320120 - A2 - Acoustics II

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 712 - EM - Department of Mechanical Engineering
Academic year: 2018
Degree: BACHELOR'S DEGREE IN AUDIOVISUAL SYSTEMS ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
ECTS credits: 6
Teaching languages: Catalan

Degree competences to which the subject contributes

Specific:
1. AUD: An ability to implement engineering projects as follows: acoustic insulation and adaptation of premises; megaphone installations: specification, analysis and selection of electroacoustic transducers; noise and vibration measurement, analysis and control systems; environmental acoustics: underwater acoustic systems.

Transversal:
2. 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.
3. 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

Guided learning hours consist, on the one hand, of theory classes (large groups) in which a lecturer briefly presents the general learning objectives corresponding to the basic subject concepts. Students are encouraged to actively participate in their own learning through practical exercises. Support material in the form of a detailed syllabus will be used via ATENEA: learning objectives according to content, concepts, examples, programmed evaluation and guided learning activities and reading lists. On the other hand, guided learning hours also consist of problem-solving classes (medium-sized groups). Students will generally work in teams of three or five members to complete numerical exercises or solve problems related to the specific learning objectives corresponding to subject content. Generic competencies such as teamwork will be incorporated into these tasks. The last type of guided learning hours consists of laboratory practicals as pairwork, aimed at developing basic instrumental skills in the field of acoustic engineering. Tasks forming the basis for the guided activities will be assigned before and after each session, to be completed by individuals or groups outside the classroom. The lecturer may assign other independent learning exercises such as guided reading or the resolution of proposed problems.

Learning objectives of the subject

On completing this subject, students will be able to:

- Calculate the frequency response of an elastic system.
- Calculate and select a vibration isolation system.
- Select appropriate noise control technology for each case.
- Diagnose ambient noise.
· Use the basic equipment available in an acoustic laboratory.

### Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 45h 30.00%</th>
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<tbody>
<tr>
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<td>Hours medium group: 0h 0.00%</td>
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<td></td>
<td>Hours small group: 15h 10.00%</td>
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<td>Guided activities: 0h 0.00%</td>
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<td>Self study: 90h 60.00%</td>
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### Content

#### Environmental acoustics

**Description:**
1.1. Overview of basic concepts  
1.2. Normative  
1.3. Noise measurement  
1.4. Environmental noise assessment

**Related activities:**
- Problem-based lectures  
- Activity 1: Problem-solving  
- Activity 2: Directed assignment  
- Activity 4: End-of-semester test

**Learning time:** 42h  
- Theory classes: 18h  
- Laboratory classes: 9h  
- Self study: 15h

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#### TOPIC 4: Acoustic insulation

**Description:**
2.1. Enclosed sound fields  
2.2. Simple wall  
2.3. Flanking transmission  
2.4. Frequency dependence  
2.5. Double wall

**Related activities:**
- Problem-based lectures  
- Activity 1: Problem-solving  
- Activity 2: Laboratory practical: Sound power and directivity/intensity measurement  
- Activity 4: Mid-semester test

**Learning time:** 26h  
- Theory classes: 9h  
- Laboratory classes: 2h  
- Self study: 15h
**TOPIC 1: Theory of vibration**

<table>
<thead>
<tr>
<th>Learning time:</th>
<th>26h</th>
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<tbody>
<tr>
<td>Theory classes:</td>
<td>9h</td>
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<tr>
<td>Laboratory classes:</td>
<td>2h</td>
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<tr>
<td>Self study:</td>
<td>15h</td>
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**Description:**
1.1. One-degree-of-freedom vibrations with and without damping.
1.2. Forced vibration.
1.3. Two-degrees-of-freedom vibrations.
1.4. N-degrees-of-freedom vibrations in continuous media.

**Related activities:**
- Problem-based lectures
- Activity 1: Problem-solving
- Activity 4: Mid-semester test

**TOPIC 2: Vibration isolation**

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<tr>
<td>Self study:</td>
<td>15h</td>
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**Description:**
2.1. Free response
2.2. Forced response
2.3. Vibration isolation

**Related activities:**
- Problem-based lectures
- Activity 1: Problem-solving
- Activity 2: Laboratory practical: vibration isolation.
- Activity 4: Mid-semester test
Structural noise transmission

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<tr>
<td>4.1. Vibration of solids</td>
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<td>4.2. Sound radiation</td>
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<tr>
<td>4.3. Structural noise transmission</td>
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<td>Problem-based lectures</td>
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<tr>
<td>Activity 1: Problem-solving</td>
</tr>
<tr>
<td>Activity 2: Laboratory practical: Sound power and directivity/intensity measurement.</td>
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<tr>
<td>Activity 4: Mid-semester test</td>
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Learning time: 1h
Theory classes: 1h

Qualification system

Nfinal = 0.5 Act4 + 0.2 Act2 + 0.1 Act1 + 0.2 Act3

For those students who meet the requirements and submit to the reevaluation examination, the grade of the reevaluation exam will replace the grades of all the on-site written evaluation acts (tests, midterm and final exams) and the grades obtained during the course for lab practices, works, projects and presentations will be kept. If the final grade after reevaluation is lower than 5.0, it will replace the initial one only if it is higher. If the final grade after reevaluation is greater or equal to 5.0, the final grade of the subject will be pass 5.0.

Regulations for carrying out activities

- If a student fails to complete any of the laboratory or continuous-assessment activities, he/she will receive no points for that activity.
- Access to laboratory sessions will be closed five minutes after the scheduled starting time.
- Individual marks will reflect attitude and participation in activities 1, 2 and 3.
- Students will be expected to have passed Acoustic I.

Bibliography

Basic:
