240EI012 - Machine Technology

Coordinating unit: 240 - ETSEIB - Barcelona School of Industrial Engineering
Teaching unit: 712 - EM - Department of Mechanical Engineering
Academic year: 2019
Degree: MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2014). (Teaching unit Compulsory)
MASTER'S DEGREE IN MANAGEMENT ENGINEERING (Syllabus 2012). (Teaching unit Combined exam)
ECTS credits: 4,5
Teaching languages: Catalan, Spanish

Teaching staff
Coordinators: Martinez Miralles, Jordi Ramon
Others: Martinez Miralles, Jordi Ramon, Martin Batlle, Mateo, Sararols Fiqueras, Miquel, Veciana Fontanet, Joaquin Maria, Zayas Fiqueras, Enrique Ernesto, Domenëch Mestres, Carlos, Blanco Romero, Maria Elena

Prior skills

Degree competences to which the subject contributes
Specific:
CEMEI03. Ability for the design and assays in machines.

Teaching methodology
The teaching methodology is based on two types of activities.
Class sessions in which the lecturer provides concepts and knowledge and, using practical exercises, shows how to apply them to solve real problems and situations. There is a 2 h class every week.
Practical sessions in small groups in which students carry out activities under the lecturer's supervision. There are lab sessions in which students become familiar with the various types of machine elements, and seminar sessions in which students solve exercises about dimensioning and selection of machine elements guided by the lecturer.

Learning objectives of the subject
General objective: To ensure that students acquire a thorough knowledge about the operation of the main commercial types of mechanical elements used in machines, and get the basic skills on how to select and size them.
Specific objectives: See the specific objectives of each part and each programmed activity
<table>
<thead>
<tr>
<th>Total learning time: 112h 30m</th>
<th>Hours large group: 27h 24.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours small group: 13h 30m 12.00%</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 0h 0.00%</td>
</tr>
<tr>
<td></td>
<td>Self study: 72h 64.00%</td>
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</tbody>
</table>
## Content

### Mechanical fatigue failure

<table>
<thead>
<tr>
<th>Learning time: 26h</th>
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<tbody>
<tr>
<td>Theory classes: 6h</td>
</tr>
<tr>
<td>Laboratory classes: 2h</td>
</tr>
<tr>
<td>Self study: 18h</td>
</tr>
</tbody>
</table>

**Description:**

**Related activities:**
Seminar sessions where the students carry out exercises under the lecturer supervision.

**Specific objectives:**
Knowledge of the basis of fatigue failure. Ability to identify the types of loads that cause fatigue failure. Being able to calculate rotating shafts under uniaxial stresses.

### Motors and receivers

<table>
<thead>
<tr>
<th>Learning time: 22h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes: 6h</td>
</tr>
<tr>
<td>Laboratory classes: 2h</td>
</tr>
<tr>
<td>Self study: 14h</td>
</tr>
</tbody>
</table>

**Description:**

**Related activities:**
Seminar sessions where the students carry out exercises under the lecturer supervision. Practical session devoted to the identification of several types of motors and their properties.

**Specific objectives:**
Knowledge of the mechanical properties of motors and receivers. Knowing how to analyze the characteristic curve of a motor. Being able to determine the motion equation of a machine. Ability to choose an electric motor for driving a steady operation machine.
# 240EI012 - Machine Technology

<table>
<thead>
<tr>
<th>Gear reducers</th>
<th><strong>Learning time:</strong> 12h 30m</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 3h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 1h 30m</td>
</tr>
<tr>
<td></td>
<td>Self study : 8h</td>
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</tbody>
</table>

**Description:**

**Related activities:**
Seminar sessions where the students carry out exercises under the lecturer supervision. Practical session devoted to the identification of several types of gear reducers and their properties.

**Specific objectives:**
Knowledge of the main types of commercial gear reducers and their applications. Ability to choose a gear reducer as machine transmission, using the information provided by the manufacturer.

<table>
<thead>
<tr>
<th>Belt drives</th>
<th><strong>Learning time:</strong> 22h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 6h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Self study : 14h</td>
</tr>
</tbody>
</table>

**Description:**

**Related activities:**
Seminar sessions where the students carry out exercises under the lecturer supervision. Practical session devoted to the identification of several types of belts and their pulleys.

**Specific objectives:**
Knowledge of the main types of belts: flat belts, V belts and timing belts. Knowing how to analyze the dynamic behaviour of belt drives and how to determine the minimum needed mounting force. Ability to select the belt type and size the belt for a certain transmission using the information provided by the manufacturer.
**Rolling and sliding bearings**

**Learning time:** 26h
- Theory classes: 6h
- Laboratory classes: 2h
- Self study: 18h

**Description:**

**Related activities:**
Seminar sessions where the students carry out exercises under the lecturer supervision. Practical session devoted to the identification of several types of sliding and rolling bearings.

**Specific objectives:**
Knowledge of the properties of the main types of sliding and rolling bearings, as well as their applications. Ability to select the type of rolling bearings and size them for a certain application using the information provided by the manufacturer.

### Qualification system

Assessment is based on two evaluation activities: a mid-term, partial test and a final exam. Both the partial test and the final exam assess the theoretical and practical aspects of the subject. Some parts of the final exam can be related to activities developed during lab sessions. The final exam is a review of the whole subject, therefore the exam assesses all the contents and skills the subject deals with.

The algorithm for calculating the final mark is: 
\[ N_{\text{final}} = \text{Maximum}[0,3 \cdot N_{\text{PP}} + 0,7 \cdot N_{\text{EF}}; N_{\text{EF}}] \]

Where: 
- \( N_{\text{PP}} \) = partial test mark; 
- \( N_{\text{EF}} \) = final exam mark.

To obtain the assessment of the subject, it is required a minimum mark \( \geq 1 \) in the final exam. Otherwise, it is considered not submitted -NP.

A special exam will be offered to those students that have not passed the subject and have an assessment different from NP. The mark obtained with this exam replaces the final exam mark.

### Regulations for carrying out activities

Personal notes and reference material can be used during the practical exercises in both the partial test and the final exam. No documentation may be consulted during the theoretical part.
Bibliography

Basic:


Complementary:


Others resources:

Audiovisual material

Transparències de classe

Audiovisual material prepared by the teaching team. This material is accessible through the Atenea Campus.