Module Specification

Electrical Machines and Power Systems

Version: 2026-27, v4.0, Approved

Contents

Part 1: Information

Module title: Electrical Machines and Power Systems

Module code: UFMEY1-30-2

Level: Level 5

For implementation from: 2026-27

UWE credit rating: 30

ECTS credit rating: 15

College: College of Arts, Technology and Environment

School: CATE School of Engineering

Partner institutions: None

Field: Engineering, Design and Mathematics

Module type: Module

Pre-requisites: None

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: This module teaches the conceptual and technological details of electrical machines and power systems engineering. The module extends the basic knowledge of electrical and electronic engineering as gained in year 1 of the degree. The advanced concepts of electrical machines, transformers and polyphase circuits will be taught and applied to various electrical power systems design. The module also delivers advanced knowledge of AC and DC power distributions and transmission methods and networks. In addition, this will include system analysis,

operation, management and automation of the electric power networks. The module ensures basic and advanced concepts are implemented within the lab to provide confidence to students in analysing and designing various aspects of electrical power engineering systems.

Features: Not applicable

Educational aims: The aim of this module is to embed advanced electrical and electronic engineering principles considered essential to the practice of electrical power engineering within the curriculum of BEng (Hons) degree course.

Outline syllabus: Introduction to machines basic: Concepts of electromotive force, torque, torque angle, multipolar and linear machines

Theoretical aspects of magnet/electromagnet: Theory of magnetism used in electrical machines and transformers, magnetic circuits, behaviour and applications of electromagnets used in electrical power plants.

Developments of emf and mmf in electric machines windings: Winding arrangements and emf and mmf produced by the armature windings,

DC Commutator motors: Armature reaction, commutation, construction and output equation, characteristics of motors and generators, parallel operation and DC machines applications

Asynchronous Machines: Construction and equivalent circuit, machine equations, circle diagram and speed control methods and performance.

Synchronous Machines: Theory and construction, machine equation, circle diagram, efficiency and mode of operations.

Electrical Machine Drives: DC Machine drives, power electronic control of AC machines and mathematical and simulation of machine systems.

Transformers: Transformer with or without load, types and operational features, parallel operation and efficiency.

Polyphase Circuits: Generation of polyphase voltages, phases sequences, star and delta connections on both loads and generation sides, star and delta conversion, power measurements, power factor improvements balanced and unbalanced loads and four-wire star connection and three-wire delta connection.

DC Transmission and Distribution Systems: Two-wire and three-wire Systems and comparison, Voltage drop and transmission efficiency, DC distributors for various loads, and distributor fed at single and both ends.

AC Transmission and Distribution: Power systems and Networks, Single and Three-Phase Distribution Systems, Effects of voltage variations on transmission line efficiency, Transmission System analysis (Nominal T and Pi methods) and analysis of components under constraints.

Distribution Automation: Energy management, conventional networks and automated systems, Typical SCADA system and load management for substation automation.

Part 3: Teaching and learning methods

Teaching and learning methods: In order to develop and progress to advanced knowledge of electrical and electronic engineering, the module tailors the already learnt basic concepts with the new and advanced knowledge and the scope of the concepts through lectures. These will be supported by directed reading, tutorial exercises, practical and simulation laboratory-based works.

Module Learning outcomes: On successful completion of this module students will achieve the following learning outcomes.

MO1 Design and analyse complex systems consisting of electrical machines, transformers, magnetic and power systems through the use of analytical methods and modelling techniques.

MO2 Evaluate cost effective performance of electrical power distribution & transmission systems through the implementation of theory of operation design of electrical machine and components.

MO3 Analyse economical power networks operation through understanding of their requirements of operation and management and promotion of sustainable development.

Hours to be allocated: 300

Contact hours:

Independent study/self-guided study = 228 hours

Face-to-face learning = 72 hours

Reading list: The reading list for this module can be accessed at readinglists.uwe.ac.uk via the following link https://uwe.rl.talis.com/index.html

Part 4: Assessment

Assessment strategy: In this module we are teaching the advanced theory and practice that underpin Electrical Power Systems and are providing practical experiences that allow students to bring concepts and practice together. The laboratory reinforces the material learned in the lecture sessions.

The assessment is designed so that students build their understanding and confidence in applying new concepts as they progress through the course.

Task 1 consists of group coursework assignment based on conceptual design and implementation using simulation software where students complete the design and its implementation followed by a written report.

Task 2 consists of an On Campus Exam at the end of semester 2, that assesses design and implementation skills.

The Resit strategy is the same as the first-sit strategy.

Assessment tasks:

Report (First Sit)
Description: Report of a project assignment (5000-6000 words)
Weighting: 50 %
Final assessment: No
Group work: Yes
Learning outcomes tested: MO1, MO2, MO3

Examination (First Sit)
Description: On Campus Exam (3 hours)
Weighting: 50 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO2, MO3

Report (Resit)
Description: Report of a project assignment (5000 - 6000 words)
Weighting: 50 %
Final assessment: No
Group work: Yes
Learning outcomes tested: MO1, MO2, MO3

Examination (Resit)
Description: On Campus Exam (3 hours)
Weighting: 50 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO2, MO3

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Electrical and Electronic Engineering [Frenchay] BEng (Hons) 2023-24

Electrical and Electronic Engineering {Foundation} [Frenchay] BEng (Hons) 2024-25

Electrical and Electronic Engineering [Frenchay] BEng (Hons) 2023-24

Electrical and Electronic Engineering [Frenchay] BEng (Hons) 2025-26

Electrical and Electronic Engineering [Frenchay] BEng (Hons) 2025-26

Electrical and Electronic Engineering {Foundation} [Frenchay] BEng (Hons) 2024-25

Electrical and Electronic Engineering [Frenchay] BEng (Hons) 2023-24