Course guide
230083 - CAVEC - Vector Calculus

Unit in charge: Barcelona School of Telecommunications Engineering
Teaching unit: 749 - MAT - Department of Mathematics.
Degree: BACHELOR’S DEGREE IN TELECOMMUNICATIONS TECHNOLOGIES AND SERVICES ENGINEERING (Syllabus 2015). (Compulsory subject).
Academic year: 2022 ECTS Credits: 6.0 Languages: Catalan, Spanish, English

LECTURER
Coordinating lecturer: Consultar aquí / See here: https://telecos.upc.edu/ca/estudis/curs-actual/professorat-responsables-coordinadors/responsables-assignatura
Others: Consultar aquí / See here: https://telecos.upc.edu/ca/estudis/curs-actual/professorat-responsables-coordinadors/professorat-assignat-idioma

PRIOR SKILLS
Linear algebra and differential and integral calculus on one variable

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES
Generical:
12 CPE N1. They will be able to identify, formulate and solve engineering problems in the ICC field and will know how to develop a method for analysing and solving problems that is systematic, critical and creative.

TEACHING METHODOLOGY

LEARNING OBJECTIVES OF THE SUBJECT
To begin with, the concepts introduced in Càlcul 1 about functions of one real variable are generalized to several variables. Specifically, differential and integral calculus and their applications as, for example, optimization problems.

The basic concepts of differential geometry of curves and surfaces, in the plane and in the space, are introduced with the aim to study the fundamental theorems of vector calculus: Stokes' theorem and divergence theorem, which are fundamental to the study of electromagnetic fields.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self study</td>
<td>85,0</td>
<td>56.67</td>
</tr>
<tr>
<td>Hours large group</td>
<td>65,0</td>
<td>43.33</td>
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</tbody>
</table>

Total learning time: 150 h
## CONTENTS

### Euclidean space

**Description:**

**Full-or-part-time:** 16h  
Theory classes: 7h  
Self study: 9h

### Functions of several variables

**Description:**
Scalar and vector functions. Graph and level sets. Composition of functions. Limits and continuity. Continuous functions on compact sets and on arc-connected sets.

**Full-or-part-time:** 14h  
Theory classes: 6h  
Self study: 8h

### Differentiation of functions of several variables

**Description:**

**Full-or-part-time:** 35h  
Theory classes: 15h  
Self study: 20h

### Curves and surfaces

**Description:**

**Full-or-part-time:** 24h  
Theory classes: 10h  
Self study: 14h

### Multiple integration

**Description:**

**Full-or-part-time:** 24h  
Theory classes: 10h  
Self study: 14h
Line and surface integrals

Description:

Full-or-part-time: 35h
Theory classes: 15h
Self study: 20h

GRADING SYSTEM

Evaluation: continuous, along the term, with a 40% weight, and a final test, with a 60% weight.

BIBLIOGRAPHY

Basic:

Complementary:

RESOURCES

Other resources:
Lecture notes and slides, collected exercises, solutions to exercises and exams