Academic course description

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

|  |  |
| --- | --- |
| **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, exemplificationIllustration, discussion |
| assessment methods | Written testIndividual project, active participation in the laboratory, involvement in group and individual tasks |
| Language of instruction | English |