

## 340102 - MAE1-E4009 - Electrical Machines I

Coordinating unit:	340 - EPSEVG - Vilanova i la Geltrú School of Engineering
Teaching unit:	709 - EE - Department of Electrical Engineering
Academic year:	2019
Degree:	BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory) BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional) BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
ECTS credits:	6
Teaching languages:	Catalan

### Teaching staff

Coordinator: EUSEBIO MARTINEZ PIERA

Others: EUSEBIO MARTINEZ PIERA

### Degree competences to which the subject contributes

Specific:

6. CE19. Ability to calculate design electrical machines.

Transversal:

1. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 3. Taking social, economic and environmental factors into account in the application of solutions. Undertaking projects that tie in with human development and sustainability.
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.

### Teaching methodology

- In the theory classes, be exposed and develop the theoretical foundations of programmed materials. They consist of theoretical explanations complemented by activities to encourage participation, discussion and critical analysis by students.
- The kinds of problems will arise and solve exercises for the subject under discussion. Students should meet individually or in groups, indicating problems.
- Within hours of laboratory practice the students will be required and submit the relevant report of the activity along with appropriate calculations and critical considerations.
- Group work will be undertaken during the course of a specific topic related to the subject.

### Learning objectives of the subject

- Provide the basics of transformers and rotating electrical machines.
- Know the various constituents and key technological aspects of transformers and rotating electrical machines.
- Present the different types of transformers and their applications.
- Analyze the performance of transformers (single and three phase) from the equivalent circuit.
- To study the electromechanical conversion of energy and implement their primary relationships in machinery and electrical devices.
- Present the main uses of the synchronous machine as a motor and a generator.
- Study the constructive peculiarities of the synchronous machine and its operation principle.
- Analyze the behavior of the synchronous machine in steady state using its equivalent circuit.
- Clearly identify what is meant by the parameters of the plate in electrical machines.



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- Plan and implement appropriate laboratory testing electrical machines ..

### Study load

Total learning time: 150h	Hours large group:	45h	30.00%
	Hours medium group:	0h	0.00%
	Hours small group:	15h	10.00%
	Guided activities:	0h	0.00%
	Self study:	90h	60.00%

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### Content

<p>1.- Principes of electric machinery</p>	<p>Learning time: 31h Theory classes: 9h Laboratory classes: 4h Self study : 18h</p>
<p>Description: 1.1.- Introduction to electrical machines. 1.2.- Main energy circuits. 1.3.- Nominal parameters or assigned. Losses.</p>	
<p>2.- Transformers</p>	<p>Learning time: 40h Theory classes: 12h Laboratory classes: 4h Self study : 24h</p>
<p>Description: 2.1.- The single-phase power transformer. 2.2.- Determination of circuit parameters. 2.3.- Three phase transformers. 2.4.- Other applications of the transformer.</p>	
<p>3.- Electromechanical Conversion of energy</p>	<p>Learning time: 26h Theory classes: 8h Practical classes: 2h Self study : 16h</p>
<p>Description: 3.1.- Electromechanical Systems. 3.2.- Energy stored in the magnetic field. 3.3.- Forces and torque in electromechanical systems. 3.4.- Dynamic equations.</p>	
<p>4.- Technological principles of the rotating electric machinery</p>	<p>Learning time: 13h Theory classes: 4h Laboratory classes: 1h Self study : 8h</p>
<p>Description: 4.1.- Air gap magnetic field. 4.2.- Electromotive forces induced in the windings. 4.3.- Aspects of construction and operation of electrical machines.</p>	

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<p>5.- Synchronous Electric Machines</p>	<p>Learning time: 40h Theory classes: 12h Laboratory classes: 4h Self study : 24h</p>
<p>Description:</p> <ul style="list-style-type: none"> <li>5.1.- General. Constructive ways. Principle of operation.</li> <li>5.2.- Equivalent circuit. Determination of circuit parameters.</li> <li>5.3.- The synchronous generator load. Methods predetermination of excitation load.</li> <li>5.4.- Synchronous Generator: feeding a load operation isolated and connected to the network.</li> <li>5.5.- The synchronous machine as a motor. Curves.</li> <li>5.6.- Magnet synchronous motor.</li> <li>5.7.- Synchronous machine with salient poles.</li> </ul>	

### Qualification system

- First test carried out during the course (30%).
- Test conducted at the end of the course (45%).
- Realization laboratory practice (25%).

### Regulations for carrying out activities

- The written tests are face and individual.
- In classes of problems and / or laboratory practices will be assessed, where appropriate, the prior work with the presentation of results of the activity.

### Bibliography

#### Basic:

Chapman, Stephen J. Máquinas eléctricas. 5a ed. México DF [Etc.]: McGraw-Hill, cop. 2012. ISBN 9786071507242.

Fitzgerald, A. E.; Kingsley, Charles; Umans, Stephen D. Máquinas eléctricas. 6a ed. México [etc.]: McGraw-Hill, 2004. ISBN 970104052X.

#### Complementary:

Fraile Mora, Jesús. Máquinas eléctricas. 6a ed. Madrid [etc.]: McGraw-Hill, cop. 2008. ISBN 9788448161125.

Sanz Feito, Javier. Máquinas eléctricas. Madrid [etc.]: Prentice Hall, cop. 2002. ISBN 8420533912.