205063 - Dynamic Analysis of Structures

**Coordinating unit:** 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering

**Teaching unit:** 737 - RMEE - Department of Strength of Materials and Structural Engineering

**Academic year:** 2019

**Degree:**
- MASTER’S DEGREE IN SPACE AND AERONAUTICAL ENGINEERING (Syllabus 2016). (Teaching unit Optional)
- MASTER’S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2013). (Teaching unit Optional)
- MASTER’S DEGREE IN AERONAUTICAL ENGINEERING (Syllabus 2014). (Teaching unit Optional)

**ECTS credits:** 3

**Teaching languages:** English

### Teaching staff

**Coordinator:** Weyler Perez, Rafael

**Others:**
- Hernández Rojas, Suilio Eliud
- Guanchez Reyes, Edinson

### Teaching methodology

Theoretical and practical sessions in which the instructor introduces the theoretical basis of the concepts, methods and results and illustrates them with examples appropriate to facilitate their understanding, and problem-based learning sessions. The instructor will provide the syllabus and monitoring of activities (ATENEA).

### Learning objectives of the subject

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### Study load

<table>
<thead>
<tr>
<th>Total learning time: 75h</th>
<th>Hours large group: 27h</th>
<th>36.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Hours small group: 0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Guided activities: 0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Self study: 48h</td>
<td>64.00%</td>
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</table>
## Content

<table>
<thead>
<tr>
<th>Module 1: Equation of motion of discrete systems</th>
<th>Learning time: 10h</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 4h</td>
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<td></td>
<td>Self study: 6h</td>
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</tbody>
</table>

**Description:**

**Related activities:**
Theoretical and practical sessions.

<table>
<thead>
<tr>
<th>Module 2: Free Vibration</th>
<th>Learning time: 22h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 8h</td>
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<tr>
<td></td>
<td>Self study: 14h</td>
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**Description:**
Eigenvalues, Eigenvector, Modes of vibration, Orthogonality Relations. Modal analysis. Systems of n degrees of freedom.

**Related activities:**
Theoretical and practical sessions.

<table>
<thead>
<tr>
<th>Module 3: Forced Vibration</th>
<th>Learning time: 25h</th>
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<tr>
<td></td>
<td>Theory classes: 9h</td>
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<tr>
<td></td>
<td>Self study: 16h</td>
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</tbody>
</table>

**Description:**
Principal coordinates, response to harmonic load, resonance, critical damping. Response to seismic movements, Modal Analysis, Spectral Analysis, Directional Combination. Systems of n degrees of freedom.

**Related activities:**
Theoretical and practical sessions.
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Module 4: Software Applications

Learning time: 18h
- Theory classes: 6h
- Self study: 12h

Description:
2d and 3d models, frame element, area element, finit element method applications, materials, sections, system loads, rigid and flexible diaphragms, vibrations functions, spectrum cases, spectral analysis, dynamic response of buildings.

Related activities:
Theoretical and practical sessions.

Qualification system

Partial exam 25 %
Final Exam 40 %
Task assignments 20 %
Proposed activity 15 %

Bibliography