

26908 - Differential Calculus

Información del Plan Docente

Academic Year	2016/17
Academic center	100 - Facultad de Ciencias
Degree	447 - Degree in Physics
ECTS	6.0
Course	1
Period	Second semester
Subject Type	Basic Education
Module	---

1.Basic info

1.1.Recommendations to take this course

1.2.Activities and key dates for the course

2.Initiation

2.1.Learning outcomes that define the subject

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 derivatives
3. Computing of Taylor series of functions and ability to discuss their eventual convergence
4. Computing of gradients, divergences, curls and Laplacians of fields in different coordinate systems
5. Application of constrained extrema theory to concrete problems

2.2.Introduction

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

5.Activities and resources

5.1.General methodological presentation

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 activities

5.3.Program

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

5.4.Planning and scheduling

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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

[1] T. M. Apostol, Calculus II , Wiley and Sons, New York, 1969.

[2] J. E. Marsden and A. J. Tromba, Calculo Vectorial , Addison Wesley, Mexico, 1998.