Course outline: 242 Testing G108A
UEENEEG108A - Trouble-shoot and repair faults in low voltage electrical apparatus and circuits

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/UEENEEG108A
Related policies:	Policy & Procedure 1 – Enrolment Policy Policy & Procedure 2 – Credit Transfer & Recognition of Prior Learning Policy & Procedure 3 – Learner Support Policy & Procedure 4 – Assessment Policy & Procedure 5 – Academic Misconduct Policy & Procedure 6 – Alcohol & Other Drugs Policy & Procedure 7 – Access, Equity & Diversity Policy & Procedure 8 – Vulnerable People Policy & Procedure 9 – Work, Health & Safety Policy & Procedure 10 – Incident, Injury & Rehabilitation Policy & Procedure 11 – Competency, & Qualification Assessment Decisions Policy & Procedure 12 – Complaints & Appeals Policy & Procedure 13 – Privacy Policy & Procedure 14 – Fees Policy & Procedure 15 – Industry & Employer Engagement Policy & Procedure 16 – Trainers & Assessors Policy & Procedure 17 – Administration & Other Staff Policy & Procedure 18 – Quality Assurance Policy & Procedure 19 – Business & Financial Risk Management Policy & Procedure 20 – Changes to Qualifications or Business Policy & Procedure 21 – Conflict of Interest Policy & Procedure 22 – Records Management Policy & Procedure 23 – Marketing & Advertising
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	T1 Troubleshooting concepts encompassing: • need to understand the correct operation of a circuit or equipment, switching and control circuit arrangements. • common faults with circuits and equipment including operator faults, incorrect connections, open-circuits, short-circuits, device faults (mechanical), supply faults. • typical faults symptoms and their causes: operation of circuit protective device, appliance does not operate, single phase motor does not develop enough torque to drive the load, three phase motor does not develop enough torque to drive the load, motor overload trips • factors to consider in clarifying the nature of a fault: initial fault report, confirmation of symptoms of the fault, comparison of symptoms with normal operation • effect to cause reasoning — assumptions of possible causes • methods for testing assumptions: visual inspection, component isolation, test equipment, sectional testing, split-half tests • repairing the fault and the steps needed to ensure fault doesn't re-occur • dealing with intermittent faults (typical causes of intermittent faults are vibration, shock, changes in temperature and electromagnetic interference). • final testing and re commissioning T2 Troubleshooting water heater and appliance circuits/equipment encompassing: • circuit diagrams of common single phase and three phase hot water systems • single phase and three phase element resistance values (determined from measurement and calculation from power and voltage ratings) • testing single and three phase elements for correct insulation resistance and continuity • element replacement techniques • operation of thermostats, thermal cut-outs and pressure relief valves, flow switches and checking sacrificial anodes • locating faults in common single and three phase hot water systems

	• repairing faulty water heating systems T3 Troubleshooting electrical appliance circuits/equipment encompassing: • circuit diagrams of common single phase and three phase appliances • methods to determine the cause of an RCD operation • identification of appliances that is causing an RCD to trip • testing single and three phase appliances for correct insulation resistance and continuity • operation of appliances controls • locating faults in common single and three phase appliances • repairing faulty appliances

Day 2	
Required Skills and Knowledge	T4 Troubleshooting lighting circuits encompassing: • circuit and wiring diagrams of common lighting circuits including single light controlled by a single switch, multiple lights controlled by a single switch, two and three way switching using the loop at the light method and the loop at the switch method. • causes of wiring faults from supplied symptoms and circuit and/or wiring diagrams • causes of faults in ELV lighting devices, include transformer (iron core or electronic), voltage drop, heat, over-voltage, poor connections, incompatible dimmers • diagrams of a basic fluorescent light circuit including lamp, ballast and starter • locating faults in fluorescent light circuits • operation of a range of lighting control including passive infra-red (PIR), dimmers, photo electric or day-light switches and time clocks • locating faults in lighting control circuits T5 Troubleshooting single phase motor and control circuits encompassing: • circuit diagrams of split phase, capacitor start, capacitor start capacitor run, universal and shaded pole single phase motors • causes of single phase motor faults from supplied symptoms and circuit diagrams • causes of electrical faults in single phase motors, include open and partially open circuit winding, short and partially short circuit winding, open circuit rotor, burnt out winding, coil shorted to frame. • reasons for a thermal overload trip and how often they are to be reset before investigating a cause • internal mechanical faults and their consequences, include bearings, fans, bent shaft, locked rotor, blocked air vents, centrifugal switches, environmental factors • faults on driven loads and couplings and their consequences, include slipping belts, poorly aligned coupling (shims), vibration, loads bearing failing, load stalling. • locating faults in single phase motors and their controls

Day 3	
Required Skills and Knowledge	T6 Troubleshooting three phase induction motor encompassing: • circuit diagrams of three phase induction motors • causes of three phase motor faults from supplied symptoms and circuit diagrams • causes of electrical faults in three phase motors, include open and partially open circuit phase winding, short and partially short circuit phase winding, open circuit rotor, burnt out phase winding, coil shorted to frame. • reasons for a thermal overload trip and how often they are to be reset before investigating a cause • internal mechanical faults and their consequences, include bearings, fans, bent shaft, locked rotor, blocked air vents, environmental factors. • faults on driven loads and couplings and their consequences, include slipping belts, poorly aligned coupling (shims), vibration, loads bearing failing, load stalling. • locating faults in three phase induction motors and their controls

	T7 Troubleshooting electrical installations encompassing: • circuit diagrams, wiring diagrams, cable schedules and specifications of electrical installations • causes of electrical installation faults from supplied symptoms and circuit diagrams include open and partially open circuit wiring, short and partially short circuit wiring, low insulation resistance, incorrect polarity, transposition of conductors, RCD tripping. • locating faults in electrical installations • repairing faulty electrical installation circuits components and wiring.

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 trouble-shoot and rectify faults.	1.1	The extent and nature of the electrical installation is determined from job specifications.	☐ Satisfactory ☐ Needs improvement ☐ Not performed
	1.2	Safety and other regulatory requirements to which the electrical installation shall comply area are identified, obtained and understood.	☐ Satisfactory ☐ Needs improvement ☐ Not performed
	1.3	OHS procedures for a given work area are identified, obtained and understood.	☐ Satisfactory ☐ Needs improvement ☐ Not performed
	1.4	OHS risk control measures and procedures in preparation for the work are followed.	☐ Satisfactory ☐ Needs improvement ☐ Not performed
	1.5	The likely extent of work to be undertaken is envisaged from fault/breakdown reports and/or discussions with appropriate person(s).	☐ Satisfactory ☐ Needs improvement ☐ Not performed
	1.6	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.	☐ Satisfactory ☐ Needs improvement ☐ Not performed
2:Trouble-shoot and repair faults.	2.1	OHS risk control measures and procedures for carrying out the work are followed.	☐ Satisfactory ☐ Needs improvement ☐ Not performed
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.	☐ Satisfactory ☐ Needs improvement ☐ Not performed
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.	☐ Satisfactory ☐ Needs improvement ☐ Not performed
	2.4	Safety hazards resulting from the fault or breakdown are documented and risk control measures devised and implemented in consultation with appropriate personnel.	☐ Satisfactory ☐ Needs improvement ☐ Not performed
	2.5	Trouble-shooting is approached methodically drawing on knowledge of electrical circuits and apparatus using measured and calculated values of circuit/apparatus parameters.	☐ Satisfactory ☐ Needs improvement ☐ Not performed
	2.6	Circuit/apparatus components are dismantled where necessary and parts stored to protect them against loss or damage.	☐ Satisfactory ☐ Needs improvement

			☐ Not performed
	2.7	Faulty circuits/components are rechecked and their fault status and acquired.	☐ Satisfactory ☐ Needs improvement ☐ Not performed
	2.8	Materials/replacement parts required to rectify faults are sourced and obtained in accordance with established procedures.	☐ Satisfactory ☐ Needs improvement ☐ Not performed
	2.9	Effectiveness of the repair is tested in accordance with established procedures.	☐ Satisfactory ☐ Needs improvement ☐ Not performed
	2.10	Apparatus is reassembled, finally tested and prepared for return to service.	☐ Satisfactory ☐ Needs improvement ☐ Not performed
	2.11	Unexpected situations are dealt with safely and with the approval of an authorised person.	☐ Satisfactory ☐ Needs improvement ☐ Not performed
	2.12	Trouble-shooting and repair activities are carried out without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.	☐ Satisfactory ☐ Needs improvement ☐ Not performed
3:Complete and report, trouble-shoot and repair activities.	3.1	OHS work completion risk control measures and procedures are followed.	☐ Satisfactory ☐ Needs improvement ☐ Not performed
	3.2	Work area is cleaned and made safe in accordance with established procedures.	☐ Satisfactory ☐ Needs improvement ☐ Not performed
	3.3	Written justification is made for repairs to apparatus.	☐ Satisfactory ☐ Needs improvement ☐ Not performed
	3.4	Work completion is documented and an appropriate person or persons notified in accordance with established procedures.	☐ Satisfactory ☐ Needs improvement ☐ Not performed

4. Assessments

Assessment	When	Satisfactory mark/outcome
Theory assessment 1	Day 3	70%
Practical assessment 1	Day 2	100%
Practical assessment 2	Day 3	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