

1. Module details**Module name****Linear and Switched Mode Power Supplies****Suggested structured learning time**

40 hours

Module code

NUE 113

Discipline code

0703225 Electrotechnology

2. Module purpose

This module will provide students with knowledge of the circuitry and operation of linear and switched mode power supplies. In addition students will gain the skills to service common faults in such power supplies.

3. Prerequisite modules

NE 178 DC Power supplies

4. Relationship to competency standards

This module provides some of the skills and knowledge underpinning competence in the following standard:

National Electrotechnology Industry Standards, specifically NES 106C, NES206C, NES301C, NES402C and NES 501C.

5. Content**Regulated power supplies**

- Principles of operation
- Advantages/disadvantages
 - Linear series
 - Switches mode

Linear power supplies

- Block diagram
- Principles of operation
- Series transistor
- Integrated circuits
 - Types
 - Specifications
- Protection
- Testing
- Fault finding and repair

Switched mode power supplies

- Block diagram
- Principles of operation
 - With/without transformers
 - Isolation

	<ul style="list-style-type: none"> – Step up/step down/DC-DC converter • Variable frequency/PWM • Terminology • Components • Suppression techniques • Testing • Repair/replacement
6 Assessment strategy	
Assessment methods	Assessment should be progressive reflecting a holistic approach to ensure the module purpose is met. To assist in ensuring validity, reliability and fairness, assessment instruments should include practical exercises, assignments and written tests consisting of a number of item types, such as multiple choice, short answer and problem solving.
Conditions of assessment	Normally learning and assessment will take place in a classroom or laboratory environment.
7. Learning outcome details	
Learning outcome 1	Describe and compare the operation of linear and switched mode regulated power supplies.
Assessment criteria	<p>1.1 Describe the purpose of regulated power supplies.</p> <p>1.2 Describe the principles of operation and list the advantages and disadvantages of linear series regulated power supplies.</p> <p>1.3 Describe the principles of operation and list the advantages and disadvantages of switched mode regulated power supplies.</p>
Learning outcome 2	Describe the operation of linear regulated power supply unit.
Assessment criteria	<p>2.1 Draw the block diagram of shunt and series regulated power supplies.</p> <p>2.2 Describe the function of the major components in a shunt regulated power supply.</p> <p>2.3 Describe the function of the major components in a series regulated power supply.</p> <p>2.4 Describe the operation of a series transistor regulated power supply.</p>

Learning outcome 3

- 2.5 List common types of integrated circuit regulators and state their specifications.
- 2.6 Describe the operation of common protective devices and circuits found in linear regulated power supplies.

Identify and repair faults in linear regulated power supplies.

Assessment criteria

- 3.1 Sketch the expected voltage waveforms in fully functional linear regulated power supplies.
- 3.2 Describe common faults in linear regulated power supplies.
- 3.3 Identify and replace faulty components in a malfunctioning linear regulated power supply.

Learning outcome 4

Describe the operation of switched mode power supply units

Assessment criteria

- 4.1 Draw the block diagram of a switched mode power supply and describe its operation.
- 4.2 Describe special hazards that may be encountered when working with switched mode power supply units.
- 4.3 Describe the principles of operation of switched mode power supplies with isolation transformers.
- 4.4 Describe the isolation requirements and circuitry in switched mode power supplies.
- 4.5 Describe the operation of step-down regulators.
- 4.6 Describe the operation of step-up regulators.
- 4.7 Describe the operation of DC-DC converters.
- 4.8 Describe the operation of variable frequency and PWM regulation techniques.
- 4.9 Describe typical protection circuitry used in switched mode power supplies.
- 4.10 Describe typical radiation suppression circuitry used in switched mode power supplies.

Learning outcome 5

Identify and repair common faults in switched mode power supplies.

Assessment criteria

- 5.1 Sketch the expected voltage waveforms in typical fully functional switched mode power supplies.

	<p>5.2 Describe common faults in switched mode power supplies.</p> <p>5.3 Identify and replace faulty components in malfunctioning switched mode power supplies.</p>
<p>Learning outcome 6</p>	<p>Perform tests to identify power supply faults in electronic equipment.</p>
<p>Assessment criteria</p>	<p>6.1 Describe the various symptoms of a power supply fault as evidenced in electronic equipment.</p> <p>6.2 List the hazards that may be encountered when performing tests on functional and non-functional power supplies in and out of equipment.</p> <p>6.3 Describe diagnostic procedures to isolate faults to a power supply unit.</p> <p>6.4 Perform tests to isolate power faults in non-functional electronic equipment.</p> <p>6.5 Replace a defective power supply in electronic equipment and test for correct operation.</p>
<p>8. Delivery of the module</p>	
<p>Delivery strategy</p>	<p>Delivery strategy must be suitable for learning both theoretical and practical aspects described in the module purpose. It is considered that the most effective way to achieve this is by the integration of theory and practice where students learn by experimentation and through research and laboratory reports. It is recommended that learning and assessment be facilitated in a holistic manner, which may require a learning outcome sequence other than that indicated in the module.</p>
<p>Recommended resource requirements</p>	<p>Minimum teacher qualifications:</p> <p>Certificate IV Assessment & Workplace Training</p> <p>Trade qualifications in the electrical/electronic discipline. This would normally be achieved by relevant workplace experience in this field.</p> <p>Non human resources:</p> <p>Resources should be sufficient for students to carry out practical exercises on an individual basis. This will require a range of linear and switched mode power supplies.</p> <p>Useful references include:</p> <p>Davis, B. 1996. Understanding DC Power Supplies & Oscillators. Prentice Hall, Sydney.</p>

Occupational health and safety requirements

User Guides

Where this module is used in an approved Traineeship or Apprenticeship program students should be advised to obtain, where available, respective EEQSBA¹ *User Guides* (these outline in detail what training and work performance the student is required to undertake for the program).

A safe and healthy environment will be provided for students in regards to classroom and laboratory safety.

¹ EEQSBA - ElectroComms and EnergyUtilities Qualifications Standards Body of Australia Ltd