320029 - MEFE - Numerical Methods for Engineers

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 749 - MAT - Department of Mathematics
737 - RMEE - Department of Strength of Materials and Structural Engineering

Academic year: 2019
Degree:
- BACHELOR'S DEGREE IN AEROSPACE TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Optional)
- BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Optional)
- BACHELOR'S DEGREE IN AEROSPACE VEHICLE ENGINEERING (Syllabus 2010). (Teaching unit Optional)
- BACHELOR'S DEGREE IN AUDIOVISUAL SYSTEMS ENGINEERING (Syllabus 2009). (Teaching unit Optional)
- BACHELOR'S DEGREE IN INDUSTRIAL DESIGN AND PRODUCT DEVELOPMENT ENGINEERING (Syllabus 2010). (Teaching unit Optional)
- BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
- BACHELOR'S DEGREE IN TEXTILE TECHNOLOGY AND DESIGN ENGINEERING (Syllabus 2009). (Teaching unit Optional)
- BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
- BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
- BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)

ECTS credits: 6 Teaching languages: Catalan, Spanish

Coordinator: E. Monsó

Degree competences to which the subject contributes

Specific:
3. (ENG) Capacitat per a la resolució dels problemes matemàtics que puguin platenjar-se a l'enginyeria. Aptitud per aplicar els coneixements sobre: àlgebra lineal; geometria, geometria diferencial; càlcul diferencial i integral; equacions diferenciais i amb derivades parcials; mètodes numèrics; algorítmica numèrica; estadística i optimització.

Transversal:
1. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.
2. TEAMWORK - Level 3. Managing and making work groups effective. Resolving possible conflicts, valuing working with others, assessing the effectiveness of a team and presenting the final results.

Teaching methodology
- Lectures
- Practical work sessions
- Autonomonous work: theory and practice
- Preparation and realisation of course activities, both in groups and individually

Learning objectives of the subject
The main objective in this assignature is to capacitate students to comprehend and to apply the so called Finite Elements Method. Most engineering problems are modelled through partial differential equations to be approximately solved by using FEM techniques.

After the numerical method issues obtained at Matemàtiques I, our students are supossed to go deeper through them in order to solve mathematical problems and also, in order to be prepared to the introduction and use of the FEM. A practical approach is to be applied, with a pretty wide sort of applications of the FEM to different engineering problems to be treated.

Development of our students' skills in the use either symbolic, programming and commercial software is also pretended. In particular MATLAB and ANSYS are packages to be used.

**Study load**

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 0h 0.00%</th>
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<tbody>
<tr>
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<td>Hours medium group: 0h 0.00%</td>
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<td>Hours small group: 60h 40.00%</td>
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<td>Guided activities: 0h 0.00%</td>
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<td></td>
<td>Self study: 90h 60.00%</td>
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<tr>
<td>(ENG) TEMA 1: INTRODUCCIÓ ALS MÈTODES NUMÈRICS</td>
<td>Learning time: 10h</td>
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<td>Laboratory classes: 4h</td>
<td>Self study : 6h</td>
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<tr>
<th>(ENG) TEMA 2: RESOLUCIÓ NUMÈRICA DE SISTEMES D'EQUACIONS LI NEALS</th>
<th>Learning time: 30h</th>
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<td>Laboratory classes: 12h</td>
<td>Self study : 18h</td>
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<tr>
<th>(ENG) TEMA 4: RESOLUCIÓ NUMÈRICA D'EQUACIONS DIFERENCIALS ORDI NÀRIES</th>
<th>Learning time: 20h</th>
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<tr>
<td>Laboratory classes: 8h</td>
<td>Self study : 12h</td>
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<tr>
<th>(ENG) TEMA 5: EQUACIONS EN DERIVADES PARCIALS</th>
<th>Learning time: 30h</th>
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<td>Laboratory classes: 12h</td>
<td>Self study : 18h</td>
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<th>(ENG) TEMA 6: MÈTODE DELS ELEMENTS FINITS</th>
<th>Learning time: 60h</th>
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<td>Laboratory classes: 24h</td>
<td>Self study : 36h</td>
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Planning of activities

(ENG) EXERCICI PER A LLIURAR 1

(ENG) EXERCICI PER A LLIURAR 2

(ENG) EX

(ENG) PROJECTE

Qualification system

- Assignments to deliver: 40%
- Individual work: 40%
- Teamwork: 20%

Bibliography

Basic:


Complementary:


Others resources: