320057 - AT - Drives and Transmissions

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 712 - EM - Department of Mechanical Engineering
          709 - DEE - Department of Electrical Engineering
          729 - MF - Department of Fluid Mechanics

Academic year: 2019
Degree: BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
          BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
ECTS credits: 6
Teaching languages: Catalan

Teaching staff
Coordinator: Rafel Sitjar
Others: Esteve Codina
         Sola De Las Fuentes, Gloria

Degree competences to which the subject contributes

Transversal:
1. SELF-DIRECTED LEARNING - Level 2: Completing set tasks based on the guidelines set by lecturers. Devoting the
time needed to complete each task, including personal contributions and expanding on the recommended information
sources.
2. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 1. Planning oral communication, answering questions
properly and writing straightforward texts that are spelt correctly and are grammatically coherent.
3. TEAMWORK - Level 2. Contributing to the consolidation of a team by planning targets and working efficiently to
favor communication, task assignment and cohesion.
4. EFFECTIVE USE OF INFORMATION RESOURCES - Level 2. Designing and executing a good strategy for advanced
searches using specialized information resources, once the various parts of an academic document have been
identified and bibliographical references provided. Choosing suitable information based on its relevance and quality.

Teaching methodology

- Sessions of practical work.
- Independent work and study exercises or tests.
- Preparation and evaluated in group activities.

The professor will introduce the theoretical foundations of the subject, concepts, methods and
results illustrating them with examples.

The sessions of practical work in classroom are:
a) session that the teacher will guide students in analyzing and solving problems by applying techniques concepts and
theoretical results. (80%)
b) Sessions of submissions made by students in groups. (20%)

Students must study independently to absorb and retain concepts, solve exercises
proposed either manually or with the aid of the computer.
Students work in small groups to prepare publicly presented.

Learning objectives of the subject

Introduce the different engines available to us, which is currently used. Understand and apply correctly the best
transmission on each machine valuing economic criteria, technical and savings energy.
320057 - AT - Drives and Transmissions

<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> 150h</td>
<td>30h</td>
<td>30h</td>
<td>0h</td>
<td>0h</td>
<td>90h</td>
</tr>
<tr>
<td></td>
<td>20.00%</td>
<td>20.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>60.00%</td>
</tr>
</tbody>
</table>
## TOPIC 1: Electric drivers. Accessories

**Description:**
- Three-phase asynchronous motors.
- Single phase motors from fractional power.
- DC motor.
- Servomotors.
- Brushless.
- Stepper Motors.
- Linear Motors.
- Natural and forced ventilation.
- Brake motor.
- Absolute and relative encoder, linear, circular.
- End of stroke: electromechanical, inductive, capacitive, etc..
- Positioning.

**Related activities:**
- P1. - Reading: Plate and terminals. Study of the connections and power supplies.
- Software to choose a high efficiency motor in case of replacement or substitution, economic study.
- P2. - Comparison engine as accessories, how to connect them to the motor control.

### Learning time:
- Theory classes: 4h
- Practical classes: 6h

## TOPIC 2: Changes in the speed of electric drives

**Description:**
- Frequency, parameterization.
- Variable engine-CC
- Servo controllers
- Booting: process
- Stability, Operating point

**Related activities:**
- P3. - Parameterization of frequency
- P4. - Static starter. Make a bypass.
- P5. - Parameterization

### Learning time:
- Theory classes: 2h
- Practical classes: 3h
<table>
<thead>
<tr>
<th>TOPIC 3: Power Output. Oil Hydraulic and hydrostatic basic elements</th>
<th>Learning time: 6h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>Theory classes: 4h</td>
</tr>
<tr>
<td>- Loss.</td>
<td>Practical classes: 2h</td>
</tr>
<tr>
<td>- Transmission and power regulation</td>
<td></td>
</tr>
<tr>
<td>- Pumps</td>
<td></td>
</tr>
<tr>
<td>- Engines</td>
<td></td>
</tr>
<tr>
<td>- Cylinders</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TOPIC 4: Connections to the motor</th>
<th>Learning time: 8h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>Theory classes: 4h</td>
</tr>
<tr>
<td>- Elastic couplings</td>
<td>Practical classes: 4h</td>
</tr>
<tr>
<td>- Accuracy couplings</td>
<td></td>
</tr>
<tr>
<td>- Torque limiters</td>
<td></td>
</tr>
<tr>
<td>- Clutches</td>
<td></td>
</tr>
<tr>
<td>- Hydraulic Couplings</td>
<td></td>
</tr>
<tr>
<td>- Mechanical speed variables</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TOPIC 5: Gear transmissions</th>
<th>Learning time: 12h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>Theory classes: 4h</td>
</tr>
<tr>
<td>- Types of gears and its calculation</td>
<td>Practical classes: 8h</td>
</tr>
<tr>
<td>- Reducers. Technology and selection</td>
<td></td>
</tr>
<tr>
<td>- Units of intermittently rotation</td>
<td></td>
</tr>
<tr>
<td>- Units of force, mechanical hammers</td>
<td></td>
</tr>
</tbody>
</table>
# 320057 - AT - Drives and Transmissions

## TOPIC 6: Flexible Transmission

<table>
<thead>
<tr>
<th>Learning time: 5h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes: 3h</td>
</tr>
<tr>
<td>Practical classes: 2h</td>
</tr>
</tbody>
</table>

**Description:**
- For belt
- For string
- Cardan joints

## TOPIC 7: Elements supports

<table>
<thead>
<tr>
<th>Learning time: 5h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes: 3h</td>
</tr>
<tr>
<td>Practical classes: 2h</td>
</tr>
</tbody>
</table>

**Description:**
- Calculation of bearings
- Sealing elements
- Lubrication of transmissions

## TOPIC 8: Transmissions with hydrostatic and mechanical components. Case studies

<table>
<thead>
<tr>
<th>Learning time: 9h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes: 4h</td>
</tr>
<tr>
<td>Practical classes: 5h</td>
</tr>
</tbody>
</table>

**Description:**
- Combination with gearboxes
- Overlapping powers
- Drive vehicles (wheels, caterpillars, etc.)
- Drive with argue
- Driven propeller, pumps and fans
- Drive mechanisms (excavators, cranes, etc.)

## Qualification system

- 1st test: 25%
- 2nd test: 25%
- 3rd test: 25%
- Activities: 25%
Bibliography

Basic:


