General course information:

Course title:	Ordinary Differential Equations	**Course code:**	CE03-UM1
Credits:	5	**Work load (hours):**	130
Course level:	Undergraduate ☒	Graduate ☐	
Course type:	Mandatory ☒	Selective ☐	
Course category:	Basic ☒	Orientation ☐	
Semester:	3rd	**Hours per week:**	4
Course objectives (capabilities pursued and learning results):			
The course content covers ***Ordinary Differential Equations*** and analytic solution methods as a natural extension of Calculus. Emphasis is given to applications in physics and mechanics in particular. The course aims at providing the student with the necessary mathematical equipment in order to be able to set up and solve mathematical models of phenomena in the context of physics and engineering.			
Prerequisites:			
Linear Algebra & Calculus I Physics I-II			

Instructor's data:

Name:	Theophanes Grammenos
Level:	Lecturer
Office:	
Tel. – email:	24210-74152, thgramme@civ.uth.gr
Other tutors:	-

Specific course information:

Week No.	**Course contents**	**Hours**	
		Course attendance	**Preparation**
1	Basic concepts and definitions, existence and uniqueness of solution, well-posed problems, integral curves, direction field, orthogonal trajectories	4	3
2-3	Equations of 1st order: separation of variables, homogeneous equations, the general linear 1st order equation, variation of parameters, exact equations, integrating factor, autonomous equations, simple models of physical phenomena, the equations of Bernoulli and Riccati	8	6
4-5	Higher order equations: general theory of n-th order linear equations, Wronski determinant, homogeneous and nonhomogeneous equations, reduction of order, variation of parameters	8	6
6-7	Linear equations with constant coefficients: homogeneous and nonhomogeneous equations,	8	8

	determination of coefficients, Euler's equation, applications to problems of dynamics and harmonic oscillations		
8	Laplace transform: properties, inverse transform, Heaviside step function, solution of linear differential equations and initial value problems	4	4
9-10	Linear systems of differential equations: canonical form, homogeneous and nonhomogeneous systems, method of elimination, variation of parameters, matrix method, determination of coefficients, method of Laplace transform	8	8
11-12	Power series solution: ordinary and singular points, theorem of Fuchs, solution by general power series, solution by Taylor/Maclaurin series, the method of Frobenius	8	8
13-14	Fourier Series	8	8

Additional hours for:			
Class project	**Examinations**	**Preparation for examinations**	**Educational visit**
	3	20	

Suggested literature:
Boyce E. and DiPrima R.C., *Elementary Differential Equations and Boundary Value problems*, Wiley, 8th ed., 2005

Teaching method *(select and describe if necessary -* **weight***):*		
Teaching	☒	75%
Seminars	☐	…….%
Demonstrations	☐	…….%
Laboratory	☐	…….%
Exercises	☒	25%
Visits at facilities	☐	…….%
Other *(describe):* ……..	☐	…….%
Total		100%

Evaluation method *(select)-* **weight:**				
	written	*%*	*Oral*	*%*
Homework	☐		☐	
Class project	☐		☐	
Interim examination	☐		☐	
Final examinations	☒	100%	☐	
Other *(describe):*	☐		☐	