Module specification

When printed this becomes an uncontrolled document. Please access the Module Directory for the most up to date version by clicking on the following link: Module directory

Module Code	ENG789
Module Title	Converters, Drives and Energy Systems
Level	7
Credit value	20
Faculty	FAST
HECoS Code	101217
Cost Code	GAME

Programmes in which module to be offered

Programme title	Is the module core or option for this programme
MSc Engineering (Electrical & Electronic) MSc Engineering (Electrical & Electronic) with Advanced Practice MEng Electrical & Electronic Engineering	Core

Pre-requisites

None

Breakdown of module hours

Learning and teaching hours	25 hrs
Placement tutor support	0 hrs
Supervised learning e.g., practical classes, workshops	5 hrs
Project supervision (level 6 projects and dissertation modules only)	0 hrs
Total active learning and teaching hours	**30** hrs
Placement / work-based learning	0 hrs
Guided independent study	170 hrs
Module duration (total hours)	200 hrs

For office use only	
Initial approval date	22nd Aug 2022
With effect from date	Sept 22
Date and details of revision	
Version number	1

Module aims

- To build upon analytical skills and knowledge gained in previous studies and thus to further develop students' abilities relating to design, analysis and evaluation of electrical power systems including generation, transmission, and distribution.

- To extend the students to develop electric drive control strategies and to consider the electric drive as a complex structure in which electrical machine, power electronics and control system interact with each other.

Module Learning Outcomes - at the end of this module, students will be able to:

In addition to the module learning outcomes, students will also cover the following accreditation of higher education programme (AHEP) fourth edition learning outcomes: **M1** & **M2**

1	Analyse the operation of power semiconductor devices and their converter applications in power electronics and electric drive systems;
2	Use methods and procedures for analysis and design of electric drive control and appropriate electrical machines selection.
3	Evaluate the performance of electrical power systems under normal and fault conditions

Assessment

Indicative Assessment Tasks:

This section outlines the type of assessment task the student will be expected to complete as part of the module. More details will be made available in the relevant academic year module handbook.

Assessment One: A time constrained examination covering all learning outcomes. Analytical and descriptive problem-based questions proposed, the student will not have the choice in the questions to be answered to fully assess the whole learning outcomes. Assessment one is a written examination (3 hrs.) and represents 100% of the overall module mark.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)
1	1-3	Examination	100%

Derogations

Credits shall be awarded by an assessment board for those Level 7 modules in which an overall mark of at least 50% has been achieved with a minimum mark of 40% in each assessment element.

Learning and Teaching Strategies

A series of workshop style lectures with student-led seminars and small group activities. Directed learning using library and internet resources will be facilitated using Moodle and MS Teams. This module will also follow the ALF (Active Learning Framework) guidelines, which will include alternative methods of assessment and a blended approach to delivery, with some theory and software sessions being delivered online (depending on requirements and student experience).

Indicative Syllabus Outline

Power Electronics and Converters: Principles of operation of power semiconductor devices; Power loss in power semiconductors; Cooling of power semiconductors and heat-sink design; Power electronic rectifies, convertors and invertors; Control and protection of power electronic devices; Pulse width modulation (PWM); Industrial applications e.g. switching mode power supplies, frequency invertors, etc.

Electrical Machines and Drives: Principles of operation and characteristics of ac and dc electrical machines; Power losses and efficiency; Mechanical requirements for electric drives; Static and dynamic drive performance; Rotary-to-linear motion; Gears; Types of mechanical loads; Thermal management and motor selection; Principles of ac and dc motor control; Dynamic analysis of ac and dc motor drives using modelling and simulation software; Integration of electrical motors and power electronics.

Energy Systems: Three-phase fundaments; Active, reactive and apparent powers, Power factor, Methods of power factor improvement, Synchronous generators construction, principles of operation, performance analysis; Types of transmission lines, Equivalent circuit of transmission line, Electrical power system distribution and protection, Per unit system of measurement; Analysis of faults in electrical power systems; Economics of electricity supply, Cost of electricity and tariffs.

Indicative Bibliography:

Essential Reads

M. Rashid, *Power Electronics: Devices, Circuits, and Applications.* 4th ed. Pearson, 2013.

Other indicative reading

V. M. Weedy, *Electrical Power Systems*, 5th ed. Hoboken: Wiley, 2012.

A. Hughes and B. Drury, *Electric Motors and Drives: Fundamentals, Types and Applications,* 5th ed. Newnes, 2019.

J. L. Kirtley, *Electric Power Principles: Sources, Conversion, Distribution and Use,* 2nd ed. Chichester: Wiley, 2019.

Plus, various others to be signposted on Moodle.

Employability skills – the Glyndŵr Graduate

Each module and programme is designed to cover core Glyndŵr Graduate Attributes with the aim that each Graduate will leave Glyndŵr having achieved key employability skills as part of

their study. The following attributes will be covered within this module either through the content or as part of the assessment. The programme is designed to cover all attributes and each module may cover different areas.

Core Attributes
Engaged
Enterprising
Creative
Ethical

Key Attitudes
Commitment
Curiosity
Resilience
Confidence
Adaptability

Practical Skillsets
Digital Fluency
Organisation
Critical Thinking
Emotional Intelligence
Communication