COURSE OUTLINE

1. GENERAL

SCHOOL	NATURAL SCIENCES		
DEPARTMENT	MATHEMATICS		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	MAT_AM436	**SEMESTER OF STUDIES**	7th
COURSE TITLE	PARTIAL 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 developmen*	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, REAL ANALYSIS I, COMPLEX ANALYSIS
TEACHING AND ASSESSMENT LANGUAGE:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBPAGE (URL)	http://www.math.upatras.gr/~tasos/pdes.html https://eclass.upatras.gr/courses/MATH951/

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*

Partial Differential Equations (PDEs) describe a wide range of complex phenomena in biology, engineering, physical sciences, economics and finance. The overall goal of this course is to enable students to develop:

- understanding of the mathematical tools used to solve and analyze PDEs.
- working experience of these tools to solve problems arising in real-world applications.

The expected learning outcomes of the course are that the students will be able to:

- use the method of characteristics to solve first order PDEs,
- analyze the basic phenomena modeled by the nonlinear transport equation: rarefaction and compression waves,
- classify second order PDEs and describe their basic characteristic properties,
- formulate and solve an appropriate initial - boundary value problem for a second order PDE, as a model for a simple physical problem, such as heat and mass transport, thermal equilibrium, and wave phenomena.

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

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

3. COURSE CONTENT

Basic notions, classification and main characteristics of partial differential equations. Method of characteristics for first-order PDEs. PDEs of Elliptic, parabolic and hyperbolic type. Special solutions, fundamental solutions, Green functions. The method of separation of variables. Wave propagation for scalar, vector and tensor fields. Geometric and physical properties of the waves. Diffusion equations and their analysis. Examples of the mathematical models for the propagation of acoustic, electromagnetic and elastic waves.

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
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	26
Tutorials	26
Solving suggested exercises	30
Personal study by the student	65
Final examination	3
Total number of hours for the Course (25 hours of work-load per ECTS credit)	***150***

4. RECOMMENDED LITERATURE

(*in Greek*)

- Τσουμπελής Δημήτρης. *Μερικές Διαφορικές Εξισώσεις. Τόμος Α.* Εκδόσεις Εταιρείας Αξιοποίησης και Διαχείρισης Περιουσίας Πανεπιστημίου Πατρών, 2009.
- Τραχανάς Στέφανος. *Μερικές Διαφορικές Εξισώσεις*. Εκδόσεις ΙΤΕ – Πανεπιστημιακές Εκδόσεις Κρήτης, 2015.
- Ακρίβης Γεώργιος, Αλικάκος Νικόλαος. *Μερικές Διαφορικές Εξισώσεις*. Σύγχρονη Εκδοτική, 2017.