IMPERIAL

Module Specification

Basic details

UID		Cohorts covered (Earliest cohort)	
Long title	Electrical Energy Systems		
New code	ELEC60012	New short title	
Brief description of module *(approx. 600 chars.)*	An efficient and reliable electrical energy system is critical for meeting the electricity demand of society in a cost-effective way. Decarbonisation of this carbon-intensive system is equally important now to achieve the net-zero emissions target and tackle climate change. This module will cover fundamental concepts and analysis methods that are essential for the efficient and reliable operation of our present and future low carbon electricity supply systems dominated by renewables such as wind and solar power.		
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	2	*Incl. project supervision, fieldwork, external visits.*
Independent study	103	*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?	No

Module delivery

Delivery mode	Taught/ Campus	Other	
Delivery term	Term 1	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
Lecturer		Fei	Teng
Lecturer		Balarko	Chaudhuri

Learning and teaching

Module description

Learning outcomes	Upon successful completion of this module, you will be able to: 1.Explain the operating principle and describe the static models of synchronous machines, transformers and transmission lines 2.Use per-unit system for analysis of electric power systems 3.Perform power flow analysis using the Gauss-Seidel technique 4.Conduct short circuit analysis for balanced and unbalanced faults 5.Analyse steady-state and transient stability of simple electric power systems 6.Appraise the challenges associated with low system inertia and short-circuit levels driven by high fractions of renewables
Module content	1.The basic theory of three-phase systems 2.Operating principle and static models of synchronous machines, transformers and transmission lines 3.Per-unit system 4.Review of solution methods for a set of non-linear equations 5.Power flow problem formulation and solution 6.Low system inertia and the role of system scheduling 7.Analysis of balanced faults 8.Method of symmetrical components and analysis of unbalanced faults 9.An introduction to power system stability
Learning and Teaching Approach	This module is taught through lectures with an unassessed problem sheets on various topics.
Assessment Strategy	The module is assessed by a 3-hour, closed book, written examination.
Feedback	You will be provided with worked solutions to the problem sheets and collective feedback on the exam.
Reading list	The reading list available via the Library's Leganto system

Quality assurance

Office use only

Date of first approval		QA Lead	
Date of last revision		Department staff	
Date of this approval	July 2025	Date of collection	
		Date exported	
Module leader	Fei Teng	Date imported	

Notes/ comments	

Template version

Assessment details

Grading method	Numerical	Pass mark	40%

Assessments

Assessment type	Assessment description	Weighting	Pass mark	Must pass?
Examination	3 hour closed book written examination	100%	40%	N
		100%		