

ETE403 - Partial Differential Equations-Mathematics IV

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	ETE403	SEMESTER	4
COURSE TITLE	Partial Differential Equations-Mathematics IV		
INDEPENDENT TEACHING ACTIVITIES <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>	WEEKLY TEACHING HOURS	CREDITS	
Lectures	4	4	
<i>Add rows if necessary. The organization of teaching and the teaching methods used are described in detail at (d).</i>			
COURSE TYPE <i>general background, special background, specialized general knowledge, skills development</i>	Special background, specialized general knowledge, skills development		
PREREQUISITE COURSES:	ETE103 (Mathematics I), ETE203 (Mathematics II), ETE302(Mathematics III)		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No		
COURSE WEBSITE (URL)			

(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 the course Partial Differential Equations (PDEs) - Mathematics IV lectures are offered with the aim of familiarizing-educating students, the basic concepts and methods of solving Partial Differential Equations and Boundary Value Problems. At the end of the course the student will have acquired and developed the following in terms of knowledge, skills and abilities:

Knowledge: Critical understanding of theories and will be able to formally describe the physical-engineering problem by selecting and combining the appropriate mathematical methods of PDEs to solve it. The working knowledge of solution methodologies for boundary value problems is essential and is the cornerstone for problems related to mathematical physics, engineering and modern biomedical applications.

Skills: The student will be able to distinguish the essential details of the problem as well as the mathematical model that describes it. By studying and interpreting the natural problem, the student will be able to design and develop the necessary mathematical methodology, combining different mathematical methods within the PDEs, and proceed to its solution, reaching the

necessary conclusions and justifications.
Ability: By combining the basic principles of PDEs and knowledge of solution methodologies, the student will be able to demonstrate the necessary innovation by solving complex and unpredictable problems in the specialized field of Materials.

General Competences

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?

<i>Adapting to new situations</i>	<i>Project planning and management</i>
<i>Decision-making</i>	<i>Respect for difference and multiculturalism</i>
<i>Working independently</i>	<i>Respect for the natural environment</i>
<i>Team work</i>	<i>Showing social, professional and ethical responsibility and sensitivity to gender issues</i>
<i>Working in an international environment</i>	<i>Criticism and self-criticism</i>
<i>Working in an interdisciplinary environment</i>	<i>Production of free, creative and inductive thinking</i>
<i>Production of new research ideas</i>	<i>.....</i>
	<i>Others...</i>
	<i>.....</i>

The course offers theoretical lectures. The course content is concentrated in the following sections:

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Analysis and problem solving of initial values with analytical and introductory computational methods.
- Production of new research ideas
- Autonomous work
- Promoting free, creative and inductive thinking

(3) SYLLABUS

Introduction to Partial Differential Equations (PDEs) and Boundary Value Problems, categorization of partial differential equations, Separation of variables, heat propagation, Fourier series, Fourier convergence theorem, Fourier Series of even and odd functions, other problems of heat propagation-heat dissipation, wave equation, Helmholtz equation, Schrodinger equation, method of characteristics, solution of PDEs in polar, cylindrical and spherical coordinates for parabolic, elliptical and hyperbolic type problems, boundary value problems and Sturm-Liouville theory. Fourier-Laplace transformations, solution of boundary value problems with integral transforms. Introduction to numerical methods for solving PDEs.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY <i>Face-to-face, Distance learning, etc.</i>	Face-to face, In class, Lectures	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY <i>Use of ICT in teaching, laboratory education, communication with students</i>	Communication with students through e-class	
TEACHING METHODS <i>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</i>	Activity	Semester workload
	Lectures (real teaching hours)	52
	Unsupervised student study preparation for final exam	48

<i>activity are given as well as the hours of non-directed study according to the principles of the ECTS</i>		
	Course total	100
STUDENT PERFORMANCE EVALUATION <i>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.</i>	LANGUAGE OF EVALUATION: Greek METHOD OF EVALUATION: Final written examination at the end of the semester which is based on theory and exercises developed during the course	

(5) ATTACHED BIBLIOGRAPHY

-Suggested bibliography:

- W. Boyce, R. DiPrima, Elementary partial differential equations and initial value problems, - Publisher: National Technical University of Athens
- S. Trachanas, Partial differential equations, Publisher: Crete University Press
- G. Dassios, K. Kyriaki, Partial differential equations, Self-publishing