Politehnica University of Bucharest

Facultyof Electronics, Telecommunications andInformation Technology

**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/Qualification | Electronic Engineering and Telecommunications |

**2. Course identification information**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 2.1 Name of the course | | | | Physics 1 | | | |
| 2.2 Lecturer | | | | Prof. Dr. Ecaterina C. NICULESCU | | | |
| 2.3 Instructor for practical activities | | | | Conf. dr. Adrian RADU  Ş.l. Dr. Mona MIHAILESCU  Ş.l. Dr. Ing. Adrian DUCARIU | | | |
| 2.4 Yearof studies | I | 2.5 Semester | 1 | 2.6 Evaluation type | Examination | 2.7 Course choice type | Required |

**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, matrices |

**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 attend all the experiments. |

**6. Specific competences**

|  |  |
| --- | --- |
| Professional competences | Understanding methods and results from physics and apply them in particular cases, 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. |
| 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, electromagnetics and optics.  Pupils begin to study microscopic 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) |
| Subject matter, general introduction. | | Presentation on the black-board, worked examples, questions, discussions, slide presentations. | 2 |
| 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. | | 2 |
| Kinematics: reference frames, velocity, acceleration. | | 2 |
| Newton laws, applications, variation and conservation theorems. | | 4 |
| Oscillations: harmonic, attenuated, attenuated and forced. Composition of parallel and perpendicular oscillations. | | Presentation on the black-board, worked examples, questions, discussions, slide presentations. | 5 |
| Special relativity: principles, kinematics, dynamics, applications. | | 6 |
| Electromagnetism: electric and magnetic fields, laws, equations, applications. | | 6 |
| Elastic waves: wave processes, equation, particular types, characteristics | | 4 |
| Optics: electromagnetic waves, characteristics, polarization, reflection and refraction, applications. | | 6 |
| References:  1). Lectures on the site of the Department of Physics.  2). Ecaterina Niculescu, Unde electromagnetice, Editura Printech, 2000.  3). Ecaterina Niculescu, Fizica vol. 1, Editura Matrix-Rom, 2003  4). Eleonora Rodica Bena, Fizica, Editura Credis, 2001.  8). Ioan M. Popescu, Fizica I, Editura Didactica si Pedagogica, 1982  9) Ch. Kittel, W. D. Knight, M. A. Ruderman, A. K. Helmholz, B. J. Moyer, Curs de Fizică Berkeley, Mecanica, Editura Didactica si Pedagogica, 1981.  10). 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 | | Remarks |
| 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 |
| 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 at the blackboard, tests, home-work. | 2 |
| Kinematics, dynamics, work, variation theorems. | | 2 |
| Oscillations | | 2 |
| Relativistic kinematics and dynamics. | | 2 |
| Electric and magnetic fields. | | 2 |
| Characteristics of elastic and electromagnetic waves. | | 2 |
| Light polarization, reflection and refraction. | | 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 begins to put the foundations of matters such as oscillations and waves, electromagnetism.  Students begin preparation for scientific research during master years.  They are initiated in several classic physics theories: special relativity, electromagnetic waves.  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 |
| * Lectures | * knowledge of fundamental concepts * application of the theory to particular problems | * work during lectures * final examination | 50% |
|  | | | |
| 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 | 25% |
| Laboratory | * experimental skills * knowledge of the theoretical background and of measurement methods | * involvement during classes, - final colloquium | 25% |
|  | | | |
| 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 Instructor for practical activities

01. 10. 2013. Prof. Dr. Ecaterina C. Niculescu Conf. Adrian Radu

S. L. Dr. Mona Mihailescu

S. L. Adrian Ducariu

Date of department approval Director of Department,

04. 10. 2013. Prof. Dr. Gheorghe Căta-Danil