

Course guide

3200212 - ME2 - Electrical Machines II

Last modified: 02/04/2024

Unit in charge: Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 709 - DEE - Department of Electrical Engineering.

Degree: BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Compulsory subject).

Academic year: 2024 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: David Romero Durán

Others: David Romero Durán

PRIOR SKILLS

Students will be expected to have passed Physics, Electrical Systems, Electrical Machines I since the knowledge acquired in those subjects is the foundation on which an understanding of Electrical Machines II will be built.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

1. ELE: Ability to calculate and design electrical machines.

TEACHING METHODOLOGY

In the lecture sessions, the lecturer presents the subject content. These sessions cover theoretical concepts, explanations about what documentation will be used and work proposals.

In the face-to-face applied sessions, students will solve applied cases.

Independent learning enables students to gain an understanding of each of the concepts covered by the lecturer. This type of learning also includes the completion of assignments.

Group work, done in three-person teams, includes preparation for laboratory sessions and the writing of post-practical reports.

LEARNING OBJECTIVES OF THE SUBJECT

This subject introduces students to the operation, construction, application and selection principles of electric motors, as well as the design of basic parts that are common to all such machines. Students will learn to use the parameters that govern the various types of motors and interpret their characteristic curves. They will use commercial catalogues and rated quantities to determine the performance of different machines and select the most appropriate one. Students will learn to solve problems related to the behaviour of electric motors analytically, paying special attention to the order of magnitude and the units used in industry.

STUDY LOAD

Type	Hours	Percentage
Hours medium group	15,0	10.00
Self study	90,0	60.00
Hours large group	30,0	20.00
Hours small group	15,0	10.00



Total learning time: 150 h

CONTENTS

TOPIC 1: ASYNCHRONOUS ALTERNATING-CURRENT MACHINES

Description:

- 1.01. Asynchronous (induction) motors.
- 1.02. Moment of a motor.
- 1.03. Equivalent circuit of asynchronous motors.
- 1.04. Circle diagram.
- 1.05. Start-up of asynchronous motors.
- 1.06. Speed regulation.

Related activities:

- Case studies
- Laboratory sessions

Full-or-part-time: 66h

Theory classes: 14h

Practical classes: 6h

Laboratory classes: 7h

Self study : 39h

TOPIC 4: DIRECT-CURRENT MACHINES

Description:

- 2.01. Construction and principles of direct-current machines.
- 2.02. Armature reaction and commutation.
- 2.03. Direct-current motors.
- 2.04. Additional topics.

Related activities:

- Case studies
- Laboratory sessions

Full-or-part-time: 46h 30m

Theory classes: 8h

Practical classes: 6h

Laboratory classes: 6h

Self study : 26h 30m

TOPIC 3: SYNCHRONOUS MOTORS

Description:

- 3.01. Construction and principles of synchronous motors.
- 3.02. Applications.
- 3.03. Additional topics.

Related activities:

- Case studies
- Laboratori sessions

Full-or-part-time: 19h 30m

Theory classes: 4h

Practical classes: 2h

Laboratory classes: 1h

Self study : 12h 30m

TOPIC 4: SPECIAL MOTORS

Description:

- 4.01. Single Phase Asynchronous Motors..
- 4.02. Universal Motor.
- 4.03. Stepper motors.
- 4.04. Additional topics.

Related activities:

- Case studies
- Laboratori sessions

Full-or-part-time: 18h

Theory classes: 4h

Practical classes: 1h

Laboratory classes: 1h

Self study : 12h

GRADING SYSTEM

First Exam - 15%

Second Exam - 25 %

Third Exam - 20 %

Fourth Exam - 25 %

Laboratory Exam - 15 %

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.

EXAMINATION RULES.

Non-attendance to the laboratory classes is an NP in the assessment items related to the contents taught in these sessions

BIBLIOGRAPHY

Basic:

- Fraile Mora, Jesús. Máquinas eléctricas. 8a ed. Madrid: Ibergarceta, 2016. ISBN 9788416228669.
- Mazón, Javier [et al.]. Guía de autoaprendizaje de máquinas eléctricas. Madrid: Pearson Educación, 2008. ISBN 9788483224908.
- Martínez Barrios, Luis. La máquina eléctrica en problemas. Barcelona: Edicions UPC, 1993. ISBN 8476533020.
- Cortés Cherta, Manuel. Curso moderno de máquinas eléctricas rotativas. Barcelona: Editores Técnicos Asociados, 1970-1989. ISBN 8471461374.

Complementary:

- Ras Oliva, Enrique. Transformadores de potencia, de medida y de protección. 7a ed. Barcelona: Marcombo, 1988. ISBN 8426706908.
- Sanz Feito, Javier. Máquinas eléctricas. Madrid: Prentice Hall, 2002. ISBN 8420533912.
- Chapman, Stephen J.; Rodríguez, Carlos; Santana, Alfredo. Máquinas eléctricas [on line]. 5a ed. México: McGraw-Hill, 2012 [Consultation: 08/03/2023]. Available on : https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=4297. ISBN 9786071507242.
- Pérez Donsión, Manuel. Motores síncronos de imanes permanentes. Santiago de Compostela: Servicio de Publicaciones e Intercambio Científico, 1990. ISBN 8471916223.
- Richardson, Donald V. Máquinas eléctricas rotativas y transformadores. México: Prentice-Hall Hispanoamericana, 1990. ISBN 9868809535.