Unit Outline (Higher Education)

Institute / School:	Institute of Innovation, Science & Sustainability
Unit Title:	Power Electronics
Unit ID:	ENGPG9201
Credit Points:	15.00
Prerequisite(s):	Nil
Co-requisite(s):	Nil
Exclusion(s):	(ENGRG2202)
ASCED:	031301

Description of the Unit:

This unit facilitates development of fundamental concepts and understanding of basic theory involved in modelling and analysis of the power electronic components that comprise power electronic devices such as power supplies, inverters, converters and their control systems. The unit covers the physical concepts and mathematical models behind each of the basic components and of their functionality within a system, such as a high voltage DC transmission system. The unit further demonstrates use of power electronics to real world engineering applications and provide links with the theories covered.

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						
Intermediate			✔			
Advanced						

Learning Outcomes:

Knowledge:

K1. Discern between and explain the operational principles of different power electronic systems and devices.

K2. Explain the principles of different power converters and switching power supplies

K3. Interpret theoretical concepts covering building blocks of power electronic conversions under different operational environments.

Skills:

S1. Investigate performances of different power electronic devices.

S2. Design, construct and analyse different power electronic systems.

S3. Evaluate the operation of power semiconductor devices in a range of operational settings.

Application of knowledge and skills:

A1. Analyse different power electronic devices by translating principles, fundamental theories and modelling techniques.

A2. Interpret the knowledge and understanding of power electronics theory to design circuits to meet specifications.

A3. Apply computer simulation tools to analyse power electronic systems and devices.

Unit Content:

Topics may include:
1. Power semiconductor devices
2. Driver and trigger circuit for power devices
3. Converters (AC-DC, DC-DC, DC-AC, AC-AC)
4. Switching Mode Power Supplies
5. DC and AC Drives
6. Principles of regenerative braking
7. Application of power electronics (e.g. in power systems, renewable energies, smart grids)

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 the ability to effectively communicate, inter-act and work with others both individually and in groups. Students will be required to display skills in-person and/or online in: • Using effective verbal and non-verbal communication • Listening for meaning and influencing via active listening • Showing empathy for others • Negotiating and demonstrating 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 professional skills and behaviours in leading others. Students will be required to display skills in: • Creating a collegial environment • Showing self -awareness and the ability to self-reflect • Inspiring and convincing others • Making informed decisions • Displaying initiative	Not applicable	Not applicable
FEDTASK 3 Critical Thinking and Creativity	Students will demonstrate an ability to work in complexity and ambiguity using the imagination to create new ideas. Students will be required to display skills in: • Reflecting critically • Evaluating ideas, concepts and information • Considering alternative perspectives to refine ideas • Challenging conventional thinking to clarify concepts • Forming creative solutions in problem solving.	Not applicable	Not applicable
FEDTASK 4 Digital Literacy	Students will demonstrate the ability to work fluently across a range of tools, platforms and applications to achieve a range of tasks. Students will be required to display skills in: • Finding, evaluating, managing, curating, organising and sharing digital information • Collating, managing, accessing and using digital data securely • Receiving and responding to messages in a range of digital media • Contributing actively to digital teams and working groups • Participating in and benefiting from digital learning opportunities.	Not applicable	Not applicable
FEDTASK 5 Sustainable and Ethical Mindset	Students will demonstrate the ability to consider and assess the consequences and impact of ideas and actions in enacting ethical and sustainable decisions. Students will be required to display skills in: • Making informed judgments that consider the impact of devising solutions in global economic environmental and societal contexts • Committing to social responsibility as a professional and a citizen • Evaluating ethical, socially responsible and/or sustainable challenges and generating and articulating responses • Embracing lifelong, life-wide and life-deep learning to be open to diverse others • Implementing required 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
K1, K2, K3, A1, A2	Tasks are developed as assessed (graded) checkpoints to verify the students` level of understanding of different power electronic technologies. The questions will be based upon the contents covered during lectures and tutorials.	Quizzes and assignments	10%-30%
S1, A1, A2, A3	The task is aimed to develop students` ability to appropriately model, analyse, design, simulate and test important concepts in this unit, and then report back technical findings. This assessment task will promote communication and hands-on skills	Lab and report	20%-30%
K1, K2, K3, S2, S3, A1	Thorough knowledge of these topics is essential to answer the exam questions. The examination tests analytical and critical thinking and a general understanding of the unit materials.	Test or exam	40%-60%

Adopted Reference Style:

IEEE ()

Refer to the library website for more information

Fed Cite - referencing tool