COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF SCIENCES		
ACADEMIC UNIT	DEPARTMENT OF MATHEMATICS		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**MAE744**	**SEMESTER**	**7th Semester**
COURSE TITLE	Numerical Solution of Ordinary Differential Equations		

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**
	3	6
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*	Specialized general
PREREQUISITE COURSES:	Numerical Analysis
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	http://users.uoi.gr/mxenos http://www.math.upatras.gr/~maik/AESDE.html

(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 objectives of the course are:

- Development of theoretical background in matters concerning the numerical solution of ordinary differential equations (ODEs) and ODE systems.
- Ability of using numerical methods for solving ODEs with computational programs that will help with the implementation, e.g. Mathematica, Matlab etc.
- Upon completion of this course the student will be able to use numerical methods for solving mathematical problems that may not have analytical solution and further deepen the understanding of such methods.

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
Adapting to new situations
Decision-making
Working independently
Team work
Working in an international environment
Working in an interdisciplinary environment
Project planning and management
Respect for difference and multiculturalism
Respect for the natural environment
Showing social, professional and ethical responsibility and sensitivity to gender issues
Criticism and self-criticism
Production of free, creative and inductive thinking
……

Production of new research ideas	*Others…* *…….*

The course aims to enable undergraduate students to develop the ability to analyze and synthesize basic knowledge of Numerical Analysis with the help of computers to numerically solve difficult problems in mathematics and/or physics. This will give to the student the opportunity to work in an international environment.

(3) SYLLABUS

Difference Equations, Initial Value Problems, One step methods (Euler – explicit and implicit, Runge Kutta methods), Multiple steps methods (Adams-Bashforth, Adams-Moulton, Predictor-Corrector methods). Convergence, Stability, Compatibility, Stiff ODE systems, Boundary Value Problems, Shooting method, Finite differences, Eigenvalue problems.

(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*	
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 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.*	Written examination at the end of the semester (obligatory), Homework and / or midterm exam (optional).

Activity	***Semester workload***
Lectures	39 hrsç
Study of theory	78 hrs
Home exercises	33 hrs
Total	150 hrs

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
- Related academic journals:

- Numerical Methods for Ordinary Differential Equations, 2nd Edition, G.D. Akrivis, V.A. Dougalis, 2012 (in Greek).
- Numerical Analysis: Ordinary Differential Equations, M.N. Vrahatis, 2012 (in Greek).