

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF SCIENCES		
ACADEMIC UNIT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	45	SEMESTER	4
COURSE TITLE	DIFFERENTIAL EQUATIONS		
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	
	5	6	
<i>Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).</i>			
COURSE TYPE <i>general background, special background, specialised general knowledge, skills development</i>	General background		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	http://ecourse.uoi.gr/enrol/index.php?id=564		

(2) LEARNING OUTCOMES

<p>Learning outcomes</p> <p><i>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.</i></p> <p><i>Consult Appendix A</i></p> <ul style="list-style-type: none"> • <i>Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area</i> • <i>Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B</i> • <i>Guidelines for writing Learning Outcomes</i>
<p>The course deals with the methods of solving differential equations and offers an overview of their application in physics. Specifically it deals with the methods for solving the main classes of first order Ordinary Differential Equations (ODE), including the cases of separable and exact differential equations, linear systems of ODE's, linear ODE's of higher order with constant and variable coefficients and partial differential equations with the use of separation of variables. Upon completion of the course, the students will be able to:</p> <ul style="list-style-type: none"> • Describe the applications of differential equations in Physics • Classify the differential equations and recognize the proper method for solving them • Produce the differential equation that describes the physical laws in certain phenomena • Calculate the solution for the corresponding initial or boundary value problem while recognizing the relevant physics involved.

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?

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...

Search for, analysis and synthesis of data and information, with the use of the necessary technology. Working independently. Criticism and self-criticism. Production of free, creative and inductive thinking.

(3) SYLLABUS

First order ordinary differential equations. Simple second order differential equations, Newton's law, applications. Special methods for differential equations with constant coefficients, Fourier series, Laplace transform, applications. Partial differential equations. The method of separation of variables. The Frobenius method. Special functions as solutions of differential equations. Applications of partial differential equations in physics. Simple systems of differential equations.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY <i>Face-to-face, Distance learning, etc.</i>	Face-to-face	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY <i>Use of ICT in teaching, laboratory education, communication with students</i>	Use of Moodle on-line learning platform for the dissemination of notes, problem sets as well as contacting the students	
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.</i>	Activity	Semester workload
<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>	Lectures	39
	Tutorials	26
	Bibliography study	60
	Non-guided study	22
	Exams	3
	Course total	150

STUDENT PERFORMANCE EVALUATION	
<p><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>Written exam at the end of the course containing theory and problem solving.</p>

(5) ATTACHED BIBLIOGRAPHY

<p>- <i>Suggested bibliography:</i> - <i>Related academic journals:</i></p> <p>Suggested bibliography :</p> <ul style="list-style-type: none"> • Vergados I. D, Mathematical Methods in Physics , Vol II, 6th Edition, Symmetria Press, Athens, 2004 • Trachanas S., Ordinary Differential Equations, Crete University Press, 2010 • Trachanas S., Partial Differential Equations, Crete University Press, 2010 • Milonas, N., Schinas N., Differential equations, Transformations & Complex functions, Tziola Press, 2015 • Boyce W. E., DiPrima R. C., Ordinary Differential Equations, N.T.U.A Press, 1999. • I. S. Sokolnikoff, R. M. Redheffer, Mathematics of Physics and Modern Engineering, N.T.U.A Press, 2001. • Bronson R., Outline of differential equations, Translation in Greek: S. K. Persidis, Shaum's Outline Series, 1978. • Vougiatzis G. B., Bozis, G. D., and D. B. Papadopoulos, Differential equations with applications, Klidarithmos Press, Athens, 2012.
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