Anno Accademico 2021/2022

MATHEMATICS (SURNAMES A-K)	
Enrollment year	2021/2022
Academic year	2021/2022
Regulations	DM270
Academic discipline	MAT/05 (MATHEMATICAL ANALYSIS)
Department	DEPARTMENT OF BIOLOGY AND BIOTECHNOLOGY "LAZZARO SPALLANZANI"
Course	BIOLOGICAL SCIENCES
Curriculum	PERCORSO COMUNE
Year of study	1°
Period	(01/10/2021 - 14/01/2022)
ECTS	6
Lesson hours	48 lesson hours
Language	Italian
Activity type	WRITTEN AND ORAL TEST
Teacher	VENERONI MARCO - 6 ECTS
Prerequisites	The course will require the knowledge of the mathematical notions generally developed in the secondary school (on the other hand, no previous knowledge of Mathematical Analysis is required). Essential prerequisites can be considered the following: algebraic equations and inequalities of the first and second degree, planar analytic geometry, trigonometry, exponential and logarithmic functions. During the first week of lessons a "crashing course" will be organized with the aim of helping the students who may show a lack of the above mentioned notions in order that they can fill their gaps.
Learning outcomes	The course is aimed at presenting the basic notions from the differential and integral calculus for functions of a single real variable.
	The various topics will be introduced in an "informal" way and using, when possible, applications from real-world situations (and, in particular,

from biological models). On
the other hand, some very important notions (like the definition of limit), in view of their "fundamental" character, will be developed by using a somehow rigorous mathematical formalism.

A special attention will be devoted to the resolution of exercises. Indeed, we believe it be important for a Biologist to acquire some "manual skill" in the usage of the basic tools of Calculus.

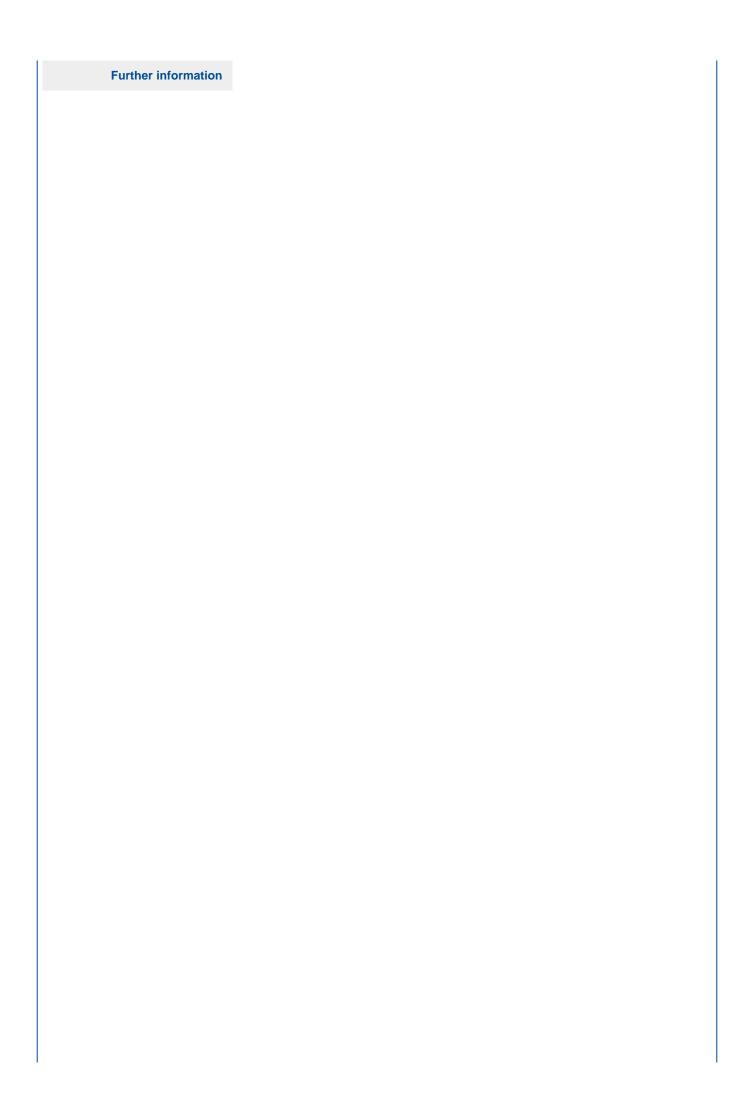|	
Course contents	Analytic geometry in the plane: the lines. Set theory: natural, integer, real numbers. Growth rate; arithmetic and geometric progressions, sequences. Mean and median values. Use of percentages. Concept of function: domain, image space, sign. Elementary functions: powers, polynomials, trigonometric functions, logarithms and exponentials. Logarithmic scales. Limits of sequences and of functions. Continuous functions and their basic properties. Discontinuities. Concept of derivative; geometrical and physical interpretation. Tangent line. Monotone, concave, convex functions. Minima, maxima and inflection points. Fundamental theorems of differential calculus. Study of a function of one real variable. Taylor polynomials. De L'Hopital's rule. Integrals. Integration by parts and by substitution.
Teaching methods	Lessons and exercise classes. The lessons will be devoted to introducing the most important notions from differential and integral calculus and to illustrating them by meands of real-world examples (related, when possible, to biological models). The exercise classes will be fundamental in order to acquire the necessary "manual skill" in the use of the mathematical tools introduced in the course. A tutoring course will complement the morning lessons. This has an optional character; on the other hand participation is especially recommended for those students who have some weaknesses in the mathematical preparation coming from the secondary school.
Reccomended or required readings	The following textbook is recommended: V. Villani, G. Gentili, Matematica - Comprendere e interpretare fenomeni delle scienze della vita, Mc Graw-Hill
Assessment methods	Written and oral exam. The written test will be devoted to the resolution of exercises involving applications of the main mathematical tools introduced during the course. The oral exam will be aimed at verifying the comprehension of the basic definitions of the theory and the capacity to illliustrate them by means of concrete examples. Further information (including the thresholds to overcome in order to be admitted to the oral part of the exam) will be made available at the website http://www-dimat.unipv.it/giulio/linkedmaterial/bio/faqbio2018.html

Further information

Further information (regarding in particular the program and the rules for the exam) will be available at the web address: https://elearning.unipv.it/course/view.php?id=148

Sustainable development

goals - Agenda 2030	Goal 3: Good health and well-being.
	[$lbl_legenda_sviluppo_sostenibile](#)

goals - Agenda 2030	Goal 3: Good health and well-being.
	[$lbl_legenda_sviluppo_sostenibile](#)