Universitat Autònoma de Barcelona

2017/2018

Mathematics

Code: 100967
ECTS Credits: 9

Degree	Type	Year	Semester
2500253 Biotechnology	FB	1	A

Contact

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Use of languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

Teachers

Enric Nart Viñals
Francesc Perera Domènech
Alex Cebrian Galan

Prerequisites

The student should have achieved the knowledge of Mathematics High School.

Objectives and Contextualisation

This is the first of three courses in mathematics in the Degree in Biotechnology. One aims to provide a prior training on differential equations, which will continue in the course Numerical Methods and later on it will apply to the subjects of the Mention of Biotechnology Processes.

Moreover, the foundations are laid for understanding the Probability and Statistics course.One of the objectives is to ease the required mathematical language for every scientist. One will stand out the interpretation of simple mathematical models of physical, chemical, ecology or genetic phenomena. The student must be able to interpret qualitatively the mathematical functions involved and the results which are derived from calculations.

Content

Basic notions of linear algebra.
- Systems of linear equations and matrices: staggering, matrix operations, inverse, determinant and rank. Geometry of plane and space.
- Vectors Rn: independence, bases, inner product.
- Eigenvectors and eigenvalues of a matrix. Some matrix models.

Calculus of one variable.
- Derivative. Elementary functions.

- The mean value theorem and its consequences. Maxima and minima.
- Taylor's formula.
- Integration and calculation of primitives.

Calculus in several variables and integration.
- Curves in the plane and in space.
- Graphic of a scalar function, curves and level surfaces.
- Partial derivatives, directional derivatives. Gradient and tangent plane.
- Higher order derivatives. Relative maxima and minima of functions of several variables.
- Constrained Extrema. Lagrange multiplier rule.
- Integration in one and several variables. Applications of integral: length of curves, calculation of areas and volumes, the center of mass.

Differential equations.
- Approach and resolution of some type differential equations (linear, first and second order).
- Computer resolution and graphical representation.
- Examples of models with differential equations: radioactive materials, blood glucose levels, epidemic growth models, population growth.
- Systems of differential equations.