[MGF101] ELECTRICAL MACHINES DESIGN

GENERAL INFORMATION

Studies	UNIVERSTIY MASTER IN ENERGY AND POWER ELECTRONICS			**Subject**	ELECTRICAL MACHINERY DESIGN, MODELLING AND ANALYSIS
Semester	1	**Course**	1	**Mention / Field of specialisation**	
Character	COMPULSORY				
Plan	2015	**Modality**	Adapted Face-to-face	**Language**	ENGLISH
Credits	6	**Hours/week**	4.28	**Total hours**	77 class hours + 73 non-class hours = **150 total hours**

PROFESSORS

UGALDE ROSILLO, GAIZKA

RIVERA TORRES, CHRISTIAN ALEJANDRO

REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
(No specific previous subjects required)	*(No previous knowledge required)*

SKILLS

VERIFICA SKILLS

SPECIFIC

MGC06 - Developing machine designs that are adjusted to the specific requirements of each application, with optimal electromagnetic and thermal performance.

MGC07 - Acquiring knowledge of new electric machine design and manufacturing trends in terms of manufacturing processes, high-performance materials, and design tools.

MGC08 - Acquiring knowledge and skills for the use of design tools and the analysis of electric machines.

MGC09 - Acquiring knowledge of electric machine design methods.

CROSS

MGTR10 - To share knowledge, reasoning and conclusions with specialist and non-specialist audiences in clear, unambiguous ways.

MGTR11 - To lead work teams effectively and efficiently in order to achieve common goals.

MGTR12 - To analyse complex information and situations in the field of study, considering several solutions for each problem and making the right decision in a given context, taking social and ethical implications into account.

MGTR13 - To identify product or business development opportunities, managing the human and material resources adequately.

BASIC

M_CB9 - To share knowledge, conclusions and their rationale with specialised and lay audiences in a clear, unambiguous manner

CONTENTS

0.- FUNDAMENTAL OF ELECTRICAL MACHINES

0.1.- Electromagnetism Laws for Magnetic Circuit Resolution

0.2.- Electro-Mechanical Energy Conversion Principles

0.3.- Brushless AC Motor Fundamentals

0.4.- Analysis of Brushless AC Motors

1.- DESIGN OF MAGNETIC CIRCUITS

1.1.- Air Gap Magnetic Field

1.2.- Air Gap Magnetic Flux

1.3.- Design of Rotor and Stator Magnetic Circuits

Coursework 1: Analytical and FEM Computation of Magnetic Field in PMSM

2.- DESIGN OF WINDINGS

2.1.- Three Phase Integral Slot Stator Windings

2.2.- Computation of the Winding Factor

2.3.- Computation of Electrical Parameters. Coil Resistance and Coil Inductances

Coursework 2. Definition of a three phase winding and computation of electrical parameters

3.- MATERIALS FOR ELECTRICAL MACHINE CONSTRUCTION

3.1.- Permanent Magnets

3.2.- Silicon Steels

3.3.- Soft Magnetic Composites

3.4.- Materials for electrical Insulation

4.- FEM ANALYSIS OF BRUSHLESS AC MACHINES

4.1.- Fundamentals of Finite Element Method

4.2.- Open Circuit Analysis and Load Analysis

4.2.- Characterization of AC Brushless Machines

Coursework 3. Characterization of AC Brushless machines

5.- THERMAL EVALUATION OF ELECTRICAL MACHINES

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources	Bibliography
Class presentations	Transducteurs électromécaniques / Marcel Jufer, Presses polytechniques et universitaires romandes ,1985,ISBN: 2880740495 Design of Brushless Permanent Magnet Motors : Monographs in Electrical and Electronic Engineering J.R. Hendershot, TJE Miller A Oxford University Press 1995 ISBN: 9780198593898 (papel)