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, Telecommunications and Informational Technologies
1.5 Cycle of studies	Licence
1.6 Program of studies/Qualification	Technologies and Systems of Telecommunications (TSTeng)

2. Course identification information

2.1 Name of the course				Physics 2			
2.2 Lecturer				Prof. Dr. Ing. Alexandru LUPAȘCU			
2.3 Instructor for practical activities				Ș.l. Dr. Ana-Maria POPOVICI Ș.l. Dr. Ioana IVAȘCU			
2.4 Year of studies	I	2.5 Semester	2	2.6 Evaluation type	Examination	2.7 Course choice type	Required

3. Total estimated time (hours per semester for academic activities)

3.1 Number of hours per week, out of which	4	3.2 course	3	3.3 seminars/laboratory	0/1
3.4 Total hours in the curricula, out of which	56	3.5 course	42	3.6 practical activities	0/14

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)	6
Preparation for practical activities, homework, essays, portfolios, etc.	6
Tutoring	3
Examinations	3
Other activities	

3.7 Total hours of individual study	48
3.9 Total hours per semester	104
3. 10 Number of ECTS credit points	4

4. Prerequisites (if applicable)

4.1 curricular	Physics 1
4.2 competence-based	Analysis, vectors, matrices, wave equation

5. Requisites (if applicable)

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

6. Specific competences

Professional competences	Using the fundamental elements referring to devices, circuits and electronic instrumentation Applying, in typical situations, the basic aquisition and signal processing methods Solving specific problems for wideband communication networks: propagation in different transmission media, circuits and equipment for high frequencies (microwave and optical).
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 optics, quantum mechanics, atomic physics, semi-conductor physics.
4.2 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)
Equation of electromagnetic waves	Presentation on the black-board, worked examples, questions, discussions, slide presentations.	1
Characteristics of electromagnetic waves, polarization		2
Reflection and refraction		3
Interference, diffraction. Applications.		4
Experimental foundation of quantum physics. Characteristics of quantum objects.		4
Principles of quantum mechanics. Schrödinger equation.		4
Simple applications of quantum laws.		2
One-dimensional applications: potential well, potential barrier, tunnel effect, quantum harmonic oscillator. Applications.	Presentation on the black-board, worked	5
Hydrogen atom. Atoms in magnetic fields.		5

Electronic spin. Introduction to atomic spectroscopy.	examples, questions, discussions, slide presentations.	
Identical micro-particles. Classical and quantum statistics. Bose-Einstein condensation. Statistics of carriers in semi-conductors.		5
Emission and absorption of radiation.		2
Initiation in laser physics.		2
Initiation in nuclear physics		3
References: http://www.physics.pub.ro/Cursuri/Electronica_I_G_(English)_2017/ 1 A. Lupaşcu, http://www.physics.pub.ro/Cursuri/Alexandru_Lupascu_-_Physics_II_ETTI_2016-2017/ 2. Max Born, Fizica Atomică, Editura Ştiinţifică, Bucureşti 1973 3. Adrese de pe pe internet http://hyperphysics.phy-astr.gsu.edu/ , https://en.wikipedia.org/wiki/ 4. Halliday & Resnick, Fundamentals of Physics, 8-th ed. Wiley India Pvt. Limited, 2008 5. I. E. Irodov, Problems in General Physics, Mir Publishers Moscow, 1981		
8.2 Practical applications	Teaching techniques	Remarks (No. of hours)
Measurement of the electron specific charge by the magnetron method.	Experiments made by small groups of students (6 experiments from the list)	2
Experimental determination of Rydberg's constant.		2
Experimental determination of Planck's constant.		2
Poisson and Gaussian statistics.		2
Electron diffraction (Debye – Scherrer experiment).		2
Heisenberg's uncertainty principle experiment.		2
Measurement of the current – voltage characteristics of a tunnel diode.		2
Bibliography: 1. Presentation of experiments from the Physics Laboratory. 2. Laboratory sheets from the Physics Laboratory.		

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 2 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 begins to put the foundations of matters such as semi-conductor physics, microwaves, lasers and opto-electronics.
Students begin preparation for scientific research during master years.
They are initiated in several modern physics theories: quantum mechanics and its applications.
During the course pupils do experiments, measure physical quantities, compute errors and give 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 basic theoretical notions - knowledge to apply theory to specific problems	- homework given during lectures - partial examination - final examination	70% (30% + 40%)
10.5 Practical applications (laboratory)	- experimental skills - knowledge of the theory and of the measurement methods	- involvement during classes - final colloquium	30%
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

25. 09. 2017.

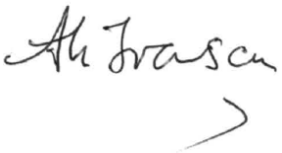
Lecturer

Prof. Dr. Ing. Alexandru Lupaşcu

Instructors for practical activities

Ş. L. Dr. Ana-Maria Popovici

Ş. L. Dr. Ioana Ivaşcu



Date of department approval

26. 09. 2017.

Director of Department,

Prof. Dr. Gheorghe Căta-Danil