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MODULE DESCRIPTOR

Module Title

Power Systems Analysis and Protection

Reference	EN4563	Version	2
Created	November 2022	SCQF Level	SCQF 10
Approved	June 2022	SCQF Points	15
Amended	August 2023	ECTS Points	7.5

Aims of Module

To provide students with the ability to assess the operation of electrical power systems, analyse their performance under steady state and transient conditions, devise methods for their protection, and evaluate their economic operation.

Learning Outcomes for Module

On completion of this module, students are expected to be able to:

1	Conceptualise how electrical energy is produced, transmitted, distributed and traded within the electrical power system.
2	Devise solutions for power systems operation and stability problems under both normal steady-state and short-circuit operating conditions.
3	Devise power system protection strategies.
4	Execute knowledge of mathematics and economics principles on the economics of electrical power systems operation.
5	Operate MATLAB and/or any appropriate software-based environment or advanced techniques for complex load flow analysis using a case study power system.

Indicative Module Content

Fundamentals of Electricity production using Conventional and Renewable Energy Technologies. Components of the power system and how electricity is transmitted, distributed and traded within the electrical power system. Power systems representation using single-line diagram and the per-unit system. Power systems short-circuit analysis. Analytical techniques used for the power system load-flow analysis and the power system stability analysis. Power Systems Protection strategies and characteristics of protection systems. Power Systems Economic operation.

Module Delivery

This module is a lecture-based module supplemented by tutorials and student centred learning.

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Indicative Student Workload	Full Time	Part Time
Contact Hours	40	40
Non-Contact Hours	110	110
Placement/Work-Based Learning Experience [Notional] Hours	N/A	N/A
TOTAL	150	150
Actual Placement hours for professional, statutory or regulatory body		

ASSESSMENT PLAN

If a major/minor model is used and box is ticked, % weightings below are indicative only.

Component 1

Type:	Examination	Weighting:	100%	Outcomes Assessed:	1, 2, 3, 4, 5
Description:	Closed Book Examination				

MODULE PERFORMANCE DESCRIPTOR

Explanatory Text

Component 1 comprises of 100% of the module grade. To pass the module, a D grade is required.

Module Grade	Minimum Requirements to achieve Module Grade:
A	A
B	B
C	C
D	D
E	E
F	F
NS	Non-submission of work by published deadline or non-attendance for examination

Module Requirements

Prerequisites for Module	EN2560 Electrical Power or Equivalent
Corequisites for module	None.
Precluded Modules	None.

INDICATIVE BIBLIOGRAPHY

1	WEEDY, B.M. and CORY, B.J., 2012. 5th ed. Electric Power Systems. Chichester: Wiley
2	J. Duncan Glover, Mulukutla S. Sarma, Thomas Overbye, Adam Birchfield, 2022, 7th Edition. Power System Analysis and Design. Publisher: Cengage, Place of publication: USA
3	Wood, A. J., Wollenberg, B. F., & Sheble, G. B., 2013. 3rd ed. Power Generation, Operation, and Control. IEEE and Wiley. Hoboken, New Jersey
4	GEC ALSTHOM Ltd, 1987. Protective Relays - Application Guide. 4th ed. Stafford: EEC
5	CONEJO, A. J. and BARINGO, L., 2018. Power System Operations, Springer. Cham, Switzerland.
6	BIGGAR, D.R. and HESAMZADEH, M.R., 2014. The Economics of Electricity Markets. IEEE and Wiley. Chichester.
7	BAYLISS, C. R. and HARDY, B. J., 2012. 4th ed. Transmission and Distribution Electrical Engineering. Oxford, UK: Elsevier.
8	TWIDELL, J. and WEIR, T., 2022, 4th Edition. Renewable Energy Resources. Routledge. Published Abingdon, Oxon: Routledge.