Course guide
2400303 - 240MAU14 - Electrical Motors

Last modified: 19/06/2026

Unit in charge: Barcelona School of Industrial Engineering
Teaching unit: 709 - DEE - Department of Electrical Engineering.

Degree: MASTER'S DEGREE IN AUTOMOTIVE ENGINEERING (Syllabus 2026). (Compulsory subject).

Academic year: 2026 **ECTS Credits:** 5.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: Montesinos Miracle, Daniel

Others: Montesinos Miracle, Daniel
Andres Martinez, Jose Antonio

TEACHING METHODOLOGY

LEARNING OBJECTIVES OF THE SUBJECT

At the end of the course, the student must be able to:
Understand the role of electric motors in the automotive sector and the requirements of the traction system.
Model the electric/hybrid vehicle for energy analysis using tools such as the Energetic Macroscopic Representation (EMR) and Inversion-Based Control (IBC).
Analyse the operation, model and design the control of direct current (DC) motors, permanent magnet synchronous motors (PMSM) and induction motors.
Apply vector control strategies to the main types of electric motors used in electric vehicles.
Know the future perspectives of electric motors for traction applications.
Acquire basic competencies in electronics to understand the power and control circuits of drives in the automotive sector.

STUDY LOAD

Type	Hours	Percentage
Self study	80,0	64.00
Hours large group	30,0	24.00
Hours small group	15,0	12.00

Total learning time: 125 h

CONTENTS

title english

Description:
content english

Full-or-part-time: 8h
Theory classes: 4h
Self study : 4h

title english

Description:
content english

Full-or-part-time: 32h
Theory classes: 6h
Guided activities: 18h
Self study : 8h

title english

Description:
content english

Full-or-part-time: 26h
Theory classes: 6h
Guided activities: 12h
Self study : 8h

title english

Description:
content english

Full-or-part-time: 30h
Theory classes: 8h
Guided activities: 10h
Self study : 12h

title english

Description:
content english

Full-or-part-time: 10h
Theory classes: 4h
Self study : 6h

title english

Description:
content english

Full-or-part-time: 4h
Theory classes: 2h
Self study : 2h

title english

Description:
content english

Full-or-part-time: 2h
Laboratory classes: 2h

title english

Description:
content english

Full-or-part-time: 4h
Laboratory classes: 4h

title english

Description:
content english

Full-or-part-time: 4h
Laboratory classes: 4h

title english

Description:
content english

Full-or-part-time: 5h
Laboratory classes: 5h

GRADING SYSTEM

BIBLIOGRAPHY

Basic:
- Husain, Iqbal. Electric and hybrid vehicles : design fundamentals . Second edition. Boca Raton, Florida : CRC Press, 2011. ISBN 978-1439811757.
- Mehrdad Ehsani, Yimin Gao, Ali Emadi. Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design. 2a. CRC Press,
- Lino Guzzella, Antonio Sciarretta . Vehicle Propulsion Systems: Introduction to Modeling and Optimization. Springer Verlag,
- J. Larminie, J. Lowry. Electric Vehicle Technology Explained. John Wiley & Sons,
- John M. Miller. Propulsion systems for hybrid vehicles. The institution of electrical engineers,
- Energetic Macroscopic Representation (EMR) [on line]. [Consultation: 08/06/2026]. Available on: https://emr-website.univ-lille.fr/.- Ribbens, William B. Understanding automotive electronics : an engineering perspective . Eight edition. ©2017. ISBN 978-0-12-810434-7.
- Tom Denton. Automobile Electrical and Electronic Systems.