ETE302 - Mathematics III

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	ETE302	**SEMESTER**	3
COURSE TITLE	Mathematics III		

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*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures	4	4
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialized general knowledge, skills development*	Special background, specialized general knowledge, skills development
PREREQUISITE COURSES:	ETE103 (Mathematics I), ETE203 (Mathematics II)
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 Mathematics III - Ordinary Differential Equations (ODEs) lectures are offered with the aim of familiarizing-educating students, the basic concepts and methods of solving Differential Equations and initial 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 ODEs to solve it. The working knowledge of solution methodologies for initial 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 ODEs, and proceed to its solution, reaching the necessary conclusions and justifications.

Ability: By combining the basic principles of ODEs 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?

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

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 ordinary differential equations - initial value problems, first order differential equations, linear equations, study of linear equations, separation of variables, differences between linear and nonlinear equations, modeling with linear equations, exact equations and integrating factors, homogeneous equations, differential equations: Clairaut, Bernoulli, Ricatti. Second-order linear differential equations, homogeneous equations with constant coefficients, fundamental solutions of linear homogeneous equations, linear independence and Wronski determinant , complex roots of the characteristic equation, multiple roots, reduction of order, non-homogeneous equations, variation of parameters-Lagrange method, method of undetermined coefficients, mechanical and electrical vibrations, forced periodic vibrations. Higher order linear differential equations, general theory of linear n-th - order linear equations, homogeneous equations with constant coefficients, method of undetermined coefficients, variation of parameters-Lagrange method. Laplace transform: definition of the Laplace transform, solving initial value problems, step functions, differential equations with discontinuous forcing functions, impulse functions, the convolution integral. Series Solutions of Second-Order Linear Equations, Frobenius method. Introductory concepts of arithmetic solution of initial value problems.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	In class, Lectures	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Communication with students through e-class	
TEACHING METHODS	***Activity***	***Semester workload***

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*	Lectures (real teaching hours)	52
	Unsupervised student study preparation for final exam	48
	Course total	100
STUDENT PERFORMANCE EVALUATION *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.*	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, Ordinary differential equations, Publisher: Crete University Press
- N. Mylonas , C. Schinas, Differential equations, Publisher Tziolas