

**1. Module details**

**Module name**

**Microwave Ovens**

**Suggested structured learning time**

A learner possessing the prerequisite skills and knowledge should achieve the module purpose in 36 to 40 hours.

**Module code**

NUE143

**Field of Education code**

031317

**2. Module purpose**

This module will provide students with the underpinning knowledge and skills necessary to maintain, test, fault find and repair domestic microwave ovens.

Learners will gain an understanding of the principles of operation of microwave ovens.

It covers basic microwave fundamentals, microwave performance, auto-cook facilities, power and control systems as well as new technology.

**3. Learning pathway**

**Intended use in the structured learning program**

This module is intended to supplement extensive workplace exposure to domestic appliance servicing work. In particular it applies to servicing of microwave ovens to ensure they comply with manufacturers' requirements. Therefore before undertaking this module an apprentice should have a clear understanding and experience of electronic safety, electronic concepts, power supply concepts, electronic components and field service procedures required to work on electronic components.

**Recommended prerequisites**

For the most effective learning this module should be undertaken only after modules in Appliance Electronics have been completed.

**4. Relationship to competency standards**

This module provides part of the underpinning knowledge and skills in the 'Evidence Guide' of specific units of competency in the National Electrotechnology Training Package and provides similar support, where mapped, to equivalent units in the National Metals and Engineering Competency Standards. For details refer to the module to unit maps, available from EEQSBA.

**5. Content**

**Summary of content**

1. Basic oven fundamentals
  - Microwave cooking basics
  - Properties of microwaves
  - Biological effects of microwaves
  - Fundamental microwave oven operation
  - Safety considerations
2. Microwave oven performance
  - Radiation leakage
  - Power output measurement
  - Oven leakage safety system
  - Magnetron tests and measurements
  - Interlocks
  - Thermal cut outs and thermostats
  - Stirrer cooling and turntable systems
3. Power control systems
  - Safety considerations
    - Microwaves
    - High voltages
  - High/low power selection
  - Duty cycle control systems
  - Basic circuit diagrams
4. "Auto-cook" facilities
  - Temperature control cooking systems
  - Humidity sensor cooking systems
  - Infrared sensor cooking systems
  - Convection microwave oven systems

5. Service, fault finding and repair
  - Manufacturers' data
  - Safety checks
  - Operating sequence
  - Typical symptoms
  - Test equipment
  - Fault identification
  - Fault location using test equipment and service manuals
  - Repairs
  - Respect for customers premises
6. New microwave oven technology
  - Inverter microwave ovens

**6. Assessment strategy**

**Assessment methods**

Assessment should be progressive reflecting a holistic approach to ensure the module is met. To assist in ensuring validity, reliability and fairness assessment instruments should include practical exercises, assignments and written tests consisting of item types, such as multiple choice, short answer and problem solving.

**Conditions of assessment**

Normally learning and assessment will take place in a formal learning environment.

**7. Learning outcome details**

**Learning outcome 1**

Describe the operation of a basic microwave oven, fundamentals of microwave cooking and the safety considerations when servicing microwave ovens.

**Assessment criteria**

- 1.1 Define the principle of microwave cooking.
- 1.2 Identify the functional blocks in a microwave oven.
- 1.3 List safety considerations when servicing microwave ovens.

**Learning outcome 2**

Measure the assessment of microwave ovens and verify correct operation of all safety systems.

**Assessment criteria**

- 2.1 Measure radiation leakage.
- 2.2 Measure magnetron output power.
- 2.3 Verify if safety interlocks are operable.

|                            |     |  |
|----------------------------|-----|--|
|                            | 2.4 | Demonstrate safe service technique   |
|                            | 2.5 | Measure magnetron operating conditions   |
|                            | 2.6 | Perform magnetron tests (out of circuit).  |
|                            | 2.7 | State the oven radiation leakage system components.  |
|                            | 2.8 | Describe the necessity for stirrer, turntable and cooling systems.   |
|                            | 2.9 | Explain the location and operation of over temperature protection devices  |
| <b>Learning outcome 3</b>  |     | Describe the principles of power control systems used in microwave ovens.  |
| <b>Assessment criteria</b> | 3.1 | Identify and describe the safety considerations of microwaves and high voltages in a microwave oven.                     |
|                            | 3.2 | Measure the change in duty cycle in a variable power microwave oven.   |
|                            | 3.3 | Locate the power control system in the schematic diagram of a microwave oven.  |
|                            | 3.4 | Describe the principles of high/low power only ovens.  |
|                            | 3.5 | Describe the principles of variable power ovens.   |
|                            | 3.6 | Sketch the schematic diagram of a basic microwave oven.  |
| <b>Learning outcome 4</b>  |     | Describe the principles of "auto-cook" facilities utilised in conventional and convection microwave ovens.               |
| <b>Assessment criteria</b> | 4.1 | Sketch a simple temperature control system.  |
|                            | 4.2 | Describe the operation of the system.  |
|                            | 4.3 | Describe the fundamental operation of a humidity sensor cooking system.  |
|                            | 4.4 | Describe the principles of infrared sensor cooking systems.  |
|                            | 4.5 | Compare the operating differences between conventional and convection microwave ovens.                                   |
| <b>Learning outcome 5</b>  |     | Use appropriate resources to service and fault find microwave ovens.   |
| <b>Assessment criteria</b> | 5.1 | Using manufacturers' data select and choose appropriate tools and test equipment to fault find domestic microwave ovens. |
|                            | 5.2 | Carry out safety checks.   |

|                                  |  |
|----------------------------------|--|
|                                  | 5.3 Isolate services and make safe components and the overall appliance.   |
|                                  | 5.4 Fabricate microwave oven test equipment.   |
| <b>Learning outcome 6</b>        | Describe the application and operating principles of new microwave oven technology.  |
| <b>Assessment criteria</b>       | 6.1 Describe the operation of new technology power circuits in microwave ovens.  |
|                                  | 6.2 Describe the operation of new technology control circuits in microwave ovens.  |
|                                  | 6.3 Describe the operation of new technology sensor circuits in microwave ovens.   |
|                                  | 6.4 Describe the operation of new technology display circuits in microwave.  |
| <b>8. Delivery of the module</b> |  |
| <b>Delivery strategy</b>         | Delivery strategies must be suitable for learning both theoretical and practical aspects described in the module purpose. It is considered that the most effective method to achieve this is by integration of theory and practice where students learn by experimentation, research and reports. It is recommended that learning and assessment be facilitated in a holistic manner that may require a learning outcome sequence other than that indicated in the module.   |
| <b>Resource requirements</b>     | Resources should be sufficient for students to carry out exercises on an individual basis.<br><br>This includes samples of different types of microwave ovens and their components. Some samples may be sectioned to show internal workings.<br><br>Useful references include:<br><br>Davidson, H.L. <i>Troubleshooting and Repairing Ovens</i><br><br>National Panasonic, <i>Technical Guide - Microwave Oven, Volume 1 - Fundamentals</i> , Matsushita Housing Products Company.<br><br>National Panasonic, <i>Technical Guide - Microwave Oven, Volume 1 - Digital Control</i> , Matsushita Housing Products Company.<br><br>Sanyo, <i>Microwave Oven Training Manual</i> |

**Occupational health and safety requirements**

Standards Australia, Standards New Zealand:

AS/NZS 3760 (Latest edition) *In-service Safety Inspection and Testing of Electrical Equipment*

AS/NZS 4836 (Latest edition) *Safe Working Practice on Low-voltage Electrical Installations*

WorkCover NSW, *WorkCover Code of Practice - Low Voltage Electrical Work Local electricity distributor and authority regulations*

Where this module is used in an approved Traineeship or Apprenticeship program learners should be advised to obtain, where available, respective EE-Oz Training Standards<sup>1</sup> **User Guides** (these outline in detail what training and work performance the Learner is required to undertake for the program).

A safe and healthy environment will be provided for learners and teachers. Safety procedures for the particular learning facilities shall be followed as part of the learning / teaching activity and assessment.

---

<sup>1</sup> EE-Oz Training Standards – ElectroComms and EnergyUtilities Industry Skills Council Ltd formally EEQSBA