

## COURSE OUTLINE

### 1. GENERAL

<b>SCHOOL</b>	NATURAL SCIENCES		
<b>DEPARTMENT</b>	MATHEMATICS		
<b>LEVEL OF COURSE</b>	UNDERGRADUATE		
<b>COURSE CODE</b>	MAT_AM438	<b>SEMESTER OF STUDIES</b>	8 <sup>th</sup>
<b>COURSE TITLE</b>	FOURIER TRANSFORM, DISTRIBUTIONS AND APPLICATIONS		
<b>INDEPENDENT TEACHING ACTIVITIES</b> <i>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</i>		<b>TEACHING HOURS PER WEEK</b>	<b>ECTS CREDITS</b>
Lectures and Tutorials		4	6
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).			
<b>COURSE TYPE</b> <i>general background, special background, specialised general knowledge, skills development</i>	Compulsory course for the specialization <i>Applied Mathematics</i> Elective course for each of the other specializations		
<b>PREREQUISITE COURSES:</b>			
<b>TEACHING AND ASSESSMENT LANGUAGE:</b>	Greek		
<b>THE COURSE IS OFFERED TO ERASMUS STUDENTS</b>	Yes		
<b>COURSE WEBPAGE (URL)</b>			

### 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

- In-depth understanding of the definition, properties and use of distributions (generalized functions) and tempered distributions. Use of Green's function method for ordinary differential equations.
- In-depth understanding of the definition, properties and use of Fourier Transform in one and several dimensions.
- Ability to solve initial-boundary value problems of partial differential 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*

*Adapting to new situations*

*Decision-making*

*Working independently*

*Team work*

*Working in an international environment*

*Working in an interdisciplinary environment*

*Production of new research ideas*

*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*

*Others...*

- Autonomous work.
- Promotion of free, creative and inductive thought.

### 3. COURSE CONTENT

**Part I:** The space of test functions and their duals, generalized functions (distributions) analysis and differential equations of distributions. Green's function method for boundary problems of second order linear differential equations. The dual problem and the solution of the inhomogeneous problem via Green's function

**Part II:** Tempered distributions, Fourier transform, convolution and properties. Fourier Transform on a Hilbert space, Parseval and Plancherel identities.

**Part III (Applications):** Fundamental solution of diffusion equation, Green's function and method of images for boundary value problems. Green's function method for Poisson equation on the plane, 2-dimensional Dirac delta function. Method of images, non-homogeneous Dirichlet problem on the disk.

#### 4. TEACHING AND LEARNING METHODS - ASSESSMENT

<p><b>TEACHING METHOD</b> <i>Face-to-face, Distance learning, etc.</i></p>	Lectures (face to face)	
<p><b>USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES</b> <i>Use of ICT in teaching, laboratory education, communication with students</i></p>		
<p><b>TEACHING ORGANIZATION</b> <i>The manner and methods of teaching are described in detail.</i></p> <p><i>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.</i></p> <p><i>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</i></p>	<b>Activity</b>	<b>Semester workload</b>
	Lectures	26
	Tutorials	26
	Individual Study	95
	Final Exam	3
	<b>Total number of hours for the Course (25 hours of work-load per ECTS credit)</b>	<b>150</b>
<p><b>STUDENT ASSESSEMENT</b> <i>Description of the evaluation procedure</i></p> <p><i>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</i></p> <p><i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></p>	<p><b>Assessment Language:</b> Greek <b>Assessment Language for Erasmus students:</b> English</p> <p><b>Assessment methods:</b> Final Course Examination including comprehension questions and problem solving.</p> <p>Minimum passing grade: 5 Maximum passing grade: 10</p>	

#### 5. RECOMMENDED LITERATURE

(in Greek)

- Τσουμπελής Δημήτρης. *Μερικές Διαφορικές Εξισώσεις. Τόμος Β*. Εκδόσεις Εταιρείας Αξιοποίησης και Διαχείρισης Περιουσίας Πανεπιστημίου Πατρών, 2010.
- Boyce William E. and DiPrima Richard C. *Στοιχειώδεις Διαφορικές Εξισώσεις και Προβλήματα Συνοριακών Τιμών*. 2<sup>η</sup> Έκδοση, Πανεπιστημιακές Εκδόσεις ΕΜΠ, 2015.