Universitat Autònoma de Barcelona

2019/2020

Calculus II

Code: 100142
ECTS Credits: 6

Degree	Type	Year	Semester
2500097 Physics	FB	1	2

Contact

Name: Francisco Javier Bafaluy Bafaluy
Email: Javier.Bafaluy@uab.cat

Use of Languages

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

Teachers

Axel Masó Puigdellosas
Juan Manuel Apio Laguia

Prerequisites

There are no prerequisites. Nevertheless, in the development of the subject it is assumed that the contents of *Càlcul I* have been assimilated.

Objectives and Contextualisation

This course is the natural continuation of *Càlcul I*. It develops the basic tools of calculus with a real variable and focuses on integration, numerical series and functional series. A first introduction to complex functions is also included.

Competences

- Develop critical thinking and reasoning and know how to communicate effectively both in the first language(s) and others
- Develop independent learning strategies
- Develop strategies for analysis, synthesis and communication that allow the concepts of physics to be transmitted in educational and dissemination-based contexts
- Respect the diversity and plurality of ideas, people and situations
- Use critical reasoning, show analytical skills, correctly use technical language and develop logical arguments
- Use mathematics to describe the physical world, selecting appropriate tools, building appropriate models, interpreting and comparing results critically with experimentation and observation

Learning Outcomes

1. Argue with logical rigor.
2. Break down a periodic function into Fourier series.
3. Calculate integrals analytically.
4. Determine the convergence of improper integrals.
5. Determine the convergence of numerical series.
6. Determine the radius of convergence for a power series.
7. Develop critical thinking and reasoning and communicate ideas effectively, both in the mother tongue and in other languages.
8. Develop independent learning strategies.
9. Express definitions and theorems rigorously.
10. Respect diversity in ideas, people and situations.
11. Transmit orally and in writing, in a clear manner, the logical-mathematical reasoning that leads to problem resolution.
12. Use critical reasoning, show analytical skills, correctly use technical language and develop logical arguments

Content

0. The field of the complex numbers

1. Riemann's Integral

The problem of the area under a curve. Riemann Integrability. The integral as a limit of Riemann sums. Fundamental theorem of calculus. Partial Integration. Change of variable.

2. Improper Integrales

Improper integral of a locally integrable function. Improper integrals of non-negative functions. Euler's Gamma function. Cauchy's principal value. Introduction to the Laplace Transform.

3. Number Series

Series of real numbers. General criterion of convergence. Absolute and conditional convergence. Absolute convergence criteria. Other convergence criteria.

4. Sequences and Series of functions

Sequences of functions. Pointwise and uniform convergence. Series of functions. Power series. Taylor series. Fourier series and an introduction to the Fourier Transform.

Methodology

Theorety classes: exposition of the theoretical body of the subject.

Practical classes: exposition of the resolution of some problems from the list previously delivered to the students and some guidance for the resolution of the rest.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Practical classes	21	0.84	
Theory classes	29	1.16	

Type: Autonomous		
Personal study	40	1.6
Problem solving	50	2

Assessment

Take-home exercices (15% of the final grade): a problem will be proposed at the end of each chapter that has to be solved individually and delivered within the established term. Their qualification can not be improved in the re-evaluation.

Short theory questions (15% of the final grade): they will be performed at the end of each chapter. Their qualification can not be improved in the re-evaluation.

First and second term tests (35% + 35% of the final grade): will be taken at the middle and at the end of the semester respectively. Each one accounts for 35% of the final grade.

Re-evaluation: allows to improve the grade obtained in the term tests (70% of the final grade). It is possible to improve both or only one of the terms but in order to be eligible for re-evaluation it is mandatory to at least have taken the two terms.

Non assessable: the student who has not carried out evaluation activities accounting for 50% of the final grade will be rated as non-assessable.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
First term test	35%	3	0.12	1, 3, 7, 4, 9, 12, 11
Re-evaluation	70%	3	0.12	1, 3, 2, 7, 6, 4, 5, 9, 12, 11
Second term test	35%	3	0.12	1, 2, 7, 6, 5, 9, 12, 11
Short theory questions	15%	1	0.04	1, 8, 7, 9, 12, 11
Take-home exercices	15%	0	0	3, 2, 8, 7, 6, 4, 5, 12, 10, 11

Bibliography

Theory:

- A. Méndez, *Càlcul en una variable real*, class notes available in Campus Virtual de la asignatura
- J. Rogawski, *Cálculo* vol 1, Reverté
- J.M. Ortega, *Introducció a l'anàlisi matemàtica*, Manuals de la UAB
- R.G. Bartle y D.R. Sherbert, *Introducción al análisis matemático de una variable,* Limusa
- M. Spivak, *Calculus*, Reverté

Problems (books containing solved exercices):

- F. Aryes y E. Mendelson, *Cálculo diferencial e integral,* McGraw-Hill (Schaum's)
- B.P Demidovich, *5000 problemas de análisis matemático*, Paraninfo