COURSE OUTLINE

(1) GENERAL

SCHOOL	Sciences		
ACADEMIC UNIT	Physics		
LEVEL OF STUDIES	undergraduate		
COURSE CODE	**109**	**SEMESTER**	**6,8**
COURSE TITLE	Computational Methods in Physics		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
	4	4
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special Background
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	http://ecourse.uoi.gr/enrol/index.php?id=1046

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The course provides to the students the basic methodologies that lead to the development of algorithms for the numerical solution of problems in Physics that cannot be addressed analytically, focussing in the appropriate choices of the algorithms, the solutions' verification and accuracy of the calculations. Upon termination of the course the students should be able to:

Evaluate numerically roots of equations, to solve differential equations, and calculate integrals.

To use optimization techniques

To use numerical simulations, e.g. Molecular Dynamics and Monte Carlo for simulating physical systems and evaluating their fundamental properties by means of Statistical Thermodynamic results.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma

Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

Search for, analysis and synthesis of data and information, with the use of the necessary technology
Adapting to new situations
Working independently
Production of new research ideas
Production of free, creative and inductive thinking

(3) SYLLABUS

Finding of roots of equations, Interpolation methods, Numerical integration, Numerical Solution of Differential equations of 1st and 2nd order, Svhrodeinger type equations, Optimization methods, Numerical simulations (Molecular Dynamics, Monte Carlo).

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	*Use of ICT in teaching, laboratory education, communication with students*
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple*	Exams at the end of the course. In the total evaluation the computer training ill be considered in an amount of 30%

Activity	***Semester workload***
lectures	39
practice	13
bibliography	6
Laboratory (computer training)	39
exams	3
Course total	***100***

choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
- Related academic journals:

1. Teaching notes
2. Numerical methods and applications for engineers I. Sarris, Th. Karakasides, eds. Tsiolas 2015 ISBN 978-960-418-520-7. (in greek)
3. Computer Methods for Physics, J. Fraklin, Cambridge University Press, 2013, ISBN 978-110-703-430-3.