Course guides
820008 - ACM - Algebra and Multivariable Calculus

Unit in charge: Barcelona East School of Engineering
Teaching unit: 749 - MAT - Department of Mathematics.

Degree:
BACHELOR’S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Compulsary subject).
BACHELOR’S DEGREE IN MATERIALS ENGINEERING (Syllabus 2010). (Compulsory subject).
BACHELOR’S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Compulsory subject).
BACHELOR’S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Compulsory subject).
BACHELOR’S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Compulsory subject).
BACHELOR’S DEGREE IN BIOMEDICAL ENGINEERING (Syllabus 2009). (Compulsory subject).
BACHELOR’S DEGREE IN ENERGY ENGINEERING (Syllabus 2009). (Compulsory subject).

Academic year: 2020  ECTS Credits: 6.0  Languages: Catalan, English, Spanish

LECTURER

Coordinating lecturer: FAYÇAL IKHOUANE EL MOUSTACHIR - MARGARIDA MITJANA RIERA

Others: Primer quadrimestre:

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. Solve mathematical problems that may arise in engineering. Apply knowledge of linear algebra; geometry; differential geometry; differential and integral calculus; differential equations and partial differential equations; numerical methods; numerical algorithms; statistics and optimisation.

Transversal:
3. SELF-DIRECTED LEARNING - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.

TEACHING METHODOLOGY

Teaching methodology is a combination of lectures in the classroom and homeworks, along with a midterm and a final exam. Because of the situation occasioned by the pandemic, each student has to do an individual part that consists of self studying the notes and short videos of each of the subjects. The presential lectures will be devoted to solving problems and questions.

LEARNING OBJECTIVES OF THE SUBJECT

To present the fundamental concepts of differential and integral calculus of several variables, and linear algebra. To develop the ability to applying them to engineering problems.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>60,0</td>
<td>40.00</td>
</tr>
<tr>
<td>Self study</td>
<td>90,0</td>
<td>60.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h
## (ENG) Linear algebra and geometry

**Description:**

**Specific objectives:**
Identify and characterize vector spaces and subspaces, and manipulate vectors. Identify diagonalizable endomorphisms.

**Full-or-part-time:** 40h  
Theory classes: 16h  
Self study: 24h

## (ENG) Functions of several variables

**Description:**

**Specific objectives:**
Study of functions of several variables with emphasis on the concepts and methods of differential calculus of several variables.

**Full-or-part-time:** 30h  
Theory classes: 12h  
Self study: 18h

## (ENG) -Extrema of real functions of several variable

**Description:**
Local and global extrema. Test for local extrema. Constrained extrema. Lagrange multiplier method.

**Specific objectives:**
To acquire the basic tools for analyzing extrema problems, both free and constrained extrema problems.

**Full-or-part-time:** 15h  
Theory classes: 6h  
Self study: 9h

## (ENG) -Multiple integration and applications

**Description:**

**Specific objectives:**
Ability for solving problems of multiple integration and its application to problems of science and engineering.

**Full-or-part-time:** 30h  
Theory classes: 12h  
Self study: 18h
**Differential geometry and field theory**

**Description:**

**Specific objectives:**
Ability to provide analytical descriptions of curves and surfaces, calculate their properties and perform differential and integral calculus operations on them. Applications in field theory.

**Full-or-part-time:** 35h
Theory classes: 14h
Self study : 21h

**GRADING SYSTEM**

The grading will be carried out by means of the assessment by the teacher. The students should pass the subject with the continuous assessment based on the controls and the realization of exercises that will be common for all students.

Examens:
- Exam 1 (25%) (Test plus a problem)
- Exam 2 (17%) (Test plus a problem)
- Exam 3 (23%) (Test plus a problem)
- Exam 4 (35%) (Test plus two problems)
The subject DOES NOT HAVE a resit test.


**EXAMINATION RULES.**

During the exams, the use of calculators, mobiles, PC's or tablets is not allowed, except for Exam 2. For the remaining exams, the students will be provided with a form that will be the only material that can be used during exams.

**BIBLIOGRAPHY**

**Basic:**

**Complementary:**
- Castellet, M.; Llerena, I. Álgebra lineal i geometria [on line]. Bellaterra: Universitat Autònoma de Barcelona. Servei de Publicacions,