Unit Outline (Higher Education)

Institute / School: Institute of Innovation, Science & Sustainability

Unit Title: Power Electronic Application to Renewable Energy

Unit ID: ENGPG9210

Credit Points: 15.00

Prerequisite(s): (ENGPG9201)

Co-requisite(s): Nil

Exclusion(s): (ENGRG9206)

ASCED: 031301

Description of the Unit:

This unit provides knowledge and understanding of the design, applications and use of different power electronics devices in wide range of off-grid and grid connected renewable energy systems. The unit further provides link between theories taught and practical life industry use and investigate power quality issues associated to its use in renewable energy systems.

Grade Scheme: Graded (HD, D, C, P, MF, F, XF)

Work Experience:

No work experience

Placement Component: No

Supplementary Assessment: Yes

Where supplementary assessment is available a student must have failed overall in the Unit but gained a final mark of 45 per cent or above, has completed all major assessment tasks (including all sub-components where a task has multiple parts) as specified in the Unit Description and is not eligible for any other form of supplementary assessment.

Course Level:

Level of Unit in Course	AQF Level of Course					
	5	6	7	8	9	10
Introductory						

Level of Unit in Course	AQF Level of Course					
	5	6	7	8	9	10
Intermediate						
Advanced				✔		

Learning Outcomes:

Knowledge:

K1. Distinguish between the operational principles of different power electronic devices applicable to renewable energy systems.

K2. Recognise the conceptual and practical advantages of switching power electronic circuits over non-switched circuits in renewable energy applications.

K3. Identify the power quality issues possible from renewable energy systems and traditional energy sources and demonstrate the use of power electronic systems to reduce such power quality problems.

Skills:

S1. Analyse the performance of different power electronic devices used in renewable energy systems.

S2. Design and construct different power electronic devices for renewable energy applications.

S3. Evaluate and integrate the operation of power semiconductor devices in a range of operational settings within renewable energy systems.

Application of knowledge and skills:

A1. Analyse different power electronic devices used in renewable energy systems through translating the physical principles, fundamental theories and modelling techniques.

A2. Propose solutions to challenges to the electrical network with the rise in the use of renewable energy technologies and the use of power electronics to eliminate certain challenges.

A3. Apply computer simulation tools to analyse power electronic devices in renewable energy systems.

Unit Content:

Topics may include:
1. Switch mode device operation
2. Switching electronic devices
3. DC-DC converters
4. Rectifiers and controlled rectifiers
5. Power quality issues in renewable energy systems
6. Inverters and PWM control
7. Multilevel converters and applications
8. Integration of multiple renewable energy sources

FEDTASKS

Federation University Federation recognises that students require key transferable employability skills to prepare them for their future workplace and society. FEDTASKS (**T**ransferable **A**ttributes **S**kills and **K**nowledge) provide a targeted focus on five key transferable Attributes, Skills, and Knowledge that are be embedded within curriculum, developed gradually towards successful measures and interlinked with cross-discipline and Co-operative Learning opportunities. *One or more FEDTASK, transferable Attributes, Skills or Knowledge must be*

evident in the specified learning outcomes and assessment for each FedUni Unit, and all must be directly assessed in each Course.

FEDTASK attribute and descriptor		**Development and acquisition of FEDTASKS in the Unit**	
		Learning Outcomes (KSA)	**Assessment task (AT#)**
FEDTASK 1 Interpersonal	Students will demonstrate high-level skills to effectively communicate, interact and work with others both individually and in groups Students will be required to display (in person and/or online) high-level skills in-person and/or online in: • Effective verbal and non-verbal communication via a range of synchronous and asynchronous methods • Active listening for meaning and influencing • High-level empathy for others • Negotiating and demonstrating extended conflict resolution skills • Working respectfully in cross-cultural and diverse teams	Not applicable	Not applicable
FEDTASK 2 Leadership	Students will demonstrate the ability to apply leadership skills and behaviours Students will be required to display skills in: • Creating, contributing to, and enabling collegial environments • Showing self-awareness and the ability to self-reflect for personal growth • Inspiring and enabling others • Making informed and evidence-based decisions through consultation with others • Displaying initiative and ability to solve problems	Not applicable	Not applicable
FEDTASK 3 Critical Thinking and Creativity	Students will demonstrate an ability to work in complex and ambiguous environments, using their imagination to create new ideas Students will be required to display skills in: • Reflecting critically on complex problems • Synthesising, evaluating ideas, concepts and information • Proposing alternative perspectives to refine ideas • Challenging conventional thinking to clarify concepts through deep inquiry • Proposing creative solutions in problem solving	Not applicable	Not applicable
FEDTASK 4 Digital Literacy	Students will demonstrate the ability to work proficiently across a range of tools, platforms and applications to achieve a range of tasks Students will be required to display high-level skills in: • Finding, accessing, collating, evaluating, managing, curating, organising and appropriately and securely sharing complex digital information at a high-level • Receiving and responding to messages in a range of digital media • Using digital tools appropriately to conduct research • Contributing proficiently to digital teams and working groups • Participating in and utilising digital learning opportunities	Not applicable	Not applicable

FEDTASK attribute and descriptor		Development and acquisition of FEDTASKS in the Unit	
		Learning Outcomes (KSA)	Assessment task (AT#)
FEDTASK 5 Sustainable and Ethical Mindset	Students will demonstrate the ability to think ethically and sustainably. Students will be required to display skills in: • The responsible conduct of research • Making informed judgments that consider the impact of devising solutions in multiple global economic environmental and societal contexts • Demonstrating commitment to social responsibility as a professional and a citizen • Generating research solutions which are sustainable,ethical, socially responsible and/or sustainable • Extending lifelong, life-wide and life-deep learning to be open to diverse others • Demonstrate extended actions to foster sustainability in their professional and personal life.	Not applicable	Not applicable

Learning Task and Assessment:

Learning Outcomes Assessed	Assessment Tasks	Assessment Type	Weighting
K3, S3, A1, A2, A3	Experimental/simulation work to verify students` ability to apply knowledge and skills acquired in the unit.	Reports, demonstrations	10% - 30%
K1, K2, K3, S1, S2, S3	Relevant tasks and problems to enforce understanding of the students and help in gradual development of knowledge and skills throughout the unit.	Assessments, quizzes.	10% - 30%
K1, K2, K3, S1, S2, A1	Questions and problems related to the materials covered in the unit.	Test or exam	40% - 60%

Adopted Reference Style:

IEEE ()

Refer to the library website for more information

Fed Cite - referencing tool