COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering		
ACADEMIC UNIT	Mechanical Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	TE0103	**SEMESTER**	3rd
COURSE TITLE	Ordinary 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*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures	5	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, specialized general knowledge, skills development*	General background
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	https://www.mie.uth.gr/?page_id=17760&lang=en

(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*

This is an undergraduate course on ordinary differential equations (ODEs) and associated initial value problems. Special emphasis is placed on fundamental concepts, solution methods and applications of ODEs to problems in Mechanical Engineering and Physics more generally.

With the successful completion of the course the students will be able to:

- Formulate the ODEs governing relevant physical phenomena such as the motion of a rigid body.
- Classify ODEs and identify the appropriate solution methods in each case.
- Solve ODEs of any order by employing analytical or numerical methods.
- Study the solutions of ODEs and draw useful conclusions concerning the behavior of the physical system described by the ODEs.

Learning outcomes

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- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Working independently
- Production of new research ideas
- Working in an interdisciplinary environment
- Production of free, creative and inductive thinking

(3) SYLLABUS

Introduction: the concepts of the ordinary differential equation and of the initial value problem, applications of differential equations. First-order equations: integral curves, existence and uniqueness of solutions; analytical methods for solving linear, separable, exact, homogeneous, autonomous, and Bernoulli equations; numerical methods; applications. Second-order linear equations: existence and uniqueness of solutions, homogeneous and non-homogeneous equations, equations with constant coefficients, applications to the problem of free and forced vibration. Third- or higher-order linear equations. The method of the power series: introduction to power series, ordinary and singular points, regular and irregular singular points, solutions about ordinary points, the Legendre equation, solutions about regular singular points, the Bessel equation. The Laplace transform: solving differential equations, step functions and applications, impulse functions and applications, the convolution theorem and applications.

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY ***Face-to-face, Distance learning, etc.***	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Supporting material is made available through the UTH e-Class platform
TEACHING METHODS *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*	*Activity* / *Semester workload* Lectures: 70 Homeworks: 35 Study and analysis of bibliography: 45 Course total (25 hours per credit unit): **150**
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 Methods of evaluation: A written midterm (30%) and a written final (70%) exam. Each exam consists of a number of problems to be solved by the students within 3 hours in the classroom.

(5) **ATTACHED BIBLIOGRAPHY**

- Suggested bibliography:

- Boyce, W.E. & DiPrima, R.C., Στοιχειώδεις Διαφορικές Εξισώσεις και Προβλήματα Συνοριακών Τιμών, Πανεπιστημιακές Εκδόσεις Ε.Μ.Π., 2015.
- Μυλωνάς, Ν. & Σχοινάς, Χ., Διαφορικές Εξισώσεις, Μετασχηματισμοί και Μιγαδικές Συναρτήσεις, Εκδόσεις Τζιόλα, 2015.
- Σταυρακάκης, Ν., Διαφορικές Εξισώσεις: Συνήθεις και Μερικές, Εκδόσεις Σταυρακάκης, 2015.
- Τραχανάς, Σ., Συνήθεις Διαφορικές Εξισώσεις, Πανεπιστημιακές Εκδόσεις Κρήτης, 2013.
- Cengel, Y. A. & Palm III, W. J., Διαφορικές Εξισώσεις για Επιστήμονες και Μηχανικούς, Εκδόσεις Τζιόλα, 2017.
- Σούρλας, Δ., Συνήθεις Διαφορικές Εξισώσεις, Εκδόσεις Συμμετρία, 2010.

- Related academic journals:

- Journal of Engineering Mathematics
- SIAM Journal on Applied Mathematics