Universitat Autònoma de Barcelona

2019/2020

Mathematics

Code: 100872
ECTS Credits: 6

Degree	Type	Year	Semester
2500252 Biochemistry	FB	1	1

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

Jaume Aguadé Bover

Prerequisites

It is recommended that students have knowledge of the following topics

- Rational numbers and real numbers: inequalities, absolute value.
- Elementary functions: linear, polynomial, rational, exponential, logarithmic and trigonometric functions.
- Solution of systems of linear equations.

Objectives and Contextualisation

This course will provide students the basic mathematical concepts and tools required to

model and analyze problems which arise from chemistry, biology and physics.

The purpose of the course is that the student not only assimilate new mathematical knowledge and techniques, but also to be able to apply them to analyze and solve properly models which arise from biosciences.

Competences

- Understand the language and proposals of other specialists.
- Use ICT for communication, information searching, data processing and calculations.
- Use the basics of mathematics, physics and chemistry that are required to understand, develop and evaluate the chemical procedures of living matter.

Learning Outcomes

1. Apply basic calculus tools to obtain information on simple mathematical models of physical, chemical or biological phenomena.
2. Interpret graphs of the functions of a variable and relate it to the formulae.

3. Interpret the formulation of simple mathematical models of physical, chemical or biological phenomena, whether discrete or continuous, described by a function or a differential equation.
4. Make calculations and graphic representations using a symbolic calculus programme.
5. Make simple calculations by hand or using symbolic calculus programmes.
6. Understand the language and proposals of other specialists.
7. Use ICT for communication, information searching, data processing and calculations.
8. Use mathematical language.
9. Use symbolic calculus programmes to make small-scale simulations.

Content

1 Real functions of a real variable.

1.1 Numbers, functions and graphs.

1.2 Elementary functions.

1.3 Limits. Indeterminations and computation of limits.

1.4 Derivatives. Continuous functions. The chain rule, derivatives of elementary functions, implicit functions. Successive derivatives.

1.5 Applications of the derivative: growth intervals and relative extremes.

Concavity and convexity. Graphical representation of a function. Optimization.

1.6 The Riemann integral. The Fundamental Theorem of Calculus.

1.7 Calculation of primitives: integration by parts and change of variables. Primitives of rational functions. Applications of the integral.

1.8 Differential equations, basic notions. First order differential equations: separate variables equations and linear differential equations. Applications to models of problems in chemistry, physics and biology.

2 Linear Algebra

2.1 Linear maps and matrix algebra.

2.2 Eigenvalues and eigenvectors.

2.3 Systems of linear differential equations with constant coefficients. Applications.

Methodology

In the theoretical lectures the teacher will develop the fundamental ideas and concepts of the subject of the course showing several illustrative examples.

Different lists of exercises will be proposed so that the student can practice and learn the contents of each topic. In the problem lectures the teacher will work on the lists of exercises, will solve the doubts of the students and will discuss and solve the exercises.

All the course material will be posted on the Virtual Campus.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Problems	15	0.6	7, 1, 6, 4, 5, 2, 9
Theory	30	1.2	6, 4, 5, 3, 2, 8
Type: Supervised			

Tutorials	10	0.4	7, 1, 4, 5, 3, 2, 8, 9
Type: Autonomous			
Exercises	45	1.8	7, 1, 4, 5, 3, 2, 8, 9
Study	40	1.6	7, 1, 6, 4, 5, 3, 2, 8, 9

Assessment

The course will be evaluated continuously through the following activities:

- one mid-term exam, whose score is denoted by MT
- a problem session, whose score is denoted by PS
- a final exam, whose score is denoted by FE

If FE is greater than or equal to 3, the score by continuous assessment, N1, will be obtained from

N1 = 0.50 FE + 0.30 MT + 0.20 PS

If N1 is greater than or equal to 5, the final score is N1. Otherwise the student may attend a recovery exam if the following requirements are satisfied.

To participate in the recovery, the students must have previously been evaluated in a set of activities whose weight equals to a minimum of two thirds of the total grade of the subject or module. Therefore, students will obtain the «Non evaluable» qualification when the assessment activities carried out have a weighting of less than 67% in the final grade.

If R denotes the score of the recovery exam, then the final grade is

N2= 0.80 R + 0.20 PS

We remark that the score of the session problem, PS, can not be recovered.

The repeating students will have to do the same assessment activities as new entry students.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Final exam	50%	3	0.12	1, 6, 5, 3, 2, 8
Mid-term exam	30%	2	0.08	1, 5, 2, 8
Problem session	20%	2	0.08	7, 1, 6, 4, 3, 9
Recovery Exam	80%	3	0.12	1, 6, 5, 3, 2, 8

Bibliography

"Introduction to Mathematics for Life Scientists", E. Batschelet, Springer, 1979.

"Cálculo con Geometria Analítica", E. W. Swokowski, G. E. Iberoamérica, México, 1989.

"Differential Equations and Their Applications", M. Braun, Springer, 1983.

"Linear Algebra and its Applications", David C. Lay, Pearson, 2017.