820008 - ACM - Algebra and Multivariable Calculus

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering
Teaching unit: 749 - MAT - Department of Mathematics
Academic year: 2019
Degree: BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN BIOMEDICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN ENERGY ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN MATERIALS ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)
ECTS credits: 6
Teaching languages: Catalan, Spanish, English

Teaching staff
Coordinator: FAYÇAL IKHOUANE EL MOUSTACHIR - MARGARIDA MITJANA RIERA
Others:
Primer quadrimestre:
ANGELES CARMONA MEJIAS - M30
FAYÇAL IKHOUANE EL MOUSTACHIR - T10, T20
MARGARIDA MITJANA RIERA - M10
JUAN TRIAS PAIRO - M20

Segon quadrimestre:
ANGELES CARMONA MEJIAS - M20
FAYÇAL IKHOUANE EL MOUSTACHIR - T10, T20
PERE LOPEZ BROSAS - T40
ALBERT MAS BLESAS - M30
MARGARIDA MITJANA RIERA - M10, M40
JUAN TRIAS PAIRO - M50, M60, T30

Opening hours
Timetable: Each teacher will determine the timetable when the course start.

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.
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Teaching methodology

Teaching methodology is a combination of lectures in the classroom and homeworks, along with a midterm and a final exam.

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>Total learning time: 150h</th>
<th>Hours large group:</th>
<th>60h</th>
<th>40.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group:</td>
<td>0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Hours small group:</td>
<td>0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Guided activities:</td>
<td>0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Self study:</td>
<td>90h</td>
<td>60.00%</td>
</tr>
</tbody>
</table>
## Content

### (ENG) Linear algebra and geometry

<table>
<thead>
<tr>
<th>Description:</th>
<th>Learning time: 40h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific objectives:</td>
<td>Self study: 24h</td>
</tr>
<tr>
<td>Identify and characterize vector spaces and subspaces, and manipulate vectors. Identify diagonalizable endomorphisms.</td>
<td></td>
</tr>
</tbody>
</table>

### (ENG) Functions of several variables

<table>
<thead>
<tr>
<th>Description:</th>
<th>Learning time: 30h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific objectives:</td>
<td>Self study: 18h</td>
</tr>
<tr>
<td>Study of functions of several variables with emphasis on the concepts and methods of differential calculus of several variables.</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Description:</th>
<th>Learning time: 15h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local and global extrema. Test for local extrema. Constrained extrema. Lagrange multiplier method.</td>
<td>Theory classes: 6h</td>
</tr>
<tr>
<td>Specific objectives:</td>
<td>Self study: 9h</td>
</tr>
<tr>
<td>To acquire the basic tools for analyzing extrema problems, both free and constrained extrema problems.</td>
<td></td>
</tr>
</tbody>
</table>
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 (20%) (Test plus a problem)
Exam 2 (20%) (Exam by pairs. The use of a calculator/computer/tablet...is allowed)
Exam 3 (20%) (Test plus a problem)
Exam 4 (40%) (Test plus two problems)

The subject DOES NOT HAVE a resit test.


**Qualification 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.

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Exam 3 (20%) (Test plus a problem)
Exam 4 (40%) (Test plus two problems)

The subject DOES NOT HAVE a resit test.


**Regulations for carrying out activities**

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

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Bibliography

**Basic:**


**Complementary:**

