26908 - Differential Calculus

Información del Plan Docente

Academic Year	2017/18
Faculty / School	100 - Facultad de Ciencias
Degree	447 - Degree in Physics
ECTS	6.0
Year	1
Semester	Second semester
Subject Type	Basic Education
Module	---

1.General information

1.1.Introduction

1.2.Recommendations to take this course

1.3.Context and importance of this course in the degree

1.4.Activities and key dates

2.Learning goals

2.1.Learning goals

1. Ability to determine existence of the limit of a sequence in metric space, and to compute it when pertinent
2. Ability to discuss continuity and differentiability of functions. Computing of deriva- tives
3. Computing of Taylor series of functions and ability to discuss their eventual con- vergence
4. Computing of gradients, divergences, curls and Laplacians of fields in different co- ordinate systems
5. Application of constrained extrema theory to concrete problems

2.2.Importance of learning goals

3.Aims of the course and competences

3.1.Aims of the course

3.2.Competences

4.Assessment (1st and 2nd call)

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4.1.Assessment tasks (description of tasks, marking system and assessment criteria)

5.Methodology, learning tasks, syllabus and resources

5.1.Methodological overview

Theory lectures: three hours a week, in three lessons, to expound the fundamentals of the subject matter.

In our experience (as students and as professors), most people do not follow all the details of a lecture in real time. When one goes to a lecture, one should expect to witness the big picture of what is going on. One should pay attention to the lecturer's advice on what is important and what is not. Lecturers spend a long time thinking on how to deliver a presentation of an immense amount of material; they do not expect students to follow every step, but they do expect them to go home and fill in the gaps in their understanding. Not attending lectures really hurt their chances of a deep understanding of the material. Thus we expect students to attend every lecture, even if there is no formal obligation to do so: it is well nigh impossible to succeed in this course without attending lessons.

Practical lectures: one hour a week of work by the students, under the tutelage of attending professors. This alternates with sessions in which the students expose their own works.

5.2.Learning tasks

5.3.Syllabus

1. Metric spaces. Open and closed balls
2. Sequences in metric spaces
3. Limits and continuity for functions of several variables
4. Differential. Directional and partial derivatives. Changes of variables. The chain rule. Other differentiation properties
5. The inverse function theorem. The implicit function theorem
6. Taylor series in several variables
7. Scalar and vector fields
8. Vector calculus and its fundamental identities
9. Systems of curvilinear coordinates (cylindrical, spherical. . .)
10. Problems of constrained extrema
11. The Legendre transform

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5.4.Course planning and calendar

February - May, no more than 45 hours/student each semester, in practice, for lessons, and 14 hours/student each semester for practical lectures, with periodic delivery of home- work.

Course schedules as decided by the Dean's office.
Examination schedules as decided by the Dean's office.
Two most helpful texts, among the many extant ones, are included in the reference list.

5.5.Bibliography and recommended resources

- BB Apostol, Tom M.. Calculus. Vol.2, Cálculo con funciones de varias variables y álgebra lineal, con aplicaciones a las ecuaciones diferenciales y a las probabilidades / Tom M. Apostol. - 2ª ed., 7ª reimp. Barcelona, [etc.] : Reverté, D.L. 2002
- BB Marsden, Jerrold E.. Cálculo vectorial / Jerrold E. Marsden, Anthony J. Tromba ; Versión en español Javier Páez Cárdenas ; Colaboración técnica Purificación González Sancho . - 4a. ed México [etc.] : Addison-Wesley Longman, 1998