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

Academic year: 2022
ECTS Credits: 6.0
Languages: Catalan, Spanish, English

LECTURER

Coordinating lecturer: FAYÇAL IKHOUANE EL MOUSTACHIR - MARGARIDA MITJANA RIERA

Others:

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>
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<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>
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Total learning time: 150 h
CONTENTS

(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
(ENG) 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 exams that are common for all students. There are three exams
- A partial exam (PE) (45%) approximately at week 11
- An exam to assess the generic competence (GC) (10%) approximately in week 8
- Final exam (FE) (45%)

According to the general evaluation regulations, in case the final grade \( FG = PE \times 0.45 + GC \times 0.1 + FE \times 0.45 \) is lower than 5, there is a Resit test (RT). This exam assesses the entire course except the generic competence. Only students with an \( PE \times 0.45 + FE \times 0.45 \) grade above or equal to 2.7 may apply.
In this case the final grade is \( \min(\max (RT \times 0.9 + GC \times 0.1, FG), 5) \).
It is recommended to consult the general evaluation regulations of the EEBE.

EXAMINATION RULES.

All exams are face-to-face

BIBLIOGRAPHY

Basic:

Complementary:
- Castellet, M.; Llerena, I. Álgebra lineal i geometria [on line]. Bellaterra: Universitat Autònoma de Barcelona. Servei de Publicacions, 1991 [Consultation: 15/05/2020]. Available on: