COURSE OUTLINE

1. GENERAL

SCHOOL	NATURAL SCIENCES		
DEPARTMENT	MATHEMATICS		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	MAT_AM231	**SEMESTER OF STUDIES**	4th
COURSE TITLE	SYMBOLIC COMPUTATION PACKAGES FOR ADVANCED MATHEMATICS		

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*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
Lectures and and Laboratory Exercises	4	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*	Compulsory course for the specialization *Applied Mathematics* Elective course for each of the other specializations
PREREQUISITE COURSES:	Recommended prerequisite knowledge: CALCULUS I, II and III, INTRODUCTION TO ORDINARY DIFFERENTIAL EQUATIONS, LINEAR ALGEBRA I
TEACHING AND ASSESSMENT LANGUAGE:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBPAGE (URL)	https://eclass.upatras.gr/courses/MATH965/

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*

With this course the student will be able to solve selected topics of Applied Mathematics at the PC Laboratory, interacting in a practical way with the open source, free package, **Sage** (**S**oftware for **A**lgebra, **G**eometry and **E**xperimentation). Particularly, the student:

- Acquires the ability to design the algorithm required to solve a problem.
- Combines the necessary Sage commands / structures to implement the program to solve the problem.

After successful completion of the course, the student will be able to:

- Design the algorithm to solve a clearly formulated problem and implement the corresponding Sage code.
- Learn to use Sage's mathematical libraries.

General Abilities

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	*Others…*
Production of new research ideas	

- Search, analyze and synthesize data and information, using the necessary technologies.
- Decision making.
- Autonomous work.
- Promote free, creative and inductive thinking.

3. COURSE CONTENT

Graphs of functions of one and two independent variables. Analysis of functions of one and more variables: limits, derivatives, integrals, Taylor expansions, Fourier series. Vector Calculus: Gradient, divergence and curl of vector fields. Linear algebra: Matrices, linear systems, eigenvectors, eigenvalues, Jordan normal form. Ordinary differential equations (ODEs): classification, solution and graphical representation of ODEs and system of ODEs. Parametric curves and surfaces.

4. TEACHING AND LEARNING METHODS - ASSESSMENT

TEACHING METHOD *Face-to-face, Distance learning, etc.*	Lectures (face to face)
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES *Use of ICT in teaching, laboratory education, communication with students*	✓ Electronic slides ✓ Support Learning through the *eClass* platform.
TEACHING ORGANIZATION *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 ECTSstandards του ECTS*	
STUDENT ASSESSEMNT *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.*	**Assessment Language:** Greek **Assessment Language for Erasmus students:** English **Assessment methods** ✓ Electronic examination: 90% ✓ Exercises: 10% Minimum passing grade: 5 Μαximum passing grade: 10

Activity	***Semester workload***
Lectures	40
Laboratory exercises	25
Solving 7-8 exercises	47
Study for Final examination	35
Final Examination	3
Total number of hours for the Course (25 hours of work-load per ECTS credit)	***150***

5. RECOMMENDED LITERATURE

(*in Greek*)

- Τσουμπελής Δημήτρης. *Ανώτερα Μαθηματικά με Συστήματα Αλγεβρικών Υπολογισμών*. Εκδόσεις Εταιρείας Αξιοποίησης και Διαχείρισης Περιουσίας Πανεπιστ. Πατρών, 2014.
- Τραχανάς Στέφανος. *Mathematica και Εφαρμογές*. Εκδόσεις ΙΤΕ – Πανεπιστημιακές Εκδόσεις Κρήτης, 2014.
- Τόγκας Αναστάσιος. *Ανώτερα Μαθηματικά με Συστήματα Συμβολικών Υπολογισμών*. Σημειώσεις μαθήματος, 2017.