

Course outline: 222 Protection Methods G063A
UEENEEG063A - Arrange circuits, control and protection for general electrical installations

Qualification:	Certificate III in Electrotechnology Electrician - UEE30811
Applicable to:	Learners, industry/employers, governments, community and Global Energy Training Solutions as the provider
Unit of competency:	Accessible from: http://training.gov.au/Training/Details/UEENEEG063A
Related policies:	<p>Policy & Procedure 1 – Enrolment Policy</p> <p>Policy & Procedure 2 – Credit Transfer & Recognition of Prior Learning</p> <p>Policy & Procedure 3 – Learner Support</p> <p>Policy & Procedure 4 – Assessment</p> <p>Policy & Procedure 5 – Academic Misconduct</p> <p>Policy & Procedure 6 – Alcohol & Other Drugs</p> <p>Policy & Procedure 7 – Access, Equity & Diversity</p> <p>Policy & Procedure 8 – Vulnerable People</p> <p>Policy & Procedure 9 – Work, Health & Safety</p> <p>Policy & Procedure 10 – Incident, Injury & Rehabilitation</p> <p>Policy & Procedure 11 – Competency, & Qualification Assessment Decisions</p> <p>Policy & Procedure 12 – Complaints & Appeals</p> <p>Policy & Procedure 13 – Privacy</p> <p>Policy & Procedure 14 – Fees</p> <p>Policy & Procedure 15 – Industry & Employer Engagement</p> <p>Policy & Procedure 16 – Trainers & Assessors</p> <p>Policy & Procedure 17 – Administration & Other Staff</p> <p>Policy & Procedure 18 – Quality Assurance</p> <p>Policy & Procedure 19 – Business & Financial Risk Management</p> <p>Policy & Procedure 20 – Changes to Qualifications or Business</p> <p>Policy & Procedure 21 – Conflict of Interest</p> <p>Policy & Procedure 22 – Records Management</p> <p>Policy & Procedure 23 – Marketing & Advertising</p>
Monitor and review:	Policy & Procedure 18 – Quality Assurance
Responsibility:	Ben Murphy – as Proprietor
Questions/queries:	Feedback and suggestions welcomed: office@gets.com.au (+61) 02 6262 0077

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1. Material requirements

- AS/NZS 3000:2007 incorporating amendment 1 and 2
- Scientific calculator, ruler, pens and pencils
- Note book
- Hand tools
- Covered footwear
- Internet access (provided)

2. Session summaries

Day 1	
Required Skills and Knowledge	<p>T1 Safety principles to which electrical systems in building and premises shall comply.</p> <ul style="list-style-type: none"> • Safety principles are given in Part1 (Section 1) of the Wiring Rules AS/NZS 3000 with deemed-to-comply requirements given in Sections 2 to 8. • Compliant methods for providing protection - include those for providing protection against direct and indirect contact; thermal effects; unwanted voltages; overcurrent; fault currents; overload; overvoltage; injury from mechanical movement. • Requirements for installation design and selection of equipment - includes compliant protection arrangements; correct functioning; compatibility with supply; estimation of maximum demands; voltage drop considerations; arrangement of circuits and the like <p>T2 Circuit and control arrangements encompassing:</p> <ul style="list-style-type: none"> • reason for dividing electrical installations into circuits • factors that shall be considered in determining the number and type of circuits required for an installation. • daily and seasonal demand for lighting power, heating and other loads in a given installation. • number and types of circuits required for a particular installation. • diagrams/schedules of circuits for given installations. • application and arrangements of SELV and PELV circuits • application and arrangement of an isolated supply

Day 2	
Required Skills and Knowledge	<p>T3 Hazards and risks in an electrical installation encompassing:</p> <ul style="list-style-type: none"> • effects on the human body of various levels of a.c. and d.c. current and duration of current flow for various current paths.

	<ul style="list-style-type: none"> • risk of ignition of flammable materials due the thermal effects of current or electric arcs in normal service of an electrical installation. • risk of injury from mechanical movement of electrically actuated equipment. • Protection against direct contact (basic protection) • acceptable methods • use of extra-low voltage
T4	<p>Protection against indirect contact encompassing:</p> <ul style="list-style-type: none"> • indirect contact with live parts of an electrical installation may occur. • methods and devices that comply with the Wiring Rules for providing protection against indirect contact. • components of the 'automatic disconnection of supply' method of protection against indirect contact. • the terms 'touch voltage' and 'touch current'. • the current path when a short circuit fault to exposed conductive parts of an appliance occurs. • protection against indirect contact is by the use of Class II equipment and by electrical separation. • additional protection by use of Residual Current Devices (RCDs) • protection against indirect contact by use of extra-low voltage and electrical separation. • Protection requirements for damp situations.

Day 3

Required Skills and Knowledge	<p>T5 Earthing encompassing:</p> <ul style="list-style-type: none"> • the terms: earthed, earthed situation, earth electrode, equipotential bonding, multiple earthed neutral (MEN) system, protective earth-neutral (PEN) conductor, main earthing conductor, protective earthing (PE) conductor, functional earthing, MEN link. • selection of minimum size-earthing conductor for a range of active conductor sizes and materials. • parts of an earthing system and the purpose of each. • typical arrangement for a MEN earthing system. • arrangements of protective earthing conductors that comply with the Wiring Rules. • requirements for equipotential bonding in a range of installation situations. • Installation of a MEN earthing system for a single phase installation <p>T6 Protection against overload and short circuit current encompassing:</p> <ul style="list-style-type: none"> • overload current or fault currents in an electrical installation. • equivalent circuit of an earth fault-loop • level of fault current possible at a given point in an installation from the fault-loop impedance and data from the electricity distributor. • methods and devices that comply with the Wiring Rules AS/NZS 3000 for providing protection against the damaging effects of overload and fault current • requirements for co-ordination between protective devices and conductors • requirements for co-ordination of protection devices for discrimination and back-up protection.
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Day 4

Required Skills and Knowledge	<p>T7 Devices for automatic disconnection of supply encompassing:</p> <ul style="list-style-type: none"> • operating principles of thermal/magnet circuit breakers. • operating principles of common types of fuses. • operating principles of residual current devices (RCD). • time/current curves tripping characteristics of various types of circuit breakers that comply with the requirements of the Wiring Rules. • time/current curves fusing characteristics of various types of fuses that comply with the
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	<ul style="list-style-type: none"> requirements of the Wiring Rules. time/current curves tripping characteristics of various types of RCDs that comply with the requirements of the Wiring Rules. factors in a fault loop that will affect the impedance of the circuit. maximum impedance of an earth fault-loop to ensure operating of a protection device. selecting a fuse for fault current limiting protection. drawing switchboard wiring arrangements of 2-pole RCDs, 4-pole RCDs, combination RCD/MCBs.
T8	Protection against over voltage and under voltage encompassing: <ul style="list-style-type: none"> causes of over voltage and how this may affect the electrical system. methods for protection against over voltage. causes of under voltage and how this may affect the electrical system. methods for protection against under voltage.
T9	Control of an electrical installation and circuits encompassing: <ul style="list-style-type: none"> switch types, current and voltage ratings and IP rating and where these apply. switching requirements for isolation, emergency, mechanical maintenance and functional control. control arrangement for complete installations with and without safety services and an alternative supply.

Day 5	
Required Skills and Knowledge	T10 Switchboards / distribution boards encompassing: <ul style="list-style-type: none"> Purpose, types and applications. Physical and circuit arrangements for whole current and CT metering. Physical and circuit arrangements of main switches, circuit protection devices, fault-current limiters and metering equipment and other distributor equipment. compliance requirements (includes location and access, arc fault protection, identification, construction suitability, equipment marking, wiring, fire protection and arc-fault protection).

3. Elements and Performance Criteria

Elements and Performance Criteria require practice and demonstration in the work place.

Element		Performance Criteria	Work Performance
1:Prepare to arrange electrical installations circuits, control and protection.	1.1	The extent and nature of the electrical installation is determined from job specifications.	<input type="checkbox"/> Satisfactory <input type="checkbox"/> Needs improvement <input type="checkbox"/> Not performed
	1.2	Safety and other regulatory requirements to which the electrical installation shall comply are identified, obtained and understood.	<input type="checkbox"/> Satisfactory <input type="checkbox"/> Needs improvement <input type="checkbox"/> Not performed
	1.3	Load requirements for individual current-using equipment is determined from job specifications or from consultation with appropriate persons.	<input type="checkbox"/> Satisfactory <input type="checkbox"/> Needs improvement <input type="checkbox"/> Not performed
2:Arrange electrical installations circuits, control and	2.1	Circuits, control and protective devices are arranged to ensure safe and functional operation of the installation and to comply with technical standards and job specifications and requirements.	<input type="checkbox"/> Satisfactory <input type="checkbox"/> Needs improvement <input type="checkbox"/> Not performed
	2.2	Earthing is arranged and terminated to comply with the MEN system requirements.	<input type="checkbox"/> Satisfactory <input type="checkbox"/> Needs improvement <input type="checkbox"/> Not performed

protection.	2.3	Protective devices are selected to meet the required switching and tripping currents, co-ordination and discrimination for overload and short-circuit protection.	<input type="checkbox"/> Satisfactory <input type="checkbox"/> Needs improvement <input type="checkbox"/> Not performed
	2.4	Residual current devices are selected to meet the required circuit, switching and tripping currents required.	<input type="checkbox"/> Satisfactory <input type="checkbox"/> Needs improvement <input type="checkbox"/> Not performed
	2.5	Switchgear/control gear is selected to meet current, voltage and IP ratings and functional requirements.	<input type="checkbox"/> Satisfactory <input type="checkbox"/> Needs improvement <input type="checkbox"/> Not performed
	2.6	Switchboards are arranged to accommodate control and protective devices, links, safety services, and other distributor equipment in accordance with requirements.	<input type="checkbox"/> Satisfactory <input type="checkbox"/> Needs improvement <input type="checkbox"/> Not performed
3:Document electrical installation circuits, control and protection arrangements	3.1	Evidence is obtained from manufacturers/suppliers that electrical equipment selected complies with safety requirements.	<input type="checkbox"/> Satisfactory <input type="checkbox"/> Needs improvement <input type="checkbox"/> Not performed
	3.2	Reasons for selections made, including calculations, are documented in accordance with established procedures.	<input type="checkbox"/> Satisfactory <input type="checkbox"/> Needs improvement <input type="checkbox"/> Not performed
	3.3	Electrical installation arrangement and specifications for all selected items are documented in accordance with established procedures and forwarded to appropriate person(s).	<input type="checkbox"/> Satisfactory <input type="checkbox"/> Needs improvement <input type="checkbox"/> Not performed

4. Assessments

Assessment	When	Satisfactory mark/outcome
Theory assessment 1	Day 2	70%
Theory assessment 2	Day 3	70%
Theory assessment 3	Day 4	70%
Theory assessment 4	Day 5	70%
Practical assessment 1	Day 5	100%
Workplace Observation	After theory and practical assessments	Must be valid, sufficient, authentic and current
Employer Competency report		
Structured workplace experience interview		
Note: Once all theory, practical and on-site assessments are complete, competency assessment decisions can be made in conjunction with the learner, employer and registered training organisation.		

5. Version control

Version	Date of release	Author	Authorised by	Position	Rational for change
V1	5/10/2015	Ben Murphy	Ben Murphy	Proprietor	Initial release
V2	7/2/2017	Ben Murphy	Ben Murphy	Proprietor	Added Elements and Performance Criteria