

a) General			
<i>School</i>	ENGINEERING		
<i>Academic unit</i>	MECHANICAL ENGINEERING		
<i>Level of studies</i>	Undergraduate		
<i>Course code</i>	MM001Y01	<i>Semester</i>	1
<i>Course title</i>	Mathematics I		
<i>Independent teaching activities</i>		<i>Weekly teaching hours</i>	<i>ECTS</i>
Lectures		5	7.5
Laboratory exercises			
<i>Course type</i>	General background		
<i>Course category</i>	Compulsory		
<i>Prerequisite courses</i>	-		
<i>Language of instruction and examinations</i>	Greek		
<i>Is the course offered to Erasmus students</i>	No		
<i>Course website (url)</i>			
b) Learning outcomes and general competences			
b1. Learning outcomes			
<p>Upon successful completion of this course, the student will be able to:</p> <ul style="list-style-type: none"> - Describe axiomatically notions and corresponding mathematical entities. - Solve problems of Linear Systems with Linear Algebra Methods as well as equations on the Complex Plane. - Distinguish / Interpret the physical meaning of the derivative, the integral as well as their use in modeling engineering problems, Field theory and elsewhere. - Apply / performs calculations with differentiable and integral functions. - Recognize / correlates notions and processes. 			
b2. General competences			
<ul style="list-style-type: none"> - 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			
<p>Vector Calculus: Vectors: Definition, Norm, Basic operations and their properties. Angle between two vectors and their Inner and Cross products. Vector spaces definition and properties. Linear independence of Vectors. Base of a Vector Space. Complex Numbers: The imaginary unit i as solution of $x^2+1=0$. Definition of Complex Numbers. Conjugate Complex Numbers.</p>			

Addition, multiplication and fractions of Complex Numbers. Complex Plane and Geometric Representation of a Complex Number. Modulus and Argument of a Complex Number. Trigonometric, Polar and exponential form of a Complex Number. Nth roots of a Complex Number and Nth-roots of unity. De Moivre's Theorem. Matrices: Definition of a Matrix and the determinant function. Evaluation and Properties of Determinants. Cramer's Method. Equality of matrices. Addition and Multiplication of Matrices. Classification of Matrices (Unitary, Symmetric, Diagonal, triangular), Transpose of a Matrix. Inverse and its evaluation. Solution of Linear Systems using Matrices. Characteristic equation of a square Matrix, Eigen values, and Eigen Vectors. Differential and Integral Calculus: Limits and Continuum of Functions of one Variable. Tangent of a Function, Rate of Change. Derivative of a function. Properties and Derivatives of Basic Functions. Rolle's and Mean Value Theorems. Study of differentiable Functions. Indefinite Integral: Definition and evaluation of characteristic cases. Integration by Parts. Evaluation with change of Variables. Definite Integral: Definition and Geometric Interpretation. The Fundamental Theorem of Integral Calculus. Improper Integrals.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face, Distance learning, etc.	
Use of information and communications technology	<ul style="list-style-type: none"> - Commercial/free/open source software - Multimedia applications - MS Teams/Moodle/eclass - Open courses 	
Teaching methods	<i>Activity</i>	<i>Semester workload</i>
	Lectures	55
	Tutorials	10
	Laboratory exercises	
	Computational exercises	
	Individual work	91
	Course total	156
Student performance evaluation	Intermediate assessment (20%) and final (written) examination (80%)	

e) Suggested bibliography

1. Vrizidis, L., Makrigiannis, Ar. And Sassalos, Sp., General Mathematics. Publisher Synchroni Ekdotiki.
2. Rassis Th., Mathematical Analysis I, Publisher Tsiotras.
3. Koutelieris, F., and Siannis, N., Linear Algebra for Engineers. Publisher Tziolas.