IMPERIAL

Module Specification

Basic details

UID		Cohorts covered (Earliest cohort)	
Long title	Power Electronics		
New code	ELEC60024	New short title	
Brief description of module *(approx. 600 chars.)*	This module aims: To demonstrate the opportunities provided by power semiconductors to improve the efficiency and controllability of electrical energy conversion as part of power supply systems, motor controls and grid interfaces; To provide you with the opportunity to design a power converter, incorporating knowledge from devices, circuits and control.		
Available as a standalone module/ short course?	No		

Statutory details

	ECTS	CATS	Non-credit	
Credit value	5	10	N	HECOS codes
FHEQ level	6			

Allocation of study hours

	Hours	
Lectures	20	
Group teaching	0	*Incl. seminars, tutorials, problem classes.*
Lab/ practical	0	
Other scheduled	10	*Incl. project supervision, fieldwork, external visits.*
Independent study	95	*Incl. wider reading/ practice, follow-up work, completion of assess*
Placement	0	*Incl. work-based learning and study that occurs overseas.*
Total hours	125	
ECTS ratio	25.00	

Project/placement activity

Is placement activity allowed?	0

Module delivery

Delivery mode	Taught/ Campus	Other	
Delivery term	2	Other	

Ownership

Primary department	Department of Electrical and Electronic Engineering
Additional teaching departments	
Delivery campus	South Kensington

Collaborative delivery

Collaborative delivery?	No
External institution	
External department	
External campus	

Associated staff

Role	CID	Given name	Surname
Module leader		Paul	Mitcheson

Learning and teaching

Module description

Learning outcomes	Upon successful completion of this module, you will be able to: 1. Describe the properties of semiconductor devices useful in power applications 2. Calculate power losses, in devices and choose heat sinks 3. Design loss reduction circuits such as snubbers and quasi resonant circuits 4. Analyse and design isolated and non-isolated dc/dc converters including s-domain modelling using circuit averaging 5. Analyse dc/ac converters including qualitative assessment of frequency spectra 6. Analyse controlled and uncontrolled ac/dc converters including electromagnetic interference issues and regulations 7. Apply power converter designs to application areas including assessment of various options for variable speed operation of induction machines and general performance limits on drive systems 8. Design and build a DC-DC converter in the coursework
Module content	Improvements to basic switch-mode power supply circuits to provide isolation, negative polarity and low ripple; inversion of DC to AC and rectification with sinusoidal current; principles of power (c.f. signal) semiconductors; analysis of power losses and loss reduction techniques; control of induction machines with an inverter; use of inverters as grid interfaces for real and reactive power control.
Learning and Teaching Approach	Through lectures which are supported by one coursework help session a week. There is an extended coursework with design, simulation and, perhaps, build tasks.
Assessment Strategy	This module is assessed by coursework (100%). You will use a combination of PSpice, Matlab and practical skills to design and build a DC-DC converter with a closed loop control of the output voltage. You will work in pairs. There is a staged assessment: report and a viva.
Feedback	You will receive formative feedback with one class a week going through the coursework.
Reading list	1) Williams, B.W.: Power Electronics, download from www.eee.strath.ac.uk/~bwwilliams/ 2) Mohan, Underland & Robbins: Power Electronics, Wiley, any edition

Quality assurance

Date of first approval	
Date of last revision	May 2026
Date of this approval	
Module leader	Prof. P. Mitcheson
Notes/ comments	

Office use only

QA Lead	
Department staff	
Date of collection	
Date exported	
Date imported	

Template version

Assessment details

Grading method	Numerical	Pass mark	40%

Assessments

Assessment type	Assessment description	Weighting	Pass mark	Must pass?
Coursework	Design, simulate and layout of power converter	50%	40%	N
Coursework	Vivas and datasheet (including lab demo of hardware)	50%	40%	N
		100%		