a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM003Y03	*Semester*	3
Course title	**Mathematics III**		

Independent teaching activities	Weekly teaching hours	ECTS
Lectures	5	6.0
Laboratory exercises		

Course type	General background
Course category	Compulsory
Prerequisite courses	-
Language of instruction and examinations	Greek
Is the course offered to Erasmus students	No
Course website (url)	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Know the important role of differential equations.

- The ability of standardization trough ordinary and partial differential equations.

- Perceive the importance of analytic and theoretical methods to the solution of the problems and the possibility to utilize the relevant software.

b2. General competences

- 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

c) Syllabus

Elementary first order non linear differential equations. First and second order equations with constant coefficients. Introduction to applications of differential and integral calculus in problems of Physics and Engineering Sciences. General theory of Ordinary Differential equations and Introduction in the standardization of simple physical problems with ordinary differential Equations. Linear ordinary D. E. of higher order: Homogeneous and non homogeneous D. E. The

methodology of specifiable coefficients and parameter change (Lagrange) for the solution of non homogeneous differential equations. The demotion of order as a technique in the solution of linear ordinary differential equations. Systems of ordinary D. E. Relation between solutions of systems of D.E. and D.E. of higher order. Linear homogeneous and non-homogeneous systems with constant coefficients. Stability of non Linear systems. Method of Linearization. Solution of second order D.E. – of variable coefficients – with power series. Development of solutions in normal and regular singular points. Special functions and their applicability. Laplace Transformation. Properties and reversal of Laplace Transformation. Convolution and applications in the solution of initial value problems and systems of D.E. Partial Differential Equations. Introduction in the modeling of natural processes- 9th Summary of course content- and problems in the Engineering science with partial differential equations. Introduction in P.D.E. of 1st order. Classification of 2nd order P.D.E. in problems of elliptical, parabolic and hyperbolic type. Sturm-Liouville problems and generalized Fourier series. Development of methodology of variable separation in Cartesian, polar, cylindrical and spherical coordinates. Application of variable separation in the solution of boundary problems for P.D.E. Laplace and Poisson, and problems of initial boundary problems for diffusion and wave equation. Introduction in solutions and Green functions. Fourier και Hankel Transformations. Solution of problems in infinite and semi-infinite sets by use of integral transforms.

d) Teaching and learning methods - Evaluation		
Delivery	Face-to-face, Distance learning, etc.	
Use of information and communications technology	- Commercial/free/open source software - Multimedia applications - MS Teams/Moodle/eclass - Open courses	
Teaching methods	*Activity*	*Semester workload*
	Lectures	65
	Tutorials	26
	Laboratory exercises	
	Computational exercises	
	Individual work	65
	Course total	156
Student performance evaluation	Intermediate assessment and written final examination.	

e) Suggested bibliography

1. Georgoudis, I., Makrigiannis, A. and Prezerakos, N. (2016) Mathematics for Engineers Functions of Several Variables-Differential Equations. Publisher Synchrony Ekdotiki E.P.E.
2. Boyce, W. And Di Prima, R. (2015). Elementary differential equations and Boundary value problems. Publisher Panepistimiaki Ekdosis N.T.U.A.