ECTS

(B) Course information in english

General course information:

Course title:	Ordinary Differential Equations	Course code:	ΓΚ0306
Credits:	6	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 I. 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 science.

Prerequisites:

Linear Algebra and Analytic Geometry
Calculus I
Physics I-II

Instructor's data:

Name:	Theophanes Grammenos
Level:	Ass.Professor
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Other tutors:	-

Specific course information:

Week No.	Course contents	Hours	
		Course attendance	Preparatio
1	Basic concepts and definitions, existence and uniqueness of solution, the concept of well-posedness, classification of ordinary differential equations, integral curves, direction field	4	3

2-3	Equations of 1st order: separation of variables, initial value problems, homogeneous equations, the general linear equation of 1st order, variation of parameters, exact equations, integrating factor, autonomous equations, singular solutions, Bernoulli eq., Riccati eq., Lagrange eq., Clairaut eq., orthogonal trajectories, mathematical models of physical phenomena	8	6
4-5	Higher order equations: general theory of n-th order linear equations, Wronski determinant, homogeneous and non-homogeneous equations, reduction of order, method of variation of parameters	8	6
6-7	Linear equations with constant coefficients: Homogeneous and non-homogeneous equations, method of determination of coefficients, Euler's equation, applications to problems of dynamics and oscillations	8	6
8-9	Laplace transform: properties, inverse transform, Heaviside step function, δ Dirac function, solution of linear differential equations and initial value problems	8	6
10-11	Linear systems of differential equations: canonical form, homogeneous and non-homogeneous systems, method of elimination, variation of parameters, matrix method, method of determination of coefficients, Laplace transform	8	6
12-13	Power series solution: ordinary and singular points, Fuchs theorem, solution by general power series, solution by Taylor/Maclaurin series, Frobenius method, Bessel equation	8	6
14	Stability: stability of solutions of linear systems, autonomous systems, phase space, phase portrait	4	3

Additional hours for:			
Class project	**Examinations**	**Preparation for examinations**	**Educational visit**
	3	15	

Suggested literature:
1. Boyce E. and DiPrima R.C., *Elementary Differential Equations and Boundary Value problems*
2. Logan, J.D., *A First Course in Differential Equations*
3. Alikakos N.-Kalogeropoulos G., *Ordinary Differential Equations* (in Greek)

Teaching method *(select and describe if necessary-**weight**):*		
Teaching	☒	80%
Seminars	☐	..........%
Demonstrations	☐	..........%
Laboratory	☐	..........%
Exercises	☒	20%

Visits at facilities	☐	..........%
Other *(describe):*	☐	..........%
Total		100%

Evaluation method *(select)*-**weight:**				
	written	*%*	*Oral*	*%*
Homework	☒	10%	☐	
Class project	☐		☐	
Interim examination	☒	10%	☐	
Final examinations	☒	80%	☐	
Other *(describe):*	☐		☐	
Total		100%		