COURSE OUTLINE

1. GENERAL

SCHOOL	NATURAL SCIENCES		
DEPARTMENT	MATHEMATICS		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	MAT_AM201	**SEMESTER OF STUDIES**	3rd
COURSE TITLE	INTRODUCTION TO 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*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
Lectures and Tutorials	5	7
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*	Background
PREREQUISITE COURSES:	Recommended prerequisite knowledge: CALCULUS I, CALCULUS II, LINEAR ALGEBRA I
TEACHING AND ASSESSMENT LANGUAGE:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBPAGE (URL)	https://eclass.upatras.gr/courses/MATH940/ https://eclass.math.upatras.gr/courses/MATHDEP294/

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*

By the end of this course, the student will have developed:

- the ability to demonstrate knowledge and understanding of the main concepts and theories concerning ODEs as well as systems of coupled first order ODEs
- the ability to apply this knowledge to decide the appropriate solving method
- the ability to model and solve simple problems using ODEs (mainly of separable variables)
- the ability to interpret qualitatively the behavior of the solutions (using graphs) .

Students who have successfully completed the course will be able to recognize and classify ODEs as well as decide the appropriate method for solving them. In addition, they will be able to interpret qualitatively the ODE solutions using graphs.

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	

- Searching, analysis and synthesis of data and information using appropriate technologies.
- Decision making.
- Autonomous work.
- Teamwork.
- Production of new research ideas.
- Promotion of free, creative and inductive thinking.

3. COURSE CONTENT

Basic concepts of ODEs. ODEs of first order, separable ODEs and ODEs which can be reduced to those. Exact ODEs of first order and Euler multipliers. Linear ODEs of first order, Bernoulli and Riccati ODEs. Applications: modeling and solving problems from different scientific fields using ODEs of first order. Qualitative analysis of the solutions of ODEs using graphs. Orthogonal trajectories. Picard's theorem for the existence and uniqueness of the solution of the initial value problem y' (x)=f(x,y), y(x_0)=y_0. General theory of linear ODEs of order n≥2. Solving linear homogeneous and non-homogeneous ODEs of order n≥2 with constant coefficients. Euler-Cauchy ODEs and techniques for solving ODEs of second order with non-constant coefficients. Applications: forced and unforced oscillations and additional problems using ODEs of order n≥2. Linear systems of two coupled first order ODEs.

In order to highlight the special educational and didactical aspects of a course, special emphasis is given on the historical evolution and scientific development of the subject as well as on its applications in technology and/or other sciences.

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*	• *eClass* platform of the University of Patras. • *eClass* platform of the Department of Mathematics.
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 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:** Written final course exam including ✓ comprehensive questions, ✓ exercises and problem solving. Minimum passing grade: 5 Maximum passing grade: 10

Activity	*Semester workload*
Lectures	39
Tutorials	26
Solving suggested exercises	45
Personal study by the student	62
Final examination	3
Total number of hours for the Course (25 hours of work-load per ECTS credit)	***175***

5. RECOMMENDED LITERATURE

(*in Greek*)

- Τσουμπελής Δημήτρης. *Συνήθεις Διαφορικές Εξισώσεις. Τόμος Α*. Εκδόσεις Πανεπιστημίου Πατρών, 2014.
- Σιαφαρίκας Παναγιώτης. *Εφαρμογές των Συνήθων Διαφορικών Εξισώσεων. Τόμος Ι*. Εκδόσεις Γκότσης, 2014.

(*in English*)

- Rai Bindhyachal and Choudhury D.P. *Ordinary Differential Equations. An Introduction*. Alpha Science International Ltd., 2005.
- Zill Dennis G. *A First Course in Differential Equations With Modeling Applications.* 10th ed., Brooks Cole, 2013.