Universitat Autònoma de Barcelona

2019/2020

Calculus

Code: 103809
ECTS Credits: 6

Degree	Type	Year	Semester
2500897 Chemical Engineering	FB	1	2

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

Artur Nicolau Nos

Prerequisites

No official prerequisite is needed to follow the course. In spite of this, if the person has long studied Mathematics at the Baccalaureate or worse did not do the scientific Bachelor, and then it would be very convenient for a study of the first and second year Baccalaureate mathematics books. Everything that the students can learn and review will be very useful for them. If once the first evaluations are made, the student discovers that he (o her) has prev mathematical difficulties, then he must do his best to correct them. Serious errors in the most elementary algebra are hardly remedied at the university level.

Objectives and Contextualisation

1. To be able to use fluidly the language of Infinitesimal Calculus

2. Achieve the theoretical knowledge of the Calcul

3. Know how to apply the methods of Infinitesimal Calculus to problems of Science and Technology

Competences

- Apply relevant knowledge of the basic sciences, such as mathematics, chemistry, physics and biology, and the principles of economics, biochemistry, statistics and material science, to comprehend, describe and resolve typical chemical engineering problems.
- Develop personal work habits.

Learning Outcomes

1. Apply the basic concepts of algebra to problem solving.
2. Apply the methods and basic concepts of differential and integral calculus of a variable to the description and calculation of magnitudes.
3. Critically evaluate the work done.
4. Work autonomously.

Content

The program of the course is as follows:

1. Differential Calculus of one real variable.

1.1 Real numbers. Absolute value. Inequations.

1.2 Concept of function. Composition of functions. Inverse function. Review of functions of real variable

(polynomials, exponentials, logarithms, trigonometrics, etc.)

1.3 Limits of functions. Continuity and discontinuities. Theorem of Bolzano.

1.4 Concept of derivative. Algebraic properties. Chain's rule.

1.5 The number e. Derivate of the inverse function. Derivates of the exponential functions and logarithms.

Logarithmic derivative. Derivate of the trigonometric functions and their inverses.

1.6 Rolle's theorem of Rolle and the mean value Theorem. Increasing and decreasing of functions.

Relative extrems The Bernouilli-l'Hôspital theorem. Newton's method of approximation to solutions of equations.

1.7 Convexity and concavity. Graphical representation of functions.

1.8 Derivatives of higher order. Taylor's formula with Lagrange's residue.

2. Integral Calculus of funtion of a real variable

2.1 Integral defined. Basic properties.

2.2 Fundamental theorems of the integral calculus.

2.3 Integration techniques. Integration of elementary functions.

2.4 Applications of the integral calculus in the calculation of areas, volumes, lengths, centers of masses, etc.

Methodology

The methodology is to be used is the usual Mathematics courses. Theory classes where the results and relevant examples are discussed and problem classes were some of the model problems are shown. Seminar classes are also
given where students have to work autonomously in the classroom, with the help of the teacher and other colleagues. The teaching plan assigns one hour per week for problem class, therefore the essential part of the learning must
be done by the student autonomously. The subject will have a space in the Aula Moodle in the platform of the Virtual Campus used by the UAB, in which the student will find all the material of help of the course. For example, it will be useful to find exams from
other years, notes from some parts of the course, seminars or exams resolved. This will be the usual channel for the communication between teachers and students.

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Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Classes of theory	30	1.2	2, 3
Solving problem class	15	0.6	2, 4
Type: Supervised			

Seminars	5	0.2	3, 4
Type: Autonomous			
Preparation of the examinations	20	0.8	3, 4
Solving problems	30	1.2	2, 3, 4
Study of the basic concepts of Calculus	39	1.56	2, 4

Assessment

An evaluation test will be made (the date is not already fixed, but it will be at the beginning of April) in which the students will have to solve exercises similar to those that have been worked in the classes. From this avaluation, the student will obtain a P1 score over 10 points. At the end of the course there will be a written test (at the beginning of June, date to be fixed for the coordination). This test covers the overall content of the subject, but paying more attention to the agenda not covered by the April test. The questions and exercises will be in the same style and difficulty as those proposed in the lists of problems of classe. The student will get a P2 score over 10 points. Four seminars will be evaluated, from the five seminars planned. In the evaluable seminars the students will work in pairs. The teacher of each group of seminar will correct these seminars and each one of them will receive a score S1, S2, S3, S4 also between 0 and 10, the score of the seminars is individual even if they are done in pairs and the students also have the possibility to do it (if ithey want) individually.

The course note is obtained by the formula:

$$Q = 0.07 \cdot S1 + 0.08 \cdot S2 + 0.07 \cdot S3 + 0.08 \cdot S4 + 0.30 \cdot P1 + 0.40 \cdot P2.$$

If Q is greater than or equal to 5, the subject is approved. Otherwise, or if you want to upload a note, there will be the possibility to do another global exam (also date to be fixed for the coordination) that will obtain a note R. The note of the second call will be calculated with the formula:

$$Q' = 0.07 \cdot S1 + 0.08 \cdot S2 + 0.07 \cdot S3 + 0.08 \cdot S4 + \text{maximum}\{0.30 \cdot P1 + 0.40 \cdot P2, 0.7R\}.$$

Note that the scores obtained in the seminars are not recoverable, then it means that the assistance andobtaining good punctuation helps a lot to overcome the subject. A single session of all the seminars will be programmed for all those people, who for justified reasons, have not been able to attend a session. The justified causes must be documented and it will be the decision of the theory professor to accept the cause. If, in the application of the evaluation regulations, doubtful cases are presented, these will be studied individually. The qualification may be rounded by the fact that student has made assistance in the majority of all classes.

In the case of going up to note, the highest rating will always be maintain of not having P1 score, neither P2 nor R the student will have a "non-evaluable". Otherwise the qualification Q 'will be put in the Sigma program.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Partial examination of the content of first semester	30	3	0.12	1, 2, 3, 4
Partial examination of the content of second semester	40	4	0.16	1, 2, 3, 4
Seminar examinations	30	4	0.16	2, 3, 4

Bibliography

- Cálculo con geometría analítica, E.W. Swokowski, 2ª edición, Grupo Editorial Iberoamèrica, 1988.

- Cálculo de una y varias variables; S.L. Salas - E.Hille; Ed. Reverte, 1994.

- Introducción al Análisis Matemático de una variable, R. Bartle - D. Sherbert;
Ed. Limusa, 1996.

-Calculus Third Edition, M.Spivak, Cambridge University Press, 2006

All these books and many others similars can be found at the Library of Science o Bioscinece. It is recommended

that you visit this library and make regular use of its funds.