1. Module details

Module name

Substation Switchgear: Installation and Maintenance

Module duration

It is expected that students with the appropriate entry knowledge and skills will successfully complete this module in 36 – 40 hours.

Module code

NUE248

Discipline code

0703130

2. Module purpose

This module provides the learner with a basic understanding of substation indoor and outdoor type switchgear and enable them to perform routine installation and maintenance.

3. Prerequisites

NE162 Electrical Principles 3.
NE31 Electrical Drawing Interpretation and Connections.

4. Relationship to competency standards

This module addresses Unit 3.13 of the E.S.I. National Competency Standards for Overhead Line Work and Cable Jointing.

5. Content

Installation and maintenance of outdoor switchgear, indoor switchgear including, oil sampling, basic electrical testing and precommissioning checks

SF_6 and vacuum equipment

Condition monitoring and philosophy of maintenance

Safety aspects of high pressure hydraulic and pneumatic systems

6. Assessment strategy

Assessment methods

Short answer questions (written, oral or graphic or computer based).
Suitable practical exercises which assess the skills required of each learning outcome.

Conditions of assessment

Theory room for written tests together with practical field observation.
Learners must demonstrate competence in all learning outcomes to the standard described by the assessment criteria and perform all activities in a safe manner in accordance with State Occupational Health and Safety Acts and Regulations, Codes of Practice and Work Procedures when applicable.

7. Learning outcome details

Learning outcome 1	**Install and maintain the main components of a circuit breaker.**	
Assessment criteria	1.1	Identify and explain the function of the main components of a circuit breaker.
	1.2	Install the main components of a circuit breaker.
	1.3	Complete pre-commissioning tests and commission a new circuit breaker.
Learning outcome 2	**Install indoor switchgear.**	
Assessment criteria	2.1	Identify indoor switchgear types and insulation medium.
	2.2	Locate, read and interpret work instructions, work procedures and manufacturer's specifications and recommendations for specific indoor switchgear.
	2.3	Perform HV switching and LV isolation in accordance with current work instructions and procedures when appropriate.
	2.4	Complete a visual examination of the indoor switchgear.
	2.5	Install indoor switchgear and connect all cables and apparatus in accordance with work instructions and manufacturer's recommendations.
	2.6	Implement precommissioning tests and procedures and record results.
	2.7	Test, commission and operate indoor switchgear electrically and mechanically.
	2.8	Check and test indoor switchgear protection circuits.
Learning outcome 3	**Maintain indoor switchgear.**	
Assessment criteria	3.1	Establish and explain the safety hazards related to the identified indoor switchgear.
	3.2	Locate, read and interpret work instructions, work procedures and manufacturer's specifications and recommendations for specific indoor switchgear.

	3.3	Perform HV switching and LV isolation in accordance with current work instructions and procedures when appropriate.
	3.4	Complete a visual examination of the indoor switchgear.
	3.5	Perform indoor switchgear operation sequence as per work instructions, work procedures and manufacturer's recommendations.
	3.6	Observe and record the functional performance of individual operating mechanisms.
	3.7	Complete minor repairs and maintenance.
	3.8	Inspect, check and test protection systems for correct operation.
	3.9	Perform appropriate injection, megger, ductor and oil tests and record and process test results.
Learning outcome 4	**Install outdoor switchgear.**	
Assessment criteria	4.1	Identify outdoor switchgear types and insulation medium.
	4.2	Locate, read and interpret work instructions, work procedures and manufacturer's specifications and recommendations for specific outdoor switchgear.
	4.3	Perform HV switching and LV isolation in accordance with current work instructions and procedures when appropriate.
	4.4	Complete a visual examination of the outdoor switchgear.
	4.5	Install outdoor switchgear and connect all cables and apparatus in accordance with work instructions and manufacturer's recommendations.
	4.6	Implement pre-commissioning tests and procedures and record results.
	4.7	Test, commission and operate outdoor switchgear electrically and mechanically.
	4.8	Check and test outdoor switchgear protection circuits.

Learning outcome 5	**Maintain outdoor switchgear.**
Assessment criteria	5.1 Establish and explain the safety hazards related to the identified outdoor switchgear. 5.2 Locate, read and interpret work instructions, work procedures and manufacturer's specifications and recommendations for specific outdoor switchgear. 5.3 Perform HV switching and LV isolation in accordance with current work instructions and procedures when appropriate. 5.4 Complete a visual examination of the outdoor switchgear. 5.5 Perform outdoor switchgear operation sequence as per work instructions, work procedures and manufacturer's recommendations. 5.6 Observe and record the functional performance of individual operating mechanisms. 5.7 Complete minor repairs and maintenance. 5.8 Inspect, check and test protection systems for correct operation. 5.9 Perform appropriate injection, megger, ductor and oil tests and record and process test results.

8. Delivery of the module

Delivery strategy	Delivery strategies must be suitable for both theoretical and/or practical learning and module purpose. It is recommended that learning and assessment be facilitated in a holistic manner which may require a learning sequence other than indicated in the body of this module descriptor.
Resource requirements	Enterprise equipment labelling manual Relevant Australian standards Enterprise work manuals and standard instructions Relevant manufacturers' equipment manuals Electricity Supply Industry Acts and Regulations
Occupational health and safety requirements	Learners should be made aware of Occupational Health and Safety issues in all situations and be expected to demonstrate safe working practices at all times. Electrical safety must be emphasised.