UNIVERSITÀ DI PAVIA

Anno Accademico 2021/2022

MATHEMATICAL ANALYSIS 1	
Enrollment year	2021/2022
Academic year	2021/2022
Regulations	DM270
Academic discipline	MAT/05 (MATHEMATICAL ANALYSIS)
Department	DEPARTMENT OF ELECTRICAL,COMPUTER AND BIOMEDICAL ENGINEERING
Course	BIOENGINEERING
Curriculum	PERCORSO COMUNE
Year of study	1°
Period	1st semester (27/09/2021 - 21/01/2022)
ECTS	9
Lesson hours	83 lesson hours
Language	Italian
Activity type	WRITTEN AND ORAL TEST
Teacher	MAZZOLENI DARIO CESARE SEVERO (titolare) - 9 ECTS
Prerequisites	Those required for the enrollment in the Faculty of Engineering.
Learning outcomes	The course is aimed at providing the basic knowledge of sequences, series, calculus (differential, integral) for real functions of one real variable, together with an introduction to ordinary differential equations. Lectures will be mainly focused on the comprehension of notions (definitions, results), although some proofs will still be detailed. Many examples and exercises will be presented througout the course. By the end of the course the students are expected to be able to correctly handle limits, derivatives, function graphs, integrals, series, differential equations, and the corresponding theoretical results.
Course contents	1. Preliminaries. Recalls and complements on: set theory, mathematical logic, real numbers. Complex numbers: algebraic, trigonometric, and exponential

	form. Operations on complex numbers; algebraic equations on the complex field. 2. Functions, Limits, Continuity. Sequences and Series. Functions: definitions, graphs; invertible functions; odd and even functions; monotone functions; periodic functions; operations on functions; nested functions. Elementary functions and corresponding graphs. Limits of functions: definitions, operations on limits. Continuous functions. Discontinuity points and their classification. Global properties of continuous functions. Limits of real sequences. Real series: definitions and basic examples; series with positive terms (and convergence tests); absolute and simple convergence. 3. Differential Calculus in one real variable and Applications. Derivative of a function: definition and properties, applications in Geometry and Physics. Derivation rules and calculus. Fundamental theorems of differential calculus. Primitives and indefinite integrals. Successive derivatives. Function study: extrema, monotonicity, convexity. De l'Hopital rules. 4. Integral Calculus. Definite integrals: definitions and basic properties, applications in Geometry and Physics. Fundamental theorems of integral calculus. Integration techniques. Improper integrals. 5. Ordinary Differential Equations. Introduction to ordinary differential equations. The Cauchy problem. Separation of variables. Linear ordinary differential equations of the first order. Linear ordinary differential equations of the second order with constant coefficients.
Teaching methods	Lectures (hours/year in lecture theatre): 45 Practical class (hours/year in lecture theatre): 38 Practicals / Workshops (hours/year in lecture theatre): 0
Reccomended or required readings	M. Bramanti, C.D. Pagani e S. Salsa. Analisi Matematica I. C.E. Zanichelli, Bologna, 2008-2009.
Assessment methods	The exam consists of a written examination and an optional oral examination: the written examination is further divided into two parts: exercises (first part) and theoretical questions (second part). Written and optional oral examinations should be passed within the same session. The oral examination is based on definitions, examples and counterexamples, theorems (some with proofs).
Further information	The exam consists of a written examination and an optional oral examination: the written examination is further divided into two parts: exercises (first part) and theoretical questions (second part). Written and optional oral examinations should be passed within the same session. The oral examination is based on definitions, examples and counterexamples, theorems (some with proofs).
Sustainable development	

goals - Agenda 2030	$lbl_legenda_sviluppo_sostenibile