820008 - ACM - Algebra and Multivariable Calculus

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering
Teaching unit: 749 - MAT - Department of Mathematics
Academic year: 2018
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)
BACHELOR'S DEGREE IN BIOMEDICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
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BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)

ECTS credits: 6
Teaching languages: Catalan, Spanish, English

Teaching staff
Coordinator: Ikhouane, Fayçal
Carmona Mejias, Àngeles
Others: MAT/EEBE

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.

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>Study load</th>
<th>Hours large group:</th>
<th>Hours medium group:</th>
<th>Hours small group:</th>
<th>Guided activities:</th>
<th>Self study:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total learning time:</strong></td>
<td>150h</td>
<td>60h</td>
<td>0h</td>
<td>0h</td>
<td>90h</td>
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<tr>
<td></td>
<td></td>
<td>40.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>60.00%</td>
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<tr>
<td>(ENG) Linear algebra and geometry</td>
<td>Learning time: 40h</td>
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<tr>
<td></td>
<td>Theory classes: 16h</td>
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<td>Self study: 24h</td>
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</tbody>
</table>

**Description:**

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

<table>
<thead>
<tr>
<th>(ENG) Functions of several variables</th>
<th>Learning time: 30h</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 12h</td>
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<td>Self study: 18h</td>
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</tbody>
</table>

**Description:**

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

<table>
<thead>
<tr>
<th>(ENG) Extrema of real functions of several variable</th>
<th>Learning time: 15h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 6h</td>
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<td>Self study: 9h</td>
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</table>

**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.
The evaluation will be conducted through the assessment by the teacher. Students can pass the subject through continuous assessment based on exams and performing exercises. The objective of ‘Self-Learning’ will be evaluated with a weight of 5%.

Two exams will be administered during the quarter, P1 with weight 40% and P2 with weight 40%
Learning Objective (LO): 5%
Problems/Controls/Solving problems: 15%

The grade is calculated as follows:

\[ P1 \times 40\% + P2 \times 40\% + LO \times 5\% + \text{Homeworks} \times 15\% \]

Students that failed ordinary evaluation and have been regularly attending tests throughout the course will have the option to perform a re-evaluation test during the period specified in the academic calendar.

The students will be able to access the re-assessment test that meets the requirements set by the EEBE in its Assessment and Permanence Regulations (https://eebe.upc.edu/ca/estudis/normatives-academiques/documents/eebe-normativa-valuacio-i-permanencia-18-19-aprovat-je-2018-06-13.pdf)
Bibliography

Basic:


Complementary: