Module Definition Form (MDF)

Module code: MOD003298	**Version:** 3 **Date Amended:** 07/Feb/2023

1. Module Title
Power Conversion Systems

2a. Module Leader
Sufian Yousef

2b. School
School of Engineering and the Built Environment

2c. Faculty
Faculty of Science and Engineering

3a. Level
7

3b. Module Type
Standard (fine graded)

4a. Credits
15

4b. Study Hours
150

5. Restrictions

Type	Module Code	Module Name	Condition
Pre-requisites:	None		
Co-requisites:	None		
Exclusions:	None		
Courses to which this module is restricted:	MSc Electronic and Electrical Engineering		

LEARNING, TEACHING AND ASSESSMENT INFORMATION

6a. Module Description

The module builds on previous knowledge from electronic principles and power electronics. It provides a conceptual foundation across several disciplines, including electronic devices and circuits, signals and systems, power converters control and some renewable energy systems. The module also addresses topics unique to energy technologies, such as power quality and design issues. Waveform and mathematical analysis are treated as an integral part of the analysis and design of the electronic / electrical circuits. This module introduces basic power system technologies, ranging from traditonal topologies to some modern renewable energy based systems. The modules builds a smooth transition from basic principles to more complex devices, topologies and applications. The module content is delivered through a combination of lectures and tutorials.

6b. Outline Content

Power electronic devices: diodes, thyristors, triacs, transistors. Power losses, heatsinks. Electrical Energy. Power converters: classification, control. PWM control techniques. DC-DC converters & control. Buck/Boost converters. AC to DC conversion. Rectifiers: 1-phase / 3-phase systems, power supply units; mean voltage DC to AC conversion. 1-phase / 3-phase Inverters. Harmonics. Power factor. Fourier Analysis. AC/AC power conversion. Cycloconverters. Matrix converters. Renewable Energy Systems – as applications of power converter topologies. Hybrid electric vehicles – as applications of power converter topologies.

6c. Key Texts/Literature

The reading list to support this module is available at: https://readinglists.aru.ac.uk/

6d. Specialist Learning Resources

N/A

7. Learning Outcomes (threshold standards)

No.	Type	On successful completion of this module the student will be expected to be able to:
1	Knowledge and Understanding	Demonstrate advanced knowledge of power electronic devices, power converter circuits and associated control techniques and current trends in power conversion systems.
2	Intellectual, practical, affective and transferrable skills	Apply a comprehensive knowledge of mathematics, statistics, and engineering principles to the solution of complex calculation the main parameters of voltage, current and power used in power systems, demonstrating thorough understanding of the phenomena and their applications.
3	Intellectual, practical, affective and transferrable skills	Formulate and analyse complex power converter topologies to reach substantiated conclusions.
4	Intellectual, practical, affective and transferrable skills	Make engineering judgments for situations with uncertainty or incomplete information, discuss the scope and limitations of the techniques.

8a. Module Occurrence to which this MDF Refers				
Year	**Occurrence**	**Period**	**Location**	**Mode of Delivery**
2024/5	ZZF	Template For Face To Face Learning Delivery		Face to Face

8b. Learning Activities for the above Module Occurrence			
Learning Activities	**Hours**	**Learning Outcomes**	**Details of Duration, frequency and other comments**
Lectures	18	1 - 4	Lecture 1.5 hr x 12 weeks
Other teacher managed learning	18	2 - 4	Tutorials 1.5 hr x 12 weeks
Student managed learning	114	1 - 4	Student managed learning
TOTAL:	150		

9. Assessment for the above Module Occurrence					
Assessment No.	**Assessment Method**	**Learning Outcomes**	**Weighting (%)**	**Fine Grade or Pass/Fail**	**Qualifying Mark (%)**
010	Coursework	1 - 2	20 (%)	Fine Grade	40 (%)
Coursework: 500 word equivalent report to be submitted, maps to Engineering Council Learning Outcome M1					
Assessment No.	**Assessment Method**	**Learning Outcomes**	**Weighting (%)**	**Fine Grade or Pass/Fail**	**Qualifying Mark (%)**
011	Examination Chelmsford	3 - 4	80 (%)	Fine Grade	40 (%)
2 hour examination, maps to Engineering Council Learning Outcome M2					

In order to pass this module, students are required to achieve an overall mark of 40% (for modules at levels 3, 4, 5 and 6) or 50% (for modules at level 7*).

In addition, students are required to:
(a) achieve the qualifying mark for each element of fine graded assessment as specified above
(b) pass any pass/fail elements

[* the pass mark of 50% applies for all module occurrences from the academic year 2024/25 – see Section 3a of this MDF to check the level of the module and Section 8a of this MDF to check the academic year]