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.
### Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group:</th>
<th>30h</th>
<th>20.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group:</td>
<td>30h</td>
<td>20.00%</td>
</tr>
<tr>
<td></td>
<td>Hours small group:</td>
<td>0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Guided activities:</td>
<td>0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Self study:</td>
<td>90h</td>
<td>60.00%</td>
</tr>
</tbody>
</table>
## Content

### TOPIC 1: Electric drivers. Accessories

<table>
<thead>
<tr>
<th>Description:</th>
<th>Learning time: 10h</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Three-phase asynchronous motors.</td>
<td>Theory classes: 4h</td>
</tr>
<tr>
<td>- Single phase motors from fractional power.</td>
<td>Practical classes: 6h</td>
</tr>
<tr>
<td>- DC motor.</td>
<td></td>
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<tr>
<td>- Servomotors.</td>
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<tr>
<td>- Brushless.</td>
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<tr>
<td>- Stepper Motors.</td>
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<tr>
<td>- Linear Motors.</td>
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<tr>
<td>- Natural and forced ventilation.</td>
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<tr>
<td>- Brake motor.</td>
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<tr>
<td>- Absolute and relative encoder, linear, circular.</td>
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<tr>
<td>- End of stroke: electromechanical, inductive, capacitive, etc..</td>
<td></td>
</tr>
<tr>
<td>- Positioning.</td>
<td></td>
</tr>
</tbody>
</table>

**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.

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

<table>
<thead>
<tr>
<th>Description:</th>
<th>Learning time: 5h</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Frequency, parameterization.</td>
<td>Theory classes: 2h</td>
</tr>
<tr>
<td>- Variable engine-CC</td>
<td>Practical classes: 3h</td>
</tr>
<tr>
<td>- Servo controllers</td>
<td></td>
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<tr>
<td>- Booting: process</td>
<td></td>
</tr>
<tr>
<td>- Stability. Operating point</td>
<td></td>
</tr>
</tbody>
</table>

**Related activities:**
- P3. - Parameterization of frequency
- P4. - Static starter. Make a bypass.
- P5. - Parameterization
### TOPIC 3: Power Output. Oil Hydraulic and hydrostatic basic elements

**Learning time:** 6h  
Theory classes: 4h  
Practical classes: 2h

**Description:**  
- Loss.  
- Transmission and power regulation  
- Pumps  
- Engines  
- Cylinders

### TOPIC 4: Connections to the motor

**Learning time:** 8h  
Theory classes: 4h  
Practical classes: 4h

**Description:**  
- Elastic couplings  
- Accuracy couplings  
- Torque limiters  
- Clutches  
- Hydraulic Couplings  
- Mechanical speed variables

### TOPIC 5: Gear transmissions

**Learning time:** 12h  
Theory classes: 4h  
Practical classes: 8h

**Description:**  
- Types of gears and its calculation  
- Reducers. Technology and selection  
- Units of intermittently rotation  
- Units of force, mechanical hammers
### TOPIC 6: Flexible Transmission

**Learning time:** 5h  
Theory classes: 3h  
Practical classes: 2h

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

### TOPIC 7: Elements supports

**Learning time:** 5h  
Theory classes: 3h  
Practical classes: 2h

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

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

**Learning time:** 9h  
Theory classes: 4h  
Practical classes: 5h

**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: