

[500173] MATHEMATICS (Cognomi A-K)

Part of [\[500173\] - MATHEMATICS](#)

General information

Course	BIOLOGICAL SCIENCES
Course type	First-cycle degree course
Academic year	2023/2024
Year	1
Type of learning activity	Basic
Teaching language	ITALIANO
ECTS	6 ECTS
Teaching activity type	Lecture
Exam type	Combined written and oral exam
Evaluation	Final Grade
Teaching period	1st semester (from 02/10/2023 to 15/01/2024)
Course teachers	RONDI LUCA - Main teacher
Attendance	Not mandatory
Disciplinary settore code	MAT/05
Location	PAVIA - University of Pavia

Lingua insegnamento for the student group

Italian

Required skills for the student group

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 necessary). Essential prerequisites can be considered the following ones: algebraic equations and inequalities of the first and second degree, planar analytic geometry, trigonometry, exponential and logarithmic functions.

The students who experience some lack of basic mathematical notions from the high school are especially invited to follow the "precorsi" and the tutoring classes.

Teaching objectives for the student group

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 presented by using a somehow rigorous mathematical formalism.

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

Course content for the student group

Analytic geometry in the plane: lines, conics. 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 for the student group

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 means 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 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.

Readings for the student group

The following textbook is recommended:

Silvia Annaratone, "Matematica sul campo. Metodi ed esempi per le scienze della vita", Pearson.

Alternatively, also the following text may be taken into consideration:

V. Villani, G. Gentili, Matematica - Comprendere e interpretare fenomeni delle scienze della vita, Mc Graw-Hill

Assessment for the student group

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 illustrate them by means of concrete examples.

Every academic year 6 "regular" exam sessions will be available. Two "extra"-sessions will be available to students who are close to obtaining their degree ("fuori corso" in the italian terminology).

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 kiro course website.

Extra info for the student group

Those students who fulfill the requirements to be included into the university project for innovative teaching may ask for online appointments with the teacher; moreover, they may access the recordings of the 2020-21 lectures.

Further information (regarding in particular the program and the rules for the exam) will be made available at the kiro course website.

2030 Agenda Goals for Sustainable Development for the student group

The course aims to provide the students with the goal 4: high quality education.

