SYLLABUS

Discipline name	Elements of Physics
Profile	Electronics and Telecommunications Engineering
Specialization	Telecommunications Technologies and Systems
Code	51320309
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				
1	**Fundamental**	**2**	**2**	**-**	**-**	**28**	**28**	**-**	**-**	**94**	**150**	**5**	**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
- 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 (power supplies, function generator, multimeter) for the experimental study of standing waves and thermoelectric effect
- gather and analyze the numerical data obtained through the explorations, draw graphs, calculate certain parameters from the graphs
- use commercial computer programs 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	Introduction. Kinematics of translation: position vector, velocity, acceleration, circular motion.
2	Fundamental principles of classical mechanics. Dynamics of translation. Energy and power. Mechanical work of a variable force. Examples.
3	The rigid body. Kinematics of rotation. Dynamics equations of rotation. The moment of inertia.
4	Harmonic oscillations. Combining of parallel and perpendicular harmonic oscillations.
5	Damped oscillations. Forced oscillations. The resonance phenomena.
6	Elastic waves. Equation of a harmonic plane wave. Differential equation of a harmonic plane wave. Speed of longitudinal and transverse waves.
7	Energy and intensity of waves. Huygens's principle. Dispersion of waves.
8	Interference of waves. Standing waves. Doppler effect.
9	Sound waves. Sound pressure. Sound intensity. Sound level. Physiological characteristics of sound
10	Geometric attenuation of sound. Sound absorption. Sound refllexion.
11	Ultrasounds. Generation and applications. Piezoelectric effect. Magnetostriction phenomena.
12	Elements of special relativity. Lorentz-Einstein transforms. Kinematic consequences of Lorentz Einstein transform.
13	Relativistic dynamics. Mass, momentum and energy.
14	Experimental consequences of the special relativity. The relativistic effect of charges in motion. Magnetic field as a relativistic effect.

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B1. Applications –Seminar (contents)	
1	Experimental observations, measurement and errors. Dimensional analysis of physical equations.
2	Problems of kinematics: position vector, velocity vector, acceleration vector.
3	Problems of dynamics.
4	Mechanical work of a variable force.
5	The harmonic oscillator in examples and problems.
6	Damped oscillator. Forced oscillations. Resonance phenomena.
7	Wave phenomena. Fourier analysis of a square wave.
8	Standing waves. Energy of sound waves.
9	Sound amplification and attenuation. Sound level.
10	Doppler effect. Ultrasounds
11	Applications of the special relativity theory
12	Experimental study of longitudinal and transverse waves.
13	Experimental study of the thermoelectric effect and graphical representation of measured data.
14	Seminary test

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

2 synthesis reports
12 sets of problems (the preparation part in every seminary)
2 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	28	6	18	3	9	64

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: $E \geq 4$ and $L \geq 4$ and $M \geq 4.5$

Course leader,

Assoc. Prof. Simona NICOARA, Ph.D.