COURSE SYLLABUS

University	**Alexandru Ioan Cuza University of Iaşi**	**Course title**	
Faculty	**Physics**	**MODELING OF PHYSICAL PROCESSES**	
Department	**Physics**		
Domain	**Physics**	**Course category** (FC/SC/CC[1]): FC	**Term** (1-4): 1
Level	**Postgraduate (MA)**	**Course type** (Co/El/F[2]): Co	

I. Course structure

Number of hours/week				Credits	Total class hours/ semester	Total hours of individual activity	Examination type (C/Ex/CE[3])	Teaching language
Course	Seminar	Lab.	Project	**5**	**56**	**94**	**Ex**	**English**
2		**2**						

II. Instructors

	Academic degree[4]	Scientific degree	Name and surname	Faculty position (tenure/ associate - organization)
Course	Assoc. prof.	PhD.	Stoleriu Laurentiu	tenure
Laboratory	Assoc. prof.	PhD.	Stoleriu Laurentiu	tenure

III. Prerequisites

Basic undergraduate courses in mathematics and physics.

IV. Course objectives

- Introducing students to the methodology of modeling of physical systems from physical process to mathematical formulation followed by analytical or numerical calculus.
- Developing the abilities of using mathematical platforms like Maple in solving physics problems.

V. Course content

Course	- Generalities. Systems, models and simulations. Verification, approximation and validation. Errors in numerical calculus. - Maple programming platform. Logical structures in Maple. Programming in Maple. - Computing and graphical representation of fields. Solving Laplace equation. - Problems with boundary conditions. Special functions. Applications (Schrodinger equation for hydrogen atom. Orbitals.) - Ordinary differential equations. Problems with initial conditions. Nonlinear oscillations. - Modeling systems with nonlinearities. Systems with local and nonlocal memory. - Monte Carlo method and applications in statistical physics. Pseudorandom numbers. Distributions.
Seminar	
Laboratory	At the laboratory the students practice the programs presented at the course. One fourth of the laboratory is dedicated to the work on each student's individual project.

VI. Minimal required references

- W. Press et al, "Numerical Recipes", Cambridge University Press, 1992

[1] FC – fundamental course, SC – specialty course, CC – complementary course
[2] Co – compulsory, El – elective, F – facultative
[3] C – colloquium, Ex – exam, CE – colloquium AND exam
[4] Professor / Associate professor / Lecturer / Assistant professor / Teaching assistant

- Burden R. et al, “Numerical analysis”, PWS-KENT Publishing Company, Boston, 1985.
- B. Char et al, “Maple V”, Springer Verlag, 1992.
- Blachman N.R. et al, “Maple V - quick reference”, Brooks/Cole Publishing Company, Pacific Grove, California, 1994.
- M. Kalos and Paula Whitlock, “Monte Carlo methods. Vol. I Basics”, John Wiley and Sons, New York, 1986.
- K. Binder, D.W. Heermann, “Monte Carlo simulatio in Statistical Physics. An Introduction”, Springer Verlag, Berlin, 1988.
- G.L. Baker, J.P.Gollub, “Chaotic dynamics. An introduction”, Cambridge University Press, 1990.
- http://stoner.phys.uaic.ro/moodle/

VII. Didactic methods

Lecture, debate, exemplification

VIII. Assessment

Pre-conditions	Attendance to all laboratories and minimal grade 5 for each of the three pieces of homework	
Exam dates	**1st Assessment**	**Week 8**
	2nd Assessment	**Week 16**

	Assessment means and methods	**Percentage of the final grade**
Exam/Colloquium	Individual project	30%
Seminar	-	-
Laboratory	Three pieces of homework	70%