Guía docente
240721 - 240721 - Cálculo II

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Unidad responsable: Escuela Técnica Superior de Ingeniería Industrial de Barcelona
Unidad que imparte: 749 - MAT - Departamento de Matemáticas.

Titulación: GRADO EN TECNOLOGÍAS INDUSTRIALES Y ANÁLISIS ECONÓMICO (Plan 2018). (Asignatura obligatoria).

Curso: 2026 **Créditos ECTS:** 6.0 **Idiomas:** Inglés

PROFESORADO

Profesorado responsable: Roldán González, Pablo

Otros: Roldán González, Pablo

METODOLOGÍAS DOCENTES

The most conceptual contents of the course will be introduced in class, as well as basic examples in relation to these contents. In addition to some proofs (few), the emphasis will be put on making the student to understand the "What" and the "Why" of these concepts. The chosen examples will rely on a most "practical" formulation to help the student to see all these mathematical concepts as natural in problems that are easy to understand.

OBJETIVOS DE APRENDIZAJE DE LA ASIGNATURA

The main goal of the course is that the student reaches a sufficient solvency in the use of the tools of the differential calculus and the vector calculus. In particular, of the derivation and the integration in several variables, and the calculus with curves and surfaces. Likewise, the aim of the subject is that this solvency is not only manifested in the conceptual understanding of the contents and in the ability to identify which methods are suitable for each of the Problems treated, but also in the acquisition of a certain "fluidity" of calculus and in a good understanding of the i nteraction between these theoretical contents and the mathematical modeling of the problems of Science and Technology.

HORAS TOTALES DE DEDICACIÓN DEL ESTUDIANTADO

Tipo	Horas	Porcentaje
Horas grupo grande	60,0	40.00
Horas aprendizaje autónomo	90,0	60.00

Dedicación total: 150 h

CONTENIDOS

1.- Continuity and derivability of functions of several variables

Descripción:
Domain. Limit. Continuity. Derivability. Chain Rule. Taylor expansion. Inverse and Implicit Function Theorems. Extreme values.

Dedicación: 55h
Grupo grande/Teoría: 22h
Aprendizaje autónomo: 33h

2.- Integration of functions of several variables

Descripción:
The Riemann integral. Integral calculus. The Cavalieri principle. The Fubini theorem. Changes of variable. Areas and volumes. Approximate integration. Applications of the integral. Center of mass. Moment of inertia.

Dedicación: 35h
Grupo grande/Teoría: 14h
Aprendizaje autónomo: 21h

3. Vector Calculus

Descripción:
Integral of functions and vector fields on curves and surfaces. Theorems of Green, Stokes and Gauss. Extreme values and method of Lagrange Multipliers

Dedicación: 45h
Grupo grande/Teoría: 18h
Aprendizaje autónomo: 27h

4. Numerical calculus: optimization

Descripción:
Linear optimization, the simplex method. Nonlinear optimization problems. Unconstrained and Constrained optimization, Overdertmined nonlinear systems

Dedicación: 15h
Grupo grande/Teoría: 6h
Aprendizaje autónomo: 9h

SISTEMA DE CALIFICACIÓN

Cualquier acto de fraude académico, plagio o uso o mera tenencia al alcance de medios no autorizados en cualquier actividad de evaluación comportará la calificación de cero (0) en la prueba o entrega afectada. Además, de acuerdo con la normativa de la Universidad, la posible derivación de los hechos para la apertura de un expediente disciplinario implicará que la asignatura quede en el estado provisional de "pendiente de evaluación" hasta la resolución del expediente. La gestión de estas incidencias se lleva a cabo de acuerdo con el **Marco de actuación para la integridad académica en la evaluación de la UPC**.

During the semester there will be two evaluations:
- One midterm exam (ME), on the date determined by the School.
- The final exam (FE), on the date determined by the School.

Exams will contain a mixture of computational and conceptual problems. Some of them will resemble problems from the list, while some will be brand new to you. The final exam is likely to be a mixture of multiple choice and free response problems.

The final mark (FM) will be computed according to this formula:
FM = max(0.5*FE + 0.5*ME, 0.8*FE + 0.2*ME)

The maximum re-evaluation exam (RE) grade will be 7. The part corresponding to the Midterm Exam will not be re-evaluated. Therefore, for those students that take the re-evaluation exam, the final mark will be computed according to this formula:
FM = max(0.5*FE + 0.5*ME, 0.8*FE + 0.2*ME, 0.8*min(RE,7.0) + 0.2*ME)

NORMAS PARA LA REALIZACIÓN DE LAS PRUEBAS.

The students can bring a manuscript sheet DINA4 with formulas for the exams. Calculator is not allowed.

BIBLIOGRAFÍA

Básica:

- Compta, Albert; Bonet, Carles; Consul, Neus; Ollé Torner, Mercè; Roig, Agustí; Pascual Gainza, Pere. Càlcul integral per a enginyers [Recurs electrònic] [en línea]. Barcelona: Universitat Politècnica de Catalunya, 2002 [Consulta: 18/03/2026]. Disponible a: https://upcommons.upc.edu/entities/publication/c90b7e34-57b4-465d-a1f4-6698140ec4e1. ISBN 9788498800302.
- Marsden, Jerrold E; Tromba, Anthony. Vector calculus. 6th ed., International ed. New York: W.H. Freeman, cop. 2012. ISBN 9781429224048.

Complementaria:

- Dahlquist, Germund ; Björck, Ake. Numerical methods [en línea]. Mineola: Dover, cop. 2003 [Consulta: 30/06/2025]. Disponible a: https://ebookcentral.proquest.com/lib/upcatalunya-ebooks/detail.action?docID=1894363. ISBN 0486428079.
- Stewart, James; Clegg, Daniel; Watson, Saleem. Calculus : early transcendentals. 9th ed. Boston: Cengage, 2021. ISBN 9780357113516.
- Quarteroni, A.; Saleri, F.; Gervasio, P. Scientific computing with MATLAB and Octave [en línea]. 4th ed. Heidelberg: Springer, 2014 [Consulta: 07/09/2022]. Disponible a: https://link-springer-com.recursos.biblioteca.upc.edu/book/10.1007/978-3-642-12430-3. ISBN 9783642453663.
- Sydsæter, K.; Berck, P.; Strøm, A. Economists' mathematical manual [en línea]. 4a ed. Berlin, Heidelberg: Springer Berlin Heidelberg, 2005 [Consulta: 24/11/2025]. Disponible a: https://link-springer-com.recursos.biblioteca.upc.edu/book/10.1007/978-3-540-28518-2. ISBN 3540285180.
- Lipsman, Ronald L. ; Jonathan M. Rosenberg. Multivariable calculus with MATLAB : witch applications to geometry and physics [en línea]. 1st ed. Cham: Springer, 2017 [Consulta: 14/10/2026]. Disponible a: https://link-springer-com.recursos.biblioteca.upc.edu/book/10.1007/978-3-319-65070-8. ISBN 331965070X.