Experimental methods. Dynamic Analyses of Enzyme Systems: Enzymatic regulation and the metabolism control; Models types; Approximations in Metabolic System design; Metabolic System's control models; The strategy of Dynamic Analysis.

Reccomended reading:

L. Lehninger, *Biochimie*, Ed. Tehnică, Bucureşti 1987;
D. E. Metzler, *Biochemistry – The chemichal reactions of living cells*, Ed. Academic Press, New York, San Francisco, London, 1977.
R. Contor, P. R. Schimmel, *Biophysical Chemistry – The behaviour of biological macromolecules*, Ed. W. H. Freeman &, New York, 1980;
V. Melnig, D. Nantu, *Cinetică enzimatică în aproximația stării staționare. Teste*, Ed. Panfilius Iaşi, 2002

Teaching methods: magisterial lecture; debate; problematization; frontal experiment; conducted revelation.

Assessment methods: colloquium (70%), laboratory (work laboratory reports 30%)

Language of instruction: Romanian

Course title: ***Spectroscopy of Biological Medium***

Type of course: optional **Level of course:** undergraduate

Year of study: III **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Prof. dr. Ghita SINGUREL

Objectives:

Optical radiation and biological tissues interactions concepts; optical research methods and instrumentation

Prerequisites: Optics, Atom and Molecule Physics Data physics manipulation

Course content:

Introduction. Optical radiometry. Absorption and scattering of optical radiation in biological tissues. Boltzmann transport equation, photons diffusion, fluorescence in biological tissues. Monte Carlo Model. Absorption and fluorescence spectrometry methods. Coherent and non-coherent radiation sources

Reccomended reading:

Gh. Singurel, Proprietățile optice ale mediilor biologice, Curs multiplicat.

Teaching methods: observation, algorithm, explanation, problems .

Assessment methods: 50% practical works, 50% final test

Language of instruction: Romanian

Course title: ***Detectors, Dosimetry and Radio-protection***

Type of course: compulsory **Level of course:** undergraduate

Year of study: III **Semester** : 1 **ECTS credits:** 5

Name of lecturer: Lect. Dr. Dan MIHAILESCU

Objectives:

Students should learn the basic concepts in absorption of ionizing radiation, radiation detectors and ionizing radiation dosimetry

Prerequisites: basic knowledge of Atomic and Nuclear Physics

Course content:

(1) Ionizing radiation (definition, classifications, generation mechanisms, ionizing radiation sources; (2) Radiation field (definition, structure, characterization by radiometric quantities); (3) Interaction of ionizing radiations with matter; (4) Dosimetric quantities; (5) Calculation of dosimetric quantities; (6) Measurement of dosimetric quantities; (7) Dosimetric methods (ionometric method, solid state dosimetry, thermoluminiscence dosimetry, photographic dosimetry, chemical dosimetry, calorimetric dosimetry); (8) Radioprotection.

Reccomended reading:

D. Mihăilescu, *Dozimetria radiațiilor ionizante*, Ed. Univ. "Al.I.Cuza", Iaşi, 2001.
D. Mihăilescu, C. Borcia, *Interacțiunea radiațiilor ionizante cu substanța. Partea I: radiații încărcate electric*, Ed. Sedcom Libris, Iaşi, 2007.
V.I. Ivanov, *Curs de dozimetrie*, Ed. Planeta, Bucureşti, 1999.
Frank H. Attix, *Introduction to Radiological Physics and Radiation Dosimetry*, John Wile & Sons, N.Y., 1986.
H.E. Johns, J.R.Cunningham, *The Physics of Radiology*, Sprinngfield,U.S.A. 1983.

Teaching methods: lecture, class discussion, brainstorming.

Assessment methods: 50% by class tests and practical assessment, 50% by final exam

Language of instruction: Romanian

Course title: *Radiology and Medical Imagistics*

Type of course: compulsory **Level of course:** undergraduate

Year of study: III **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Lect. Dr. Ioana RUSU, lect.dr. Cătălin BORCIA

Objectives:

Learn of fundamental knowledge of radiology and medical imaging modalities. Apply this knowledge to solve different problems in medical imaging practice. Implement methods to analyze the quality of medical images as a medical physicist in the frame of a quality assurance program. Identify and use bibliographic resources for continuous formation. Demonstrate an interdisciplinary understanding of imaging.

Prerequisites: Electricity and magnetism, Atomic and molecular physics, Nuclear physics, Detectors, dosimetry and radio-protection

Course content:

Basics of medical imaging; Ultrasound imaging; X-ray medical imaging; Computed tomography; Elements of nuclear medicine; Optics in medical imaging; Electrical impedance tomography; Magnetic Resonance Imaging; Imaging fusion techniques; Standardization in information management in medicine: DICOM standard

Reccomended reading:

W.R.Hendee,E.R.Ritenour,*Medical Imaging Physics*,Ed. Wiley-Liss 2002 New York
H. E. Johns, J. R. Cunningham, *The Physics of Radiology (Fourth Edition),* Charles C Thomas Publisher (1983).
Steve Webb, *The physics of medical Imaging*, Ed. Taylor & Francis (1988) Bristol and Philadelphia
D.D. Stark, W.G. Bradley, *Magnetic Resonance Imaging*, C.V. Mosby Co., St. Louis, MO 1988.
C. Borcia, *Surse de radiații şi radioprotecție*, Ed. Univ. „Al. I. Cuza" Iaşi (2003)
Jim Breithaupt, *Physics for advanced level, Fourth Edition*, Nelson Thornes Ltd., UK
M. Toma, D. Dorohoi, I. Rusu, M. Burlea, E. Macsim, D. Urzica, *Tehnici biofizice pentru diagnostic si terapie*, Ed. Univ. "A.I.Cuza", Iasi (2003)

Teaching methods: lecture, laboratory work, class discussion, brainstorming.

Assessment methods: final exam, lab report and portfolio

Language of instruction: Romanian

Course title: *Electronic and Medical Instrumentation*

Type of course: compulsory **Level of course:** undergraduate

Year of study: III **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Lect. Dr. Octavian RUSU

Objectives:

The students should obtain knowledge of theoretical fundamentals for electronic devices and circuits used in medical electronics and of practical methods for using electronics circuit for low-level signals.

Prerequisites: Mathematics, Physics, Biology and Electronics

Course content:

The course is divided into six sections. The course begins with an overview of the subject of Medical Electronics, discussing its scope and relevance to physicists and a review of electronic devices and circuit's basics. The second section imparts fundamental knowledge about bioelectrical signals, multiports and electronics amplifiers used in medical environment. The third section is on electrical noise. Specifically, the types of noises that affect electronic circuits and a series of methods to decrease the noise effects on electronic are studied. In the fourth section linear amplifier circuits and their applications in medicine are described. Next section describes digital circuits and their use in biomedical instruments. The last section imparts fundamentals knowledge in analog to digital signal conversion; hardware digital signal processing and standard buses used in medical data acquisition systems.

Reccomended reading:

Y. Haritantis, *Medical Electronics, Laboratory of Medical Physics*, University of Patras, 1995
L.A. Geddes, L.E. Baker, *Principles of Applied Biomedical Instrumentation*, J Wiley, New York, 1989
J.G. Webster (Ed), *Medical Instrumentation - Applications and Design*, Houghton Miflin Co. B.H. Brown,
R.H. Smallwood, *Medical Physics and Physiological Measurement*, Blackwell Scientific Ltd.
A. Bennet, *Electrical Noise*, McGrow-Hill, 1960
Gh. Cartianu, s.a., *Semnale, circuite si sisteme*, E.D.P. Bucuresti, 1980
C. Miron, *Introducere în electronica*, ED. Dacia, Cluj,1983
O. Radu, Gh. Sandulescu, *Filtre numerice - aplicatii*, Ed. Tehnica, Bucuresti, 1979

Teaching methods:

Assessment methods:

Language of instruction: Romanian

Course title: *Nuclear Medicine*

Type of course: optional **Level of course:** undergraduate

Year of study: III **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Prof. dr. Valeriu RUSU, prof. dr. Cipriana ŞTEFĂNESCU

Objectives:

Students should learn the basic concepts in nuclear medicine: radioisotopes in medicine and biology, experimental devices in nuclear medicine, data acquisition and processing, dosimetry and radioprotection in nuclear medicine.

Prerequisites: Nuclear Physics, Detectors, Dosimetry and Radioprotection

Course content:

(1) Essential data about evolution of Nuclear Medicine; (2) Physical basis of Nuclear Medicine; (3) Radioisotopes for Nuclear Medicine; (4) Radiopharmaceuticals; (5) Elements of radiobiology; (6) Elements of radioprotection; (7) Nuclear Medicine instrumentation; (8) Gamma-camera; (9) Single photon emission computed tomography (SPECT); (10) Positron emission tomography; (11) Main applications of Scintigraphy in medicine; (12) Principles of in vitro investigation methods.

Reccomended reading:

Aurengo A., Grémy F., Petitclerc T., *Biophysique*, Ed. Médécine-Sciences Flammarion, Paris, 1997
Early P.J, Sode D.B, *Principles and practice of Nuclear Medicine*. Ed. Mosby, 1995.
Herman S. *Aparatură medicală. principiile fizice ale aparturii medicale moderne*, Ed.Teora, Bucureşti, 2000.
Merrick M.V., *Essentials of Nuclear Medicine*, Churchill Livingstone, 1984.
Murray P. C., Ell P. J., *Nuclear Medicine Principles*, Ed. Churchill Livingston, Edinburg, 1996.
Ştefănescu C., Rusu V. *De la fizica şi biofizica radiofarmaceuticelor la imagini funcționale şi moleculare*. Ed. Tehnopress, Iaşi, 2007.

Teaching methods: lecture, class discussion, brainstorming

Assessment methods: 50% by class tests and practical assessment, 50% by final exam

Language of instruction: Romanian

Course title: *Data Bases*

Type of course: compulsory **Level of course:** undergraduate

Year of study: III **Semester** : 1 **ECTS credits:** 5

Name of lecturer: Asist.dr. Petronel POSTOLACHE

Objectives:

Introducing students to the main concepts and fundamental notions of databases, relational model of databases, design techniques for databases

Prerequisites: Basic undergraduate courses in programming languages and informational technologies

Course content:

Theoretical models of databases (relational model, hierarchic model). The theory of relational databases design. The Entity-Relationship model. Elements of relational algebra. My-SQL. Searching. Relation between tables. Normal forms for relational schemes. Types of restrictions. Integrity restrictions.

Reccomended reading:

C.J. Date, *An introduction to Databases Systems*, Ac.Press, 1990.
V. Felea, *Baze de date relationale.Dependente*, Ed.Univ.Iasi, 1996.
J.D. Ullman, *Principles of Databases Systems*, Comp.Sc.Press,1990.
Bill McCarthy , *PHP4*, Teora, 2002
Paul DuBois, *MySQL*, Teora, 2001
http://stoner.phys.uaic.ro/moodle/

Teaching methods: Lecture, debate, exemplification

Assessment methods: evaluation of practical work 20%, two laboratory projects 30%, final written exam 50%

Language of instruction: Romanian

Course title: *Computer Programming*

Type of course: compulsory **Level of course:** undergraduate

Year of study: III **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Conf. dr. Vasile TURA

Objectives:

The course offers students an introduction to the design and analysis of algorithms. Students will learn the basic principles of algorithms design and compare methods of analyzing the performance of these algorithms. Also, they will study the data structures that optimize the operation of algorithms. The knowledge gained will be used by students in designing and analysis of algorithms used to solve typical search and sorting problems.

Prerequisites: basic PC knowledge

Course content:

Efficiency. Analysis. Order of dependence. Complements of mathematical analysis. Solving recurrence equations with applications in analysis of recursive algorithms. Complements of programming in C++. Data Structures. Paradigms: divide-et-impera, dynamic programming, greedy algorithms. Backtracking. Branch-and-bound. Computational complexity - the problem of sorting. Computational complexity - the problem of search. NP problems. Algorithms for numerical analysis. Introduction to parallel algorithms for computing. (laboratory) Sequential search. Operations with matrices. Binary search. Recursive algorithms. Fibonacci string calculation. Mergesort recursively. Mergesort in-place. Quicksort. Optimal search approach. Dijkstra and Kruskal algorithms. Selection. Probabilistic selection. The traveling salesman problem. The knapsack problem . Parallel search of the maximum. Mergesort parallel.

Reccomended reading:

Brian Overland, *C++ Ghid pentru începători*, Editura Corint, 2006.
Valeriu Iorga, *Programare în C & C++, Culegere de probleme*, Ed. Niculescu, 2003.
Bruce Eckel, *Thinking in C++, Second Edition*, Prentice Hall, 2000.

Teaching methods: lecture, explanation, heuristic conversation, problematisation

Assessment methods: oral and written examination, practical test

Language of instruction: Romanian

Course title: *Computer Architecture*

Type of course: optional **Level of course:** undergraduate

Year of study: III **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Lect. Dr. Paul GASNER

Objectives:

Acquirement of basic knowledge in the field of architecture and functionality of computing systems: Boolean algebra, logical gates, combinational circuits, sequential circuits, numbers and instructions representation, processors. Development of capability to apply knowledge of computers architectures in practical situations. Development of capability to search, analyze information from a large spectra of resources. Development of capability to team work to find experimental and technological solutions. Development of capability to successfully initiate and manage personal and team projects. Determination and perseverate to achieve the tasks and assumed responsibilities.

Prerequisites: none

Course content:

Hystory. Basics of Boolean Algebra. Combinational circuits. Gates. K-maps. Multiplexors. Decodors. Numbers' representations. ALU. Latches. Sequential analysis. Counters. Registries. Processors. Modern Architectures.

Reccomended reading:

Aurel Gontean, Mircea Babaita, *Structuri logice programabile. Aplicatii*, Editura de Vest, Timisoara 1997
Ghe. Toacse*, Introducere in microprocesoare*, Ed. St. si Encicl., Bucuresti, 1985
John Woram, *The PC Configuration Handbook*, Random House, New York, 1990

Teaching methods: University lecture. Debate, Frontal experiment, Directional discovery, Directional experiment, team-working solutions

Assessment methods: written examination

Language of instruction: Romanian

Course title: *Non-destructive Physical Measurement and Control Methods*

Type of course: compulsory **Level of course:** undergraduate

Year of study: IV **Semester** : 1 **ECTS credits:** 5

Name of lecturer: Prof. Dr. Maria NEAGU, Lect. Dr. Paul GASNER

Objectives:

Imparting knowledge concerning fundamentals on physical principles of non-destructive testing. Learning by the students of the theoretical and practical knowledge concerning the non-destructive methods of measurement and control.

Prerequisites: Mechanic and acoustics, Electricity, Magnetism, Optics

Course content:

Physical principles of non-destructive testing. Non-Destructive methods of measurement and control (magnetic, magneto-elastic, magneto-optic, optic, spectroscopic, ellipsometric, holographic, ultrasonic, with penetrating radiations, with penetrating liquids, with microwaves, with eddy currents, etc.).

Reccomended reading:

J. Blitz, *Electrical and Magnetic Methods of Nondestructive Testing*, Adam Hilger, England (1991)
F. Fiorillo, *Measurement and characterization of magnetic materials*, Elsevier Academic Press, Amsterdam (2004)
H. Gavrilă, H. Chiriac, P. Ciureanu, V. Ioniță, A. Yelon, *Magnetism Tehnic şi Aplicat*, Editura Academiei Române, Bucureşti (2000)
D. Jiles, *Introduction to magnetism and magnetic materials*, Chapman & Hall, London (1995)
V. Pop, *Bazele Opticii*, Intreprinderea Poligrafică Iaşi (1988)
D. Moisil, G. Moisil, *Teoria şi Practica Elipsometriei*, Ed. Tehnică, Bucureşti (1974)
H. Tompkins, *A user'guide to ellipsometry*, Academic Press Inc., Boston, San Diego (1993)
M. Neagu, *Metode de măsură şi control nedistructiv a materialelor*, Ed. Univ."Al. I. Cuza", Iaşi (2003)
M. Neagu, *Elipsometrie. Magneto-optică*, Editura Stef, Iaşi (2007)
J. M. Walls, R. Smith, *Surface science techniques*, Elsevier Science Ltd (1994)
G.H. Bryant, *Principles of microwave measurements*, Peter Peregrinus Ltd., London (1988)
D. D. Sandu, *Dispozitive electronice pentru microunde*, Ed. Ştiinț. şi Encicl., (1982)

Teaching methods: Lecturing. Laboratory experiments

Assessment methods: Written exam (50%). Laboratory works evaluation (50%).

Language of instruction: Romanian

Course title: ***Microwave Physics. Applications.***

Type of course: compulsory **Level of course:** undergraduate

Year of study: IV **Semester** : 1 **ECTS credits:** 5

Name of lecturer: Lect. Dr. Paul GASNER

Objectives:

Acquirement of basic knowledge in the field generating, propagation and receive the electromagnetic fields of high frequency and electronic device for microwaves. Development of capability to apply knowledge of electromagnetism in practical situations. Development of capability to search, analyze information from a large spectra of resources. Development of capability to team work to find experimental and technological solutions. Development of capability to successfully initiate and manage personal and team projects. Determination and perseverate to achieve the tasks and assumed responsibilities.

Prerequisites: Electricity and Magnetism, Electrodynamics, Electronic devices and circuits

Course content:

Propagation equations of electromagnetic waves in different media. TE and TM modes in rectangular metallic guides. TE and TM modes in cylindrical metallic guides. Power in metallic guides. Resonant cavities. Dipol radiation. Microwaves antenna. Devices with transfer of electrons (Gunn). Diode IMPATT, Read structure. Diode tunnel. The Clistron reflex. The Magnetron. TLM formalism, basics. Microwave junctions. Microstrip structures

Reccomended reading:

D.D. Sandu, *Microunde*, Ed. Victor, Bucureşti, 2005
G. Rulea, *Tehnica microundelor*, EDP, 1981
3G. Rulea, *Bazele teoretice şi experimentale ale tehnicii microundelor*, Ed. Şt. şi Encicl., 1989
D. D. Sandu, *Dispozitive electronice pentru microunde*, Ed. Şt. şi Encicl., 1982
D. D. Sandu, *Electronică fizică şi aplicată*, Edit. Universităţii "Al.I.Cuza" Iaşi, 1994
A. Harvey, *Microwave Engineering*, Academic Press, 1963
A. Ishimaru, *Electromagnetic wave propagation, radiation and scattering*, Prentice Hall Intern. Editions, 1986

Teaching methods: University lecture. Debate, Frontal experiment, Directional discovery, Directional experiment, team-working solutions

Assessment methods: written exam, work reports

Language of instruction: Romanian

Course title: ***Physics and Technology of Polarized Media***

Type of course: compulsory **Level of course:** undergraduate

Year of study: IV **Semester** : 1 **ECTS credits:** 5

Name of lecturer: Prof. dr. Liliana MITOSERIU

Objectives:

Obtaining knowledge related to the: behavior of polar and nonpolar dielectrics under various electric fields; understanding the role of dielectrics in changing the electric fieldstructure, description of dielectrics by complex method; knowledge related to the measurements methods of permittivity and losses, advanced methods; understanding the magnetic behavior of matter; equations of the magnetic field in matter; Dia, para, ferromagnetism – classical theories; knowledge on the methods of measuring the magnetic characteristics of matter; advanced methods.

Prerequisites: Electricity and Magnetism, Electrodynamics, Solid state Physics

Course content:

1. Definitions. Electric dipole. Ecuations of the electric field in matter; 2. General phenomenology of dielectrics. Polarization. Fundamental equation of dielectrics. Applications; 3. Energies and forces in dielectrics; 4. Polarization mechanisms of dielectrics: induced and orientational; 5. Dielectric relaxation. Microscopic mechanisms for the Debye relaxation; 6. Ecuations of the magnetic field in vacuum and in matter; 7. Diamagnetism, classical theory; 8. Paramagnetism (Langevin, Brillouin); 9. Feromagnetism, ferimagnetism. 10. Applications.

Reccomended reading:

L. Mitoseriu, V. Tura, *Fizica dielectricilor*, 1999; *Electricitate si magnetism*, 2000, Ed. Univ."Al.I. Cuza" Iasi
M. Socaciu, *Dielectrici şi aplicaţii*, Ed. Pantheon, Craiova, 1994
Bunget I., Popescu M., *Fizica dielectricilor solizi*, Ed. St. & Enc., Bucuresti, 1978
A. Jonsker, *Dielectric relaxation in solids*, Chelsea Dielectric Press., London, 1983
E. Burzo, *Fizica fenomenelor magnetice vol I-III*, Editura Academiei Bucureşti, 1979
S. Chikazumi, *Magnetismul*, Editura Ştiinţifică şi Enciclopedică, Bucureşti 1981
Al. Stancu, *Magnetization process in particulate ferromagnetic media*, Cartea Universitara Bucuresti, 2006

Teaching methods: Power Point presentations, Didactic films & animation, Demonstrative experiments.

Assessment methods: Exam: written and oral. Laboratory examination

Language of instruction: Romanian

Course title: ***Data Storage Technologies and Materials***

Type of course: compulsory **Level of course:** undergraduate

Year of study: IV **Semester** : 1 **ECTS credits:** 5

Name of lecturer: Conf. dr. Florin BRINZA

Objectives:

To present main theoretical and practical aspects of structure, obtaining and processing of materials, devices and technologies used in data storage. Analysis of physical aspects involved in magnetic, optical and electronic data storage. To present tendencies in materials and technologies used in future. Creating an knowledge background for graduate activities.

Prerequisites: Electricity and magnetism, Optics, Solid State Physics, Solid state devices and circuits.

Course content:

Recording media. Types. Physical processes during information storage. Basics of magnetic recording data. Thin films and particulate media obtaining. Analog and digital recording on thin films and particulate media. Recording heads. Other systems involved. Basic of electronic circuits used. High density discs and tapes. Magnetic cards. Basics of recording and reading from magnetic cards. Auxiliary systems used in magnetic cards recording. Semiconductors technology. Single crystall technology. Storage technology based on ferroelectric media and semiconductor devices. Solid state memory cards. Optical storage. CD and DVD. Materials used, physics of recordings and readings, auxiliary systems, standards and performances. Trends in data storage

Reccomended reading:

Tomai, N., *Notiuni de tehnologia infor*matiei, Editura Risoprint, Cluj-Napoca, 2003.
Stokes A., Concise *Encyclopaedia of Information Technology* , Aldershot: Gower Publishing Company Limited , 1982.
P. Ciureanu, H. Gavrilă, *Înregistrări magnetice digitale*, Editura Ştiinţifică şi Enciclopedică, Bucureşti,1987.
R.C. Bogdan (coordonator), *Memoriile calculatoarelor electronice*, Editura Tehnică, Bucureşti, 1975

Teaching methods: multimedia-assisted conference, Demonstrative experiment.

Assessment methods: two tests 50% of topics, final examination 50 % (written)

Language of instruction: Romanian

Course title: *Technology Transference*

Type of course: compulsory **Level of course:** undergraduate

Year of study: IV **Semester** : 1 **ECTS credits:** 5

Name of lecturer: Ing. Dr. Radu Grigore GROSU

Objectives:

Prerequisites: Electricity and magnetism, Optics, Solid State Physics, Solid state devices and circuits.

Course content:

Reccomended reading:

Belous V., *Implementare sau absorbtie*, Rev de Inventica, vol. III,Nr.15,p.3-5, 1995.
Belous V., *Inventica*, Ed. Asachi, Iasi, 1992
Belous V., *Performantica*, Ed. Performantica, Iasi, 1995.
Grosu R.-G., *The local public administration, an important factor for Technology Transfer*, International Conference Technology Transfer for Rconomic Development experiences for Countries în Transition, 19-20 June 2000, Zagreb, Croatia.
Grosu R.-G., *Managementul afacerilor în structurile de transfer tehnologic*,Casa de Editura Venus, Iasi, 2004.
Grosu R.-G, *Aspecte si Concepte Legislative în Structurile Inovativ Tehnologice de Afaceri*;
Grosu R.-G., *Ghid – Modalitati de Administrare si Dezvoltare a Parcurilor Tehnologice si Industriale*,Casa de Editura Venus, Iasi, 2004.
L. Chirica, *Managementul transferului international de tehnologie*, Ed.All Educational SA, Bucuresti,1997.
S. S. Robert, *Striving to positiveli contribute to society through the enterprise system*, The University of Texas at Austin, Annual Report, 1994-1995.
S. S. Robert, *The Technology Transfer Gap*, IC²/UPDATE, The University of Texas at Austin, 1995.

Teaching methods:

Assessment methods:

Language of instruction: Romanian

Course title: *Physics of Partially Ordered Systems*

Type of course: compulsory **Level of course:** undergraduate

Year of study: IV **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Prof. dr. Dana Ortansa DOROHOI

Objectives:

Discussions about the complex problems regarding the structure of liquids and liquid crystals; The specific methods for the study of the systems partially ordered; The understanding of the great importance of liquids for the life; Applications of liquids and liquid crystals

Prerequisites: Physics of atoms and molecules, Quantum Mechanics, Statistics, UV and VIS Spectroscopy

Course content:

1. Liquid state. Basic characteristics of liquid state. Thermal motion in liquids. Classification of liquids. Intermolecular forces in liquids. Empirical potentials. Statistics thermodynamics of the simple liquids. 2. Theories for liquid state. Cynetic model of a simple liquid. Eyring cell model. Takehiro Abe cell model. Statistic model of the three component solutions. Applications of the cell model for determining the electro-optical parameters of the molecules. Correlation functions. Theory of the simple liquids on the basis of correlation functions. 3. Liquid crystals. Structural particularities and applications of liquid crystals. Thermotropic liquid crystals (classification, structural characterization). Lyotropic liquid crystals (hydrophobic and hydrophilic interactions, model membranes). Lyotropic liquid crystals in biological membranes. Method to determine the degree of order of liquid crystals. Technical and scientific applications of liquid crystals

Reccomended reading:

I. Georgescu, I. Petrea, D. Borşan, *Fizica Stării lic*hide, EDP, Bucureşti, 1982.
D. Dorohoi, *Fizica Starii lichide. Modele şi Experimente*, Ed. Gama, Iaşi, 1994.
C. Moţoc şi I. Muscutariu, *Introducere în Fizica Cristalelor lichide*, Ed. Facla, Timişoara, 1980.
L. Nasta, R. Moldovan, S. Frunză T. Beica, *Metode opto-electronice de afişaj*, Ed. Univ. Bucureşti, 1992
L. Georgescu, E. Barna, D. Borşan, V. Popa Niță, V. Dima, N. Stamatin, *Fizica Stării lichide şi a cristalelor lichide*, Ed. Univ. Bucureşti, 1987.

Teaching methods: courses, free discussions, laboratory works, seminars

Assessment methods: examen

Language of instruction: Romanian

Course title: *Laser Physics & Technological Applications*

Type of course: compulsory **Level of course:** undergraduate

Year of study: IV **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Lect. Dr. Valentin POHOATA

Objectives:

Learning the fundamental concepts of principal lasers operation, the design and build-in lasers.

Prerequisites: Optics, Atomic and Molecular physics, Plasma physics

Course content:

Classical electromagnetic theory of light. Quantum characterization of atomic systems. Light interaction with atomic systems. Resonators. Light interference in parallel beams. The Fabry – Perot interferometer. Light amplification. Laser properties. Solid lasers: (YAG-Nd) and Ruby. Gas lasers: He-Ne, CO2, Ar, N2

Reccomended reading:

Gh. Singurel, *Fizica laserilor*, Ed. Univ. Al. I. Cuza, Iaşi (2001)
Wolfgang Demtroder, *Laser Spectroscopy*, Ed. Springer New York, (1998)
A. Vlahovici, *Metode optice şi spectrale de analiză*, Ed. Univ. Al. I. Cuza, Iaşi (2002)
M. Strat, Georgeta Strat, *Spectroscopie şi laseri*, Ed. Univ. Al. I. Cuza, Iaşi (2001)
A. Eliaşevici, *Spectroscopie atomică şi moleculară*, Ed. Acad. Române, Bucureşti (1966)
Max Born and Emil Wolf, *Principles of Otics*, Pergamon Press, New York (1959)

Teaching methods: Course exposes representative's experiments and consultations

Assessment methods: Writing examination 50%, laboratory activities 50%.

Language of instruction: Romanian

Course title: *Physics and Technology of Magnetic Materials*

Type of course: compulsory **Level of course:** undergraduate

Year of study: IV **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Lect. Dr. Cristian ENACHESCU

Objectives:

The main objective of the course is to initiate the students in the study of the magnetic materials and with their modern applications. The students will learn the properties of different magnetic substances, the evolution of recording media and the possibilities of data storage, analogic and digital.

Prerequisites: Optics, Atomic and Molecular physics, Plasma physics

Course content:

Magnetic substances. Experimental methods in magnetism. Recording media and recording systems. Photomagnetic and magnetooptic materials. Thin films. Particulate media. Random access memories (RAM) and read only memories (ROM). Amorphous magnetic materials. Magnetism in medicine. Models in magnetism: Stoner-Wolfarth, Ising, Monte Carlo, Preisach. VSM magnetometer. Study of magnetization curves using a VSM magnetometer. Producing and measuring amorphous nanowires.

Reccomended reading:

C. Papusoi, *Proprietăți magnetice ale corpului solid*, Univ. Al. I.Cuza Iasi, 1980
H. Gavrilă, H. Chiriac, P. Ciureanu, V. Ioniță, A. Yelon, *Magnetism tehnic şi aplicații*, Ed. Academiei Române, 2000
D. Jiles, *Magnetism and Magnetic materials*, Ed. Chapman and Hall, 1989
D. Craik, *Magnetism Principles and applications*, Wiley, 1995
A. Goldman, *Handbook of Modern Ferromagnetic materials*, Kluwer Academic Publishers, 1999
H. Gavrila, *Înregistrări magnetice*, Ed. Printech, 2005
H. Gavrila, W. Kappel, M.M. Codescu, *Materiale magnetice*, Ed. Printech, 2005

Teaching methods: Presentations using video projector.Experiments

Assessment methods: Written and Oral Exams

Language of instruction: Romanian

Course title: ***Phase Transitions. Order-disorder Phenomena. Applications***

Type of course: optional **Level of course:** undergraduate

Year of study: IV **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Conf. dr. Cristian-Ioan BABAN

Objectives:

Students should obtain basic knowledge of the laws and applications of phase transitions. Through experiments performed in the laboratory and by solving problems, students should be able to analyse phase transitions in various systems for technical application.

Prerequisites: Molecular and Thermal Physics, Thermodynamics and Statistical Physics, Electricity and Magnetism

Course content:

Basic concepts in phase transition thermodynamics. Classification, transition order. Thermodynamics of systems with variable amount of matter. Phase transitions. Clapeyron-Clausius and Ehrenfest equations. Landau theory. Statistical treatment of phase transitions. Fluctuations. Critical indices. Phase transitions in bi- and three-component systems, phase diagrams. Order-disorder phenomena and theories. Bragg-Williams approximation. Phase transition kinetics. Magnetic phase transitions. Superfluidity. Superconductivity. Coexistence of ordered phases. General applications of phase transitions.

Reccomended reading:

V. Georgescu, *Tranziții de fază, Metode de studiu*, Ed.Univ. “Al. I. Cuza”, Iaşi, 1998.
Gh. Ciobanu, *Termodinamică şi fizică statistică*, Editura tehnică, Bucureşti, 2004.
W. Greiner, L. Neise, H. Stöcker *Thermodynamics and Statistical Mechanics*, Springer-Verlag, New York, 1995.
H: E: Stanley, *Introduction to phase transitions and critical phenomena*, Clarendon Press, Oxford, 1971.
V: Pop, I. Chicinas, N. Jumate, *Fizica materialelor- metode experimentale*, Ed. Presa Universitară clujeana, Cluj Napoca, 2001

Teaching methods: Power Point presentations, conversation, experiments

Assessment methods: 50% final exam, 50% laboratory reports

Language of instruction: Romanian

Course title: *Chaos and Self-organization*

Type of course: optional **Level of course:** undergraduate

Year of study: IV **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Conf. dr. Dan Gheorghe DIMITRIU

Objectives:

The students become accustomed with the general information on nonlinear dynamics, chaos, self-organization, fractals. The students become accustomed with some experimental and numerical techniques for analysis of complex nonlinear systems. The students will develop practical abilities to use specialized software for the nonlinear signals analysis. The students will develop abilities to interdisciplinary approach the study of the complex phenomena in laboratory and nature

Prerequisites: Nonlinear dynamics

Course content:

Nonlinear dynamics (fixed points, periodic solutions, Poincare map, Lyapunov exponents, stability, bifurcations, atractors, repellors). Models in nonlinear dynamics (logistic map, Turing model, Lorenz model, Brusselator, Rossler model, van der Pol oscillator, Duffing oscillator, Chua oscillator). Chaos (scenarios of transition to chaos, deterministic chaos, chaos characterization, control and anti-control of chaos methods). Self-organization (far-from-equilibrium systems, instability, symmetry breaking, hysteresis, self-organized structures in physics, chemistry and biology). Fractals (fractal dimensions, fractal maps, strange attractors, multifractals, fractal applications). Complex analysis of nonlinear signals (direct analysis, statistic analysis, power spectrum, Floquet coefficients, method for state space reconstruction, recurrence map, wavelet maps).

Reccomended reading:

A. H. Nayfeh, B. Balachandran, Applied *nonlinear dynamics – Analytical, computational, and experimental methods*, John Wiley & Sons, 1995;
J. S. Bendat, *Nonlinear systems techniques and applications*, John Wiley & Sons, 1998;
S. N. Rasband, *Chaotic dynamics of nonlinear systems*, John Wiley & Sons, 1990;
J. C. Sprott, *Chaos and time series analysis*, Oxford University Press, 2003;
H. G. Schuster, *Deterministic chaos. An introduction*, 3rd Ed., VCH, 1995;
H.-O. Peitgen, H. Jurgens, D. Saupe, *Chaos and fractals* 2nd Ed., Springer, 2004;
H. Kantz, T. Schreiber, *Nonlinear time series analysis*, Cambridge University Press, 1997.

Teaching methods: Exposure, conversation, university lecture, synthetic analysis, demonstration

Assessment methods: Write and oral exam, Laboratory colloquium

Language of instruction: Romanian

Course title: *Teaching Physics*

Type of course: facultative **Level of course:** undergraduate

Year of study: II **Semester** : 2 **ECTS credits:** 5

Name of lecturer: Lect. Dr. Laura ANITA

Objectives:

To familiarize students with the didactics' concepts; to develop an understanding of and an ability to use the teaching methods and strategies; to fulfill the personal development of the students

Prerequisites: Psychology, Pedagogy

Course content:

The objectives of physics teaching. The secondary school physics curriculum Instructional strategies and methods. Assessment. Physics and other disciplines: interdisciplinary approaches to curriculum. Computers in physics class. Teacher resources: materials for physics teaching. Planning for effective teaching

Reccomended reading:

L.I. Anita, *Didactica fizicii- note de curs*,Editura Universitatii "Al.I. Cuza", Iasi, 2007
O.F. Caltun, *Didactica fizicii*, Editura Universitatii "Al.I. Cuza", Iasi, 2002
L. Ciascai, *Didactica fizicii, EdituraCorint*, Bucuresti, 2001
Ministerul Educatiei Nationale, Consiliul National pentru Curriculum, Curriculum-ul National pentru învatamântul obligatoriu. Cadru de referinta.Bucuresti, 1998
*** *Manualele si programele scolare*

Teaching methods: lecture, discussion

Assessment methods: written and oral examination

Language of instruction: Romanian

Course title: *Teaching Practice*

Type of course: facultative **Level of course:** undergraduate

Year of study: III **Semester** : 1,2 **ECTS credits:** 5

Name of lecturer: Lect. Dr. Laura ANITA

Objectives:

To plan, to organize and to evaluate classroom activities; to draw up school documents needed to be done by teachers; to manage the class; to develop a professional attitude as a physics teacher

Prerequisites: Psychology, Pedagogy, Teaching Physics

Course content:

Planning for effective teaching. Instructional strategies and methods in physics teaching. Assessment. Classroom management

Reccomended reading:

L.I. Anita, *Caiet de practica pedagogica*, Editura Universitatii "Al.I. Cuza", Iasi, 2003
L.I. Anita, *Didactica fizicii- note de curs*,Editura Universitatii "Al.I. Cuza", Iasi, 2007
O.F. Caltun, *Didactica fizicii*, Editura Universitatii "Al.I. Cuza", Iasi, 2002
Ghiduri metodologice de aplicare a programelor scolare în învatamântul preuniversitar, CNC, Bucuresti, 2001- 2002.

Teaching methods: lecture, discussion, problem solving, laboratory experiments

Assessment methods: 50% school activities, 50% portfolio

Language of instruction: Romanian

IInd cycle

Graduate

Curricula and

Course Informations

Master field of study: PHYSICS

Specialization: *PLASMA PHYSICS, SPECTROSCOPY AND SELFORGANISATION*

Title conferred: Master diploma in the specialization Plasma Physics, Spectroscopy and Selforganisation

Official length of programe: 2 years (120 credits)

Form of education: full-time studies

Master programe description:

Mission: Training of specialists in the fields of plasma physics, spectroscopy and selforganisation able to provide responsible staff for specific activities: research entities, economic and educational institutions. A graduate of this Master programe in plasma physics, spectroscopy and selforganization, faces with the need to solve a problem, will have the necessary methods to collect original scientific material, and other relevant information on which to assess critically and to analyze. Graduates will be able to develop solutions, and will have the ability to communicate their results and recommendations.
Master Program in Plasma physics, spectroscopy and selforganization can be followed by all those who wish to obtain research and innovation skills through Doctoral School of the Faculty of Physics, specializations in: Plasma Physics, Optics and Spectroscopy.

CURRICULUM

Ist YEAR

Academic year 2009/2010

Nr. Crt	Discipline	Semester I				Semester II			
		C	S/L	V	credits	C	S/L	V	credits
1.	Fundamentals of Mathematical Physics	2	2	E	6	-	-	-	-
2.	Interaction of ionizing radiation with matter	2	2	E	6	-	-	-	-
3.	Methods of Structural and Biostructural Analysis	2	2	E	6	-	-	-	-
4.	Quantum generators	2	2	E	6	-	-	-	-
5.	Research activities for preparing the MSc. Thesis	-	4	C	6	-	-	-	-
6.	Virtual Instrumentation	-	-	-	-	2	2	E	6
7.	Optional courses: O1; O2	-	-	-	-	2	2	E	6
8.	Surface analysis methods	-	-	-	-	2	2	E	6
9.	Plasma diagnosis	-	-	-	-	2	2	E	6
10.	Research activities for preparing the MSc. Thesis	-	-	-	-	-	4	C	6
	TOTAL HOURS	**8**	**8+4**	**-**	**-**	**8**	**8+4**	**-**	**-**
	TOTAL CREDITS	**-**	**-**	**-**	**30**	**-**	**-**	**-**	**30**

Optional course O1: Action of electromagnetic field on complex systems

Optional course O2: Experimental methods in physics of materials

IInd YEAR
Academic year 2010/2011

Nr. Crt	Discipline	Semester I				Semester II			
		C	S/L	V	credits	C	S/L	V	credits
1.	Chaotic phenomena and cotrol methods	2	2	E	6	-	-	-	-
2.	Biocompatibility and biomaterials	2	2	E	6	-	-	-	-
3.	Topical problems in the physics of self-organized systems	2	2	E	6	-	-	-	-
4.	Low temperature plasma physics and applications	2	2	E	6	-	-	-	-
5.	Research activities for preparing the MSc. Thesis	-	4	C	6	-	-	-	-
6.	Introduction to the physics of polymers. Polymer materials with special properties	-	-	-	-	2	2	E	6
7.	Optional courses: O1; O2	-	-	-	-	2	2	E	6
8.	High temperature plasma physics	-	-	-	-	2	2	E	6
9.	Waves and instabilities	-	-	-	-	2	2	E	6
10.	Research activities for preparing the MSc. Thesis	-	-	-	-	-	4	C	6
11.	MSc Thesis								5
	TOTAL HOURS	**8**	**8+4**	**-**	**-**	**8**	**8+4**	**-**	**-**
	TOTAL CREDITS	**-**	**-**	**-**	**30**	**-**	**-**	**-**	**30+5**

Optional course O1: Methods for the study of partial ordered systems
Optional course O2: Applied Spectroscopy

Course title: ***Fundamentals of Mathematical Physics***

Type of course: compulsory **Level of course:** graduate

Year of study: I **Semester** : 1 **ECTS credits:** 6

Name of lecturer: Prof. Ciprian DARIESCU, PhD

Objectives:

It intends to supply good knowledge on basics and main results of mathematical physics. By its role, this course should prepare the student for a Ph.D. in Physics. Therefore, the modern views and the checked formalisms are constantly emphasized as far as possible.

Prerequisites: Mathematical Physics Equations, Differential Equations, Functional Analysis, Algebra.

Course content:

I. Elliptic Equations (Laplace and Poisson Equations, boundary conditions, types of solutions, Green identity, fundamental solution of Laplace-Beltrami operator, Green functions and Poisson formula, potentials method, Laplace –Fourier method of variables separation, basic symmetries and special functions: spherical functions, Bessel functions, hypergeometric functions). II. Parabolic equations: General physical processes, Heat propagation equation, solutions and Laplace-Fourier method, heat propagation equation in entire space, fundamental solution of heat propagation operator. III. Hyperbolic equations: physical general processes, Wave equation and standard conditions, Laplace-Fourier method and types of solutions, IV. Systems of linear and non-linear differential equations. Examples.

Bibliografie:

V. Barbu. *Procese la limita pentru ecuatii cu derivate partiale*. Ed. Academiei Romane, Bucuresti, 1993.
A.N. Tihonov, A.A. Samarski,*Ecuatiile fizicii matematice*,Ed.Tehnica,Bucuresti 1956
V.S. Vladimirov, *Ecuatiile fizicii matematice*. Ed. St. Si Ped, Bucuresti, 1980.

Teaching methods: Lectures, Thematic Debates, Applications

Assessment methods: Written examination (50 %) and seminar activity (50 %).

Language of instruction: Romanian

Course title: ***Interaction of Ionizing Radiation with Matter***

Type of course: compulsory **Level of course:** graduate

Year of study: I **Semester** : 1 **ECTS credits:** 6

Name of lecturer: lect. Cătălin BORCIA, PhD

Objectives:

Learn advanced knowledge of radiation interaction with matter; apply this knowledge for studying the transport of radiations through matter; apply the knowledge in practice; work in a team for solving experimental and technological issues; identify and use bibliographic resources for continuous formation.

Prerequisites: Electricity and magnetism, Atomic and molecular physics, Nuclear physics, Dosimetry and radioprotection, Plasma physics

Course content:

1) Fundamentals of ionizing radiation physics; 2) Interaction of hard charged particles with matter; 3) Interaction of light charged particles with matter; 4) Elements of electron beam dosimetry; 5) Interaction of photons with matter; 6) Elements of photon beam dosimetry; 7) Interaction of neutrons with matter; 8) Ionizing radiations transport thorough matter; 9) Elements of radiobiology; 10) Ionizing radiations applications; 11) Analysis and control techniques with ionizing radiations.

Reccomended reading:

D. Mihăilescu**,** C. Borcia, *Interacțiunea radiațiilor ionizante cu substanța. Partea I: radiații încărcate electric*, Ed. Sedcom Libris, Iaşi (2007)
D. Mihăilescu, *Dozimetria radiațiilor ionizante*, Ed. Universității Al.I.Cuza, Iaşi, 2001
D.W. Anderson, *Absorption of Ionizing Radiation*, Univ. Park Press, Baltimore 1984
E.B.Podgoršak, *Radiation Physics for Medical Physicists*, Springer Berlin, 2006
F. H. Attix, *Introduction to Radiological Physics and Radiation Dosimetry*, John Wiley & Sons, New York 1986
F. Khan, *The Physics of Radiation Therapy*, Williams & Wilkins, 1994
A. Bielajev, *Fundamentals of the Monte Carlo method for neutral and charged particle transport*, Univ. of Michigan, 2001

Teaching methods: lecture, laboratory work, class discussion

Assessment methods: exam, lab report, portfolio

Language of instruction: Romanian

Course title: *Quantum Generators*

Type of course: compulsory **Level of course:** graduate

Year of study: I **Semester** : 1 **ECTS credits:** 6

Name of lecturer: Lect. Valentin POHOAȚĂ, PhD

Objectives:

Learning the fundamental concepts of lasers generation, laser properties and its applications

Prerequisites: Optics, Atomic and Molecular physics, Plasma physics

Course content:

Classical electromagnetic theory of light. Light propagation in matter. Bandwidth enlargement mechanisms for dipole ensembles emission spectra. Quantum characterization of atomic systems. Optical resonators. Light amplification. Laser oscillations. Kinetic equation of laser systems. Steady states lasers. Elements of nonlinear optics. Applications: laser ablation, laser spectroscopy, laser induces fluorescence.

Reccomended reading:

Gh. Singurel, *Fizica laserilor*, Ed. Univ. Al. I. Cuza, Iaşi (2001)
A. E. Sigman, *An introduction to lasers and masers*, McGraw-Hill Book Company, New York, (1971)
Wolfgang Demtroder, *Laser Spectroscopy*, Ed. Springer New York, (1998)
P.W.Milonni, J.H.Eberly, *Lasers*, Wiley-Interscience Publication, New York (1988)
A. Vlahovici, *Metode optice şi spectrale de analiză*, Ed. Univ. Al. I. Cuza, Iaşi (2002)
M. Strat, Georgeta Strat, *Spectroscopie şi laseri*, Ed. Univ. Al. I. Cuza, Iaşi (2001)
A. Eliaşevici, *Spectroscopie atomică şi moleculară*, Ed. Acad. Române, Bucureşti (1966)
Max Born and Emil Wolf, *Principles of Otics*, Pergamon Press, New York (1959)

Teaching methods: Course exposes, representative's experiments and consultations

Assessment methods: Writing examination 50%, laboratory activities 50%.

Language of instruction: Romanian

Course title: *Virtual Instrumentation*

Type of course: compulsory **Level of course:** graduate

Year of study: I **Semester** : 2 **ECTS credits:** 6

Name of lecturer: Lect. Catalin AGHIORGHIESEI, PhD

Objectives:

Analog and Digital measurements concepts; Data Acquisition Boards principles; Components of a Virtual Instrument; Practical works for Virtual Instrumentation

Prerequisites: General Physics, Electronics, Data physics manipulation

Course content:

I. Measurement and control systems – analog measurement systems; digital measurement systems. II. Data acquisition – Data Acquisition Board, serial port rs-232, parallel port IEEE-1284, GPIB IEEE 488.2. III. Programming virtual instruments in LabView – introduction (front panel and block diagram); data types, operations; instructions; graphical elements

Reccomended reading:

Robert A.Witte, *Analog and Digital Measurements*, Prentice Hall PTR, 2002
Tran Tien Lang, *Electronics of Measuring Systems*: *Practical Implementation of Analogue and Digital Techniques*, John Wiley & Sons Inc., 1987
John Turner and Martyn Hill, *Instrumentation for Engineers and Scientists*, Oxford University Press Inc. NY, 1999
LabView Tutorial Manual, National InstrumentsCorp., 1996 (www.ni.com).
LabVIEW. Basics Course Manual, National Instruments Corp., USA, 1998.

Teaching methods: observation, algorithm, explanation, problems

Assessment methods: 50% practical works, 50% final test

Language of instruction: Romanian

Course title: *Surface Analysis Methods*

Type of course: compulsory **Level of course:** graduate

Year of study: I **Semester** : 2 **ECTS credits:** 6

Name of lecturer: Prof. Maria NEAGU, PhD

Objectives:

Imparting knowledge concerning fundamentals on physical principles and mesurement methods used for the surfaces characterisation. Understanding the theoretical knowledge by experiments. Capacities development for establishing measurement methods.

Prerequisites: Mechanic and acoustics, Electricity, Magnetism, Optics.

Course content:

Surface properties. Optical microscopy. Interferometric methods. Elipsometric methods. Holographic methods. Magneto-optical methods. Atomic force microscopy. Fourier transform Infrared Absorption Spectroscopy: Attenuated total reflection (ATR) and Diffuse reflectance (DRIFTS). Auger electrons spectroscopy. Photoelectrons spectroscopy. Raman spectroscopy. Scanning electronic microscopy.

Reccomended reading:

J. M. Walls, R. Smith, *Surface science techniques*, Elsevier Science Ltd 1994
H. Luth, *Surfaces and interfaces of solid materials*, Springer Berlin 1998
J. T. Yates, T. E. Madey, *Vibrational spectroscopy of molecules and surfaces*, Plenum Press, New York and London 1987
R. M. A. Azzam, N. M. Bashara, *Ellipsometry and polarized light*, North Holland Physics Publishing 1987
F. Fiorillo, *Measurement and characterization of magnetic materials*, Elsevier Academic Press, Amsterdam 2004
M. Enăchescu, *Atomic resolution and nanometer scale structuring*, Hier Nymus, Munchen 1994
D. Jiles, *Introduction to magnetism and magnetic materials*, Chapman & Hall, London 1995
D. Moisil, G. Moisil, *Teoria şi Practica Elipsometriei*, Ed. Tehnică, Bucureşti 1973
A. Eliaşevici, *Spectroscopie atomică şi moleculară*, Ed. Acad. Rom, Bucureşti 1966
V. Pop, *Bazele Opticii*, Intreprinderea Poligrafică Iaşi 1988
Gh. Singurel, *Fizica laserilor*, Editura Univ. “Al. I. Cuza”Iaşi 2001
M. Neagu, *Metode de măsură şi control nedistructiv a materialelor*, Ed. Univ."Al. I. Cuza", Iaşi (2003)
M. Neagu, *Elipsometrie. Magneto-optică*, Ed. Stef, Iaşi (2007)

Teaching methods: Lecturing. Laboratory experiments.

Assessment methods: Written exam (50%). Laboratory works evaluation (50%).

Language of instruction: Romanian

Course title: *Plasma diagnosis*

Type of course: compulsory **Level of course:** graduate

Year of study: I **Semester** : 2 **ECTS credits:** 6

Name of lecturer: Assoc. prof. Lucel SIRGHI, PhD

Objectives:

Acquiring knowledge concerning: Plasma parameters in technological devices, laboratory and nature;Techniques and methods used for measuring and monitoring plasma parameters in laboratory and technological devices; Techniques and experimental methods used for study of plasma in nature; Control of plasma used in laboratory and technological; Developing of good laboratory practice in the field of plasma physics

Prerequisites: mechanics, thermodynamics, electromagnetism, statistical physics, plasma physics, optics and optical spectroscopy.

Course content:

Introduction. Plasma parameters. Classification of plasma 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 diffusion Energy distribution function of electrons. Method of IInd 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.

Reccomended reading:

G. Popa si L. Sirghi, *Bazele fizicii plasmei*, Ed. Univ. “Al. I. Cuza” 2004
I. H. Hudchinson, *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-Holtgreeven, *Plasma Diagnostics*, North-Holland Pub. Comp., Amsterdam 1968.
R. H. Huddlestone, *Plasma Diagnostics* Techniques, Acad. Press, NY 1965.

Teaching methods: exposition, explanation, PC assisted projections, discussions

Assessment methods: exam

Language of instruction: Romanian

Course title: ***Chaotic Phenomena and Cotrol Methods***

Type of course: compulsory **Level of course:** graduate

Year of study: II **Semester** : 1 **ECTS credits:** 6

Name of lecturer: Assoc. prof. Dan-Gheorghe DIMITRIU, PhD

Objectives:

The students become accustomed with the main characteristics of the chaotic phenomena and with the main methods of chaos control. The students will develop their abilities to apply specific techniques for the chaotic phenomena diagnosis. The students will develop practical abilities to use specialized software for the chaotic signals analysis. The students will develop abilities to interdisciplinary approach the study of the complex phenomena in laboratory and nature

Prerequisites: Chaos and self-organization

Course content:

General characteristics of the chaotic systems. Routes of transition to chaos (by period-doubling, by quasi-periodicity, by intermittency, by homoclinic orbits). Quantities for chaotic states characterization (Lyapunov exponents, generalized correlation dimension, fractal dimensions, information dimension, mutual information, generalized entropy, etc.) Chaotic systems examples. The bifurcations control. The chaos control by feedback methods (OGY method, Pyragas method). The chaos control by synchronization. The chaos control by parametric perturbations. The intelligent chaos control (by neuronal networks, by adaptive fuzzy logic methods). Experimental chaos control (in plasma, lasers, chemical medium, biological systems). The chaos anti-control.

Reccomended reading:

J. C. Sprott, *Chaos and time series analysis*, Oxford University Press, 2003;
R. Gilmore, M. Lefranc, *The topology of chaos*, Wiley-Interscience, New York, 2002;
H. G. Schuster (Ed.), *Handbook of chaos control*, Wiley-VCH, 1999;
A. H. Nayfeh, B. Balachandran, *Applied nonlinear dynamics – Analytical, computational, and experimental methods*, John Wiley & Sons, 1995;
R. C. Hilborn, *Chaos and nonlinear dynamics. An introduction for scientists and engineers*, Oxford University Press, 1994;
H. G. Schuster, *Deterministic chaos. an introduction*, 3rd Ed., VCH, 1995;
E. N. Lorenz, *The essence of chaos*, University College London Press Ltd., 1993.

Teaching methods: Exposure, conversation, university lecture, synthetic analysis, demonstration

Assessment methods: Write and oral exam, Laboratory colloquium

Language of instruction: Romanian

Course title: *Biocompatibility and Biomaterials*

Type of course: compulsory **Level of course:** graduate

Year of study: II **Semester** : 1 **ECTS credits:** 6

Name of lecturer: Prof. Nicoleta DUMITRASCU, PhD

Objectives:

Knowledge importance of materials used in medicine and techniques for biocompatibility improvement; Knowledge of treatment methods for medical materials; Medical applications of polymers

Prerequisites: Solid State Physics; Elements of plasma physics; Anatomy and biochemistry - generalities.

Course content:

Biomaterials and biocompatibility. Biomaterials science. Physical, chemical and biological properties of biomaterials. Classes of materials used in medicine. Elements in contact with the surface of a biomaterial: blood, plasma proteins, cells, tissues. Testing of biomaterials (in vitro, in vivo). Techniques of biomaterial surface analysis: AFM, STM, SEM, XPS, AES, SIMS , ellipsometry, IR (generalities). Improvement of materials biocompatibility in contact with living organisms. Desinfection and sterilization of biomaterials.

Reccomended reading:

H. Boenig, *Fundamentals of Plasma Chemistry and Tehnology*, Technomic Publishing Co.Inc. Lancaster Basel, 1990.
Practical Surface Analysis, 2- edition, Edited by D. Briggs, M. P. Seah, John Wiley & Sons Ltd, 1990
Biomaterials Science, An intoduction to materials in medicine, Eds. B. D. Ratner and A. S. Hoffman, Academic Press, New York, 1996
XXX - *Articole despre biomateriale şi biocompatilbilitate*

Teaching methods: lecture, class discussion, brainstorming

Assessment methods: final exam (oral and written examinations), lab report

Language of instruction: Romanian

Course title: ***Topical Problems in The Physics of Self-Organized Systems***

Type of course: compulsory **Level of course:** graduate

Year of study: II **Semester** : 1 **ECTS credits:** 6

Name of lecturer: lect. Sebastian POPESCU, PhD

Objectives:

Learning the current methods used in Complexity Science. Understanding the self-assembling mechanisms of self-organized structures appearing in different complex systems. Analysis of physical phenomena leading to similar behaviors of different complex systems. Geting in touch with the present topics about self-organization in various complex systems

Prerequisites: Plasma physics, Nonlinear Dynamics

Course content:

Complex systems: definitions; classifications; Self-organizing systems. General characteristics of self-organization processes: nonequilibrium, nonlinearity, symmetry breaking, instability, bifurcations, long-range order; Turing structures in chemical and physical systems; Physical basis of current filamentation in plasma; 1/f noise; Physical basis of negative differential resistance; Self-organization in active optical media; Self-organization in fluid and magnetofluid turbulence.

Reccomended reading:

S. Popescu, *Probleme actuale ale fizicii sistemelor autoorganizate*, Ed. TEHNOPRESS Iaşi, 2004
I. Prigogine, I. Stengers, *Noua alianță*, Ed. Politică, 1984
I. Prigogine, *De la existență la devenire*, Ed. Ştiințifică, 1992
H. Haken, *Synergetics- an introduction*, Springer Verlag 1978
H. Haken, *Advanced Synergetics*, Springer Verlag 1983
G. Nicolis, I. Prigogine, *Exploring Complexity – an introduction*, Freeman & Co., 1989

Teaching methods: lecture, discussion, problem solving

Assessment methods: permanent 30%, final exam 70%

Language of instruction: Romanian

Course title: ***Low Temperature Plasma Physics and Applications***

Type of course: compulsory **Level of course:** graduate

Year of study: II **Semester** : 1 **ECTS credits:** 6

Name of lecturer: Lect. Viorel ANITA, PhD

Objectives:

Prerequisites:

Course content:

Reccomended reading:

G.Popa, L.Sirghi, *Bazele fizicii plasmei*, Ed. Universitații "Al.I.Cuza Iaşi Iaşi, 1989
F.F. Chen, Plenum Press, *Introduction to Plasma Physics,* NY, 1974
I.I.Popescu, D.St.Ciubotaru, *Bazele Fizicii plasmei*, Ed. Tehnică Bucureşti, 1987
I.I.Popescu, I. Iova, E.Toader, *Fizica Plasmei şi Aplicații*, Ed.St. Enc., Buc, 1981.
Alfred Grill, *Plasma in Materials Fabrication from Fundamentals to Applications*, IEE press, 1994

Teaching methods:

Assessment methods:

Language of instruction: Romanian

Course title: ***Introduction to the Physics of Polymers. Polymer Materials with Special Properties***

Type of course: compulsory **Level of course:** graduate

Year of study: II **Semester** : 2 **ECTS credits:** 6

Name of lecturer: Assoc. prof. Gabriela BORCIA, PhD

Objectives:

Learn the fundamental knowledge on the physics of polymer materials, their volume and surface properties. Presentation of polymer materials with special properties, obtained by various physical and chemical methods, and of their performances. Demonstration, by laboratory work, on the use of analysis techniques to identify the properties of polymer materials of interest in modern applications

Prerequisites:

Course content:

General notions, clasiffication criteria. Structure of macromolecular compounds. Aggregation and phase states, tranzition temperatures. Elements of polymerization reaction thermodynamics. Physico-chemical properties of polymer materials of interest in applications. Polymer materials with special properties: inteligent composite materials, interpenetrated polymer networks, liquid crystals in various materials, drug carrier polymers, metalocenes, polymers with biomedical applications, polymer membranes, carbon fibres and carbon fibre composites, conductor and semiconductor polymers, polymer sensors, biodegradable polymers. Techniques for complex polymer materials characterisation. Applications in making of polymers with selected surface properties

Reccomended reading:

S. Dumitrescu, M. Dărângă, *Fizica polimerilor*, Ed. Institutului Politehnic Iaşi, 1989
Materials Today, revistă Elsevier B.V. - 2004-prezent
Progress in Polymer Science, revistă Elsevier B.V. - 2004-prezent
S.J. Kuchanov, S.V. Panyukov, *Comprehensive polymer science*, Pergamon Press, 1996
D. Klee, H. Hocker, G.C. Eastmond, *Advances in Polymer Science. Biomedical Applications/Polymer Blends*, Springer-Verlag, Berlin, 1999
R.W. Richards, S.K. Peace, *Polymer Surfaces and Interfaces III*, John Wiley & Sons, Chichester, 1999
F. Garbassi, M. Morra, E. Occhiello, Eds., *Polymer Surfaces: from Physics to Technology*, J. Wiley, 1998
J.L. Koening, *Spectroscopy of Polymers*, ACS Books, 1992

Teaching methods: lecture, class discussion, laboratory work.

Assessment methods: final exam, lab report and portfolio

Language of instruction: Romanian

Course title: *High Temperature Plasma Physics*

Type of course: compulsory **Level of course:** graduate

Year of study: II **Semester** : 2 **ECTS credits:** 6

Name of lecturer: Assoc. prof. Dumitru ALEXANDROAEI, PhD

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.

Prerequisites: Basic knowledge of Mathematics, Electrodynamics and General Plasma Physics

Course content:

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. Physical processes in stellar plasma. Thermonuclear stellar fusion. Stellar atmosphere. Waves and instabilities in hot plasmas. Diagnosis.

Reccomended reading:

F.F.Chen, *Introduction to Plasma Phys. and Control*. Fusion, Plenum Press, 1974
N. Krall and A. Trivelpiece, *Principles of Plasma Physics*, McGraw-Hill, 1973.
S.R.Seshadri, *Fundam. of Plasma Physics*, Elsevier Publ, Comp., New-York,1973
M.Mitchner, C.H.Kruger, *Partially Ionized Gases*, Wiley Inter. Publ., New-York, 1973
K.Miayamoto, *Plasma Phys. for Nucl. Fus*, Asco Trade Typesett.Ldt.H-Kong,1976
M.Clark Jr., *Plasmas and Controll.Fusion*, MIT Press, John Wiley&Sons,New-York,London
G.Bekefi, *Radiation Processes in Plasm*as, John Wiley&Sons,New-York, 1966
G.K.Parks, *Phys. of Space Plasmas*, Addison Wesley Publ. Comp., Redwood City, 1991
G.Schmidt, *Physics of High Temperature Plasmas*, Acad.Press, New- York, London, 1979
I.I.Popescu,I.Iova,E.Toader, *Plasma Phys and Applic*., Ed. St., Bucuresti, 1981
Gh.Popa, L.Sirghi, *Basics of plasma Phys*., Ed. Universitatii "Al.I.Cuza", Iasi, 2000
M.Lieberman, Al.Lichteberg, *Princep. of Plasma Discarges and Materials Process*., John Willey &Sons, Edt., New York,1994

Teaching methods: Course oral presentations, seminars and practical works

Assessment methods: final written / oral test (60%) + hourly class seminar activity (15%)+ hourly lab activity (25%)

Language of instruction: Romanian

Course title: *Waves and Instabilities*

Type of course: compulsory **Level of course:** graduate

Year of study: II **Semester** : 2 **ECTS credits:** 6

Name of lecturer: lect. Sorin J. TALASMAN, PhD

Objectives:

Characterization of the wave type perturbations appearing in plasma. The study of the wave types and propagation modes in cold and hot plasmas. Explanation of some aspects related to the wave energy transfer through plasma. Introduction to the weak turbulence theory. Explanations of some nonlinear mechanisms responsible for triggering different types of instabilities. Introduction to the study of the parametric instability. Presentation of some algebraic and analytical criteria for testing the stability of a physical system. Accustomisation with some mathematical methods specific to the theoretical approach of the phenomena related to the topics of the course.

Prerequisites: Differential Eqs. and Mathematical Physics Eqs., The theory of functions of a complex variable, Mechanics, Molecular Physics, Elements of Statistical Physics, Electricity and Magnetism, Electrodynamics, Plasma Physics.

Course content:

Part I: Waves in plasma (Basic equations and characteristics of the waves. The waves propagation in homogeneous infinite cold plasma. The waves propagation in homogeneous infinite hot plasma. Drift waves and instabilities). Part II: Instabilities and non-linear phenomena in plasma.(MHD instabilities. The weak turbulence theory. Waves and non-linear effects. Parametric instabilities)

Reccomended reading:

Sveshnikov A. G., Tikhonov A. N., *The Theory of Functions of a Complex Variable*, MIR, Moscow, 1973.
Hayashi Ch., Nonlinear Oscillations in Physical Systems, Princeton Univ. Press, New Jersey, 1985.
Detsch R. V.,*Teoria magnetohidrodinamică în fizica plasmei*, Ed. Acad., Buc., 1966.
Deutsch R. V., *Unde magnetohidrodinamice*, Edit. Acad. Buc., 1969.
Hasegawa A., *Plasma Instabilities and Nonlinear Efffests*, Springer Verlag, Berlin, 1975.
Liu C. S., Tripathi V. K., *Interaction of Electromagnetic Waves with Electron Beams and Plasmas*, World Scientif., London, 1994.
Popescu I. I., Toader E., *Cinetica şi dinamica plasmei*, Ed. St. şi Encicl., Buc., 1983.
Quemada D., *Ondes dans les Plasmas*, Herman, Paris, 1968.
Smirnov B. M., *Physics of Weakly Ionized Gases*, MIR, Moscow, 1981.
Stix Th. H., *The Theory of Plasma Waves*, Mc Graw Hill, 1962.
Swanson G. D., *Plasma Waves*, Acad. Press Inc., London, 1995

Teaching methods: Lectures and media. Detailed presentation of an exemple, followed by similar problems resolved by students at the blackboard.

Assessment methods: Final written paper (75%), Seminar (25%)

Language of instruction: Romanian

Course title: ***Methods for the Study of Partial Ordered Systems***

Type of course: optional **Level of course:** graduate

Year of study: II **Semester** : 2 **ECTS credits:** 6

Name of lecturer: Prof. Dana Ortansa DOROHOI, PhD

Objectives:

Discussions about the complex problems regarding the structure of liquids and liquid crystals; The specific methods for the study of the systems partially ordered; The understanding of the great importance of liquids for the life; Applications of liquids and liquid crystals

Prerequisites: Physics of atoms and molecules, Quantum Mechanics, Statistics, UV and VIS Spectroscopy

Course content:

1. Liquid state. Basic characteristics of liquid state. Thermal motion in liquids. Classification of liquids. Intermolecular forces in liquids. Empirical potentials. Statistics thermodynamics of the simple liquids. 2. Theories for liquid state. Cynetic model of a simple liquid. Eyring cell model. Takehiro Abe cell model. Statistic model of the three component solutions. Applications of the cell model for determining the electro-optical parameters of the molecules. Correlation functions. Theory of the simple liquids on the basis of correlation functions. 3. Liquid crystals. Structural particularities and applications of liquid crystals. Thermotropic liquid crystals (classification, structural characterization). Lyotropic liquid crystals (hydrophobic and hydrophilic interactions, model membranes). Lyotropic liquid crystals in biological membranes. Method to determine the degree of order of liquid crystals. Technical and scientific applications of liquid crystals

Reccomended reading:

I. Georgescu, I. Petra, D. Borşan, *Fizica Stării lichide*, EDP Bucureşti, 1982.
D. Dorohoi, *Fizica Starii lichide. Modele şi Experimente*, Ed. Gama, Iaşi, 1994.
C. Moţoc şi I. Muscutariu, *Introducere în Fizica Cristalelor lichide*, Ed. Facla, Timişoara, 1980.
L. Nasta, R. Moldovan, S. Frunză T. Beica, *Metode opto-electronice de afişaj*, Ed. Univ. Bucureşti, 1992
L. Georgescu, E. Barna, D. Borşan, V. Popa Niţă, V. Dima, N. Stamatin, *Fizica Stării lichide şi a cristalelor lichide*, Ed. Univ. Bucureşti, 1987.

Teaching methods: courses, free discussions, laboratory works, seminars

Assessment methods: final exam

Language of instruction: Romanian

Course title: *Applied Spectroscopy*

Type of course: optional **Level of course:** graduate

Year of study: II **Semester** : 2 **ECTS credits:** 6

Name of lecturer: Lect. Adeline CIOCAN, PhD

Objectives:

In this course, there are first presented the basic notions which Spectroscopy operates with and especially Analytical Spectroscopy. There are described the common elements of spectral techniques such as spectral instruments, sources and detectors. It is emphasized on the optical atomic and molecular spectrochemical methods, in order to obtain elemental analysis of the solid, liquid and gaseous samples and especially the detection of trace elements but also applications on the spectral diagnosis. There are also presented other modern spectral techniques for the qualitative and quantitative information, such as micro-FTIR and SEM-EDX .

Prerequisites: Optics, Atomic and Molecular Physics, Quantum Mechanics

Course content:

Optical spectral information and its quantification; Spectral measurements. Optical and components devices used in optical and spectral instruments; Spectral radiation sources and detectors ; Introduction to atomic spectroscopy-Intensity of spectral lines; Optical emission spectroscopy in flame, arc, spark and different plasma sources; Atomic absorption spectrophotometry; Atomic fluorescence spectrophotometry; Molecular spectroscopy. UV-VIS absorption molecular spectrophotometry; Dispersive IR molecular spectrophotometry and FTIR spectrometry; Scattering spectral methods (Raman spectroscopy); Introduction to electron microscopy; Introduction to X-Ray spectrometry. SEM-EDX technique.

Reccomended reading:

J.D.Ingle, S.R.Crouch, *Spectrochemical analysis*, Prentice Hall, New Jersey, 1988
W.Demtroeder, Laser *Spectroscopy – Basic concepts and Instrumentation*, Springer-Verlag, 1996
M.G.Delibas, *Curs de Optica*, Ed.II.Univ. “Al.I.Cuza” – Iasi, 2001
M.A.Eliasevici, Spectroscopie atomica si moleculara, Ed. Academiei Romaniei, Bucuresti, 1966
D.Birca-Galateanu, M.Giurgea, I.Iova, V.Sahini, A.Trutia si R.Titeica, *Introducere in spectroscopia experimentala*, Ed.Tehnica, Bucuresti, 1966
A.Vlahovici, *Metode optice si spectrale de analiza*, Ed.Univ. “ Al.I.Cuza “ - Iasi, 2002
Manual SEM-EDX
P.G. Ploaie, Z.Petre, *Introducere in Microscopia electronica*, Ed. Acad. RSR, Buc., 1979
Bruker FTIR-Tutorial
R.Jenkins. *An introduction to X-Ray spectroscopy*, 1976

Teaching methods: Exposure and dialogue

Assessment methods: Written evaluation

Language of instruction: Romanian

Master field of study: PHYSICS

Specialization: *BIOPHYSICS AND MEDICAL PHYSICS*

Title conferred: Master diploma in the specialization Biophysics and medical physics

Official length of programme: 2 years (120 credits)

Form of education: full-time studies

Master programe description:

1. The investigation of biophysical properties of excitable membranes
2. Functional studies regarding protein nanopores inserted in reconstituted lipid membranes
3. Electric and elastic coupling between artificial lipid membranes and selected anti-microbial peptides
4. Modulation of ion transport mediated by certain pore-forming peptides and antibiotics, by the membrane dipole potential and lipid microdomains
5. Elucidation of mechanisms underlying the functioning of anti-microbial peptides in reconstituted lipid membranes
6. Bioelectromagnetism – The effect exerted by electromagnetic factors (ferofluids, microwaves, geomagnetic fields) upon living organisms
7. The analysis of complex systems in biology
8. The structural and functional study of artificial and natural biologicla systems, with specific emphasis on matter transport, energy bioconversion and molecular kinetics

CURRICULUM

Ist YEAR

Academic year 2009/2010

Nr. crt.	Discipline	Semester I				Semester II			
		C	S/L	V	credits	C	S/L	V	credits
1	Fundamentals of Mathematical Physics	2	2	E	6	-	-	-	-
2	Ionizing radiation interaction with matter	2	2	E	6	-	-	-	-
3.	Methods of structural and biostructural analysis	2	2	E	6	-	-	-	-
4.	Systems biophysics	-	2	E	6	-	-	-	-
5.	Research activities for preparing the MSc. Thesis		4	C	6	-	-	-	-
6.	Optional course 1	-	-	-	-	2	2	E	8
7.	Electromagnetic field action on complex systems	-	-	-	-	3	3	E	8
8.	Molecular principles of bioactive systems	-	-	-	-	3	3	E	8
9	Research activities for preparing the MSc. Thesis	-	-	-	-	-	4	C	6
	TOTAL HOURS	**6**	**8+4**	**-**	**-**	**8**	**8+4**	**-**	**-**
	TOTAL CREDITS	**-**	**-**	**-**	**30**	**-**	**-**	**-**	**30**

Optional course 1: Virtual instrumentation
Methods of surfaces study

IInd YEAR
Academic year 2010/2011

Nr. crt.	Discipline	Semester I				Semester II			
		C	S/L	V	credits	C	S/L	V	credits
1	Chaotic phenomena and control methods	2	2	E	6	-	-	-	-
2	Biocompatibility and biomaterials	2	2	E	6	-	-	-	-
3.	Neurotransmitters and neuropharmaceuticals	2	2	E	6	-	-	-	-
4.	NMR in medicine and biology	2	2	E	6	-	-	-	-
5.	Research activities for preparing the MSc. Thesis	-	4	C	6	-	-	-	-
6.	Physical bases of clinic dosimetry	-	-	-	-	3	3	E	8
7.	Physics of radiotherapy. Irradiation techniques	-	-	-	-	3	3	E	8
8.	Optional course 2	-	-	-	-	2	2	E	8
9	Research activities for preparing the MSc. Thesis	-	-	-	-	-	4	C	6
10.	MSc. Thesis	-	-	-	-	-	-	-	5
	TOTAL HOURS	**8**	**8+4**	**-**	**-**	**8**	**8+4**	**-**	**-**
	TOTAL CREDITS	**-**	**-**	**-**	**30**	**-**	**-**	**-**	**30+5**

Optional course 2: Introduction in polymer physics. Polymer materials with special properties
Study methods of particle systems with partial ordering

Course title: ***Methods of Structural and Biostructural Analysis***

Type of course: compulsory **Level of course:** graduate

Year of study: I **Semester** : 1 **ECTS credits:** 6

Name of lecturer: Prof. Viorel MELNIG, PhD

Objectives:

The ability of applying the knowledges concerning the way of achieving and analyse of polymer and biopolymer samples structures as: the biopolymers purification, the primary structure characterization of biopolymers, the characterization of the secondary biopolymers structure, meso- and nano phase analyse through X-rays techniques, experimental determination of 3D biomolecules structure, 3D design techniques of biomolecules. The capacity to prospect, process and analyse information from variety of bibliographic sources and report research elaboration. The ability to generate new ideation concerning experimentally assays of analysis. Team skill worked for solving experimental and technological problems. Critical formulations ability considering the current stage from area, and looms new research directions. Personal and group's projects successfully capacity for initiated and administered; determination and sedulous in the realization of the tasks and of the responsibility.

Prerequisites: Elements of Biostructure, Molecular Physics, General Biophysics

Course content:

Molecular and biomolecular architecture. General concern about the structural and biostructural analysis possibilities. Molecular modelling possibilities. The samples preparation. Separation and purification methods. Biomolecules primary structure assessment methods. Mass spectrometry applied to biomolecules. Structure and biostructure X-rays diffraction analyse. IR structure analyse. Structure analyse through NMR techniques.

Reccomended reading:

Renee R. Alexander &, *Basic Biochemical Methods*, John Wiley & Sons, 1985.
W. Schrepp; Harald Pasch. Maldi-Tof Mass *Spectrometry of Synthetic Polymers* (Springer Laboratory). Berlin: Springer-Verlag.
Blow, D. *Outline of Crystallography for Biologists*. Oxford: Oxford Univ. Press 2002
Wuthrich, K. *NMR of Proteins and Nucleic Acids*, Wiley-Interscience, New York, USA 1986.
A. R. Leach, *Molecular Modelling: Principles and Applications*, 2001.

Teaching methods: magisterial lecture; debate; problematization; frontal experiment; conducted revelation**.**

Assessment methods: exam (45%), colloquium (research project 35%), laboratory (20%)

Language of instruction: Romanian

Course title: *Systems Biophysics*

Type of course: compulsory **Level of course:** graduate

Year of study: I **Semester** : 1 **ECTS credits:** 6

Name of lecturer: Prof. Dorina CREANGA, PhD

Objectives:

Prerequisites:

Course content:

Reccomended reading:

Hope, Lohman et al., *Biophysic*s, Acad. Press. New York, 1980
Gheorghe V., Popescu A.,*Introducere in Bionica*, ed. St. 1990,
Popescu, A., *Fundamentele biofizicii medicale*, Vol. I, II, Editura ALL, Bucuresti, 1994,2001
Neacsu, I., Creanga, D., *Proprietati electrice ale membranelor celulare*, Ed. Univ. Al. I. Cuza, Iasi, 2003,
Creanga, D., *Lucrari de biofizica sistemelor*, Ed. Univ. Al. I. Cuza, Iasi, 2003

Teaching methods:

Assessment methods:

Language of instruction: Romanian

Course title: ***Neurotransmitters and Neuropharmaceuticals***

Type of course: compulsory **Level of course:** graduate

Year of study: II **Semester** : 1 **ECTS credits:** 6

Name of lecturer: Prof. Tudor LUCHIAN, PhD

Objectives:

The layout of essential concepts and paradigsm which underlie the description of neurotransmitters and neuropharmaceuticals, as well as their interaction with ion channels. We will follow and describe particular hypothesis and experimental data that led to the discovery of neurotransmitters. A particular emphasis will be put on the presentation of physical and chemical results which explain the molecular interaction between neurotransmitters and ion channels.

Prerequisites: General physics, Mathematical analysis, General biophysics, Physiology, Electricity and magnetism, Biochemistry

Course content:

Molecular description of physical processes associated to neuronal excitation. Particular natural and artificial toxins used to isolate and purify various ion channels involed in cellular excitability. Chemical synapses. Physical and chemical principles of synapses functioning. Neurotransmitters exocytose. Excitatory and inhibitory post-synaptic potentials. Cellualr signaling. Molecular mechanism of signal transduction mediated by membrane receptors. Natural systems for the exogenous expression and study of ion channels. Stochastic methods and principles to studying the kinetics of various ion channels and their interaction with various chemicals. The description of an experimental setup used in patch-clamp experiments. Principles of calcium channels identification in excitable membranes. The general description of structure and function of calcium channels. The general description of structure and function chemically-modulated ion channels involved in synaptic communication.

Reccomended reading:

T. Luchian, *Introducere in biofizica moleculara si celulara*, 'Alexandru I. Cuza' University Publishing House, Iasi, 2001
Lodish, H., Baltimore, D., Berk, A., Zipursky, S. L., Matsudaira, P., Darnell, *Molecular Cell Biology*,. J. W. H. Freeman and Company, New York 1995
Hille, B., *Ionic Channels of Excitable Membranes*,. Sinauer Associates, Inc. 1992
T. Luchian, *Electrofiziologie moleculara. Teorie si Aplicatii*, Sedcom Libris, Iasi,2006
R. J. Lewis, K. J. Nielsen, D. J. Craik, M. L. Loghnan, D. A. Adams, I. A. Sharpe, T. Luchian, D. J. Adams, T. Bond, L. Thomas, A. Jones, J. L. Matheson, R. Drinkwater, P. R. Andrews, P. F. Alewood. *J. Biol. Chem*. 2000, 275:45
T. Luchian BBA-Biomembranes, 2001, 15

Teaching methods: Direct lecturing, demonstration, observation.

Assessment methods: written, periodic testing, testing of lab skills

Language of instruction: Romanian

Course title: *NMR in Medicine and Biology*

Type of course: optional **Level of course:** graduate

Year of study: II **Semester** : 1 **ECTS credits:** 6

Name of lecturer: Assoc. prof. Dan-Gheorghe DIMITRIU, PhD

Objectives:

The students become accustomed with the nuclear magnetic resonance methods. The students will develop their abilities to investigate complex molecules by NMR spectroscopy. The students will learn and develop abilities to operate with NMR medical imaging techniques. The students will develop practical abilities to interpret the results of some complex medical tests

Prerequisites: Nuclear physics

Course content:

Nuclear momentum and nuclear magnetic momentum. The hyperfine structure of the spectra. Stern-Gerlach method and NMR methods (Rabi, Bloch and Purcell) to measure the nuclear magnetic momentum. NMR spectroscopy. Biological tissues magnetization. NMR medical imaging device components. NMR image acquisition and reconstruction. Spatial characteristics of the NMR image. Functional NMR imaging. NMR image artifacts removing methods. Protection methods during the NMR image acquisition. Advantages and disadvantages of the NMR imaging as against other medical imaging methods.

Reccomended reading:

E. Lozneanu, *Fizica nucleara*, Ed. Univ. „Al. I. Cuza" Iaşi, 2003;
D. G. Dimitriu, *Rezonanța magnetică nucleară în medicină şi biologie* – Note de curs, Editura PIM, Iaşi, 2008;
E. Breitmaier, *Structure elucidation by NMR in organic chemistry. A practical guide*, John Wiley & Sons, Chichester, West Sussex, 2002;
J. B. Lambert, E. P. Mazzola, *Nuclear magnetic resonance spectroscopy. An introduction to principles, applications, and experimental methods*, Pearson Education, Upper Saddle River, New Jersey, 2003;
W. R. Hendee, E. Russell Ritenour, *Medical imaging physics*, 4th Edition, Wiley-Liss, New York, 2002;
P. Sprawls, *Magnetic resonance imaging. Principles, methods, and techniques*, Medical Physics Publishing, Madison, 2000;
Ed. P. A. Rinck, *Magnetic resonance in medicine. The basic textbook of the*

Teaching methods: Exposure, conversation, university lecture, synthetic analysis, demonstration

Assessment methods: Write and oral exam, Laboratory reports

Language of instruction: Romanian

Course title: *Physical Bases of Clinic Dosimetry*

Type of course: compulsory **Level of course:** graduate

Year of study: II **Semester** : 2 **ECTS credits:** 8

Name of lecturer: lect. Dan MIHĂILESCU, PhD

Objectives:

On completion, students should have obtained theoretical and practical knowledge in the field of clinical dosimetry, according to national and international Codes of Practice and the Romanian legislation.

Prerequisites: Advanced knowledge of Interactions of Ionizing Radiation with Matter, basic knowledge of Detectors, Dosimetry and Radioprotection

Course content:

(1) Dosimetric principles, quantities and units. Radiation dosimeters; (2) Teletherapy machines; (3) Radiotherapy with external photon and electron beams: physical aspects; (4) Dosimetry of photon and electron beams; (5) Calibration of photon and electron beams; (6) Acceptance tests and commissioning; (7) Brachytherapy: physical aspects and dosimetry; (8) Clinical dosimetry in hadron-therapy; (9) Clinical dosimetry of neutron beams.

Reccomended reading:

Ervin B. Podgorsak, *Review of Radiation Oncology Physics: A Handbook for Teachers and Students*, IAEA Viena, 2003.
F.M. Khan, *The physics of radiation therapy*, Williams and Wilkins, Baltimore, Maryland, U.S.A., 1994.
H.E. Johns, J.R. Cunningham, J.R., *The physics of radiology*, Thomas, Springfield, Illinois, U.S.A., 1984.
D. Mihăilescu, *Dozimetria radiațiilor ionizante*, Ed. Univ. "Al.I.Cuza", Iaşi, 2001.
D. Mihăilescu, C. Borcia, *Interacțiunea radiațiilor ionizante cu substanța. Partea I: radiații încărcate electric*, Ed. Sedcom Libris, Iaşi, 2007.

Teaching methods: lecture, class discussion, brainstorming

Assessment methods: 25% by class tests and practical assessment, 25% by research project, 50% by final exam (closed-ended questionnaire)

Language of instruction: Romanian

Master field of study: PHYSICS

Specialization: *ADVANCED MATERIALS. NANOTECHNOLOGIES*

Title conferred: Master diploma in the specialization Advanced materials. Nanotechnologies

Official length of programme: 2 years (120 credits)

Form of education: full-time studies

Master programe description:

The master study programe is addressed to students who have completed a license in Physics and Technological Physical, and to students from the Physical Chemistry, Chemistry, Materials Science and Engineering. It is designed as an extension, deepening and application of physics to producing, characterization and current applications of new magnetic materials, semiconductors and dielectrics as well as nanotechnologies. Master programe is focused on accounting the methods and physical processes as basis of dedicated technologies for production and characterization of advanced materials. Proposed applications of this specialization include special chapters useful in studying and understanding of the properties of advanced materials as well as specialized courses in technologies for obtaining advanced materials, methods of investigating of with low dimensional materilas and scientific and technological applications.

Students will be initiate in processing, structure characterisation, properties and performance of the new nanostructured. The research is conducted in laboratories with highlly specialized equippements (microscopic electronic microscope AFM, magnetometre VSM, AGM and SQUID systems for characterizing the behavior of electromagnetic fields of different frequencies). Students are directly involved in scientific research projects having the opportunity to be assimilated into existing research teams. During the summer, students are able to go to research laboratories in the areas of material science in European universities.

CURRICULUM

Ist YEAR

Academic year 2009/2010

Nr. crt.	Discipline	Semester I				Semester II			
		C	S/L	V	credits	C	S/L	V	credits
1.	Fundamentals of Mathematical Physics	2	2	E	6	-	-	-	-
2.	Physical processes in semiconductors thin solid films	2	2	E	6	-	-	-	-
3.	Modeling of physical processes	2	2	E	6	-	-	-	-
4.	Optional course 1	2	2	E	6	-	-	-	-
5.	Research activities for preparing the MSc. Thesis	-	4	C	6	-	-	-	-
6.	Virtual instrumentation	-	-	-	-	2	2	E	6
7.	Quantic theories of solid state	-	-	-	-	2	2	E	6
8.	Physics of dielectrics	-	-	-	-	2	2	E	6
9.	Optional course 2	-	-	-	-	2	2	E	6
10.	Research activities for preparing the MSc. Thesis	-	-	-	-		4	C	6
	TOTAL HOURS	**8**	**8+4**	**-**	**-**	**8**	**8+4**	**-**	**-**
	TOTAL CREDITS	**-**	**-**	**-**	**30**	**-**	**-**	**-**	**30**

Optional course 1: Electronic transport phenomena.
Transparent thin solid films based on oxidic semiconductors.

Optional course 2: Physics and technology of nanocomposited materials.
Nanostructured materials for medical application.

IInd YEAR
Academic year 2010/2011

Nr. crt.	Discipline	Semester I				Semester II			
		C	S/L	V	credits	C	S/L	V	credits
1.	Advanced materials preparation techniques. Nanotechnologies	2	2	E	6	-	-	-	-
2.	Physics of magnetic materials	2	2	E	6	-	-	-	-
3.	Optional course 1	2	2	E	6	-	-	-	-
4.	Optional course 2	2	2	E	6	-	-	-	-
5.	Research activities for preparing the MSc. Thesis	-	4	C	6	-	-	-	-
6.	Experimental methods in physics of materials	-	-	-	-	2	2	E	6
7.	Theoretical and numerical micro magnetism	-	-	-	-	2	2	E	6
8.	Optional course 3	-	-	-	-	2	2	E	6
9.	Optional course 4	-	-	-	-	2	2	E	6
10.	Research activities for preparing the MSc. Thesis	-	-	-	-	-	4	C	6
11.	MSc. Thesis	-	-	-	-	-	-	-	5
	TOTAL HOURS	**8**	**8+4**	**-**	**-**	**8**	**8+4**	**-**	**-**
	TOTAL CREDITS	**-**	**-**	**-**	**30**	**-**	**-**	**-**	**30+5**

Optional course 1: Nano- and micro technologies in sensors and actuators manufacturing. / Fundamental and functional properties of low-dimension materials.
Optional course 2: Nanotechnologies in integrated circuits manufacture. / Multifunctional intelligent materials.
Optional course 3: Physics and technology of solid surface/High-frequencies investigation methods for materials.
Optional course 4: Spintronics. / Electromagnetic methods in investigation and treatments of surfaces.

Course title: ***Physical Processes in Semiconductors Thin Solid Films***

Type of course: compulsory **Level of course:** graduate

Year of study: I **Semester**: 1 **ECTS credits:** 6

Name of lecturer: Assoc. prof. George Mihail RUSU, PhD

Objectives:

The course aim is to study theoretical and applied physical phenomena in semiconductors and semiconducting structures (M-S, MIS, S-S junctions both in thin films and multilayered structures). Also, the main devices built up based on these structures will be investigated.

Prerequisites: Solid Sate Physics, Statistical Physics

Course content:

Basic properties of semicondutors. Surface and interface phenomena. Physical processes in metal-semiconductor structure. Analisis of the metal-oxide-semiconductor structure. Physical processes in semiconductor junctions (semiconductor homo- and heterojunctions). Energy band diagrams. Theoretical aproaches. Transport phenomena in semiconductor junctions. Optical and photoelectrical phenomena in semiconductor junctions. Preparation and characterization of semiconducting microstructures. Applications.

Reccomended reading:

Milnes A.G., Feucht D.L., *Heterojunctions and Metal-semiconductors Junctions*, Academic Press N.Y.1972
V. Dolocan, *Fizica Joncțiunilor cu semiconductoare*, Ed. Acad. R.S.R.,Buc., 1982.
G.I. Rusu, G.G. Rusu, *Bazele fizicii semiconductorilor*, Ed. Tehnica St. si Did. CERMI, Iasi, 2005
I.Dima, I. Licea, *Fenomene fotoelectrice în semiconductori şi aplicații*, Ed. Acad. R. S. R., Bucureşti, 1980.
V. Dolocan, *Fizica electronică a stării solide*, Ed. Acad. R. S. R., Bucureşti, 1984.
M. Jaros: *Physics and Applications of Semiconductor Microstructures*, Oxford Science Publications, 1989
I.D. Bursuc, N. Suliţanu, *Solidul. Teorii. Fenomene. Aplicații.*, Ed. Şt., Buc, 1991.
F.T.Vasko, A.V.Kuznetsov, *Electronic States and Optical Transitions in Semiconductor Heterostructures*, Springer, 1999
I. Dima, I. Munteanu, *Materiale şi dispozitive semiconductoare*, EDP, Buc, 1980.
B.K. Ridley, *Quantum Process in Semiconductors*, Oxford University Press, 1988.

Teaching methods: didactical demonstration, systemic exposure, conversation

Assessment methods: writing examination

Language of instruction: Romanian

Course title: *Modeling of Physical Processes*

Type of course: compulsory **Level of course:** graduate

Year of study: I **Semester** : **ECTS credits:** 6

Name of lecturer: Assoc. prof. Laurentiu STOLERIU, PhD

Objectives:

Introducing students to the methodology of modeling of physical systems from physicsl process to mathematical formulation followed by analytical or numerical calculus. Developing the abilities of using mathematical platforms like Maple or Mathematica in solving physics problems

Prerequisites: Basic undergraduate courses in mathematics and physics

Course content:

Generalities. Systems, models and simulations. Verification, approximation and validation. Errors in numerical calculus. Maple programming platform. Logical structures in Maple. Programming in Maple. Computing and graphical representation of fields. Solving Laplace equation. Problems with boundary conditions. Special functions. Applications (Schrodinger equation for hydrogen atom. Orbitals.). Ordinary differential equations. Problems with initial conditions. Nonlinear oscillations. Modeling systems with nonlinearities. Systems with local and nonlocal memory. Monte Carlo method and applications in statistical physics. Pseudorandom numbers. Distributions.

Reccomended reading:

W. Press et al, *Numerical Recipes*, Cambridge University Press, 1992
Burden R. et al, *Numerical analysis*, PWS-KENT Publishing Co, Boston, 1985.
B. Char et al, *Maple V*, Springer Verlag, 1992.
Blachman N.R. et al, *Maple V - quick reference*, Brooks/Cole Publishing Company, Pacific Grove, California, 1994.
M. Kalos and Paula Whitlock, *Monte Carlo methods. Vol. I Basics*, John Wiley and Sons, New York, 1986.
K. Binder, D.W. Heermann, *Monte Carlo simulatio in Statistical Physics. An Introduction*, Springer Verlag, Berlin, 1988.
G.L. Baker, J.P.Gollub, *Chaotic dynamics. An introduction*, Cambridge University Press, 1990.
http://stoner.phys.uaic.ro/moodle/

Teaching methods: Lecture, debate, exemplification

Assessment methods: evaluation of practical work 20%, a project 30%, final exam 50%

Language of instruction: Romanian

Course title: *Electronic Transport Phenomena*

Type of course: optional **Level of course:** graduate

Year of study: I **Semester**: 1 **ECTS credits:** 6

Name of lecturer: Prof. Diana MARDARE, PhD

Objectives:

The students should obtain knowledge on the electronic transport phenomena in solid bodies. In the particular situation of thin films, correlation between the deposition method, deposition parameters used in each method and electronic transport phenomena will be performed.

Prerequisites: Condensed Matter Physics

Course content:

Boltzmann transport equation.Scatttering mechanisms of the charge carriers in solid bodies. Electrical conduction in solid bodies. Thermal con duction in solid bodies. Thermoelectrical phenomena. Galvanomagnetical phenomen. Tensoresistiv effect. Electronic processes in photocatalysis. Transport phenomena in thin films

Reccomended reading:

Diana Mardare, *Straturi subțiri policristaline şi amorfe*. Oxidul de titan, Ed. "Politehnium", Iaşi, 2005.
Diana Mardare, *Fenomene de transport în corpurile solide*, Ed. "Gh. Asachi", Iaşi, 2002.
P. S. Kireev, *Fizica semiconductorilor*, Ed. Şt. şi Enciclopedică, Bucureşti, 1977.
x x x *Handbook of Thin Film Technology*, Eds. L. I. Maissel, R. Glang) McGraw Hill Book Company, New York, 1970.
M. Balkanski, *Handbook on Semiconductors*, North-Holland, Amsterdam, 1994.

Teaching methods: Lectures supported by slides and video

Assessment methods: Written paper

Language of instruction: Romanian

Course title: ***Transparent Thin Solid Films Based on Oxidic Semiconductors***

Type of course: optional **Level of course:** graduate

Year of study: I **Semester**: 1 **ECTS credits:** 6

Name of lecturer: Prof. Felicia IACOMI, PhD

Objectives:

Deposition techniques and structural, electrical and optical characterization methods of transparent and conductive thin films based on semiconductor oxides (TCO) are described. Applications of these films in transparent electronics, opto-electronics, sensors, etc. are presented.

Prerequisites: Solid state physics, Semiconductor physics, Electronics

Course content:

An introduction in the study of TCO thin films. TCO thin film deposition techniques: vacuum thermal evaporation, DC and RF sputtering, pyroliza-spray, spin-coating, chemical vapor deposition, deep chemical bath deposition. The influence of deposition parameters and substrate nature on the structure and morphology and on the electrical and optical properties of thin films is analysed. The influence of doping and co-doping on the bandgape size and electrical and optical properties of thin films is presented. Multilayer structures for certain applications are introduced (transparent electronics, optoelectronics, sensors).

Reccomended reading:

G.I.Rusu, G.M.G.Rusu, *Bazele Fizicii semiconductorilor*, Ed. Tehn. şi Did. CERMI, Iaşi, 2005;
Z. Qiao, *Fabrication and study of ITO thin films prepared by magnetron sputtering*, disertaţie, 2003;
X. Li, S.E. Asher, B.M. Keyes, et al, *p-type ZnO thin films grown by MOCVD*, online pe http://www.osti.gov/bridge;
M. Purica, F. Iacomi, C. Baban, P. Prepelita, N. Apetroaei, D. Mardare, D. Luca,, Thin Solid Films, 515 p. 8674 - 8678 2007;
E. Budianu, M. Purica, F. Iacomi, C. Baban, P. Prepelita and E. Manea , “Silicon metal-semiconductor–metal photodetector with zinc oxide transparent conducting electrodes”, Thin Solid Films, 516, p. 1629-1633, 2008;
N, Iftimie, F. Iacomi, N. Rezlescu, “High performance gas sensing materials based on nanostructured zinc oxide films”, JOAM, 10, 7, 2008, p.1810

Teaching methods: exposal, discutions, lab work

Assessment methods: tests, experimental application

Language of instruction: Romanian

Course title: *Quantum Theories of Solid State*

Type of course: compulsory **Level of course:** graduate

Year of study: I **Semester** : 2 **ECTS credits:** 6

Name of lecturer: Prof. Marina-Aura DARIESCU, PhD

Objectives:

It intends to supply good knowledge on special elements of Quantum Mechanics, Quantum Statistics and Quantum Field Theories, with major applications in most important chapters of physics. It offers the bunch of ideas, notions and mathematical methods that proved their usefulness in modern technologies.

Prerequisites: Functional Analysis, Mathematical Physics Equations, Quantum Physics, Statistical Physics, Solid State Physics.

Course content:

Schrodinger's Equation: significant models of potential wells, potential barriers, periodic potentials, energy bands. Time-dependent Perturbation Theory. Applications. Scattering Theory: Cross sections. Many-Particle Systems: Born-Oppenheimer approximation, Hartree-Fock Equation. Quantum Statistics. Applications. Basics of Quantum Field Theories. Elements of Quantum Dynamics in mesoscopic systems. Basics of Quantum Information.

Reccomended reading:

P.J.E.Peebles, *Quantum Mechanics* , Princeton University Press, New Jersey, 1992
C.Dariescu, Marina-Aura Dariescu, I. Gottlieb, *Capitole de baza in Mecanica Cuantica. Microparticule si Campuri* Ed. Venus, Iasi, 2007
C. Dariescu, I.Gottlieb, Marina-Aura Dariescu, *Campuri Cuantice Libere*, Ed. BIT, Iasi, 1998
S. Datta, *Electronic transport in mesoscopic sistems* Cambridge Univ. Press, 2003
M. Ignat. *Termodinamica si fizica statistica*. Ed. Univ. Al. I. Cuza Iasi, 1983-1984

Teaching methods: Lectures, Thematic debates, Applications

Assessment methods: Written examination (50 %) and seminar activity (50 %).

Language of instruction: Romanian

Course title: *Physics of Dielectrics*

Type of course: compulsory **Level of course:** graduate

Year of study: I **Semester** : 2 **ECTS credits:** 6

Name of lecturer: Prof. Liliana MITOSERIU, PhD

Objectives:

Acquiring information and understanding phenomena related to: the dipolar and multipolar structures, behavior of polar and nonpolar dielectrics under static and dynamic fields; local fields (Lorentz, Onsager); description of dielectrics by complex method: impedance, admittance, dielectric module formalism; dielectric relaxation – Debye mechanisms and microscopical models; empirical laws (Cole-Cole, Cole-Davidson, etc.); abilities in measuring, modeling and understanding experimental complex dielectric data of various systems; impedance spectroscopy principles; dielectric mixtures – mixing rules (effective field models); energy, forces and applications in nanoscience; nonlinear dielectrics (ferro, piezo, pyroelectricity), applications in microelectronics.

Prerequisites: Electricity and Magnetism, Electrodynamics, Solid State Physics.

Course content:

1. Multipole development of potential. Local & integral eq. of the electric field in matter. Boundary conditions; 2. General phenomenology of dielectrics. Linear and nonlinear dielectrics; 3. Polarization. Fundamental equation of dielectrics. Applications; 4. Local fields (Lorentz, Onsager); 5. Polarization mechanisms of dielectrics: induced, orientational, interfacial. 6. Energies and forces in dielectrics. Applications in nanoscience: nanodielectrics, dielectroforesis; 7. Dielectric relaxation. Microscopic mechanisms. 8. Impedance spectroscopy for dielectrics. Impedance, admittance, dielectric module formalism; 9. Dielectric mixtures – mixing rules (effective field models); 10. Nonlinear dielectrics (fero, piezo, pyroelectricity), applications in microelectronics.

Reccomended reading:

L. Mitoseriu, V. Tura, *Fizica dielectricilor*, 1999; *Electricitate si magnetism*, 2000, Ed. Univ."Al.I. Cuza" Iasi
M. Socaciu, *Dielectrici şi aplicaţii*, Ed. Pantheon, Craiova, 1994
I. Bunget, M. Popescu, *Fizica dielectricilor solizi*, Ed. St. & Enc., Bucuresti, 1978
A. Jonsker, *Dielectric relaxation in solids*, Chelsea Dielectric Press., London, 1983
A. Ianculescu, *Electroceramica* v. I-II, Ed. Matrix Rom Bucuresti, 2003, 2004
L. Mitoseriu (ed.), *New Developments in Adv. Functional Ceram*, Transworld Research Network, 2007
A. Ianculescu, L. Mitoseriu, *Ceramici avansate cu aplicatii in microelectronica*, Ed. Politehnica Press 2007
N. Setter (ed.), *Piezoelectric materials in devices*, Ed. EPFL Swiss Federal Inst. of Technology, 2002

Teaching methods: Power Point presentations, Didactic films & animation, Demonstrative experiments.

Assessment methods: Exam: written and oral. Laboratory examination

Language of instruction: Romanian

Course title: ***Physics and Technology of Nanocomposited Materials***

Type of course: optional **Level of course:** graduate

Year of study: I **Semester** : 2 **ECTS credits:** 6

Name of lecturer: Assoc. prof. Vasile ȚURA, PhD

Objectives:

The main types of nanocomposites, characteristic properties and typical applications for which they were developed. Methods for characterization of mechanical, electrical, magnetic and optical properties of nanocomposite materials. Current state of knowledge in modeling physical properties of nanocomposites.

Prerequisites: mechanics, electricity and magnetism, optics

Course content:

Ceramic/metal nanocomposites. Technology. Preparation: mechanical alloys, sol-gel synthesis, spraying of melts. Structures: particles, thin layers, wires, porous structures. Applications: electrical, magnetic, optical. Matrix polymer nanocomposites: polymer/polymer, ceramic/polymer, metal/polymer, carbon nanotubes/polymer. Preparation technologies: solid mixtures, mixture of solutions, in-situ polymerization, polymer coatings, inorganic coatings. Applications: mechanical, electrical, optical. Nanocomposites: natural, biological, synthetic. Nanocomposites synthesized by imitating natural processes. Proteins packaging. Modeling of nanocomposites: current issues. Multi-physics modeling.

Reccomended reading:

Ajayan P.M. (ed): *Nanocomposite Science and Technology*, Wiley Verlag GmbH, Weinheim, 2003;
Nicolais L. and Carotenuto G.: *Metal-Polymer Nanocomposites*, John Wiley and Sons, 2005;
Stroscio M.A., Dutta M. (ed): *Biological nanostructures and applications of nanostructures in biology. Electrical, mechanical and optical properties*, Kluwer Academic, 2004.

Teaching methods: lecture, explanation, conversation

Assessment methods: oral and written examination

Language of instruction: Romanian

Course title: ***Advanced Materials Preparation Techniques. Nanotechnologies***

Type of course: compulsory **Level of course:** graduate

Year of study: II **Semester** : 1 **ECTS credits:** 6

Name of lecturer: Assoc. prof. Leontie LIVIU, PhD

Objectives:

To provide students with a comprehensive overview on the fundamentals of thin film preparation and characterization. To enable the students to develop a thorough understanding of how core physics can be used to understand thin film deposition processes. Students should learn about up-to-date preparation technologies (thermal vacuum evaporation, r.f. magnetron sputtering, sol-gel, spray pyrolysis), as well as investigation by divers methods (XRD, AFM, XPS) of thin-film materials. The extent of knowledge must include top technologies using thin films, including nanotechnologies. To establish the correlation between processing variables and materials characteristics and performance within the framework of key modern technologies. To allow students to develop a sense of teamwork, communication skills and research methodologies through team project.

Prerequisites: basic knowledge of Calculus and Solid State Physics

Course content:

Thin film definition. Crystalline and amorphous films. Choosing a deposition method. Classification of Deposition Technologies. Thin-film nucleation and growth. Thermal vacuum evaporation. Apparatus. Applications. Magnetron sputtering. Apparatus. Applications. Chemical methods. Chemical Vapor Deposition (CVD). Apparatus. Applications. Electrochemical and electroless methods. Molecular beam epitaxy (MBE). Pulsed laser deposition (PLD). Thin film applications in nanoelectronics (optoelectronic devices, photodetectors, solar cells, sensors and actuators), nanotechnologies.

Reccomended reading:

Edward L. Wolf, *Nanophysics and Nanotechnology*, Wiley-WCH Verlag GmbH & Co. KgaA, Weinheim, 2004;
Bharat Bushnan (Ed.), *Springer Handbook of Nanotechnology*, Spinger-Verlag, Berlin, Heidelberg, New York, 2004;
K. Seshan (Ed.), *Handbook of thin film deposition processes and techniques*, 2nd Ed., Noyes Publications, William ANDREW Publishing, Norwich, N. Y., USA, 2002;
M. Ohring, *The material science of thin films*, Academic Press, New York, 1992;
N. Sulițanu, *Fizica Suprafeței Solide*, Ed. Univ. "AL.I.Cuza" Iaşi,1997;
J.M. Walls, R. Smith, *Surface Science Techniques*, Pergamon Press, NY, 1994;
C.E.Morosanu,*Depunerea chimică din vapori a straturilor subțiri*, Ed.Tehnică,Buc.1981
L. Oniciu, E. Grunwald, Galvanotehnica, Ed. Şt şi Encicloped., Buc., 1980;
I. Spînulescu, Fizica straturilor subțiri şi aplicațiile acestora, Ed. Şt., Bucureşti, 1975

Teaching methods: Lectures accompanied by computer mediated presentations (online, DVD, PowerPoint); simulation, modelling

Assessment methods: Written exam

Language of instruction: Romanian

Course title: *Physics of Magnetic Materials*

Type of course: compulsory **Level of course:** graduate

Year of study: II **Semester** : 1 **ECTS credits:** 6

Name of lecturer: Prof. Ovidiu Florin CALTUN, PhD

Objectives:

The students become familiar with magnetization processes in soft and hard, crystalline and amorphous materials. The students become able to correlate the magnetic properties with the microstructure. The students develop their skills in measuring and characterizing the magnetization processes in different types of magnetic materials. The competences in biographical and experimental research will be emphasized.

Prerequisites: Electricity and magnetism, Solid state physics

Course content:

The origin of magnetism. Diamagnetism. Paramagnetism. Ferri and Ferromagnetism. Antiferromagnetism. Metamagnetism. Superparamagnetism. Ferromagnetic resonance. Methods in characterization magnetic materials. Soft and hard magnetic materials. Nanoparticulate magnetic media. Thin magnetic films. Magnetic materials applications. Recording media.

Reccomended reading:

G. Bertotti, *Hysteresis in Magnetism (For Physicists, Material Scientists and Engineers*) Academic Press Boston, 1998
H. N. Bertram, *Theory of magnetic recording,* Cambridge University. Press, 1994
R. M. Bozorth, *Ferromagnetism* IEEE Press, 1993
E. Burzo, *Fizica fenomenelor magnetice* vol I, II, III, Ed. Academiei Bucureşti1979
S. Chikazumi, *Magnetismul* Editura Ştiinţifică şi Enciclopedică, Bucureşti 1981
D.J. Craik, *Magnetism (Principles and Applications)* Wiley New York1997
A. Goldman, *Handbook of Modern Ferromagnetic Materials* Kluwer,1999
D. Jiles, *Magnetism and Magnetic Materials*, Chapman & Hall, New York, 1991
Charles Kittel, *Introduction to Solid State Physics*, Wiley New York, 1996
E. Purcell *Cursul de fizica Berkeley II (Electricitate si magnetism)* EDP 1987
Al. Stancu, *Magnetization process in particulate ferromagnetic media*, Cartea Universitara Bucuresti 2006
Al. Stancu, *Tratat de Electtricitatea si magnetism,* Cartea Universitara Bucuresti
V. Tutovan, *Introducere in masurari electrice si magnetice* EDP 1962
S. Vonsovsky, *Magnetism of elementary particles* Mir Publishers Moscow, 1975
E. P. Wohlfarth, ed., *Ferromagnetic Materials* North-Holland, 1980

Teaching methods: Lectures, debate. Brainstorming, experiment, inquiry

Assessment methods: Research project

Language of instruction: Romanian

Course title: ***Nano- and Micro Technologies in Sensors and Actuators Manufacturing***

Type of course: optional **Level of course:** graduate

Year of study: II **Semester** : 1 **ECTS credits:** 6

Name of lecturer: Assoc. prof. Florin BRINZA, PhD

Objectives:

Building basic knowledge refer to physical principles of building and working of solid state sensors and transducers used in environment parameters measurement and monitorising. Technological parameters and construction mode are presented for students in context of devices used as sensors for various physics parameters. Learning the modes for integrating sensors in control and measurements apparatus. Presenting tendencies for next generation sensors and micro sensors. Specific instrumentation for environment measurements. Instruments-computers interface. Knowledge base used in after-graduate activity.

Prerequisites: Molecular Physics, Mechanics, Electricity and Magnetism, Optics, Solid State Physics

Course content:

1. Technologies and materials for solid state devices used as sensors and transducers. 2. Temperature and radiation sensors. 3. Humidity sensors. 4. pH sensors. 5. Acoustic and ultra acoustic sensors. 6. Gas sensors. 7. Complex transducers. 8. One-chip-lab. 10. Specific instruments for environments. 11. Instruments for humidity, pH and conductivity measurements. 12. Anemometers, gas analyzers. 13. Instruments for pressure and vibration measurements.

Reccomended reading:

I.D. Bursuc, N. Sulitanu, *Solidul. Fenomene, teorie, aplicații*. Ed. Şt. şi Enc., Bucureşti, 1991.
G.I.Rusu, G. G. Rusu, *Fizica semiconductorilor*, p.I, Ed. Univ. „Al.I.Cuza" Iasi, 2005
N.M. Barlea, *Fizica Senzorilor*, Ed. Albastră, Cluj, 2000.
G. Ionescu ş.a., *Traductoare pentru automatizări industriale*, Ed. Tehnică, Bucureşti, 1985.
Jantschi Lorentz, *Metrologia si monitorizarea mediului*, Ed. Amicii, Cluj, 2003
Ungureanu Florina, *Monitorizarea mediului asistata pe calculator*, Ed. Gh. Asachi Iasi, 2001.

Teaching methods: multimedia-assisted conference, Demonstrative experiment. Individual experiment

Assessment methods: write examination 60%, practical skills (implementation of a sensor) 40%.

Language of instruction: Romanian

Course title: ***Fundamental and Functional Properties of Low-Dimension Materials***

Type of course: optional **Level of course:** graduate

Year of study: II **Semester** : 1 **ECTS credits:** 6

Name of lecturer: prof. Felicia IACOMI, PhD

Objectives:

The influence of quantum size effect on the fundamentale properties of low dimensional materials is presented. Some functionale properties and applications of low dimensional materials are evidenced. Students formation for the work team in research applications.

Prerequisites: quantum mechanics, solid state physics, quantum theory of solid state

Course content:

An introduction in the study of low dimensional materials. Classification. Synthesis and characterisation methods. Fundamentale properties of low dimensional materials (Melting point, unit cell parameters. Mechanical properties. Optical properties. Electrical properties. Ferroelectrics and dielectrics. Superparamagnetism). Functionale properties of low dimensional materials. Applications (Molecular electronics. Nanoelectronics. Biological applications. Quantum devices with controlled bandgaps. Photonique crystals and plasmonique wave gides)

Reccomended reading:

V.Pop. I.Chicinas, N. Jumate, *Fizica materialelor. Metode experimentale*, Presa Universitara Clujeana, 2001,
F. Iacomi, *Zeolitii naturali. Structura. Proprietati. Utilizari,* Ed. Universitatii A. Vlaicu Arad, 2001,
F.Iacomi, *Spectroscopia vibrațională a materialelor zeolitice*, Ed. Stef, Iasi, 2007
S.Sugano, H.Koizumi, *Microcluster Physics*, Springer Series in Material Science,
Gunther Bauer, Wolfgang Richter, *Optical Characterization of Epitaxial Semiconductor Layers*, Springer Verlag, 1996
D.I.Bower, W.F.Maddams, *The vibrational spectroscopy of polymers*, J. S. Harris . Physics of Advanced Semiconductor Devices (Spring 2004),
M. Johnson, *Spintronics, New Frontiers of functional materials*, 2004
L. Quian, J. Hinestroza, *Application of Nanotechnology for high performance textiles*, JTATM, 2004

Teaching methods: exposal, discutions, lab work

Assessment methods: tests, experimental application

Language of instruction: Romanian

Course title: ***Experimental Methods in Physics of Materials***

Type of course: compulsory **Level of course:** graduate

Year of study: II **Semester** : 2 **ECTS credits:** 6

Name of lecturer: Assoc. prof. Cristian-Ioan BABAN, PhD

Objectives:

The student will obtain good understanding of characterization of materials by introducing the basic principles and performing experiences of a large range of techniques used to characterize different types of materials. After a successful completion of this course, the student shall: have an ability to recommend appropriate methods for particular material problems; be able to apply the principles and knowledge obtained to put forward individually a work plan in solving a particular problem; be able to explain the data obtained and the phenomena exhibited in the materials analysis

Prerequisites: Solid state physics, Quantum mechanics, Physics of atoms and molecules

Course content:

X-ray diffraction technique. Fundamentals of scanning electron microscopy, electron diffraction and neutron diffraction. Scanning tunneling microscopy and atomic force microscopy. Transmission electron microscopy. Electron emission spectroscopies. Visible / UV emission, reflection, and absorption. Vibrational spectroscopy and nuclear magnetic resonance. Low temperature techniques. Experimantal methods for magnetic materials. Thermal analysis (DSC and DTA).

Reccomended reading:

P.E.J. Flewitt, R.K. Wild, *Physical Methods for Materials Characterisation*, Institute of Physics, Bristol and Philadelphia, 1994.
R.C. Brundle et al., *Encyclopedia of materials characterization :surfaces, interfaces, thin films* London: Butterworth-Heinemann, 1992
V. Pop, I. Chicinaş, N. Jumate, *Fizica Materialelor: Metode experimentale*, Presa Universitară Clujeană, 2001
N. Sulițanu, *Fizica suprafeței solide*, Editura Universității Al. I. Cuza, 1997
G: G: Rusu, C. Baban, Mihaela Rusu, *Materiale şi dispozitive semiconductoare, lucrări de laborator*, Editura Universității Al. I. Cuza, 1998
I. Bunget, A. Răican, *Metode experimentale în fizica solidului*, Univ. Bucureşti, 1974
I. Pop, V. Niculescu, *Structura corpului solid*, Ed. Academiei, Bucureşti, 1971
K.H. Kuo (Ed.), *The Application of Electron Microscopy to Materials Science, Solid State Phenomena 5*, Trans Tech. Publications, Aedermannsdorf, Switzerland., 1989

Teaching methods: lecture, explanation, conversation, debate. examples

Assessment methods: written test, application, portfolio

Language of instruction: Romanian

Course title: ***Physics and technology of solid surface***

Type of course: optional **Level of course:** graduate

Year of study: II **Semester** : 2 **ECTS credits:** 6

Name of lecturer:

Objectives:

Prerequisites:

Course content:

Reccomended reading:

N. Sulitanu, *Fizica Suprafetei Solide*, Ed. Univ. "AL.I.Cuza" Iasi, 1997.
M.C. Desjonqueres, D. Spanjaard, *Concepte de Fizica Suprafetei*, Ed. Tehnica Bucuresti, 1998
H. Luth, *Surfaces and Intyerfaces of Solid Materials*, Springer, Berlin, NY, London, 1998
M. Prutton, *Electronic Properties of Surfaces*, Adam Hilger Ltd, Bristol, 1984
M. Ruhle, H. Gleiter, *Interface Controlled Materials*, EUROMAT-vol 9, Wiley-VCH, 2000
C.B. Duke, E.W. Plummer, Frontiers in Surface and Interface Science, Elsevier, Amsterdam, 2002
J.M. Walls, R. Smith, *Surface Science Techniques*, Pergamon Press, NY, 1994
R. Nix, An *Introduction to Surface Chemistry*, Queen Mary Univ. of London, 1996
Teoreanu, *Introducere in Chimia Fizica a Starii Solide*, EDP Buc. 1995
M. Kaminsky, *Atomic and Ionic Impact Phenomena on Metal Surfaces*, Springer-Verlag, Belin, 1965
I. D. Bursuc, N. D. Sulitanu, *Fizica corpului solid si a semiconductorilor. Indrumar de lucrari practice*. Partea I-a ;I a II-a, Univ. „Al.I.Cuza" Iasi 1984, 1988

Teaching methods:

Assessment methods:

Language of instruction: Romanian

Course title: ***High-frequencies Investigation Methods for Materials***

Type of course: optional **Level of course:** graduate

Year of study: II **Semester** : 2 **ECTS credits:** 6

Name of lecturer: Assoc. prof. Florin Mihai TUFESCU, PhD

Objectives:

To present current research on the properties of matter at high frequencies and the models which explain its behaviour. The course emphasizes the essential elements needed for the deep 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.

Prerequisites: Solid state Physics, Electronics, Electric and electronic measurements, Dielectrics, Microwaves.

Course content:

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 measuring. 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.

Reccomended reading:

Rulea, G., *Tehnica frecvențelor foarte înalte*, Ed. Did. şi Ped., Bucureşti, 1972
Sandu, D.D.; *Dispozitive electronice pentru microunde*, Ed. St. şi Enc., Buc, 1982
Roberts, S., von Hippel, A.; *Dielectric and Waves*, John Wiley, New York, 1959
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)
Nicula,Al.,Puskas,F.,*Dielectrici si feroelectrici*, Ed.Scrisul Romanesc, Craiova, 1982

Teaching methods: Multimedia lectures, written assignments. Debate. Examples.

Assessment methods: written assignments and exam

Language of instruction: Romanian

Master field of study: PHYSICS

Specialization: *MODELLING AND SIMULATION*

Title conferred: Master diploma in the specialization Modelling and simulation

Official length of programme: 2 years (120 credits)

Form of education: full-time studies

Master programe description:

Mission: Modeling physical processes or systems is an essential step towards the understanding of any phenomenon. The graduates of the Modeling and simulation master will be able to solve real, complex problems with applications in different areas by using their knowledge in physics, numerical methods and programming. The graduates will be able to successfully approach jobs in scientific research, high technologies, as well as positions in innovation departments and in education.

Motivation: Last 50 years meant in physics the development of a new branch - computational physics. The classical branches - theoretical and experimental physics - have also been transformed by the appearance of the computer. Graduate, the computing power increased allowing solving more and more complex problems from both mathematical and numerical point of view. The new branch developed methods which allowed approaching real problems, problems without an analytical solution. These elements are main arguments for the specialists in modeling and simulation: they can fit in many companies because they are able to approach complex problems, they can build mathematical models and are able to implement computer programs to offer possible solutions to the problems.

We are organizing this master in a very favorable context:

- CARPATH Research Center was accredited by the CNCSIS as an Excellence Research Center since 2006. One of the main excellence areas is modeling and simulation.
- In 2006 the interdisciplinary research platform AMON was established as a collaborative structure of several faculties: Physics, Chemistry, Biology and Informatics. The initial funding was about 1 MEuro. The most important part of the platform is the rAMONa supercomputer.
- There are several PhD advisors which have experience in modeling and simulation
- There is a clear need of specialist in this area.

CURRICULUM

Ist YEAR

Academic year 2009/2010

Nr.	Discipline	Semester I				Semester II			
		C	S/L	V	credits	C	S/L	V	credits
1.	Fundamentals of Mathematical Physics	2	2	E	6	-	-	-	-
2.	Modelling of physical processes	2	2	E	6	-	-	-	-
3.	Design of computer algorithms	2	2	E	6	-	-	-	-
4.	Optional course 1	2	2	E	6	-	-	-	-
5.	Research activities for preparing the MSc. Thesis	-	4	C	6	-	-	-	-
6.	Virtual instrumentation	-	-	-	-	2	2	E	6
7.	Quantum theory of solid state	-	-	-	-	2	2	E	6
8.	Introduction to the simulation of discreet events. Ising and Monte Carlo models.	-	-	-	-	2	2	E	6
9.	Optional course 2	-	-	-	-	2	2	E	6
10.	Research activities for preparing the MSc. Thesis	-	-	-	-	-	4	C	6
	TOTAL HOURS	**8**	**8+4**	**-**	**-**	**8**	**8+4**	**-**	**-**
	TOTAL CREDITS	**-**	**-**	**-**	**30**	**-**	**-**	**-**	**30**

Optional course 1: Physical processes in semiconductors
Computer architecture

Optional course 2: Physics of dielectrics
The security of communication systems

IInd YEAR
Academic year 2010/2011

Nr.	Discipline	Semester I				Semester II			
		C	S/L	V	credits	C	S/L	V	credits
1.	Experimental methods in physics of materials	2	2	E	6	-	-	-	-
2.	Simulation of electronic circuits	2	2	E	6	-	-	-	-
3.	Parallel computing, SMP, clustering and parallel algorithms	2	2	E	6	-	-	-	-
4.	Optional course 3	2	2	E	6	-	-	-	-
5.	Research activities for preparing the MSc. Thesis	-	4	C	6	-	-	-	-
6.	Theoretical and numerical micromagnetism	-	-	-	-	2	2	E	6
7.	Low dimensionality systems	-	-	-	-	2	2	E	6
8.	Advanced numerical methods. Finite elements	-	-	-	-	2	2	E	6
9.	Optional course 4	-	-	-	-	2	2	E	6
10.	Research activities for preparing the MSc. Thesis	-	-	-	-	-	4	C	3
11.	MSc. Thesis								3
	TOTAL HOURS	**8**	**8+4**	**-**	**-**	**8**	**8+4**	**-**	**-**
	TOTAL CREDITS	**-**	**-**	**-**	**30**	**-**	**-**	**-**	**30**

Optional course 3: Physics of magnetic materials
Modern computer operating systems
Optional course 4: Models in astronomy and astrophysics
Computer networks. Administration

Course title: *Design of Computer Algorithms*

Type of course: compulsory **Level of course:** graduate

Year of study: I **Semester** : 1 **ECTS credits:** 6

Name of lecturer: Assoc. prof. Vasile TURA, PhD

Objectives:

The course offers students an introduction to the design and analysis of algorithms. Students will learn the basic principles of algorithms design and compare methods of analyzing the performance of these algorithms. Also, they will study the data structures that optimize the operation of algorithms. The knowledge gained will be used by students in designing and analysis of algorithms used to solve typical search and sorting problems.

Prerequisites: computers programming (C++)

Course content:

(course) Algorithms. Efficiency. Analysis. Order of dependence. Complements of mathematical analysis. Solving recurrence equations with applications in analysis of recursive algorithms. Complements of programming in C++. Data Structures. Paradigms: divide-et-impera, dynamic programming, greedy algorithms. Backtracking. Branch-and-bound. Computational complexity - the problem of sorting. Computational complexity - the problem of search. NP problems. Algorithms for numerical analysis. Introduction to parallel algorithms for computing. (laboratory) Sequential search. Operations with matrices. Binary search. Recursive algorithms. Fibonacci string calculation. Mergesort recursively. Mergesort in-place. Quicksort. Optimal search approach. Dijkstra and Kruskal algorithms. Selection. Probabilistic selection. The traveling salesman problem. The knapsack problem . Parallel search of the maximum. Mergesort parallel.

Reccomended reading:

T. H. Cormen, C.E. Leiserson, R.L. Rivest: *Introducere în algoritmi*, Libris Agora, 2000;
D. Lucanu, *Structuri de date si algoritmi*, Editura Universităţii “Al. I. Cuza” Iaşi, 2004;
R. Neapolitan, K. Naimipour, *Foundations of Algorithms Using C++ Pseudocode*, 3d ed., Jones and Bartlett Publishers, 2004;
A. Drozdek, *Data structures and algorithms in C++,* 2nd ed., Brooks/Cole, 2001.

Teaching methods: lecture, explanation, heuristic conversation, problematisation

Assessment methods: oral and written examination, practical test

Language of instruction: Romanian

Course title: *Computer Architecture*

Type of course: optional **Level of course:** graduate

Year of study: I **Semester** : 1 **ECTS credits:** 6

Name of lecturer: Lect. Paul GASNER,PhD

Objectives:

Acquirement of basic knowledge in the field of architecture and functionality of computing systems: Boolean algebra, logical gates, combinational circuits, sequential circuits, numbers and instructions representation, processors. Development of capability to apply knowledge of computers architectures in practical situations. Development of capability to search, analyze information from a large spectra of resources. Development of capability to team work to find experimental and technological solutions. Development of capability to successfully initiate and manage personal and team projects. Determination and perseverate to achieve the tasks and assumed responsibilities.

Prerequisites:

Course content:

Hystory. Basics of Boolean Algebra. Combinational circuits. Gates. K-maps. Multiplexors. Decodors. Numbers' representations. ALU. Latches. Sequential analysis. Counters. Registries. Processors. Modern Architectures.

Reccomended reading:

Aurel Gontean, Mircea Babaita, *Structuri logice programabile. Aplicatii*, Editura de Vest, Timisoara 1997
Ghe. Toacse*, Introducere in microprocesoare*, Ed. St. si Encicl., Bucuresti, 1985
John Woram, *The PC Configuration Handbook*, Random House, New York, 1990

Teaching methods: University lecture. Debate, Frontal experiment, Directional discovery, Directional experiment, team-working solutions

Assessment methods: written examination

Language of instruction: Romanian

Course title: ***Introduction to the Simulation of Discreet events. Ising and Monte Carlo Models.***

Type of course: compulsory **Level of course:** graduate

Year of study: I **Semester** : 2 **ECTS credits:** 6

Name of lecturer: Lect. Cristian ENACHESCU, PhD

Objectives:

The main objectives of this course are the presentation of the most important elements of the Monte Carlo method and of the ising model, including applications in physics and other sciences such as economics and social sciences. An important point consists in the study of ordered systems and spin glasses by the way of various Ising models. The course puts the theoretical basis of the random numbers generators and to the realizations of predefined distributions. The specific methods of optimization of Monte Carlo results will be discussed.

Prerequisites: Computers programming

Course content:

Ising modelŞ general presentation. 1D, 2D and 3D cases: Theoretical treatment and phase transition study in Ising models. Special types of Ising models: Random Anizotropy Ising, Random Field Ising, Spin glasses. Edward Anderson Spin Glass model. Elements of probability theory and statistics. Random numbers generation. Sampling in Monte Carlo method. Random uniform variables. Monte Carlo metropolis. Random Walks. Glauber dynamics. Markov chains. Dynamic Monte Carlo methods. Monte Carlo Entropic Sampling. Finite systems studies. Statistical analysis of data. Optimization and variance reduction methods. Monte Carlo in economics and social sciences. Risk analysis.

Reccomended reading:

G.S.Fishman, *Monte Carlo: Concepts, Algorithms, and Applicatioins*, Springer Verlag, New York. (1995)
Monte Carlo Methods in Statistical Physics, ed. K. Binder, Springer- Verlag 1979
K. Binder. and D.W. Heermann,. *Monte Carlo Simulation in Statistical Physics. An Introduction* (4th edition). Springer. (2002)
N. Metropolis and S. Ulam.. *The MonteCarlo method.* Journal of the American Statistical Association 44:335-341, 1949

Teaching methods: Presentations using video projector

Assessment methods: Written and Oral Exams (practical exam on computer)

Language of instruction: Romanian

Course title: *Simulation of Electronic Circuits*

Type of course: compulsory **Level of course:** graduate

Year of study: II **Semester** : 1 **ECTS credits:** 6

Name of lecturer: Lect. Paul GASNER,PhD

Objectives:

Acquirement of basic knowledge in the field of modeling and simulations of electronic circuits. Development of capability to apply knowledge of electromagnetism in practical situations. Development of capability to search, analyze information from a large spectra of resources. Development of capability to team work to find experimental and technological solutions and prepare research reports. Development of capability to successfully initiate and manage personal and team projects. Development of capability to criticize the stage in the field and see new possible research direction. Determination and perseverate to achieve the tasks and assumed responsibilities.

Prerequisites: Electricity and Magnetism, Electrodynamics, Electronic devices and circuits, Microwaves Physics

Course content:

Diport characterization. Electromagnetic field propagation in free space, metallic guide, dielectric guide, microstrip, planar structures. Method of Moments. Finite element method, TLM formalism. WCIP method. Tools for design and simulation of circuots (ORCAD, SPICE, CADANCE, APLAC, SONET, NEC, HFSS). Optimization of circuits characteristics.

Reccomended reading:

D.D. Sandu, *Microunde*, Ed. Victor, Bucureşti, 2005
G. Rulea, *Bazele teoretice şi experimentale ale tehnicii microundelor*, Ed. Şt. şi Encicl., 1989
D. D. Sandu, *Electronică fizică şi aplicată*, Edit. Universităţii "Al.I.Cuza" Iaşi, 1994
A. Harvey, *Microwave Engineering*, Academic Press, 1963
A. Ishimaru, *Electromagnetic wave propagation, radiation and scattering*, Prentice Hall Intern. Editions, 1986
I. Casian-Botez, *Teoria şi proiectarea circuitelor de microunde*, Matrix Rom, Buc., 1998
K. G. Gupta, A. Benalla, *Microstrip antenna design*, Artech House, 1988
Documentaţie utilitare APLAC, SONET, NEC, IEEE – MTT şi AP

Teaching methods: University lecture. Debate, Frontal experiment, Directional discovery, Directional experiment, team-working solutions

Assessment methods: research report, work reports

Language of instruction: Romanian

Course title: ***Parallel Computing, SMP, Clustering and Parallel Algorithms***

Type of course: compulsory **Level of course:** graduate

Year of study: II **Semester** : 1 **ECTS credits:** 6

Name of lecturer: Lect. Octavian RUSU, PhD

Objectives:

Prerequisites:

Course content:

Reccomended reading:

Modern Operating Systems – Andrew Tanenbaum, Prenitence Hall, 2003
Distributed Systems: Principles and Paradigms – Andrew Tanenbaum, Maarten van Steen, Prenitence Hall, 2003
http://gridengine.sunsource.net/
http://eu-datagrid.web.cern.ch/eu-datagrid

Teaching methods:

Assessment methods:

Language of instruction: Romanian

Course title: ***Theoretical and Numerical Micromagnetism***

Type of course: compulsory **Level of course:** graduate

Year of study: II **Semester** : 2 **ECTS credits:** 6

Name of lecturer: Prof. Alexandru STANCU, PhD

Objectives:

Prerequisites:

Course content:

Reccomended reading:

Brown, W.F.,*Criterion for uniform micromagnetization*, Phys. Rev. 105,1957, p.1479
Brown, W.F., *Micromagnetics*, Interscience publishers, 1963.
Stoner, E.C., Wohlfarth, E.P., *A mechanism of magnetic hysteresis in heterogeneous alloys*, Phyl. Trans. Roy. Soc. London, A240, 1948, p. 599-642.
Aharoni, A., Frei, E.H., Shtrikman, S., Treves, D., *The reversible susceptibility tensor of the Stoner-Wohlfarth model*, Bulletin of the Res.Council of Israel, 6A,1957.
Chang, C.R., *Micromagnetic studies of coherent rotation with quartic crystalline anisotropy*, J. Appl. Phys., vol. 69(4), 1991, p. 2431-2439.
Russek, S.E., McMichael, R.D., Donahue, M.J., Kaka, S., *High speed switching and rotational dynamics in small magnetic thin film devices*, in Hillebrands, B., Ounadjela, K., (Eds.), *Spin dynamics in confined magnetic structures*, vol. II, springer Verlag 2003, Topics Appl. Phys., vol. 87, p. 93-156.
Aharoni, A., *Introduction to the theory of ferromagnetism*, Oxford Science Publications, 1998.
A. Stancu, *Magnetization processes in particulate ferromagnetic media*, Cartea Universitară, 2006.

Teaching methods:

Assessment methods:

Language of instruction: Romanian

Course title: ***Advanced Numerical Methods. Finite Elements***

Type of course: compulsory **Level of course:** graduate

Year of study: II **Semester** : 2 **ECTS credits:** 6

Name of lecturer: Lect. Dorin CIMPOIESU, PhD

Objectives:

Prerequisites:

Course content:

Reccomended reading:

I. Păvăloiu, *Rezolvarea ecuațiilor prin interpolare*, Editura Dacia Cluj, 1981.
Dan Gârbea, *Analiză cu elemente finite*, Editura Tehnică, Bucureşti, 1990.
C. Ilioi, *Analiză numerică*, p a II-a , Ed. Univ „Al. I. Cuza" Iaşi, 1983.
C.Ilioi, G. Țârdea, *Splines and finite elements*, Ed. Univ. „Al. I. Cuza" Iaşi, 1998.
M.V.K. Chari, S.J. Salon, *Numerical methods in electromagnetism*, Academic Press, 2000.
O.C. Zienkiewicz, R. L. Taylor, *The Finite Element Method*, IEEE Butterworth Heinemann, London, 2000.
J.L. Volakis, A. Chatterjee, L.C. Kempel *Finite element method for electromagnetics*, IEEE/Oxford University Press, 1998.

Teaching methods:

Assessment methods:

Language of instruction: Romanian

Course title: ***Models in Astronomy and Astrophysics***

Type of course: optional **Level of course:** graduate

Year of study: I **Semester** : 1 **ECTS credits:** 6

Name of lecturer: Prof. Ciprian DARIESCU, PhD

Objectives:

It intends to supply a good knowledge on basics and main results of modern astronomy, astrophysics and cosmology. We shall develop the capacity of analyzing information from a large variety of bibliographic sources and a good research background for a correct understanding of the Universe.

Prerequisites: Astrophysics and Cosmology (optional course, III), Thermodynamics and Statistical Physics, Optics and Spectroscopy, Plasma Physics

Course content:

General Astronomy: Ephemeredes and the Solar Systems, Basics of Astronomy and Stellar Astrophysics, Galactic Astronomy and Astrophysics. Extragalactic Astronomy: Galaxy Classification, Intergalactic distances. Cosmology: Big-Bang Theory of the Hot Universe, Inflation, Large Scale Structures, Wormholes and Parallel Universes. Modern Trends in Extra-dimensional Cosmology.

Reccomended reading:

V. Ureche, *Universul. Astronomie*, Ed. Dacia, Cluj, 1982.
E. Toma, *Introducere in astrofizica*, Ed. Tehnica, Bucuresti, 1980.
N. Straumann, *General Relativity and Relativistic Astrophysics*, Springer-Verlag, 1984.
S. Gottlober, *Early Evolution of the Universe and Formation of Structure*, Akademie Verlag, Berlin, 1990.

Teaching methods: Lectures

Assessment methods: Written and oral examination (50 %) and seminar activity (50 %)

Language of instruction: Romanian

Course title: ***Computer Networks. Administration***

Type of course: optional **Level of course:** graduate

Year of study: II **Semester** : 2 **ECTS credits:** 6

Name of lecturer: Lect. Octavian RUSU, PhD

Objectives:

Prerequisites:

Course content:

Reccomended reading:

A. Tanenbaum, *Retele de Calculatoare*, Editura Agora 2004
V. T. Dadârlat, *Retele de Calculatoare – de la cablare la interconectare*, Editura Albastra, 2002
W. Stallings*, Local Networks. Hand book of Computer Communications*, Macmillan Publishing Co., NZ 1988

Teaching methods:

Assessment methods:

Language of instruction: Romanian

Master field of study: PHYSICS

Specialization: *PHYSICS AND DIDACTICS*

Title conferred: **Master diploma in the specialization Physics and didactics**

Official length of programme: **2 years (120 credits)**

Form of education: **full-time studies**

Master programe description:

The study programme addresses to graduates licensed in the Exact Sciences and Natural Sciences who have completed Module I and pedagogical practice in secondary education (180 - 210 units of transferable credits ECTS). In accordance with the Education Law, to practice in secondary education they need to acquire 30 units of credit following the pedagogic Mode II and the minimum 90 units of credit in special course and teaching physics. The program is addressed equally to the teachers who work in education and who wish to deepen the teaching of physics, to follow the course of a doctoral school in epsitemiology and applied didactics.

The teachers engaged on instruction in this program of master studies is comprised of experts from the field of special courses in physics, applied didactics, computer assisted instruction, open distance education and quality assurance in education. Some of the specialized courses are conducted in collaboration with other programs of master study from the Faculty of Physics, training and research programs specialized engaging students from all directions of instruction.

The master Physics and Didactics respond equally to market demand for training and to long-term strategy of the Faculty - to develop a group of research and expertise in the field of physics education.

CURRICULUM

Ist YEAR

Academic year 2009/2010

Nr. crt.	Discipline	Semester I				Semester II			
		C	S/L	V	credits	C	S/L	V	credits
1.	Fundamentals of Mathematical Physics	2	2	E	6	-	-	-	-
2.	Elements of macro and microcurricular projection	2	1	E	6	-	-	-	-
3.	Optional course 1	1	1	C	6	-	-	-	-
4.	Optional course 2	2	2	E	6	-	-	-	-
5.	Special practice in highschools	-	4	C	6	-	-	-	-
6.	Virtual Instrumentation	-	-	-	-	2	2	E	6
7.	Solving physics problems methodologies	-	-	-	-	2	1	E	6
8.	Optional course 3	-	-	-	-	1	1	C	6
9.	Optional course 4	-	-	-	-	2	2	E	6
10.	Special practice in highschools	-	-	-	-	-	4	C	6
	TOTAL HOURS	**7**	**6+4**	**-**	**-**	**7**	**6+4**	**-**	**-**
	TOTAL CREDITS	**-**	**-**	**-**	**30**	**-**	**-**	**-**	**30**

Optional course 1: Standards in education. Assessment of performances. / Elements of Earth Physics
Optional course 2: Modelling of physical processes / Physical processes in semiconductors
Optional course 3: Multimedia tools for Physics education / Active and cooperative teaching methods
Optional course 4: Physico-chemical basis of organization and operation of living biological systems / Physics and technology of nanocomposite materials / Physics of dielectrics / Applied spectroscopy

IInd YEAR
Academic year 2010/2011

Nr. crt.	Discipline	Semester I				Semester II			
		C	S/L	V	credits	C	S/L	V	credits
1.	Methodology of experiment integrated in physics lesson	2	2	E	6	-	-	-	-
2.	Didactics of Science	2	1	E	6	-	-	-	-
3.	Optional course 5	1	1	C	6	-	-	-	-
4.	Optional course 6	2	2	E	6	-	-	-	-
5.	Special practice in highschools	-	4	C	6	-	-	-	-
6.	Experimental methods in physics of materials	-	-	-	-	2	2	E	6
7.	Introduction to the physics of polymers	-	-	-	-	2	2	E	6
8.	Optional course 7	-	-	-	-	2	2	C	6
9.	Optional course 8	-	-	-	-	2	2	E	6
10.	Research activities for preparing the MSc. Thesis	-	-	-	-	-	4	C	6
11.	MSc. Thesis								5
	TOTAL HOURS	**7**	**6+4**	**-**	**-**	**8**	**8+4**	**-**	**-**
	TOTAL CREDITS	**-**	**-**	**-**	**30**	**-**	**-**	**-**	**30+5**

Optional course 5: Communication techniques / Development of creativity within physics lessons
Optional course 6: Physics of magnetic materials / Simulation of electronic circuits / Fundamental and functional properties of materials with low dimensionality
Optional course 7: Biomechanics / Physics of the Atmospheric Environment; Atmospheric Pollution / Chaos and selforganisation
Optional course 8: Evolution of ideas in physics / Methodology of scientific research

Course title: ***Elements of Macro and Microcurricular Projection***

Type of course: compulsory **Level of course:** graduate

Year of study: I **Semester** : 1 **ECTS credits:** 6

Name of lecturer: Prof. Ovidiu Florin CALTUN, PhD

Objectives:

Will be developed students competences in instructional activities planning by: flexible approach of the syllabus contents, centering the learning process on the student, planning and monitoring learning activities, developing attitudes focused on Physics impact on the society evolution, cooperative solving of theoretical, practical and technological problems, inquiry based education technologies.

Prerequisites: Didactics of Physics, Pedagogy, Scholar Psychology

Course content:

Science curricular area. Physics curricula. Curriculum decided by scholar institution. Basic concepts, macroconcept grids of concepts. Learning unit. General and specific competences. Organizing the contents. Assessment and evaluation. Correlation between competences – contents and performances. Planning the lessons. Instructional and learning resources. Active and cooperative learning. Critical thinking and scirntific literacy.

Recommended reading:

Programele şcolare în vigoare
Singer, M. ş.a., coord., *Ghid metodologic pentru aplicarea programei de fizică. Clasele a VI-a – a VIII-a*, M.E.C., C.N.C., Ed. Aramis, Bucureşti 2001
Singer, M. ş.a., coord., *Ghid metodologic. Aria curriculară Matematică şi Ştiințe ale naturii*. Liceu, M.E.C., C.N.C., Ed. Aramis, Bucureşti 2001
Meyer, G., *De ce şi cum evaluăm*, Ed. Polirom, Iaşi 2000
Nicola, I., *Tratat de pedagogie şcolară*, Ed. Aramis Print, Bucureşti, 2002
Cerghit, I. ş.a., *Prelegeri pedagogice*, Ed. Polirom, Iaşi 2001
Dumitriu, I. A., *Dezvoltarea gândirii critice şi învățarea eficientă*, Ed. De Vest, Timişoara 2000;
Radu, I.T., *Evaluarea în procesul didactic*, EDP, Bucureşti 2005
Neacşu, I., Stoica, A. (coord.), *Ghid general de evaluare şi examinare*, Ed. Aramis, Bucureşti 1996
Stoica, A., coord., *Evaluarea curentă şi examenele*, S.N.E.E., Ed. ProGnosis, Bucureşti 2001
O. F. Călțun, *Didactica fizicii*, Ed. Universității Al. I. Cuza, Iaşi 2007
O. F. Călțun, Fizica. Practica pedagogică

Teaching methods: Lectures, debate, problems solving

Assessment methods: Oral and written tests

Language of instruction: Romanian

Course title: ***Standards in Education. Assessment of Performances***

Type of course: optional **Level of course:** graduate

Year of study: I **Semester** : 1 **ECTS credits:** 6

Name of lecturer: Prof. Alexandru STANCU, PhD, Prof. dr. Ovidiu CALTUN, PhD

Objectives:

Will be developed the competences in understanding, knowledge and practices in education politics in adjusting and reforming educational system, defining competences and standards. Using the standards and performance descriptors in assessment and evaluation.

Prerequisites:

Course content:

Standarde. Premise în elaborarea standardelor. Profesionalizarea standardelor. Competențe. Competențe specifice şi standarde de referință. Model de taxonomie. Impactul standardelor asupra calității. Implementarea standardelor. Avantaje. Aplicarea standadelorîn evaluarea instituțională. Aplicarea în evaluarea cadrelor didactice. Evaluarea elevilor. Principii nucleu a diferitelor sisteme de standarde de calitate în educație. Instrumente de evaluarea a performanței şi descriptori de performanță.

Reccomended reading: Micro and macro curricular projection, Didactics of Physics, Didactics of Science

Legea 87 – 2006 , Privind asigurarea calității în educație, Monitorul Oficial
*** M.E.C., *Programa de fizică revizuită pentru clasele a VII-a – a VIIIa*, aprobată prin Ordin al Ministrului, Nr. 4740/ 25.08.2003, *** M.E.C., *Programele de fizică pentru clasele a IX-a şi a X-a*, aprobată prin Ordin al Ministrului, Nr. 3458/ 09.08.2004 *** M.E.C., *Standarde pentru profesia de cadru didactic*, Gliga L., Ed. Polisib 2002
Meyer, G., *De ce şi cum evaluăm*, Ed. Polirom, Iaşi 2000
Crişan, Al. ş.a., *Curriculum Național pentru învățământul obligatoriu. Cadru de referință, M.E.N.*, Consiliul Național pentru Curriculum, Bucureşti 1998
Radu, I.T., *Evaluarea în procesul didactic*, EDP, Bucureşti 2005
Neacşu, I, Stoica, A., *Ghid general de evaluare şi examinare*, Ed. Aramis, Buc.1996
Chirleşan, G., coord., Ghid de evaluare la fizică, M.E.N., S.N.E.E., Bucureşti 1999
Stoica, A., Evaluarea curentă şi examenele, S.N.E.E., Ed. ProGnosis, Buc. 2001;
Strungă, C., *Evaluarea şcolară*, Ed. de Vest, Timişoara 1999
Worthen, R., Sanders, J.R., Fitypatrick, J.L. , *Program evaluation – Alternative approaches and practical guidelines*, Longman Publishers, 1997
The Joint Committee on Standards for Educational Evaluation, (coord.) Sanders - J.R. , *The program evaluation standards*, Sage Publications, Inc., 1994
Boone, E.J., *Developing programs in adult education*, Waveland Press, Inc., 1992

Teaching methods: lecture, debate, brainstorming and problem solving

Assessment methods: written and oral examination, portfolio

Language of instruction: Romanian

Course title: *Elements of Earth Physics*

Type of course: optional **Level of course:** graduate

Year of study: I **Semester** : 1 **ECTS credits:** 6

Name of lecturer: Assoc. prof. Cristian-Ioan BABAN, PhD

Objectives:

The student will obtain good understanding about origin, evolution, structure and processes of the planet Earth. After a successful completion of this course, the student shall be able to show a basic knowledge about earth's gravitational and magnetic fields, plate tectonics, seismology and also the role of solid earth in climate changes.

Prerequisites: Calculus, Mechanics

Course content:

Solar system formation, accretion and the early thermal state of the Earth. The Radiometric dating. Earth's gravitational field. Earth's internal structure. Variations of earth's orbital parameters. The magnetic field of the Earth. Seismology. Plate tectonics. Seismic waves and earth's interior. Natural radioactivity of Earth's crust and mantle. Physical methods for paleoclimate reconstruction.

Reccomended reading:

T. J. Ahrens, *Global Earth Physics: a handbook of physical constants*, American Geophysical Union, Washington DC, 1995
J. P. Poirier, *Introduction to the Physics of the Earth's Interior*, Cambridge University Press, 2000
D. L. Anderson, *Theory of the Earth*, Blakwell-Scientific Publications,1989
N. Lupei, *Dinamica terestra*, Editura: Albatros,1979
Şt. Airinei, *Originea, evoluția şi structura internă a Pământului*, Editura Ştiințifică, Bucureşti, 1974

Teaching methods: lecture, multimedia conference, discussion

Assessment methods: Project presentation and project report, portfolio

Language of instruction: Romanian

Course title: *Solving Physics Problems Methodologies*

Type of course: compulsory **Level of course:** graduate

Year of study: I **Semester** : 2 **ECTS credits:** 6

Name of lecturer: Lect. Ioan DUMITRU, PhD

Objectives:

Students will be able to identify types of problems in physics, to apply various methods to solve them, to use classroom strategies that lead to the formation of the skills of analysis and solving of physics problems and investigation of the surrounding world.

Prerequisites: Basic physics and didactics

Course content:

1. Aspects of knowledge process in physics. 2. Reconstruction of knowledge by teaching (inductive reasoning, deductive reasoning). 3. Cognitive obstacles in solving physics problems by students. 4. Types of physics problems. 5. Strategies for solving problems, steps for solving physics problems. 6. Learning through investigation, problematization technique, learning through problems.

Reccomended reading:

L. Anița, *Didactica fizicii*, Editura Universității"Al.I.Cuza", 2007
M. Vicentini, M. Mayer, *Didattica della fisica*, La Nuova Italia Editrice, Milano, 2000
L.Trowbridge, R. Bybee, *Teaching Secondary School Science*, Prentice Hall, 6-th edition, New Jersey, 1996
*** *Manualele şcolare în vigoare*

Teaching methods: lecture, debate, directed discussions

Assessment methods: written test

Language of instruction: Romanian

Course title: *Multimedia Tools for Physics Education*

Type of course: optional **Level of course:** graduate

Year of study: I **Semester** : 2 **ECTS credits:** 6

Name of lecturer: Assoc. prof. Laurentiu STOLERIU, PhD

Objectives:

The course is aimed at initiating students in the use of modern educational technologies based on multimedia systems and their application in the study of physics. Participants will be acquainted with the production of multimedia materials like complex webpages that contains access to various audio-video elements.

Prerequisites:

Course content:

WWW evolution as part of educational technology. Multimedia. Basic concepts. Types of multimedia information. Multimedia technologies. Multimedia networks. Multimedia applications in education. Strengths and shortcomings of educational materials in multimedia format. Case Studies.

Reccomended reading:

http://stoner.phys.uaic.ro/cursuri/
http://www.crocodile-clips.com/
http://webphysics.davidson.edu/Applets/Applets.html
Badrul Huda Khan, *Educational Technology Pub., WEB-Based Instruction*, 1997.
Berge Zane L., Collins Mauri P. (eds.), Hampton Press, *Computer Mediated Communication and the Online Classroom*, 1995.
Charles C.M., Blanford Ginny, Weber Arianne (ed.), Addison Wesley Longman Inc., *Introduction to Educational Research*, 1998.
Hamilton Mary Lynn, Falmer Press, *Reconceptualizing Teaching Practice: Developing Competences though Self-Study*, 1998.
Henry Jane, Stylus Pub., *Teaching Through Projects* , 1994.
Kouki Rafa, Wright David, Idea Group Pub., *Telelearning Via the Internet*, 1999.
Scaife Jon, Wellington Jerry, Open Univ. Press*, Information Technology in Science and Technology Education*, 1992
Toohey Susan , Open Univ. Press, *Designing Courses for Higher Education*, 1999.

Teaching methods: lecture (using videoproiectorul exposure), case studies

Assessment methods: Practical application on a given topic

Language of instruction: Romanian

Course title: ***Active and Cooperative Teaching Methods***

Type of course: optional **Level of course:** graduate

Year of study: I **Semester** : 2 **ECTS credits:** 6

Name of lecturer: Lect. Laura- Iulia ANIȚA, PhD

Objectives:

To develop an understanding of and an ability to use different instructional methods and strategies; to correlate physics curriculum with instructional methods to increase the learning of physics; to demonstrate an adequate awareness of educational foundations and the place of Physics in the large framework of education

Prerequisites: Psychology, Pedagogy, Teaching Physics

Course content:

Instructional strategies and methods : inquiry, discussion, problem solving, investigation, laboratory work, modeling, team work; Active methods- prerequisites to effective physics teaching; Interdisciplinary approaches to physics curriculum; Planning for effective teaching

Reccomended reading:

L.I. Anița, *Didactica fizicii- note de curs,*Editura Universității "Al.I. Cuza", Iaşi, 2007
M. Ionescu, I. Radu, *Didactica modernă,* Editura Dacia, Cluj- Napoca, 2004
L.W. Trowbridge, R.W. Bybee, *Teaching Secondary School Science,* Prentice Hall, 1996

Teaching methods: lecture, discussion

Assessment methods: exam

Language of instruction: Romanian

Course title: ***Methodology of Experiment Integrated in Physics Lesson***

Type of course: compulsory **Level of course:** graduate

Year of study: II **Semester** : 1 **ECTS credits:** 6

Name of lecturer: Assoc. prof. Cristian-Ioan BABAN, PhD

Objectives:

To give to students basic elements of didactics of laboratory experiments of several types and how to organize the physics laboratory. To give to students basic understanding of experiment's role in teaching physics. After a successful completion of this course, the student shall be able to analyze and use the experiment in physics lessons.

Prerequisites: Teaching physics, Teaching practice.

Course content:

The role of experiment in teaching physics. Physics laboratory in schools. Laboratory experiment and its didactic functions. How to prepare laboratory experiments. Types of experiments. Laboratory datasheet. Virtual laboratory.

Reccomended reading:

Călțun O., *Didactica fizicii*, Editura Universității "A. I. Cuza" Iaşi - 2002
Anghel S. ş.a. *Metodica predării fizicii*, Ed. A.T. Arg Tempus – Piteşti – 1995
Stoenescu G., ş.a. *Metodica predării fizicii*, Ed. SITECH, Craiova – 1999
E. Tereja, *Metodica predării fizicii*, Edit ura Universității "Al. I. Cuza", Iaşi, 1996
L. Cornea, *Rolul experimentatorului în cunoaşterea ştiințifică*, Editura ştiințifică, Bucureşti 1961
Pop, V., Turcitu, D., Panaghianu, M., *Ghidul profesorului de fizică*, Editura Radical, Craiova, 1998
Cerghit,I. *Metode de învățământ*, Ed. Didactică şi Pedagogică, Bucureşti, 1983
U. Haber-Schain ş. a. *Fizica PSSC* (Textul elevului, Textul profesorului, Supliment de teme avansate), Ed. Didactică şi Pedagogică, Bucureşti, 1974

Teaching methods: lecture, experiments

Assessment methods: practical application

Language of instruction: Romanian

Course title: *Didactics of Science*

Type of course: compulsory **Level of course:** graduate

Year of study: II **Semester** : 1 **ECTS credits:** 6

Name of lecturer: Prof. Ovidiu Florin CALTUN, PhD Lect. Laura- Iulia ANIȚA, PhD

Objectives:

The trainees become familiar with Science curricula, teaching methods and assessment strategies.

Prerequisites:

Course content:

Aims and objectives in Science education, National recommendation. Unit of content. Methods to asses and evaluation techniques. Teaching tools in Science education. Planning and developing learning process. Extracurricular activities.

Recommended reading: Didactics of Physics, Pedagogy

L. Anița, *Didactica fizicii*, Editura Universității"Al.I.Cuza", 2007
L.Trowbridge, R. Bybee, *Teaching Secondary School Science*,Prentice Hall, 6-th edition, New Jersey, 1996
*** *Manualele şcolare în vigoare*

Teaching methods: exposition, lectures, demonstration, solving problem

Assessment methods: oral examination, practical works

Language of instruction: Romanian

Course title: *Communication Techniques*

Type of course: optional **Level of course:** graduate

Year of study: II **Semester** : 1 **ECTS credits:** 6

Name of lecturer: Lect. Laura- Iulia ANIȚA, PhD

Objectives:

Prerequisites:

Course content:

Reccomended reading:

L. Anița, *Didactica fizicii*, Editura Universității "Al.I.Cuza", Iaşi, 2007
M. Vicentini, *Strumenti comunicativi nell'insegnamento della fisica*, La Nuova Italia Editrice, Milano, 2000
A. de Peretti, J.A. Legrand,J. Boniface, *Tehnici de comunicare*, Polirom, 2001
C. Postelnicu, *Fundamente ale didacticii şcolare*, Editura Aramis, 2000
L. Trowbridge, R. Bybee, *Teaching Secondary School Science*, Prentice Hall, 6-th edition, 1996

Teaching methods:

Assessment methods:

Language of instruction: Romanian

Course title: ***Development of Creativity Within Physics Lessons***

Type of course: optional **Level of course:** graduate

Year of study: II **Semester** : 1 **ECTS credits:** 6

Name of lecturer: Prof. dr. Ovidiu Florin CALTUN Ph. D.

Objectives:

Will be developed the competences in identifying creative profiles and in developing the pupils' creativeness;

Prerequisites:

Course content:

Creativity and encouraging creativeness. Definition of the creativity. Myths of the creativity. Process in creativity. Products of the creativity. Criteria for creativity's assessment. Methods for students' creativity revelation. Creative personalities. Methods for encourage, train and develop creative behaviors. Rewarding creative behaviors. Inhibition of creativeness.

Recommended reading: Didactics of Physics, Pedagogy, Active and cooperative methods in teaching Physics, Solving Physics Problems

Teaching methods: lecture, debate, brainstorming

Assessment methods: written and oral examination, Portfolio

Language of instruction: Romanian

Course title: *Evolution of Ideas in Physics*

Type of course: optional **Level of course:** graduate

Year of study: II **Semester** : 2 **ECTS credits:** 6

Name of lecturer: Prof. Marina-Aura DARIESCU, PhD

Objectives:

The main objective of the present course is to provide the future teachers a good knowledge in basics of physics and historical evolution of major ideas and concepts, in order to have a good understanding of nature.

Prerequisites: Quantum Mechanics, Electrodynamics, Thermodynamics and Statistical Physics, Atomic and Nuclear Physics, History of Physics.

Course content:

Ancient Physics: Democrit, Aristotel, Arhimede; Classical Mechanics: Galilei and Newton; Elements of Thermodynamics and Statistical Physics; Electromagnetism: electric current laws, electromagnetic field, Maxwell equations; Principles of Special Relativity and Lorentz-Einstein transformations; Basics of General Relativity, Historical development of Quantum Mechanics, De Broglie hypothesis, Wave functions, Heisenberg Principle. Structure of Nucleus and Elementary Particles.

Reccomended reading:

George Gamow. *Biografia fizicii*. Editura stiintifica, Bucuresti, 1971.
I. Gottlieb, C. Dariescu, Marina-Aura Dariescu. *Fundamentarea Mecanicii Cuantice*. Ed. Tehnica, Chisinau, 1994.
Cursul de Fizica Berkley, Vol. I - V.
V. Novacu. *Dialectica Dezvoltarii Fizicii Contemporane*. Ed. Acad. Rom., 1988.
S. W. Hawking. *A Brief History of Time*. Bantam Books, New York, 1988.

Teaching methods: Lectures, Thematic debates

Assessment methods: Oral examination (50 %) and prepared talks (50 %).

Language of instruction: Romanian

Master field of study: PHYSICS

Specialization: *PHYSICS AND ENVIROMENTAL PROTECTION*

Title conferred: Master diploma in the specialization
Physics and enviromental protection

Official length of programme: 2 years (120 credits)

Form of education: full-time studies

Master programe description:

The humankind is confronted with the extremely acute problem of restraining the anthropic effects on the environment. These effects are determined by the continuous deterioration of environmental condition, as a result of direct and indirect human activity. In this respect, the Master program on the *Physics and Protection of the Environment* has as main objectives the formation of specialists in the environment domain and the endorsement of a responsible and friendly environmental behavior. The program offers knowledge about physical methods for monitoring environmental parameters (particularly the phenomena related to pollution) and for adjusting these parameters at levels compatible with E.U. regulations. This expertise will be useful in designing and efficiently using unconventional energy sources both for domestic use and for supplying small and medium enterprises (SME). The program is significantly founded on the experience of our research groups and is elaborated following the trend of similar environmental educational programs. The knowledge of biological, physical and chemical properties of the environment, as well as of the complex interactions between these components, will allow the efficient and scientifically management of environmental resources, as a indispensable condition of a *sustainable development*.

CURRICULUM

Ist YEAR

Academic year 2009/2010

Nr. crt.	Discipline	Semester I				Semester II			
		C	S/L	V	credits	C	S/L	V	credits
1.	Elements of Aero- and Hydrodynamics	2	2	E	8	-	-	-	-
2.	Physics of the Atmospheric Environment; Atmospheric Pollution	2	2	E	8	-	-	-	-
3.	Elements of Earth Physics	1	1	C	6	-	-	-	-
4.	Photocatalisys in environmental depollution	2	2	E	8	-	-	-	-
5.	Physical Diagnostic Methods in Environmental Protection	-	-	-	-	2	1	E	6
6.	Sensor and instrumentation for environment monitoring	-	-	-	-	2	1	C	6
7.	Electromagnetic Pollution	-	-	-	-	2	1	E	6
8.	Optional courses O1, O2	-	-	-	-	2	2	E	6
9.	Research activities for preparing the MSc. Thesis (2 weeks)	-	-	-	-	-	4	C	6
	TOTAL HOURS	**7**	**7**	**-**	**-**	**8**	**5+4**	**-**	**-**
	TOTAL CREDITS	**-**			**30**	**-**			**30**

Optional course O1: Regional Air Pollution & Global Climate Changes

Optional course O2: Virtual instrumetation

IInd YEAR
Academic year 2010/2011

Nr. crt.	Discipline	Semester I				Semestrul II			
		C	S/L	V	credits	C	S/L	V	credits
1.	Radioactive Pollution	2	2	E	6	-	-	-	-
2.	Ecosystem and Materials Interaction with Living Beings	2	2	E	6	-	-	-	-
3.	Physical Diagnostic Methods in Environmental Protection	2	2	E	6	-	-	-	-
4.	Optional courses O3, O4	2	1	C	6	-	-	-	-
5.	Research activities for preparing the MSc. Thesis		4	C	6	-	-	-	-
6.	Radio-ecology	-	-	-	-	2	1	C	6
7.	Applied spectroscopy	-	-	-	-	2	2	E	6
8.	Internal and International Environmental Law	-	-	-	-	1	1	C	6
9.	Optional courses O5, O6	-	-	-	-	2	2	E	6
10.	Research activities for preparing the MSc. Thesis	-	-	-	-	-	4	C	6
11.	MSc. Thesis	-	-	-	-	-	-	-	5
	TOTAL HOURS	**8**	**7+4**	**-**	**-**	**7**	**6+4**	**-**	**-**
	TOTAL CREDITS	**-**			**30**	**-**			**30 + 5**

Optional course O3: Renewable energy sources
Optional course O4: Neurotransmitters and neurofarmaceutics
Optional course O5: Chemical processes in the atmosphere
Optional course O6: Introduction to polymer physics. Polymeric materials with special properties

Course title: ***Elements of Aero- and Hydrodynamics***

Type of course: compulsory **Level of course:** graduate

Year of study: I **Semester** : 1 **ECTS credits:** 8

Name of lecturer: Lect. Sorin TALSMAN, PhD

Objectives:

The course introduces the fundamentals of the fluid mechanics and intend to accustom the students to the specific methods and practical applications of this domain of physics

Prerequisites: Differential Eqs. and Mathematical Physics Eqs., The theory of functions of a complex variable, Mechanics, Molecular Physics, Elements of Statistical Physics, Plasma Physics.

Course content:

Generalities (Types of forces acting on fluids. Common physical properties of gases and liquids. Specific physical properties of liquids. Specific physical properties of gases). Elements of statics (Pressure tensor. The fundamental equation of the fluid statics. Consequences of the fundamental equation. Applications to the Pascal principle. The action theorems of the resting fluids on the solid surfaces). Elements of kinematics (Methods of studying the motion of fluids: Lagrange method, Euler method. The classification of the motion types. The continuity equation). Fluid dynamics (Ideal fluids: The motion equation. Different forms of the motion equation. The energy conservation law: the Bernoulli function. Particular cases for the motion of fluids: steady motion, semi-steady motion, potential non-steady motion. The Thomson-Lagrange theorem. Real fluids: The Navier-Stokes motion equation. Different forms of the N-S equation. The energy conservation law. The steady motion. The Hagen-Poiseuille motion: the law, the flow). Plain potential motion of the ideal fluids (The relation between the plain potential motion and the theory of the functions of a complex variable. The complex potential function. The circulation on a plain curve. The flow through a plain curve. Elementary plain potential motions: translation, point-source, turbion, dipole, motion around a circle). Fundamentals of the similitude theory (Types of similitude. Homologues elements. Similitude invariants. Methods for the derivation of the similitude criteria. Hydro-dynamics criteria: Reynolds, Froude, Strouhal, Mach, Euler, Newton).

Reccomended reading:

Brădeanu P., *Mecanica fluidelor*, Edit. Tehnică, Buc., 1973
Liepmann H. W., *Elements de la dynamique des gazs*, Gauthier-Willars, Paris, 1962
McCormack P. D.-Physical Fluid Dynamics, Acad. Press, New York, (1973).
Reynolds A. J., *Turbulent Flows in Engineering*, John Willey & Sons, London, 1974)
Vasilescu Al. A., *Analiza dimensională şi teoria similitudinii*, Edit. Acad., Buc., 1969
Florea J., Panaitescu V., *Mecanica fluidelor*, Edit. Did. şi Ped., Buc., 1979

Teaching methods: Lectures and media. Detailed presentation of an exemple, followed by similar problems resolved by students at the blackboard

Assessment methods: Final written paper (75%), Seminar (25%)

Language of instruction: Romanian

Course title: ***Physics of the Atmospheric Environment; Atmospheric Pollution***

Type of course: compulsory **Level of course:** graduate

Year of study: I **Semester** : 1 **ECTS credits:** 8

Name of lecturer: Assoc. prof. Liviu LEONTIE, PhD

Objectives:

Students are to get thoroughly into the key concepts of the atmospheric physics and meteorology, the physical foundation of meteorological phenomena and of the weather forecasting, as well as of pollutant transport and environmental effects. They should be able to initiate and work on meteorological/environmental applications. They should be able to develop a sense of teamwork, communication skills and research methodologies through team project. To actively promote an environment-friendly behavior. They should be able to influence political decision-makers about the environmental impact.

Prerequisites: basic knowledge of university Calculus and Physics

Course content:

Introduction. General characteristics of the atmosphere. The atmosphere as a physical sytem. Weather and climate. Composition and structure of the atmosphere. Ozone. Water vapors. Aerosols. Atmospherics statics. Equation of state. Air pressure. Barometric formula. Geopotential. Thermal processes. Dry-adiabatic and wet-adiabaic proceses. Thermodynamic stability. Atmospheric thermodynamic diagrams. Radiation in the earth-atmosphere system. Solar spectrum. Solar constant. Diffusion and absorption of solar radiation. Earth Albedo. Radiation of earth's surface and atmosphere. Thermal regime of the atmosphere. Heat balance. Water cycle. Phase transitions of water in the atmosphere. Vapor pressure over water. Condensation nuclei. Fog. Atmospheric dynamics. Forces in the atmosphere. General equations of motion. Vertical profile of the mean wind velocity. Atmospheric turbulence. Atmospheric pollutant transport in the lower atmosphere electrical phenomena in the atmosphere. Ionization state of the atmosphere. Ionosphere. Electric field of the atmosphere. Storm electricity.

Reccomended reading:

Leroux, M., *Global Warming-Myth or reality? The Erring Ways of Climatology*, Springer-Praxis, Berlin - Heidelberg - New York, 2005;
Leontie, L., *Fizica Atmosferei*, Ed. „Politehnium", Iaşi, 2004;
Leontie, L., *Introducere în Fizica Atmosferei (Partea I)*, Ed. „Gh. Asachi", Iaşi, 2002;
Ahrens, C. D, *Meteorology Today*, Brooks/Cole, Pacific Grove, 2000;
Holton, J. R., *Introducere în Meteorologia Dinamică*, Ed. Tehnică, Bucureşti, 1996;
Ştefan, S., *Fizica interacţiei atmosferă-ocean*, Univ. Bucureşti, 1996;
Ciulache, S., N. Ionac, *Meteorologie grafică*, Vol. I, Ed. Univ. Bucureşti, 1995;
Drăghici, I., *Dinamica atmosferei*, Ed. Tehnică, Bucureşti, 1988;
Pop Gh., *Introducere în meteorologie şi climatologie*, Ed. Şt. şi Encicl., Buc, 1988;

Teaching methods: Lectures, computer mediated presentations, problem method, debate, discussion, discovery techniques, research project, excursion

Assessment methods: Written exam

Language of instruction: Romanian

Course title: ***Photocatalisys in Environmental Depollution***

Type of course: compulsory **Level of course:** graduate

Year of study: I **Semester** : 1 **ECTS credits:** 6

Name of lecturer: Prof. Diana MARDARE, PhD

Objectives:

The students should understand the fact that the photocatalytic technology can maintain a clean environment only by using the solar energy. The students should obtain the ability to correlate the optical and electrical properties of the photocatalytic materials (as thin films) with their structure and morphology, which, at their turn can be coordinated by the deposition method of the thin film and also by the deposition parameters which can be varied in each method.

Prerequisites: Condensed Matter Physics

Course content:

The importance of the study of the oxidation processes having effect in environmental depollution. Electronic processes in photocatalysis. Prerequisite in obtaining photocatalytic thin films. Measurement methods for the thickness of photocatalytic thin films. Structure and morphology of photocatalytic thin films. Optical band gap of photocatalytic thin films. Photocatalysisin water and air purrification

Reccomended reading:

Diana Mardare, *Straturi subțiri policristaline şi amorfe.oxidul de titan*, Editura "Politehnium", Iaşi-2005
A. Fujishima,K. Hashimoto, T. Watanabe,*TiO2 photocatalysis. Fundamentals and applications*. BKC Inc. 4-5-11 Kudanminami, Chiyoda-ku, Tokyo 102-0074 Japan
M. Balkanski, *Handbook on Semiconductors*, North-Holland, Amsterdam, 1994.

Teaching methods: Lectures supported by slides and video

Assessment methods: Written paper

Language of instruction: Romanian

Course title: ***Physical Diagnostic Methods in Environmental Protection***

Type of course: compulsory **Level of course:** graduate

Year of study: I **Semester** : 2 **ECTS credits:** 6

Name of lecturer: Lect. Ioana RUSU, PhD

Objectives:

Appropriation of fundamental knowledge related to physical methods applied in environmental protection: tunable diode laser absorption spectroscopy, cavity ring down spectroscopy (CRDS), microwave spectroscopy; optogalvanic spectroscopy, absorption and spontaneous emission in flames and plasmas, laser induced atomic, molecular and photofragmentation fluorescence.

Prerequisites: Electricity and magnetism, Atomic and molecular physics, Plasma physics

Course content:

1. Air pollution. Categories of pollutants; 2. Optical spectroscopy. 2.1. Absorption spectroscopy (indirect methods). 2.1.1 Tunable diode laser absorption spectroscopy, 2.1.2 Cavity ring down spectroscopy (CRDS), 2.1.3. Microwave spectroscopy; 2.2 Absorption spectroscopy (direct methods); 2.2.1 Optogalvanic spectroscopy, 2.2.1 'Pump-probe'/non-linear techniques; 2.3 Absorption and spontaneous emission in flames and plasmas; 2.4 Laser induced atomic, molecular and photofragmentation fluorescence; 3. Ionisation/mass spectrometry; 4. Methods for sampling from process gas.

Reccomended reading:

Penelope Monkhouse, *On-line diagnostic methods for metal species in industrial process gas*, Progress in energy and combustion science 28 (2002) 331-381
I. Iova, I. Iovit-Popescu, E. Toader, *Bazele spectroscopiei plasmei*, Ed. Ştiințifică şi Enciclopedică, 1987
Gh. Singurel, *Spectroscopie. Probleme practice*, Ed. Univ. A.I.Cuza, Iasi, 1980
J. McMurry, *Fundamentals of Organic Chemistry*, Brooks/Cole Publishing Company, Pacific Grove, California, 1986
M. Culea, S. Nicoară, E. Culea, I. Popa, *Monitorizarea factorilor de mediu. Aplicații*, Risoprint, Cluj Napoca, 2003

Teaching methods: lecture, class discussion, brainstorming

Assessment methods: exam and portfolio

Language of instruction: Romanian

Course title: ***Sensor and Instrumentation for Environment Monitoring***

Type of course: compulsory **Level of course:** graduate

Year of study: I **Semester** : 2 **ECTS credits:** 6

Name of lecturer: Assoc. prof. Florin BRINZA, PhD

Objectives:

Building basic knowledge refer to physical principles of building and working of solid state sensors and transducers used in environment parameters measurement and monitorising . Technological parameters and construction mode are presented for students in context of devices used as sensors for various physics parameters. Learning the modes for integrating sensors in control and measurements apparatus. Presenting tendencies for next generation sensors and micro sensors. Specific instrumentation for environment measurements. Instruments-computers interface. Knowledge base used in after-graduate activity.

Prerequisites: Molecular Physics, Mechanics, Electricity and Magnetism, Optics, Solid State Physics

Course content:

1. Technologies and materials for solid state devices used as sensors and transducers. 2. Temperature and radiation sensors. 3. Humidity sensors. 4. pH sensors. 5. Acoustic and ultra acoustic sensors. 6. Gas sensors. 7. Complex transducers. 8. One-chip-lab. 10. Specific instruments for environments. 11. Instruments for humidity, pH and conductivity measurements. 12. Anemometers, gas analyzers. 13. Instruments for pressure and vibration measurements.

Reccomended reading:

I.D. Bursuc, N. Sulitanu, *Solidul. Fenomene, teorie, aplicații*. Ed. Şt. şi Enc., Buc.
G.I.Rusu, G. G. Rusu, *Fizica semiconductorilor*, p.I, Ed. Univ. „Al.I.Cuza" Iasi, 2005.
N.M. Barlea, *Fizca Senzorilor*, Ed. Albastră, Cluj, 2000.
G. Ionescu ş.a., *Traductoare pentru automatizări industriale*, Ed. Tehnică, Buc., 1985.
Jantschi Lorentz, *Metrologia si monitorizarea mediului*, Ed. Amicii, Cluj, 2003.
Ungureanu Florina, *Monitorizarea mediului asistata pe calculator*, Ed. Gh. Asachi Iasi, 2001.

Teaching methods: multimedia-assisted conference, Demonstrative experiment. Individual experiment

Assessment methods: write examination 60%, practical skills (implementation of a sensor) 40%

Language of instruction: Romanian

Course title: *Electromagnetic Pollution*

Type of course: compulsory **Level of course:** graduate

Year of study: I **Semester** : 2 **ECTS credits:** 6

Name of lecturer: Lect. Paul GASNER, PhD

Objectives:

Acquirement of basic knowledge in the electromagnetic compatibility, electromagnetic field propagation, radiant systems, biological effects of electromagnetic fields, measurements, standards, safety. Development of capability to apply knowledge of electromagnetism in practical situations. Development of capability to search, analyze information from a large spectra of resources. Development of capability to team work to find experimental and technological solutions. Development of capability to successfully initiate and manage personal and team projects. Determination and perseverate to achieve the tasks and assumed responsibilities.

Prerequisites: Electricity and Magnetism, Electrodynamics, Electronic devices and circuits

Course content:

Propagation equations of electromagnetic waves in different media. Propagation electromagnetic modes. TLM model fundamentals. Antenna, radiant systems, parameters. Interaction with substance. Safety standards, Biological effects. Measurements units. Ultraviolet and infrared sources, measurements. Safety for lasers

Reccomended reading:

D.D. Sandu, *Microunde*, Ed. Victor, Bucureşti, 2005
H. Moseley, *Non-ionising radiation*, Medical Physics Handbook 18,1988
G. Rulea, *Bazele teoretice şi experimentale ale tehnicii microundelor*, Ed. Şt. şi Encicl., 1989
D. D. Sandu, *Dispozitive electronice pentru microunde*, Ed. Şt. şi Encicl., 19820
D. D. Sandu, *Electronică fizică şi aplicată*, Edit. Universităţii "Al.I.Cuza" Iaşi, 1994
Ch. Polk, E. Postow, *Handbook of Biological Effects of Electromagnetic Fields*, CRC Press, New York, 1996
A. Ishimaru, *Electromagnetic wave propagation, radiation and scattering*, Prentice Hall Intern. Editions, 1986

Teaching methods: University lecture. Debate, Frontal experiment, Directional discovery, Directional experiment, team-working solutions

Assessment methods: written exam, work reports

Language of instruction: Romanian

Course title: ***Regional Air Pollution & Global Climate Changes***

Type of course: optional **Level of course:** graduate

Year of study: I **Semester** : 2 **ECTS credits:** 6

Name of lecturer: Ioan BALIN, PhD

Objectives:

Prerequisites:

Course content:

Reccomended reading:

Balin I., 1999, "*DOAS: Differential Optical Absorbtion Spectroscopy Techniquefor Air Pollution Measurements*", Diplôme d'étude postgrade en sciences de l'environnement (CPSE 97-99, EPFL)
Benoit Lazarrotto: "*Ozone and Water Vapor Measurements by RAMAN lidar in the Planetary Boundary layer*", EPFL, Thèse N° 2351(pdf), (2001)
Gilles Larchevêque, "*Development of the Jungfraujoch multiwavelength lidar system for continuous observations of the aerosol optical properties in the free troposphere*", Thése N° 2539 (2002)
Rodrigo Jimenez, "*Development and application of UV-visible and mid-infrared differential absorption spectroscopy techniques for pollutant trace gas monitoring*" Thése N° 2944 (2003)
Ioan Balin, "*Measurement and analysis of aersols-cirrus-contrails, water vapor and temperature in the upper troposphere with the Jungfraujoch LIDAR system*" Thése N° 2975 (2004)
Olivier Couach, *Etude et modélisation de la pollution photochimique sur la ville de Grenoble*. Thèse EPFL, no 2639 (2002)

Teaching methods:

Assessment methods:

Language of instruction: Romanian

Course title: *Radioactive Pollution*

Type of course: compulsory **Level of course:** graduate

Year of study: II **Semester** : 1 **ECTS credits:** 6

Name of lecturer: Lect. Dan MIHAILESCU, PhD

Objectives:

On completion, students should have obtained: (1) advanced knowledge in the field of radioactive pollution sources, (2) familiarity with the basic principles of environmental radioactivity; (3) familiarity with the main techniques of radioactivity analysis.

Prerequisites: basic knowledge of Atomic and Nuclear Physics, Dosimetry and Radioprotection

Course content:

(1) Natural radioactivity; (2) Technological modified exposure to natural radiation; (3) Man-made radioactivity; (4) Measurements of radioactivity; (5) The nuclear fuel cycle and the influence on the environment; (6) Nuclear tests; (7) Monitoring accidentally released radionuclides in the environment; (8) Environmental radioactivity survey in Romania and abroad.

Reccomended reading:

V. Valkovic, *Radioactivity in the Environment*, Elsevier, 2000.
Mohamed M. El Baradei, W. Burkart, M. F. L'Annunziata (editors), *Handbook of Radioactivity Analysis*, Elsevier Inc. 2003.
*** *United Nations Scientific Committee on the Effects of Atomic Radiations* (UNSCEAR),
2000 *Report to the General Assembly, United Nations*
D. Mihăilescu, *Dozimetria radiațiilor ionizante*, Ed. Univ. "Al. I. Cuza" Iasi, 2001.
A. Baciu, *Curs de Radioactivitate pentru Supravegherea Radioactivității Mediului*, Ed. H. Hulubei, Bucureşti, 1997.

Teaching methods: lecture, class discussion, brainstorming

Assessment methods: 25% by class tests and practical assessment, 25% by research project, 50% by final exam (closed-ended questionnaire)

Language of instruction: Romanian

Course title: ***Ecosystem and Materials Interaction with Living Beings***

Type of course: compulsory **Level of course:** graduate

Year of study: II **Semester** : 1 **ECTS credits:** 6

Name of lecturer: Prof. Nicoleta DUMITRASCU, PhD

Objectives:

Prerequisites:

Course content:

Reccomended reading:

Biomaterials Science, An intoduction to materials in medicine, Eds. B. D. Ratner and A. S. Hoffman, Academic Press, New York, 1996
Compendiu de imunologie fundamentală, Andrieş L., Olinescu A., Ed. Ştiința, Chişinău, 1992.
H. Boenig, *Fundamentals of Plasma Chemistry and Tehnology*, Technomic Publishing Co.Inc. Lancaster Basel, 1990
Practical Surface Analysis, 2- edition, Edited by D. Briggs, M. P. Seah, John Wiley & Sons Ltd, 1990
Human Biochemistry, Ninth Edition, Orten J. M., Neuhaus O. W., The C. V. Mosby Comp., Saint Louis, 1975.

Teaching methods:

Assessment methods:

Language of instruction: Romanian

Course title: ***Physical Diagnostic Methods in Environmental Protection***

Type of course: compulsory **Level of course:** graduate

Year of study: II **Semester** : 1 **ECTS credits:** 6

Name of lecturer: Prof. Ovidiu Florin CALȚUN, PhD

Objectives:

Prerequisites:

Course content:

Reccomended reading:

Alexandroaei, D., Creangă, D., Delibaş, M., ş.a., *Experimente de fizică generală şi biofizică, Editura Universității* "Al.I.Cuza", Iaşi,2000;
Antoniu, M., *Măsurări electrice şi electronice*, vol.1, Editura "Gh. Asachi", Iaşi, 1995;
Bârlea, N.M., *Fizica senzorilor*, Editura Albastră, Cluj-Napoca,2000;
Bodea, M., *Aparate electronice pentru măsurare şi control*, Editura Didactică şi Pedagogică, Bucureşti, 1988;

Teaching methods:

Assessment methods:

Language of instruction: Romanian

Course title: *Renewable Energy Sources*

Type of course: optional **Level of course:** graduate

Year of study: II **Semester** : 2 **ECTS credits:** 6

Name of lecturer: Assoc. prof. George RUSU, PhD

Objectives:

During the course will be presented main alternatively energy sources, physical principles of these sources and the main ways for storing obtained energy. Also, technical and economical studies regarding the investments in the area of non-conventional or dual energy sources will be presented.

Prerequisites: General physics, Environment physics, Ecology

Course content:

1. Solar energy: potential of the solar radiation; principles of the photovoltaic conversion; thermal conversion; chemical conversion. Solar heating techniques (active and passive). 2. Wind energy: wind generator types; storing of the wind energy. 3. Geothermal energy: technology of the geothermal energy conversion; thermoelectric conversion; heat pumps. 4. Hydroelectric energy: micro-hydroelectric plant; energy of the waves and tides; conversion and storing of the hydroelectric energy. 5. Ways of storing the energetic resources: accumulator plants, hydrogen, super-capacitors 6. Bioenergy: (wood waste, non-wood waste, biogas). 7. Combustion cells: working principles; types of combustion cells (alkaline, membranes with protons exchanges, with phosphoric acid, etc.). Applications. 8. Obtaining energy by cogeneration. 9. Impact on the environment and benefices.

Reccomended reading:

Dănescu, Al. ş.a., *Utilizarea energiei solare*, Ed. Tehnică, 1987.
Ilie, V., ş.a., *Utilizarea energiei vântului*, Ed. Tehnică, 1987.
Tănăsescu F., ş.a., *Conversia energiei.Tehnici neconvenționale*, Ed. Tehnică, 1987.
Sorensen Bent, *Renewable Energy. Its physics, engineering, use, environmental impacts, economy and planning aspects*, Second Edition, Academic Press, 2000

Teaching methods: Oral expositions. Media presentations. Cases studies

Assessment methods: Writing examination

Language of instruction: Romanian

Course title: *Radio-ecology*

Type of course: compulsory **Level of course:** graduate

Year of study: II **Semester** : 2 **ECTS credits:** 6

Name of lecturer: Lect. Catalin BORCIA, PhD

Objectives:

Learn advanced knowledge of radioisotopes transfer in ecosystems and the radiation effects on he environment. Apply this knowledge to solve different problems in the environment protection field. Use of computer software for simulation of radioisotopes transfer processes in ecosystems.

Prerequisites: Atomic and molecular physics, Nuclear physics, Radioactive pollution

Course content:

Effects of ionizing radiations on the individual, population, community and ecosystem; fluxes of radionuclides and their behavior in ecosystems; models of radionuclides fluxes in air, water and soil; methods of identifying and assessment of radioactive compounds activity in water and soil samples; radioactive sourcs management in the event of uncontrolled release in the case of a nuclear incident or accident; use of radionuclides as tracers in ecological processes; risk analysis models.

Reccomended reading:

A. Kabata-Pendias, H. Pendias, *Trace elements in soils and plants*, CRC Press 2001
V. Valkovic, *Radioactivity in the environment*, Elsevier Inc. 2000
M. El Baradei, W. Burkart, M. F. *L'Annunziata, Handbook of Radioactivity Analysis* (Second Edition), Elsevier Inc. 2003
C. Borcia, *Surse de radiații şi radioprotecție,* Ed. Univ. „Al. I. Cuza" Iaşi 2003

Teaching methods: lecture, class discussion, brainstorming

Assessment methods: final exam, lab reports, portfolio

Language of instruction: Romanian

Course title: ***Internal and International Environmental Law***

Type of course: compulsory **Level of course:** graduate

Year of study: II **Semester** : 2 **ECTS credits:** 6

Name of lecturer: Prof. Gheorghe DURAC, PhD

Objectives:

Prerequisites:

Course content:

Reccomended reading:

M.Duțu, *Principii şi instituții fundamentale de drept comunitar al mediului,* Ed.*Economică,* Bucureşti, 2005;
Mircea Duțu, *Drept internațional şi comunitar al mediului,* Editura Economică, Bucureşti, 1995;
D.Mazilu, *Dreptul comunitar al mediului,* Ed.*Lumina Lex,* Bucureşti, 2006;
E.Lupan, *Dreptul mediului,* Ed.*Lumina Lex,* Bucureşti, 2001;
D.Marinescu, *Tratat de dreptul mediului,* Ed.*All Beck,* Bucureşti, 2003;
L. Kramer, *EU Environmental Law,* Ed.*Sweet &Maxwell,* London, 2000;
Th. Handler, *Regulating the european environment,* Chancery Law Publishing – a div. of John Wileg & Sons Ltd., London, 1994;
Ph. le Tourneau, L. Cadet, *Droit de la responsabilité,* Ed. Dalloz, 1996;
Gh.Durac, L.Bouriaud, *Dreptul mediului. Răspunderea juridică pentru daune ecologice,* Ed. *Junimea,* Iaşi, 2004

Teaching methods:

Assessment methods:

Language of instruction: Romanian

Course title: ***Chemical Processes in the Atmosphere***

Type of course: optional **Level of course:** graduate

Year of study: II **Semester** : 2 **ECTS credits:** 6

Name of lecturer: Assoc. prof. Romeo Iulian OLARIU, PhD, lect. Cecilia ARSENE, PhD

Objectives:

Prerequisites:

Course content:

Reccomended reading:

Air Borne Particulate Matter, ed. T. Kouimtzis, C. Samare, Springer, Berlin, 1995.
Atmospheric Chemistry and Physics, Seinfeld, J.H., S.N. Pandis, John Wiley, New York, 1998.
Pollution – Cause, Effects and Control, ed. R.M. Harrison, the Royal Society of Chemistry, Cambridge, 1995.
Environmental Chemistry. A Global Perspective. Garry W. Van Loon and Stephen J. Duffy, Oxford University Press Inc., New York, 2000.
Surse, procese şi produse de poluare, I. Cojocaru, Ed. Junimea, Iaşi, 1995.
Encyclopedia of Analytical Chemistry, ed. R.A. Meyers, John Wiley – Sons, Chicester, 2000
Environmental Health Criteria, World Health Organisation, Geneva, 1979.
Understanding our Environment. An Introduction to Environmental Chemistry and Pollution, ed. R.M. Harrison, Cambridge, 1997.
Pollution. Causes, Effects and Control, ed. R.M. Harrison, Cambridge, 1995

Teaching methods:

Assessment methods:

Language of instruction: Romanian

Master field of study: PHYSICS

Specialization: *PHYSICAL METHODS APLLIED IN KINESIOTHERAPY MEDICAL RECOVERY*

Title conferred: Master diploma in the specialization Physical methods apllied in kinesiotherapy medical recovery

Official length of programme: 2 years (120 credits)

Form of education: full-time studies

Master programe description:

The main program objective is to prepare its residents to assume appropriate responsibilities in the clinical practice of kinesiotherapy.

The kinesiotherapist is academically and clinically prepared to provide rehabilitation exercise and education under the prescription of a licensed physician in an appropriate setting. Kinesiotherapists are qualified to implement exercise programs designed to reverse or minimize debilitation and enhance the functional capacity of medically stable patients in a wellness, sub-acute, or extended care setting. The role of the kinesiotherapist demands intelligence, judgment, honesty, interpersonal skills, and the capacity to react to emergencies in a calm and reasoned manner. An attitude of respect for self and others, adherence to the concepts of privilege and confidentiality in communicating with patients, and a commitment to the patient's welfare are standard attributes. At a minimum, a kinesiotherapist is educated in areas of basic exercise science and clinical applications of rehabilitation exercise.

Benefits:

- Assurance of public confidence
- Enhancement of employment opportunities
- Assurance of latest and most effective treatment protocols
- Increased prestige among other allied health care professionals
- Enhancement of professional competence

CURRICULUM

Ist YEAR

Academic year 2009/2010

Nr. crt.	Discipline	Semester I				Semester II			
		C	S/L	V	credits	C	S/L	V	credits
1.	Theoretical and practical basics of kinesiology	2	2	E	7	-	-	-	-
2.	Bioelectricity. Fundamental and clinical applications	2	3	E	8	-	-	-	-
3.	Biomechanics	2	3	E	8	-	-	-	-
4.	Medical recovery by physical exercise	2	2	E	7	-	-	-	-
5.	Medical physics applied in locomotory apparatus recovery	-	-	-	-	2	2	E	6
6.	Basics of medical imaging	-	-	-	-	2	2	E	6
7.	Fundamentals of physiopathology	-	-	-	-	2	2	E	6
8.	Optional courses O1, O2	-	-	-	-	2	2	E	6
9.	Research activities for preparing the MSc. thesis	-	-	-	-	-	4	C	6
	TOTAL HOURS	**8**	**10**	**-**	**-**	**8**	**8+4**	**-**	**-**
	TOTAL CREDITS	**-**			**30**	**-**			**30**

Optional course O1: Basics of structure of matter

Optional course O2: Systems Biophysics

IInd YEAR
Academic year 2010/2011

Nr. crt.	Discipline	Semester I				Semester II			
		C	S/L	V	credits	C	S/L	V	credits
1.	Massage and Reflexotherapy	2	1	E	7	-	-	-	-
2.	Present treatment methods in pain therapy	2	2	E	8	-	-	-	-
3.	Optional courses O3, O4	2	1	E	7	-	-	-	-
4.	Research activities for preparing the MSc. Thesis		4	C	8	-	-	-	-
5.	Physics applications in rheumatological recovery	-	-	-	-	2	1	E	8
6.	Biocompatibility and biomaterials	-	-	-	-	2	1	E	8
7.	The effect of electromagnetic field on the complex systems	-	-	-	-	2	1	E	8
8.	Research activities for preparing the MSc. thesis	-	-	-	-	-	7	C	6
9.	MSc. thesis	-	-	-	-	-	-	-	5
	TOTAL HOURS	**6**	**4+4**	**-**	**-**	**6**	**3+7**	**-**	**-**
	TOTAL CREDITS	**-**			**30**	**-**			**30 + 5**

Optional course O3: Ecosystem and Materials Interaction with Living Beings
Optional course O4: Neurotransmitters and neurofarmaceutics

Course title: ***Bioelectricity. Fundamental and Clinical Applications***

Type of course: compulsory **Level of course:** graduate

Year of study: I **Semester** : 1 **ECTS credits:** 6

Name of lecturer: Prof. Tudor LUCHIAN, PhD

Objectives:

Prerequisites:

Course content:

Reccomended reading:

Henderson, R. and J. H. Wang 1972. *Biochemistry* 11: 4565-4569
Catterall, W. A. 1988. *Science* 242: 50-61
Miller, C, *Ion Channel Reconstruction*, Plenum Press, New York,1986.
T. Luchian, B. Bancia, C. Pavel and G. Popa, *Electromagnetic Biology and Medicine* Vol. 21, No. 3, 287–302, 2002
T. Luchian, *Introducere in biofizica moleculara si celulara*, 'Alexandru I. Cuza' University Publishing House, Iasi, 2001
Tudor Luchian, *Electrofiziologie moleculara. Teorie si aplicatii*, Sedcom-Libris Publishing House, Iasi, 2006 (ISBN: 973-670-154-9)

Teaching methods:

Assessment methods:

Language of instruction: Romanian

Course title: *Biomechanics*

Type of course: compulsory **Level of course:** graduate

Year of study: I **Semester** : 1 **ECTS credits:** 8

Name of lecturer: Lect. Sebastian POPESCU, PhD

Objectives:

To accustom the students with the basics of Biomechanics. To assimilate the basic knowledge on the biomechanical systems analysis. To form and develop the ability of using the mathematical tools for describing and analyzing physical phenomena in biomechanical systems

Prerequisites: general knowledge in physics, human anatomy and physiology

Course content:

Introduction. Divisions of Biomechanics. Short history; Biokinematics. Physiological effects of acceleration. Sensorial perception of angular motion; Biodynamics. Body mass index. Balistocardiography; Types of forces in Biomechanics. String tension and normal reaction. Gravitational force. Physiological effects of imponderability. Friction force. Clinical applications. Blood viscosity. Centripetal and centrifugal forces. Centrifugal separator; Biokinetics. Mechanical work and physiological work. Kinetic energy and potential energy. Mechanical power and efficiency. Kinetic study of running. Human metabolism. Biostatics. Body equilibrium. Gravity center of human body. Levers in human body; Biomechanics of fluids. General characteristics of fluids. Statics of fluids. Clinical applications. Fluid dynamics. Medical applications of fluid dynamics. Surface phenomena in liquids; Biomechanics of circulatory system. The heart. Structure and function of the heart as a pump. Elements of hemodynamics; Elastic properties of bones and muscles. Shear and strain. Deformation of elongation/compression. Deformation of torsion; Anthropometry and similitude in biomechanics. Cell division. Human body characteristics. Sportive performances in running and vertical jump; Mechanical oscillations and waves; Bioacustics. Sound waves. Sound qualities. Sound sources. Human voice. Sound receptors. Human ear. Doppler effect. Ultrasounds and their applications in medicine.

Reccomended reading:

S. Popescu, *Complemente de mecanică fizică şi acustică – biomecanică*, Ed. Tehnopress, Iasi, 2005
T. Sbenghe, *Kinesiologie - stiinta miscarii*, Ed. Medicala, Bucuresti 2002.
V. Papilian, *Anatomia omului, vol. I - Aparatul locomotor*, EDP, Bucuresti 1982.
M. M. Sternheim, J. W. Kane, *General Physics*, John Wiley & Sons, New York 1995
C. R. Nave, B. C. Nave, *Physics for the Health Sciences*, 3rd edition, W. B. Saunders Company, Philadelphia (PA, USA) 1985.
D. M. Burns, S. G. G. MacDonald, *Physics for Biology and Pre-Medical Students*, Addison-Wesley Publishing Company, Manila, Philippines, 1970.

Teaching methods: lecture, discussion, problem solving, experiment

Assessment methods: permanent 30%; final written exam 70%

Language of instruction: Romanian

Course title: ***Medical recovery by physical exercise***

Type of course: compulsory **Level of course:** graduate

Year of study: I **Semester** : 1 **ECTS credits:** 7

Name of lecturer: Prof. Veronica BALTEANU, PhD

Objectives:

Prerequisites:

Course content:

Reccomended reading:

Flora D., *Tehnici de bază în kinetoterapie*, Ed. Univ. Oradea, 2002.
Sbenghe T., *Kinetoterapia profilactică, terapeutică şi de recuperare*, Ed. Medicală, Bucureşti, 1987-1994.
Şdic L., *Kinetoterapia în recuperarea algiilor şi tulburărilor de statică vertebrală*, Ed. Medicală, Bucureşti, 1982.
Encyclopédie Médico Chirurgicale (vol. 3), Editions Tehnques France, Paris.

Teaching methods:

Assessment methods:

Language of instruction: Romanian

Course title: ***Medical Physics Applied in Locomotory Apparatus Recovery***

Type of course: compulsory **Level of course:** graduate

Year of study: I **Semester** : 2 **ECTS credits:** 6

Name of lecturer: Mariana MUTICA, PhD

Objectives:

Prerequisites:

Course content:

Reccomended reading:

Baran T., *Biofizica Medicală* – curs, litografia IMF Iaşi, 1985
Kiss I., *Fiziokinetoterapia şi Recuperarea Medicală*, Ed. Medicală, Buc. 1999
Rusu V., *Mic Dicționar Medical,* vol. 1 şi 2, Litografia IMF Iaşi, 1983
Sbenghe T., *Kinetologia Profilactică, Terapeutică şi de recuperare*, Ed. Medicală, Buc. 1987
Vlad T., *Fiziopatologie* – curs, Ed. Univ. „Al. I. Cuza" Iaşi, 2004

Teaching methods:

Assessment methods:

Language of instruction: Romanian

Course title: *Basics of Medical Imaging*

Type of course: compulsory **Level of course:** graduate

Year of study: I **Semester** : 2 **ECTS credits:** 6

Name of lecturer: Lect. Ioana RUSU, PhD, Lect. Catalin BORCIA, PhD

Objectives:

Learn basic knowledge of radiology and medical imaging. Apply this knowledge to solve different problems in medical imaging practice. Identify and use bibliographic resources for continuous formation

Prerequisites: Electricity and magnetism, Atomic and molecular physics, Nuclear physics

Course content:

1. Basics of medical imaging; 2. Ultrasound imaging; 3. X-ray medical imaging; 4. Computed tomography; 5. Optics in medical imaging; 6. Electrical impedance tomography; 7. Magnetic Resonance Imaging; 8. Nuclear Medicine

Reccomended reading:

W. R. Hendee, E. R. Ritenour, *Medical Imaging Physics*, Ed. Wiley-Liss New York, 2002
H. E. Johns, J. R. Cunningham, *The Physics of Radiology* (Fourth Edition), Charles C Thomas Publisher 1983
S. Webb, *The physics of medical Imaging*, Ed. Taylor & Francis Bristol and Philadelphia, 1988
C. Borcia, *Surse de radiații şi radioprotecție*, Ed. Univ. „Al. I. Cuza" Iaşi, 2003
M. Toma, D. Dorohoi, I. Rusu, M. Burlea, E. Macsim, D. Urzica, *Tehnici biofizice pentru diagnostic si terapie*, Ed. Univ. "A.I.Cuza", Iasi, 2003

Teaching methods: lecture, class discussion, brainstorming

Assessment methods: final exam – closed-ended questionnaire, portfolio

Language of instruction: Romanian

Course title: *Fundamentals of Physiopathology*

Type of course: compulsory **Level of course:** graduate

Year of study: I **Semester** : 2 **ECTS credits:** 6

Name of lecturer: Lect. Laura AILIOAIE, PhD

Objectives:

Prerequisites:

Course content:

Reccomended reading:

Bullock, B.L., Henze, R.L. *Focus on Pathophysiology*. Philadelphia: J.B. Lippincott, 1999.
Chandrasoma, P., Taylor, C.R. *Pathology Notes*. Norwalk: Appleton & Lange, 1992.
Cotran, R. Kumar, V., Collins, T. & Robbins, S. L. Robbins *Pathologic Basis of Disease* (6th ed.). Philadelphia: W.B. Saunders, 1999.
Huether, S.E., McCance, K.L. Understanding Pathophysiology. St. Louis: Mosby, 1996.
McCance, K.L. & Huether, S.E. *Pathophysiology: The Biologic Basis for Disease in Adults and Children* (3rd ed.). St. Louis: Mosby-Year Book, 1997.
Vlad T. *Elemente de fiziopatologie*. Ed. didactica a „Univ. Al.I.Cuza", Iaşi, 2004.
Walter, J.B. *An Introduction to the Principles of Disease* (3rd ed.). Philadelphia: W.B. Saunders, 1992.

Teaching methods:

Assessment methods:

Language of instruction: Romanian

Course title: ***Basics of Structure of Matter***

Type of course: optional **Level of course:** graduate

Year of study: I **Semester** : 2 **ECTS credits:** 6

Name of lecturer: Lect. Ioana RUSU, PhD

Objectives:

The student became familiar with the fundamental theories of the atomic structure, emission and absorption of radiation, atoms in external fields, properties of solids, liquids; gases, temperature, heat, thermodynamics.

Prerequisites: Thermodynamics, Electricity and Magnetism, Atomic and molecular physics

Course content:

1. Matter, substance, field. 2. Fundaments of atomic structure. 3. Emission and absorption of radiation. 4. Atoms in external fields. Planck's constant. 5. Properties of solids, liquids; gases. 6. Temperature, heat, thermodynamics

Reccomended reading:

Margareta Tibu, *Fizica atomului si moleculei*, P.I, fasc.I si fasc.II, P.II-a, Centru de multiplicare al Universității Iaşi, 1985
Ştefan Muscalu, *Fizica atomica*, Ed. did. şi ped. Bucureşti, 1980
Ion M. Popescu, *Fizica*, Vol.II, Ed.did. şi ped. Bucureşti, 1981
Emil Luca şi alții, *Fizică generală*, Ed. Did. şi Ped. Bucureşti, 1975
Radu Țiteica, I. Popescu, *Fizica*, Vol.III, Ed. Tehnică, Bucureşti, 1975
M. Toma, *Fizica atomului*, www.plasma.uaic.ro/cursFAM
S. Oancea, ş.a., *Atomi. Molecule. Stări de agregare*, Edit DAN, Iaşi 1999

Teaching methods: lecture, class discussion, brainstorming

Assessment methods: oral examination and portfolio

Language of instruction: Romanian

Course title: ***Present Treatment methods in Pain Therapy***

Type of course: compulsory **Level of course:** graduate

Year of study: II **Semester** : 1 **ECTS credits:** 8

Name of lecturer: Lect. Ioan Sorin STRATULAT, PhD

Objectives:

Prerequisites:

Course content:

Reccomended reading:

S.I. Stratulat. S. Gurlui, *Aplicații medicale ale luminii liniar polarizate*, spectrul VIS/$IR_{apropiat}$, Ed. Tehnopress, Iaşi, 208 pagini, 2003
S.I. Stratulat, *Recuperare medicală, balneoclimatologie şi fizioterapie*, Ed. Performantica, 298 pag., Iaşi, 2005
S.I. Stratulat, *Recuperare medicală, balneoclimatologie şi fizioterapie. Apliocații în medicina generală*, Ed. Performantica, 190 pag., Iaşi, 2005

Teaching methods:

Assessment methods:

Language of instruction: Romanian

Course title: ***Physics Applications in Rheumatological Recovery***

Type of course: compulsory **Level of course:** graduate

Year of study: II **Semester** : 2 **ECTS credits:** 8

Name of lecturer: Lect. Laura AILIOAIE, PhD

Objectives:

Prerequisites:

Course content:

Reccomended reading:

Ailioaie Laura., Ailioaie C. – „*Biofizica locomoției umane. Aparatul locomotor: aspecte clinice şi metode de investigație*". Editura *Vasiliana '98*, Iaşi, 2000,
Goția S., Ailioaie C., Ailioaie Laura – *„Boli reumatismale şi kinetoterapia la copil"* – Editura TEHNOPRESS, Iaşi, 362 pag, 2004, ISBN: 973-702-022-7.
Veronica Bălteanu, Ailioaie Laura - "Compendiu de Kinetoterapie - Tehnici şi Metode. Editura Tehnică, Ştiințifică şi Didactică CERMI, Iaşi, 150 pag, 2005.

Teaching methods:

Assessment methods:

Language of instruction: Romanian

GENERAL INFORMATION FOR ERASMUS STUDENTS

What is ECTS?

ECTS, the *European Community Course Credit Transfer System,* has been developed in order to provide common procedures to guarantee academic recognition of studies abroad. It provides a way of measuring and comparing learning achievements, and transferring them from one institution to another.

The ECTS is based on the principle of mutual trust and confidence between the participating higher education institutions. The few rules of ECTS, concerning *information* (on courses available), *agreement* (between the home and host institutions), and the *use of credits* (to indicate student workload), are intended as a reinforcement of this mutual trust and confidence. Each department taking part in ECTS describes the courses it offers not only in terms of content, but also in terms of credits allocated to each course.

Romanian and ECTS credit and grading systems

Credits allocated to courses are relative values reflecting the quantity of work each course demands in relation to the total quantity of work required to complete a full year of academic study at a given institution. Like the Romanian credit system, ECTS is a credit system based on student workload. Student workload refers to the time spent in lectures, practice and independent study. It includes all work needed to prepare for examinations and to meet requirements. Credits are awarded only if a course has been completed and all requirements have been met and examinations passed. The basic allocation of academic credits in ECTS is 60 credits per year of study and 30 credits per semester.

It is up to the participating institutions to subdivide the credits for the different courses. Practical placements and optional courses, which form an integral part of the course of study, also receive academic credit. It is important that no special courses are set up for ECTS purposes, but all ECTS courses are mainstream courses of the participating institutions, as followed by home students under normal regulations.

Examination and assessment results are usually expressed in grades. However, many different grading systems co-exist in Europe. On the basis of information, comments and statistical data provided by 80 institutions participating in the ECTS pilot scheme, the ECTS grading scale has been developed.

A	Excellent	outstanding performance with only minor errors
B	Very Good	above average standard with some errors
C	Good	generally sound work with a number of notable errors
D	Satisfactory	fair but with significant shortcomings
E	Sufficient	performance meeting the minimum criteria
FX	Fail	some more work required before the credit can be awarded
F	Fail	considerable further work is required

The ECTS grading scale provides information on the student's performance over and above that provided by the institution's grade; it does not replace the local grade.

The Romanian grading scale runs from 1 to 10. The marks have the following meanings: 1 - 4 fail, 5 - 6 sufficient, 7 satisfactory, 8 good, 9 very good, 10 excellent.

INFORMATION ON THE INSTITUTION

Adress

"Alexandru Ioan Cuza" University
11 Carol I Boulevard
RO-700506 – Iaşi, ROMANIA
Tel.: (+40 32) 20 10 10
Fax: (+ 40 32) 21 33 30; 201 201

Location

The "Alexandru Ioan Cuza" University is located in Iaşi, a city of almost half a million inhabitants which is the cultural, regional and business capital of the north-eastern part of Romania, founded some 600 years ago. The city has a number of large hospitals, theatres, museums, and bookshops providing books in all major European languages, art galleries, industry as well as other business offices. The city is well provided with restaurants, cafes and bars, and has a very pleasant and characteristically peaceful atmosphere.

The main University building (A) is situated on the Copou hill, within 20 minutes walk from the railway station and 15 minutes from the old city centre (address: Bulevardul Carol I nr.11). This building is 100 years old; it used to be called "the University Palace"; it is one of the finest buildings of the city and perhaps the finest University building in the whole country, giving Iaşi a marked academic air. Seven of the 14 faculties are hosted in building A (Chemistry, History, Law, Letters, Mathematics, Philosophy, and Physics). Another building (B), also situated on the Copou hill just across the street, hosts the Faculties of Biology, Geography-Geology and Economics (address: Bulevardul Carol I nr.22). The Faculty of Computer Science is hosted by the modern building of the University Computer Centre (building C, address Str.Berthelot nr.16) while the Faculty of Physical Education and Sports, and the Faculty of Psychology and Education Sciences are hosted in building D (address: Str.Toma Cozma nr.3). Both buildings C and D are also in the vicinity of the Main University building. The Faculty of Orthodox Theology with its student hostel is in the old city centre (Bulevardul Ştefan cel Mare şi Sfânt nr.45). The main university campus is made up of 15 hostels with a total capacity of about 5,000 places and is situated in the close vicinity of the main University building. The new hostel destined for ERASMUS students is within 5 minutes walk from the university (1/2 km).

Library Facilities

The "Mihai Eminescu" Central University Library (generally referred to as BCU) is also situated on the Copou hill, very close to the main university building.

All students enrolled in the University and all visiting students are allowed to use the various libraries. In order to borrow a book or magazine from any library, one needs a library pass that can be obtained at the loan desk of BCU, where the provisional student identification card will be required.

Arrival

Your place of arrival in Romania will be most likely the Otopeni International Airport near Bucharest. You can take a taxi/bus from the airport to the North Railway Station (Gara de Nord) in Bucharest, from where all the trains to Iasi leave. There are several trains every day from Bucharest to Iasi. The best choice, due to the comfort provided, would be the InterCity (IC) train. The trip takes about 6 hours by the InterCity (IC) and about 7 hours by the Rapid (R) or Accelerate (Acc) trains. For information about the train schedule and prices you can visit www.infofer.ro

It is advisable to take a taxi that is registered by any taxi company and not a private one (even if it bears the label „taxi") from the airport to the railway station. It is always advisable to buy a 1 class train ticket. Train schedule can suffer small changes every year, so it is better to buy a ticket directly from the railway station and not to make a reservation before arrival.

If you decide to take the plane, you should know there are three airline companies that have flights to Iasi: Tarom Air Transport, Carpatair and Austrian Airlines

Tarom Air Transport has two internal flights per day. The trip from Bucharest to Iasi takes about one hour. If your flight to Iasi is part of an international Tarom flight (for example, Rome-Bucharest-Iasi), the trip Bucharest-Iasi will be free of charge.

Carpatair has one internal flight per day, from Monday to Saturday. International Carpatair flights only come from Italy (cities: Torino, Bologna, Florence, Milano, Rome, Venice, Verona, Ancona) and from Germany (cities: Dusseldorf, Munchen, Stuttgart). You will have one stop and plane change in Timisoara.

Austrian Airlines has one flight per day from Vienna to Iasi directly. When you reach Bucharest (Henri Coanda International Airport) and you must change planes for Iasi, you must pick up your luggage and do the check-in again.

Also, it is advisable to buy your plane ticket from a tourist agency, where you can be advised about the lowest prices and the most convenient flights.

A third possibility to reach Iasi is the minibus (maxitaxi). There are several minibus stations near the North Railway Station (Gara de Nord) in Bucharest.

There are at least 4 trips to Iasi organised per day. The ticket is 40 lei (approx. 13 EUR). The trip takes about 6 hours.

If you have a lot of luggage, the trip by minibus is less recommended, especially if there are many passengers.

Climate

The Romanian climate is characterised by hot summers and cold winters. In winter there are many days with temperatures below freezing. You will need a warm winter coat and at least one woollen sweater. In summer, there will be fairly hot days (above 30^0 C) and you will want to wear summer clothes. In the spring and autumn months, temperatures will vary between 5^0 - 20^0 C during the day, so that a jacket over a shirt or T-shirt will be about right for most days. If possible, you should include these clothing items in your basic wardrobe. You can of course buy them here and you will find the prices much lower than in your own country.

Residence Permit

Since January 2001 citizens of the Schengen countries no longer need a visa to enter Romania. However, if you stay longer than 90 days you need to get a

residence permit from the Romanian police authorities. The following documents are required: an application form (official form that you take directly from the Authority for Foreigners, Iasi, Str. Costachescu no. 6, Tel: 0040 232 302322, Fax: 0040 232 302321) valid national identity document/passport (original + one copy); a certificate issued by our institution certifying your registration as Erasmus students and the period of study; the proof of the means of support; the proof of social health insurance; fees (please see http://aps.mai.gov.ro/english/ index_en.htm).

Registration and Admission

The Erasmus Office is part of the European Programmes Office, which functions within the Department of International Relations and is in charge of the management of the European educational programmes implemented in the University.

Contact:

Alexandru Ioan Cuza University
Bd. Carol I, no. 11, Iasi 700506
Department of International Relations
European Programmes Office
Tel: (0040 232) 201021, Fax: (0040 232) 201201,
Email: erasmus@uaic.ro

Opening hours:

The Erasmus Office is open to students between 11 to14.30, Monday Thursday (12.30 - 13.00 lunch break). Our office hours are 07.30 - 16.00, Monday Friday. We are open throughout the summer vacation period.

For Faculty of Physics please contact **Prof. Nicoleta DUMITRASCU, PhD** (nicoleta.dumitrascu@uaic.ro), Faculty coordinator for ERASMUS Programme.

At the beginning of the academic year (in October) or at the beginning of the second semester (in February) you are registered temporarily, for one or two semesters, at the faculty that has an Erasmus bilateral contract with
your home faculty.

The following documents are required: your Transcript of Records from your home faculty; your Learning Agreement signed by: the ECTS coordinators of your home faculty and university; by the ECTS coordinator of your host faculty, and by the ECTS institutional coordinator of Alexandru Ioan Cuza University; a copy of the first page of your passport; two ID photos.

After registration you receive: a student ID card (carnet de student) that is valid only for your Erasmus study period. The student card may be required in the University or in any other institution where student identity needs to be proved. You must use your student card during the session of exams, when each professor will write down, under signature, the grade you obtained in his/her exam. a travel card (legitimatie de transport) that you can use when you buy train tickets and season tickets for buses/trams/trolley-buses. By showing your student travel card you can have a 50%- reduction of the price of these tickets.

The faculty that registered you must provide you the same study conditions as for Romanian students: access to libraries, laboratories, reading rooms, Internet rooms. During your study mobility at Alexandru Ioan Cuza University of Iasi, you have the same rights and obligations as the other students of the university, except the right to receive Romanian government scholarships.

Student Services

Accommodation

Our University offers accommodation for the Erasmus students in Gaudeamus Centre for International Exchanges (17 Codrescu Street, Tel.:0040 232 201077, Director: Mrs. Teodora TANASA). Gaudeamus Centre is situated in the campus, within walking distance from the mainUniversity Building, the University Library, and Titu Maiorescu Students' Canteen. Places are available in double or triple rooms, fully furnished, including a TV set and a refrigerator. Each room has a private bathroom and a little balcony. Access to the Internet is free-of-charge. On each floor there is a kitchen fully equipped for cooking. Laundry can be done at request and free-of-charge.

The accommodation fee to be paid is 175 EUR/month for a place in a double room or in a triple room. It is not possible to choose a single room. For accommodation periods shorter than one month the fee to be paid is 15 EUR/night for a place in a double room or in a triple room. In order to arrange for your accommodation in this hostel (actually a twostar hotel) you are kindly asked to fill in the reservation form for student accommodation (see below), mentioning the date and hour of your arrival in Iasi and if you prefer to share a double or a triple room. On arrival you will be given the key to your room from the Reception Desk, which is open 24 hrs./day.

Health and Medical Assistance

Students' Medical Office no. 7: Dr. Carmen CARARE, general practitioner, address: Titu Maiorescu Campus, Student Residence no. C 8, ground floor, tel. 201324.

At the Students' Medical Office no. 7 all students of our University can have free-of-charge medical assistance: medical examinations, prescriptions, treatments, etc. Students must show their student card/certificate, their passport and, if necessary, their medical insurance.

Internet Facilities

In Gaudeamus Centre for International Exchanges, free-of-charge Internet connection can be provided in each room. Almost all faculties have computer rooms, where students can have free-of-charge access to Internet. It is possible to use these computers only based on the student card, which proves that the student

Meals

Students can cook their own meals (Gaudeamus Centre offers facilities for cooking) or eat at the university student cafeteria (Titu Maiorescu Canteen). This cafeteria is situated in the Titu Maiorescu Campus, near the main University building. Students can have breakfast, lunch and dinner at about 10 EUR.

There are also other pizzerias and restaurants in the area (including Gaudeamus Restaurant), where prices are a little higher.

Sport facilities

The University has its own Sports Centre (volley-ball, gymnastics, basketball, handball, fitness) and outdoor sport grounds (handball, basketball, football): 3 Toma Cozma Str., Building D of the University, underground floor.

There are also many possibilities in the city to do sport activities (aerobics, swimming, sauna, massage, skiing on Copou Hill in winter time, etc.). Numerous aerobics and fitness private clubs; Swimming pool (open air) [Str. Palat]; Swimming pool [Hotel Moldova, tel. 256031]

Telephone numbers and addresses can be found in the local phone book, which can be obtained free-ofcharge from the Central Post Office.

Erasmus Intensive Language Courses (EILC)

The Department of Romanian Language and Literature and Comparative Literature of our Faculty of Letters organises, with European Commission funding, two Erasmus Intensive Language Courses (EILC) in the next academic year between:

31 August - 25 September 2009
18 January - 12 February 2010.

The International Office of your home University must undertake an official application procedure for your participation in the EILC course. For more informations visit University web site at http://www.uaic.ro/uaic/bin/view/Students/EILC.

Other Romanian Language Courses

The Department of Romanian Language and Literature and Comparative Literature of our Faculty of Letters also organises:

- Intensive Romanian language courses - beginner level (15 hours/week for 10 weeks) both during the first and second semester (a group requires a minimum number of 10 participants);
- Romanian language, culture and civilization courses - intermediate level (4 hours/week) both during the first and second semester of each academic year.

Erasmus students are registered for this course without sending a special application. The course is free of charge and generally appreciated by guest students for its 6 ECTS credits and for the possibility it offers them to know each other and to quickly integrate among Romanian students. At the end of the course you are delivered a language certificate mentioning the total number of classes, the level of the course as well as the number of credits awarded.

FACULTATEA DE FIZICĂ

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