COURSE OUTLINE

1. GENERAL

SCHOOL	NATURAL SCIENCES		
DEPARTMENT	MATHEMATICS		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	MAT_AM232	**SEMESTER OF STUDIES**	4th
COURSE TITLE	SECOND COURSE IN 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	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*	Specialization course
PREREQUISITE COURSES:	Recommended prerequisite knowledge: CALCULUS II, LINEAR ALGEBRA I, INTRODUCTION TO ORDINARY DIFFERENTIAL EQUATIONS
TEACHING AND ASSESSMENT LANGUAGE:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBPAGE (URL)	https://eclass.math.upatras.gr/courses/MATHDEP113/

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 decide the appropriate solving method for systems of ODEs and especially linear systems of ODEs
- To solve ODEs by using the infinite series method
- To apply the Laplace transform for solving ODEs and/or systems of ODEs
- To examine the form of solutions of boundary value problems
- To solve special types of integral equations by using boundary value problems or Laplace transform
- To model and solve simple problems using systems (mainly linear) of ODEs or/and integral Equations.

A student who has succesfully completed the course will be able to solve ODEs using the infinite series method and/or the Laplace transform and to examine the form of solutions of boundary value problems, to decide the appropriate method for solving systems of ODEs and to solve special types of integral equations.

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	

- Decision making.
- Autonomous work.
- Teamwork.
- Production of new research ideas.
- Promotion of free, creative and inductive thinking.

3. COURSE CONTENT

Linear systems of ODEs. Solving methods of linear systems of ODEs (elimination method, methods using eigenvalues and eigenvectors of a matrix). Series solutions of linear differential equations. Laplace transform for solving linear ODEs and systems of ODEs. Boundary value problems. Sturm-Liouville problems. Integral equations of Fredholm and Volterra type. Solving Fredholm integral equations whose kernel is a Green function of a homogeneous Sturm Liouville problem and Volterra integral equations with convolution type kernel. Applications of systems of ODEs and integral equations.

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 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	52
Solving suggested exercises	65
Personal study by the student	30
Final examination	3
Total number of hours for the Course (25 hours of work-load per ECTS credit)	***150***

5. RECOMMENDED LITERATURE

(*in Greek*)

- Σιαφαρίκας Παναγιώτης. *Εφαρμογές των Συνήθων Διαφορικών Εξισώσεων. Τόμος ΙΙ*. Εκδόσεις Γκότση, 2015.
- Δάσιος Γεώργιος. *Συνήθεις Διαφορικές Εξισώσεις*. 3η Έκδοση, Εκδόσεις Γκότση, 2017.
- Boyce William E. and Richard C. DiPrima. *Στοιχειώδεις Διαφορικές Εξισώσεις και Προβλήματα Συνοριακών Τιμών*. 2η Έκδοση, Πανεπιστημιακές Εκδόσεις ΕΜΠ, 2015.
- Σταυρακάκης Νικόλαος. *Διαφορικές Εξισώσεις: Συνήθεις και Μερικές. Θεωρία και Εφαρμογές από τη Φύση και τη Ζωή*. 2η Έκδοση, Εκδόσεις Τσότρας, 2017.

(*in English*)

- Boyce William E. and Richard C. DiPrima. *Elementary Differential Equations and Boundary Value Problems*. 10th ed., Wiley, 2012.
- Rai Bindhyachal and Choudhury D.P. *Ordinary Differential Equations. An Introduction*. Alpha Science International Ltd., 2005.