240022 - Calculus II

Coordinating unit: 240 - ETSEIB - Barcelona School of Industrial Engineering
Teaching unit: 749 - MAT - Department of Mathematics
Academic year: 2017
Degree: BACHELOR'S DEGREE IN MATERIALS ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)
ECTS credits: 6

Teaching languages: Catalan, Spanish

Coordinator: JUAN RAMÓN PACHA

Degree competences to which the subject contributes

Specific:
1. Capacity to solve mathematical problems that can appear in engineering. Aptitude to apply knowledge about: linear algebra; geometry; differential geometry; differential and integral calculus; differential equations and derived partial equations; numerical methods; numerical algorithm; statistics and optimisation.

Teaching methodology

In the theory sessions, the module’s more conceptual contents will be introduced as well as basic examples related to these contents. In addition to some demonstrations (few), students will be helped to understand the core of these concepts. For this reason these examples will generally have a formulation as “practical” as possible to help students see these concepts as natural in understandable problems.

In problems sessions, the practical contents of the module will develop. On one hand elaborated examples, related to basic concepts seen in theory sessions, will be presented. On the other hand more practical calculus methods and tools, related to the different contents introduced in theory sessions, will be introduced. Problems will be carried out mainly by the professor, although students' participation will be encouraged. To do this, students must first of all prepare in problems for the upcoming sessions. Seconds, it is intended that some of these problems are solved by students individually or in a group, during the lecture development and under supervision of the problems sessions professor.

It is intended that the problems' collections are extensive enough to provide the student with enough material to autonomously complete the learning process. In addition students will be oriented on the best problems for its learning process.

Learning objectives of the subject

This subject's main objective is to provide the student with a sufficient solvency when using calculus tools with several variables as well as Laplace transform and Fourier series. Likewise, it is an objective that this solvency is not only manifested in the contents conceptual comprehension and in the ability to identify which tools are appropriate in each of the problems, but also in acquiring a certain calculus “fluency” and a good comprehension of the interaction of these theoretic concepts and the mathematical modelling of science and technology problems.

Specific skills: ability to address the mathematical problems that arise in the engineering. Ability to apply their knowledge on: Linear Algebra, Geometry, Differential and Integral Calculus, etc.
Content

1.- Continuity and derivatives of functions with several variables

Description:

2.- Integration functions with several variables

Description:

3.- Laplace transform and Fourier's series.

Description:
Introduction. Laplace transform. Fourier's series. Applications
Qualification system

The evaluation consists in the following activities:
- A partial exam in the middle of the semester (EP1) in the timetable set by the School for its realization.
- A partial exam in the second part of the course (EP2) on the date the School establishes for the final exam.
- A short test (“control” C1) to be developed in the classes of problems or in the timetable set for its realization.

The final mark (NF) is:

\[ \text{NF} = 0.35 \times \text{EP1} + 0.5 \times \text{EP2} + 0.15 \times \text{C1}. \]

The re-evaluation consists in the following activity:
- An exam where all the programme of the course will be assessed (ER) on the date the School establishes for its realization.

The final mark taking into account the exam where all the programme of the course will be assessed (NR) is:

\[ \text{NR} = \text{ER}. \]

Regulations for carrying out activities

The evaluations could be done with the help of material support (a handwritten formulary); with the exception of the test C1, where the professor in charge to each group will decide discretionally the permitted examination support materials.

Bibliography

Basic:

Complementary:

Others resources:
- Students will be able to access a subject's website and a subject's Intranet in which all the necessary material considered suitable for autonomous learning will be uploaded.