

MODULE DESCRIPTOR

Module Title

Power Systems Analysis and Protection

Reference	EN4563	Version	3
Created	January 2024	SCQF Level	SCQF 10
Approved	June 2022	SCQF Points	15
Amended	April 2024	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 the analysis and stability problems of power systems under both steady-state and short-circuit operating conditions.
- 3 Devise strategies for the power systems' protection.
- 4 Execute mathematical knowledge and principles of economics on the economic operation of electrical power systems.
- 5 Operate advanced analytical techniques for the analysis of complex power systems' load flow problems using case studies.

Indicative Module Content

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

Module Delivery

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

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
<i>Actual Placement hours for professional, statutory or regulatory body</i>		

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.