Last update: 04-05-2017

820127 - ME1EE - Electrical Machines I

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering

Teaching unit: 709 - EE - Department of Electrical Engineering

Academic year: 2017

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

ECTS credits: 6 Teaching languages: Catalan

Teaching staff

Coordinator: Ramon Bargalló Perpiñà

Others: Ramon Bargalló Perpiñà, Altres

Prior skills

Differential and Integral calculus
Matrix calculus
ODE
Complex number algebra
Electromagnetics
DC and AC circuit analysis
Scientific calculator use (HP 50G and CFX-9950)

Requirements

Electricas Systems course

Degree competences to which the subject contributes

Specific:

1. Carry out calculations for the design of electrical machines.

Transversal:

3. TEAMWORK - Level 3. Managing and making work groups effective. Resolving possible conflicts, valuing working with others, assessing the effectiveness of a team and presenting the final results.

Teaching methodology

Expositive methodology for theory classes.
PBL for exercices classes.
Normalized test on laboratory classes.

Learning objectives of the subject

Electromagnetic laws application to electromechanical conversion and coupled circuit analysis applied to industrial power transformer and rotating electrical machines.

Last update: 04-05-2017

820127 - ME1EE - Electrical Machines I

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%

Last update: 04-05-2017

820127 - ME1EE - Electrical Machines I

Content

Power Transformer introduction

Learning time: 14h

Theory classes: 5h
Laboratory classes: 2h
Self study : 7h

Description:
ELectrical circuit. Dielectric system. MAgnetic system. Thermal system. Rated values and definition for voltage, current and power.

Related activities:
Heating test for a transformer

Three phase transformers

Learning time: 23h

Theory classes: 7h
Laboratory classes: 5h
Guided activities: 11h

Description:
Three phase transformer construction. three limbs transformers. Rotation of phases.

Related activities:
Normalized test of single phase transformer.
Tests on three phase transformers. Rotation angle determination

Special Transformers

Learning time: 8h

Theory classes: 3h
Self study : 5h

Description:
Autotransformers. Three coils transformer. Measurement transformers.

Electromechanical energy conversion.

Learning time: 10h

Theory classes: 4h
Self study : 6h

Description:
Electromagnetic field as a optimum for electromechanical conversion. Elemental actuator. EMF. Torque. Mechanical port. Losses.

820127 - ME1EE - Electrical Machines I

AC machines: fundamentals.	Learning time: 25h Theory classes: 7h Self study : 18h

Description:
ELemental Alternating Current generator. Windings. EMF. distribution, short pitching and winding factor. Harmonic effects. Magnetic field on airgap. Rotating field theory.

Asynchronous machine: motor	Learning time: 42h Theory classes: 13h Laboratory classes: 4h Self study : 25h

Description:
Three phase asynchronous motor. Fundamentals. Slip. MAgnetic field on airgap. Torque. Equivalent circuit. Power descomposition. Circle's diagram. Steady-State characteristics. Load variations and point of equilibrium. Voltage and frequency modifications.

Related activities:
Normalized test for losses segregation. Equivalent circuit determination.
Normalized test for mechanical characteristic determination.

Asynchronous machine: special applications.	Learning time: 28h Theory classes: 6h Laboratory classes: 4h Self study : 18h

Description:
Asynchronous generator. Double Fed Induction machine: application to eolic generation. Single phase machine. Torque. Equivalent circuit. Start. Mechanical characteristic.

Related activities:
Single phase motor: start up. MEchanical characteristic determination.
Asynchronous generator: Autonomous work. Infinite bus work.

Qualification system

Final test: 20%
Laboratory:20%
Homework exercicis+classe exercises: 20%
middle term exam: 20+20%

Last update: 04-05-2017

820127 - ME1EE - Electrical Machines I

Regulations for carrying out activities

Scientific calculator
1 sheet with expressions.
COntinuous evaluation, no final reexam.

Bibliography

Basic:

Zorbas, Dino. Electric machines : principles, applications and control schematics. 2nd ed. Montreal: McGill University, 2015. ISBN 9781133628514.

Fraile Mora, Jesús. Máquinas eléctricas. 7a ed. Madrid [etc.]: Garceta, 2015. ISBN 8416228132.

Boldea, I.; Tutelea, Lucian. Electric machines : steady state, transients and design with MATLAB. Boca Raton [etc.]: CRC Press / Taylor & Francis Group, cop. 2010. ISBN 9781420055726.

Complementary:

Gross, Charles A. Electric machines. Boca Raton: Taylor & Francis, 2007. ISBN 0849385814.