COURSE DESCRIPTION

1. Program identification information

1.1 Higher education institution	Politehnica University of Bucharest
1.2 Faculty	Faculty of Electronics, Telecommunications and Information Technology
1.3 Department	Physics
1.4 Domain of studies	Electronic Engineering and Telecommunications
1.5 Cycle of studies	License
1.6 Program of studies	Technologies and Telecommunication Systems

2. Course identification information

2.1 Name of the course				Physics 1			
2.2 Lecturer				Prof. Dr. Ing. Alexandru LUPAŞCU			
2.3 Instructor for practical activities				Ş.l. Dr. Ana-Maria POPOVICI Ş.l. Dr. Ioana IVAŞCU			
2.4 Year of studies	I	2.5 Semester	1	2.6 Evaluation type	Examination	2.7 Course choice type	Mandatory

3. Total estimated time (hours per semesterfor academic activities)

3.1 Number of hours per week, out of which	5	3.2 course	3	3.3 seminars/laboratory	1/1
3.4 Total hours in the curricula, out of which	70	3.5 course	42	3.6 seminar/laboratory	14/14
Distribution of time					Hours
Study according to the manual, course support, bibliography and hand notes					30
Supplemental documentation (library, electronic access resources, in the field, etc)					8
Preparation for practical activities, homework, essays, portfolios, etc.					16
Tutoring					3
Examinations					3
Other activities					

3.7 Total hours of individual study	60
3.9 Total hours per semester	130
3. 10 Number of ECTS credit points	5

4. Prerequisites (if applicable)

4.1 curricular	Notions of algebra and analysis, programming, general physics.
4.2 competence-based	Derivation, integration, vectors and vector operations, matrices and matrix operations

5. Requisites (if applicable)

5.1 for running the course	Possibility to use video projector
5.2 for running of the	Specialized laboratory from the Physics Department. Students must

applications	accomplish all the experiments.

6. Specific competences

Professional competences	Understanding methods and results from physics and apply them in engineering work, in particular from electronics. Ability to build and apply mathematical and physical models. Application of mathematics in various situations. Course develops abilities to measure physical quantities, to accumulate and treat experimental data, to compute errors and to present final results of an experiment. Using of fundamental elements that refer to the electronic devices, circuits and instrumentation.
Transversal competences	Students acquire efficient methods of learning, combine theoretical and experimental results and begin to work together in teams. They learn how to find basic points and bring them to light. Pupils discover how to defend an idea and how to sustain an argument.

7. Course objectives (as implied by the grid of specific competences)

7.1 General objective of the course	Students understand modern physics and learn how to apply it in engineering. They study the confirmation of theory by experiment and learn how to solve problems from mechanics, special relativity and electromagnetics. Pupils begin to study microscopic physics.
7.2 Specific objectives	Students study applied mathematics and physics and learn how to solve various problems from science and engineering. They apply models in simple situations and initiate scientific research.

8. Content

8.1 Lectures	Teaching techniques	Remarks (No. of hours)
Subject matter, general introduction.	Presentation on the black-board, worked examples, questions, discussions, slide presentations.	1
Mathematical appendices: complex numbers, vectors and vectors analysis, partial derivatives, initiation in solving differential equations – ordinary and with partial derivatives, multiple integrals (when required, along all semester).		5
Measurement units, dimensional analysis.		1
Kinematics: reference frames, velocity, acceleration.		2
Newton laws, applications, variation and conservation theorems.		5
Oscillations: harmonic, attenuated, attenuated and forced. Composition of parallel and perpendicular oscillations.	Presentation on the black-board, worked	5

Special relativity: principles, kinematics, dynamics, applications.	examples, questions, discussions, slide presentations.	5
Elastic waves: wave processes, equation, particular types, characteristics		4
Thermodynamics and statistical physics, principles, characteristic functions, Boltzmann and Maxwell distributions, applications		5
Electromagnetism: electric and magnetic fields, laws, equations, applications.		4
Optics: electromagnetic waves, characteristics, polarization, reflection and refraction, applications.		5
References: http://www.physics.pub.ro/Cursuri/Electronica_I_G_(English)_2017/ 1. A. Lupaşcu, http://www.physics.pub.ro/Cursuri/Alexandru_Lupascu_-_Physics_I_ETTI_2016-2017/ 2016, 2017. 2. A. Lupaşcu, Thermodynamics and Statistical Physics, 1991, Editura Polirom 3. Web addresses: http://hyperphysics.phy-astr.gsu.edu/ , https://en.wikipedia.org/wiki/ 4. Ch. Kittel, W. D. Knight, M. A. Ruderman, A. K. Helmholz, B. J. Moyer, Curs de Fizică Berkeley, Mecanica, Editura Didactica si Pedagogica, 1981. 4.bis. Ch. Kittel, W. D. Knight, M. A. Ruderman, A. K. Helmholz, B. J. Moyer, Curs de Fizică Berkeley, Mechanics, 1973, 2nd ed. 5. Halliday & Resnick, Fundamentals of Physics, 8-th ed. Wiley India Pvt. Limited, 2008		
8.2 a. Laboratory (6 experiments from the list below)	Teaching techniques	Remars
Statistical handling of experimental data	Presentation, numerical applications	2
Measurement of light velocity	Individual experiments (6 from the list)	2
Michelson interferometer		2
Light dispersion, the prism spectrometer.		2
Interference and polarization of electromagnetic waves.		2
Young double-slit experiment.		2
Fresnel diffraction through circular apertures.		2
Diffraction gratings used to measure light wavelength.		2
Polarized light, polarimeter.		2
Thermistor		2
References: 1. Presentation of experiments from the Physics Laboratory. 2. Laboratory sheets from the Physics Laboratory.		
8.2 b. Seminary	Teaching techniques	Remarks
Significant figures, measurement units, dimensional analysis.	Report of the theory, examples, problems answered by students	2
Kinematics, particle trajectory, calculation of the position and the velocity knowing the acceleration		2
Dynamics, work, energy (kinetic and potential), variation theorems		2
Oscillations and waves		2

Relativistic kinematics and dynamics.	at the blackboard, tests, home-work.	2
Bohr model, atomic spectra, Compton effect		2

References:
1. I. E. Irodov, Problems in General Physics, Mir Publishers, 1988
2. Problems for students on the web-site of the Department of Physics.
3. Tipler, Physics for scientists and Engineers, 4th ed., W. H. Freeman & Co. 1999

9. Bridging the course content with the expectations of the epistemic community representatives, professional associations and employers representatives for the domain of the program

The course Physics 1 is a fundamental topic having an important role in the creation of the attitude of a future researcher-engineer. Lectures facilitate the passage from high-school to university subjects.

Physics creates a link between mathematical and physics models and methods applied to engineering.

One put foundations to important subjects such as oscillations and waves, thermodynamics.

Students begin preparation for scientific research during master years.

They are initiated in several classic physics theories: special relativity, thermodynamics.

This is the first course where pupils do experiments, measure physical quantities, compute errors and final results.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Weight in the final mark
10.4 Lectures	- knowledge of fundamental concepts - application of the theory to particular problems	- home work given during lectures - final examination	60%
10.5 Practical applications			
Seminars	- answers to tests and questions - solutions to problems at the final examination	- involvement during classes, credits during the semester, homework - final examination	20%
Laboratory	- experimental skills - knowledge of the theoretical background and of measurement methods	- involvement during classes - realization of experiments - presentation of final results - final colloquium	20%

10.6 Minimal performance standard
- knowledge of basic quantities and laws for the submitted chapters of Physics - solving of simple problems - understanding problems involved in physics experiments

Date | Lecturer | Instructors for practical activities

25. 09. 2017. | Prof. Dr. Ing. Alexandru Lupaşcu | Ş. L. Dr. Ana-Maria Popovici

Ş. L. Dr. Ioana Ivaşcu

Date of department approval | Director of Department,

26. 09. 2017. | Prof. Dr. Gheorghe Căta-Danil