Module Specification

Power Electronics and Energy Systems

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Contents

Part 1: Information

Module title: Power Electronics and Energy Systems

Module code: UFMFST-30-3

Level: Level 6

For implementation from: 2023-24

UWE credit rating: 30

ECTS credit rating: 15

Faculty: Faculty of Environment & Technology

Department: FET Dept of Engineering Design & Mathematics

Partner institutions: None

Field: Engineering, Design and Mathematics

Module type: Module

Pre-requisites: Principles of Electrical Engineering 2021-22

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: This module introduces concepts in Renewable Energy Industry. It develops students' knowledge of power electronics and its application in power and energy systems. The module will cover the fundamentals of power networks, renewable energies with an emphasis on wind and solar power, and power electronics with an emphasis on power electronic converters, inverters and HVDC for control of power flows in electrical networks, renewable energy systems and electric tractions.

There are international goals for sustainable development of power systems and renewable energy is central to achieving these. This module is designed to develop students' knowledge of power electronics and its application in power and energy systems. The module builds upon earlier modules on analogue electronics.

Features: Not applicable

Educational aims: This module aims to equip students to work as engineers in the fields of power electronics, energy systems and renewable and sustainable nergy, Students will be encouraged and expected to be able to reach a level of competence and professionalism to solve a range of scenario based problems.

Outline syllabus: Typically, the following topics will be covered:

Introduction to three phase, per unit systems, generation methodologies of traditional and renewable sources, such as solar, wind and the concept of smart grids.
Use of computational packages, such as PSCAD, MATLAB and ATPDraw for analysis and design of networks.
Components of power networks, computation of load flow and fault current.
Introduction to power electronic semiconductor devices and their characteristics.
Power electronic switching techniques and control.
Design and analysis of DC-DC Choppers, Boost and Buck power converters, multiphase-multilevel AC-DC converters, multiphase-multilevel DC-AC Inverters and HVDC for integration and transfer of renewable energy generation to existing networks or local loads.

Part 3: Teaching and learning methods

Teaching and learning methods: The delivery is intended to ensure that students have opportunity to develop practical lab-based skills alongside theoretical understanding of power electronics and energy systems. The module will be delivered using a combination of lectures (concepts and the scope of topics will be introduced) and tutorials (involving example exercises) as well as computer based simulation and laboratory based experimental demonstrations. Both the computer

based simulation and the laboratory based demonstrations will enhance student understanding of real-world applications of the material delivered in the module.

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

MO1 Design and apply suitable analysis techniques to both power electronics and renewable network systems

MO2 Design and evaluate simulations useing of appropriate software

MO3 Design and develop simulated power electronics and energy systems

MO4 Apply and select suitable techniques for the analysis and design of power electronic devices and their use for integration of renewable sources to power grids

Hours to be allocated: 300

Contact hours:

Independent study/self-guided study = 228 hours

Face-to-face learning = 72 hours

Total = 300

Reading list: The reading list for this module can be accessed at readinglists.uwe.ac.uk via the following link https://rl.talis.com/3/uwe/lists/6C70F618-32F3-E9B3-E1FC-3DDCE7F27B3D.html

Part 4: Assessment

Assessment strategy: The assessment for this module consists of the following:

An individual written assignment that contributes 50% towards the final mark of the module. The assignment assesses the students' ability to translate their theoretical and practical knowledge to investigate performance of a scenario that requires computation, design and simulation within software.

An exam that contributes 50% towards the final mark of the module. The examination assesses the students' understanding of concepts and techniques and their ability to apply them to electrical problems.

Resit is the same as the first sit

Assessment tasks:

Written Assignment (First Sit)
Description: Individual written Assignment with evidence of the software simulation (max 1500 words)
Weighting: 50 %
Final assessment: No
Group work: No
Learning outcomes tested: MO1, MO2, MO3, MO4

Examination (First Sit)
Description: Written examination (3hours)
Weighting: 50 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2, MO3, MO4

Written Assignment (Resit)
Description: Individual written Assignment with evidence of the software simulation (max 1500 words)
Weighting: 50 %
Final assessment: No
Group work: No
Learning outcomes tested: MO1, MO2, MO3, MO4

Examination (Resit)
Description: Written examination (3 hours)

Weighting: 50 %

Final assessment: Yes

Group work: No

Learning outcomes tested: MO1, MO2, MO3, MO4

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Engineering {Top-Up} [Frenchay] BSc (Hons) 2023-24

Engineering {Top-Up} [Frenchay] BSc (Hons) 2023-24

Electronic Engineering (Nuclear) {Apprenticeship-UCW} {Top-Up} [MOD] BEng (Hons) 2023-24

Electronic Engineering {Apprenticeship-UCW} {Top-Up} [Frenchay] BEng (Hons) 2023-24

Electronic Engineering [Sep][FT][Frenchay][3yrs] BEng (Hons) 2021-22

Electronic Engineering {Apprenticeship-GLOSCOLL} [Sep][FT][GlosColl][5yrs] - Withdrawn BEng (Hons) 2020-21

Electronic Engineering [Sep][SW][Frenchay][4yrs] BEng (Hons) 2020-21

Electronic Engineering {Foundation} [Sep][FT][Frenchay][4yrs] BEng (Hons) 2020-21