SYLLABUS

Discipline name	Advanced Physics
Profile	Electronics and Telecommunications Engineering
Specialization	Telecommunications Technologies and Systems
Code	51321109
Course leader	Associate Professor Simona NICOARA , Ph.D – snicoara@phys.utcluj.ro
Collaborators	Assistant Professor Codruta Badea, PhD – badeacodruta@yahoo.com
Department	Physics
Faculty	Material Science and Engineering

Sem.	Type of discipline	Course	Applications			Course	Applications			Ind. study	TOTAL	Credits	Form of assessment
		[hours/week]				[hours/sem.]							
			S	L	P		S	L	P				
2	**Fundamental**	**2**	**1**	**-**	**-**	**28**	**14**	**-**	**-**	**78**	**120**	**4**	**Exam**

Acquired competences :
Acquired skills (what the student is able to do):
After completing the discipline, the students will be able to: - express given physical problems in a mathematical form and solve them based on simple mathematics and differential calculus - calculate the electric field distributions produced by different charges distributions - calculate the magnetic field distributions produced by different charges distributions - elaborate and present a report on a given scientific problem - collaborate in a team for solving real physics problems or performing experimental work - understand the most important physical quantities that are encountered in electronics engineering.
Acquired abilities: (what type of equipment/instruments/software the student is able to handle)
After completing the discipline, the students will be able to: – use the lab instrumentation (optical spectrometer, multimeters) for the experimental study of atomic spectra, photoelectric effect and Hall effect – gather and analyze the numerical data obtained through the explorations, draw graphs, calculate certain parameters from the graphs – use commercial computer programs (MathCad, Origin) for interpretation of the experimental data

Prerequisites (if necessary)
Good knowledge in high school physics Good knowledge in high school mathematics Some knowledge in operating computers (Word, Power Point, Excel)

A. Course/Lecture (course/lecture titles)	
1	Electrostatics. The static electric field. Characteristic parameters. Gauss law in free space
2	The electric dipole. Polarization of dielectrics. Gauss law in dielectrics. Energy stored in electric fields.
3	Magnetostatics. Magnetic field lines and sources. The Biot-savart law. Ampere'Law.
4	Magnetic dipoles. Matter in magnetic fields. Diamagnetism. Paramagnetism. Feromognetism.
5	Elements of Electrodynamics. Electromagnetic induction. Magnetoelectric induction. The system of Maxwell's equations.
6	Energy and intensity of electromagnetic waves. The Poynting vector. The spectra of electromagnetic waves.
7	Wave-like behavior of light: Interference, diffraction, dispersion, polarization and absorption of electromagnetic waves.
8	Elements of quantum physics. Blackbody radiation. Planck's hypothesis. The photoelectric effect. The Compton effect.
9	De Broglie waves. Diffraction of electrons. Duality of matter. Heisenberg's principle of uncertainly. The wave function and its physical interpretation.
10	Schroedinger's equation. Microparticles in a potential well. Tunneling the potential well. The tunneling microscope. The tunnel diode.
11	The hydrogen atom. Stimulated emission of radiation. Principles and applications of lasers.
12	Elements of solid state physics. Crystals. Energy bands for electrons in solids. Electric conduction in solids: conductors, semiconductors, and insulators. Intrinsic semiconductors.
13	Extrinsic semiconductors. Physical processes in the p-n junction and applications. The semiconducting diode and photovoltaic cell.
14	Superconductors. Characteristic phenomena and applications.

B1. Applications –Seminar (contents)	
1	Calculating the electric potential and electric field intensity of certain distributions of charges.
2	Applications of Gauss's law
3	Applications of Biot-savart's law and Ampere's law
4	Study of the photoelectric effect
5	Study of the Hall effect
6	Study of the atomic emission spectra.

C. Individual study (reference study contents, synthesis materials, projects, applications etc.)

2 synthesis reports
3 sets of problems (the preparation part in every seminary)
3 laboratory reports after collecting the experimental data

Individual study structure	Course study	Problem solving, laboratory, project	Applications preparation	Examination time	Additional reference study	Total no. of individual study hours
Hours	35	12	14	3	14	78

References (Textbooks, courses, laboratory manual, exercise book)

1. P.A. Tipler, College Physics, Worth Publishers, New-York, 1987.
2. M. Browne, Physics for engineering and science, McGraw-Hill, New-York, 1999
3. E. Culea, S. Nicoara, Fundamentals of Physics, RISOPRINT, Cluj-Napoca 2004
4. I. Cosma, T. Ristoiu, Fizica aplicata-probleme rezolvate, Ed. UT Press 2005.
5. The web page: http://hyperphysics.phy-astr.gsu.edu/hbase/HFrame.html

Final evaluation	
Evaluation method	Written exam (E): problem solving (70%) and theoretical subjects (30%).
Mark components	Exam (E: 0…10 points); Seminary (L: 0…10 points); Homework (H: 0…10 points);
Mark computation	M = 0.6E + 0.2L + 0.2H. Pass if: E≥4 and L≥4 and M≥4.5

Course leader,

Assoc. Prof.   Simona NICOARA, Ph.D.