IMPERIAL

Module Specification

Basic details

UID		Cohorts covered	Earliest cohort: Latest c:
Long title	Selected Topics in Power Systems		
New code	ELEC70064	New short title	
Brief description of module *(approx. 600 chars.)*	Decarbonisation of the electric power sector necessitates deployment of new power network control technologies and also radical changes in the way these networks are planned, operated and controlled. In this context, this module provides an outline of five timely topics which are critical for secure and cost-effective operation of a low-carbon electric power system but could not be accommodated as separate modules within the one-year MSc course in Future Power Networks. You will need to take a deeper dive into these topics if needed for your MSc project.		

561 characters

Available as a standalone module/ short course? N

Statutory details

	ECTS	CATS	Non-credit		
Credit value	5	10	N	HECOS codes	
FHEQ level	Level 7				

Allocation of study hours

	Hours	
Lectures	20	
Group teaching		*Incl. seminars, tutorials, problem classes.*
Lab/ practical		
Other scheduled		*Incl. project supervision, fieldwork, external visits.*
Independent study	105	*Incl. wider reading/ practice, follow-up work, completion of assessments*
Placement		*Incl. work-based learning and study that occurs overseas.*
Total hours	125	
ECTS ratio	25.00	

Project/placement activity

Is placement activity allowed? No

Module delivery

Delivery mode	Taught/ Campus	Other	
Delivery term	Term 1	Other	

Ownership

Primary department	Electrical and Electronic Engineering
Additional teaching departments	N/A

Delivery campus	South Kensington

Collaborative delivery

Collaborative delivery?	N
External institution	N/A
External department	N/A
External campus	N/A

Associated staff

Role	CID	Given name	Surname
Module Leader		Yunjie	Gu
Lecturer		Adria	Junyent-Ferre
Lecturer		Bikash	Pal
Module Leader		Fei	Teng (sabbatical 26-27)
Lecturer		Goran	Strbac
Lecturer		Elina	Spyrou
Lecturer		Mark	O'Malley

Learning and teaching

Module description

Learning outcomes	On successfully completing this module you should be able to: 1) assess the role of power electronics in distribution networks. 2) compare in broad terms the main state estimation methods and their associated challenges. 3) appraise the costs and benefits of integrated energy systems. 4) evaluate the impact of low system inertia and the associated mitigation measures. 5) assess the emerging system needs and services in a renewables-dominated power grid
Module content	1. Power electronics in distribution networks: the concept of soft-open-point, converter topologies, design challenges and solutions, approaches to decentralised control, impact on distribution network operation. 2. Power system state estimation: methods of state estimation, bad data detection, network observability, and pseudo measurements. 3. Integrated energy systems: operation and design of multi-vector energy systems, carbon and cost benefits of adopting an integrated approach, balancing local and national level decarbonisation objectives. 4. System operation with low inertia: impact of low inertia on frequency control, virtual inertia for converter interfaced generation. 5. Emerging system needs of a renewables-dominated power grids and the new services required to fulfil these needs to ensure secure and cost-effective operation
Learning support	
Learning and Teaching Approach	The module will be delivered primarily through lectures introducing the key concepts and methods. Learning will be reinforced through a combination of non-assessed problem sheets and an assessed coursework element.
Assessment Strategy	The summative assessment will be based on a written examination at the end of the module and a coursework component. Formative assessment will be based on the discussions held during the lectures and the solution of example exercises linked to the content of the lectures.
Feedback	You will receive feedback on the final examination in the form of a detailed model answer highlighting the most common mistakes, and alternate approaches to the solutions reflecting on the performance of your cohort. You will also receive feedback annotated on your submitted coursework report in Blackboard. Example exercises will be given in the lectures with model solutions to enable you to self-assess your progress.

Reading list	- Kundur, Prabha. "Power system stability." Power system stability and control 10 (2007). - Abur, Ali, and Antonio Gomez Exposito. Power system state estimation: theory and implementation. CRC press, 2004.

Quality assurance

Date of first approval	
Date of last revision	November 2025
Date of this approval	
Module leader	Fei Teng, Yunjie Gu
Notes/ comments	

Office use only

QA Lead	
Department staff	
Date of collection	
Date exported	
Date imported	

Template version #####

Assessment details

Grading method	Numeric	Pass mark	50%

Assessments

Assessment type	Assessment description	Weighting	Pass mark	Must pass?
Examination	Final exam	60%	50%	N
Coursework	Coursework report	40%	50%	N
		100%		