

WM994-15 Electrical Drivetrains

26/27

Department

WMG

Level

Taught Postgraduate Level

Module leader

Carlos Pastor Fernandez

Credit value

15

Module duration

4 weeks

Assessment

Multiple

Study location

University of Warwick main campus, Coventry

Description

Introductory description

Electric drivetrains lies at the core of modern electric vehicles, involving the integration of key subsystems such as tyres, transmission, electric machines, and drive technologies, all of which collectively contribute to the overall vehicle attributes. Power electronics, control systems, and electric motors are crucial in electric vehicles as they ensure efficient energy conversion and optimal performance. These elements work together to enhance vehicle efficiency, reliability, and sustainability, driving the advancement of electric mobility.

The module includes a significant practical element where students gain hands-on experience of electric machine design, switches characterisation and electric machine modeling and control.

Module aims

The purpose of the module is for the students to learn about advanced propulsion technologies for hybrid and electric vehicles. In particular, the learning is focused on electric machines, power electronics and control appropriate for hybrid and electric vehicles.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be

covered. Actual sessions held may differ.

- Electric machine types and characteristics.
- Design of control for electric machines.
- Use of power electronics in electric machines.
- The future of propulsion technology in the automotive industry.
- Hands-on practical: Electric machine design.
- Hands-on practical: Electric machine modeling and control.
- Hands-on practical: Switches characterisation.

Learning outcomes

By the end of the module, students should be able to:

- Analyse and compare a range of electric machine technologies used in propulsion systems, including their principles of operation, performance characteristics, and suitability for automotive applications. [AHEP:4; 7, M2, M4, M5, M6]
- Demonstrate comprehensive understanding of power electronics devices and control methods for different machine technologies [AHEP:4; 7, M2, M3]
- Interpret practicalities of electrical drivetrains in real-world application to hybrid and electric vehicles [AHEP:4; 7, M2, M3, M6]
- Interpret electric machine design and power electronics or control modelling activities in hybrid and electric vehicles [AHEP:4; 7, M2]
- Work within a team collaboratively to resolve problems in the context of electric drivetrains [AHEP:4; 7, M16]

Indicative reading list

[Reading lists can be found in Talis](#)

[Specific reading list for the module](#)

Subject specific skills

- Electric machine types and characteristics
- Power electronics used in electric motors;
- Control systems for electric machines
- Future propulsion technology in the automotive industry
- Hands-on practical in electric machine design.
- Hands-on practical in electric machine modeling and control
- Hands-on practical in switches characterisation

Transferable skills

Critical thinking; Problem solving; Self-awareness; Communication; Teamwork and working effectively with others; Information literacy (research skills); Digital literacy; Sustainability; Professionalism; Organisational awareness.

Study

Study time

Type	Required
Lectures	12 sessions of 1 hour (8%)
Seminars	2 sessions of 1 hour (1%)
Supervised practical classes	16 sessions of 1 hour (11%)
Online learning (independent)	15 sessions of 1 hour (10%)
Private study	45 hours (30%)
Assessment	60 hours (40%)
Total	150 hours

Private study description

Online independent learning and private study learning includes:

- Preparation and revision of lectures after delivery
- Completion of activities related to electric machine, power electronics and control.
- Prior research required to complete the assessment

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group A3

	Weighting	Study time	Eligible for self-certification
Evaluation of technology application	60%	36 hours	Yes (extension)
This part is related to discussing a typical electric machine configuration and their associated control and power electronics system.			
Evaluation of practical activities - Group work	40%	24 hours	No

Weighting

Study time

Eligible for self-certification

Students are divided into groups of 3 to 6 supported by a tutor. Each group needs to record 2 presentations based on the practical activities undertaken in the module. Module marker is able to observe the contribution of each student in sufficient detail through the recording to allocate individual marks without the use of peer assessment.

Assessment group R3

	Weighting	Study time	Eligible for self-certification
Evaluation of practical activities - Individual work	40%		No
The student needs to record 2 presentations based on the practical activities undertaken in the module.			
Evaluation of technology application	60%	36 hours	No

Feedback on assessment

Feedback is provided following on from University/Department current policies. The written feedback will be provided based on WMG feedback template and it will address each of the questions submitted.

Availability

Pre-requisites

To take this module, you must have passed:

- All of
 - [WM985-15 Automotive Hybridisation and Electrification](#)

Post-requisite modules

If you pass this module, you can take:

- WM983-15 Electrical machine design and manufacturing
- WM982-15 Power electronic converter design and manufacturing

There is currently no information about the courses for which this module is core or optional.