26908 - Differential Calculus

Información del Plan Docente

Academic Year	2018/19
Subject	26908 - Differential Calculus
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.Aims of the course

1.2.Context and importance of this course in the degree

1.3.Recommendations to take this course

2.Learning goals

2.1.Competences

2.2.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

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

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

4.Methodology, learning tasks, syllabus and resources

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4.1.Methodological overview

The methodology followed in this course is oriented towards achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as lectures and practice sessions, among others.

4.2.Learning tasks

This 6 ECTS course includes the following learning tasks:

- Lectures (45 hours): Three weekly sessions of one hour each, to explain the main concepts of the subject matter. In our experience, most people do not follow all the details of a lecture in real time. In a lecture, we expect to witness the big picture of what is going on. The student should pay attention to the lecture's advice on what is important and what is not. Lectures 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 do some autonomous work and study. Not attending lectures really spoil 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 since it is highly difficult to succeed in this course without attending these sessions.
- Practice sessions (14 hours): One-hour of weekly sessions in which students work under the supervision of professors. This alternates with sessions in which the students espose their own works. Periodic submission of homework.

4.3.Syllabus

The course will address the following topics:

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

4.4.Course planning and calendar

The course runs from February to May. No more than 45 hours for lectures, and 14 hours of practice sessions.

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the Faculty of Science website.

4.5.Bibliography and recommended resources