Academic course description

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| BACHELOR ‘S PROGRAMME3rd YEAR OF STUDY, 2nd SEMESTER |

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| **Course title** | | **Introduction to modelling of physical processes** |
| Course code | |  |
| Course type | | full attendance |
| Course level | | 1st cycle (bachelor’s degree) |
| Year of study, semester | | 3rd year of study, 2nd semester |
| Number of ECTS credits | | 5 |
| Number of hours per week | | 4 (2 lecture hours + 2 seminar hours) |
| Name of lecture holder | | Lect.dr. Petronel POSTOLACHE |
| Name of seminar holder | | Lect.dr. Petronel POSTOLACHE |
| Prerequisites | | Advanced level of English |
| A | **General and course-specific competences** | |
|  | **General competences:**   * Elaboration of a specialty or licence work, respecting the objectives, proposed deadlines and norms of professional ethics. * Realization of a project/ team activity and identification of specific professional roles. * Elaboration, drafting and presentation in Romanian and/ or in a language of international circulation of a specialty work on a current topic in the field.   **Course-specific competences**:   * Identification of IT basics use (algorithms, programming languages, specific software, numerical modeling) in the study of Physics. * C 2.2 Explanation of the specific steps needed to develop algorithms for solving average difficulty problems. * Comparison of the results given by numerical models or simulations of physical phenomena with data provided by literature and/ or experimental measurements. * Proper use of numerical methods and mathematical statistics in the analysis and processing of specific physical data * Elaboration of graphs and reports for explaining and interpreting physical results obtained by statistical methods. * Proper use in professional communication of the terminology specific to Physics but also to related domains (especially Mathematics) * Presentation of scientific and popularization seminars on topics such as Atomic Physics, Nuclear and Elementary Particles Physics, Quantum Mechanics, Material Physics, Optics. | |
| B | **Learning outcomes** | |
|  | * Familiarize the students with the methodology of modeling physical systems from physical phenomena to mathematical forms followed by analytical or numerical solving. * Developing students' abilities to use mathematical platforms such as Maple, Mathematica to solve modeling problems for physical systems. | |
| C | **Lecture content** | |
|  | * General introduction. Physical systems and processes * Introduction to Maple simulation software * Algebra calculus in Maple. Solving equations * 2D and 3D plots. * Solving ordinary differential equations * Solving partial differential equations * Simulation of a physical process | |
| D | **Recommended reading for lectures** | |
|  | 1. http://stoner.phys.uaic.ro/moodle 2. James Claycomb -Mathematical Methods for Physics using Matlab and Maple 3. - Angela B. Shiflet George W. Shiflet -Introduction to Computational Science: Modeling and Simulation for the Sciences (Second Edition) | |
| E | **Seminar / laboratory content** | |
|  | * Experimental physics / Computational physics * Numerical calculation. Type of errors/aproximations. * Maple software * 2D, 3D graphs * Solving differential equations * Example: RLC circuit. * Project proposal and discussion of requirements * Individual project work * Project presentation | |
| F | **Recommended reading for seminars** | |
|  | 1. http://stoner.phys.uaic.ro/moodle 2. Maple software Manual/Help | |
| G | **Education style** | |
| learning and teaching methods | | Lecture, exemplification  Illustration, discussion |
| assessment methods | | Written test  Individual project, active participation in the laboratory, involvement in group and individual tasks |
| Language of instruction | | English |