22527VIC

Certificate II in Integrated Technologies (Pre-vocational)

This course has been accredited under Part 4.4 of the Education and Training Reform Act 2006.

Accredited for the period: 1 July 2020 to 30 June 2022

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Version History

22527VIC Certificate II Integrated Technologies (Pre-vocational) has been replaced by the equivalent 22586VIC Certificate II in Integrated Technologies (Pre-vocational).

The expiry date of 22527VIC has been revised from 30 June 2025 to 30 June 2022.

The accreditation period of the replacement 22586VIC Certificate II in Integrated Technologies (Pre-vocational) is 1January 2022 to 31 December 2026.

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Section A: Copyright and course classification information

1. Copyright owner of the course	Copyright of this material is held by the Department of Education and Training, Victoria. © State of Victoria (Department of Education and Training) 2019
2. Address	Executive Director Engagement, Participation and Inclusion Higher Education and Skills Department of Education and Training PO Box 4367 Melbourne VIC 3001 Organisational contact: Manager, Training Products Unit Higher Education and Skills Email: course.enquiry@edumail.vic.gov.au Day to day contact: George Adda Curriculum Maintenance Manager - Engineering Industries Box Hill Institute of TAFE Private Bag 2014 Box Hill Victoria 3128 Ph:(03) 9286 9880 Email: g.adda@boxhill.edu.au
3. Type of submission	Reaccreditation
4. Copyright acknowledgement	The following units of competency: CPPSEC2021A Install security equipment and systems CPPSEC2023A Install CCTV equipment and system CPPSEC2026A Perform routine maintenance on security equipment and system are from the **CPP07 - Property Services Training Package** administered by the Commonwealth of Australia © Commonwealth of Australia The following units of competency: CUAANM301 Create 2D digital animations CUAANM302 Create 3D digital animations are from the **CUA - Creative Arts and Culture Training Package** administered by the Commonwealth of Australia © Commonwealth of Australia

	The following units of competency: ICTCBL246 Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule ICTDRE301 Install digital reception equipment ICTDRE302 Locate and rectify digital reception equipment faults ICTGAM301 Apply simple modelling techniques ICTGAM303 Review and apply the principles of animation ICTICT302 Install and optimise operating system software ICTICT303 Connect internal hardware components ICTNWK302 Determine and action network problems ICTNWK305 Install and manage network protocols ICTNWK405 Build a small wireless local area network ICTPRG301 Apply introductory programming techniques ICTSAS202 Apply problem-solving techniques to routine ICT malfunctions ICTSAS203 Connect hardware peripherals ICTSAS206 Detect and protect from spam and destructive software ICTSAS308 Run standard diagnostic tests ICTSAS303 Care for computer hardware ICTSAS304 Provide basic system administration ICTSAS306 Maintain equipment and software ICTSAS307 Install, configure and secure a small office or home office network ICTTEN208 Use electrical skills when working with telecommunications networks ICTTEN207 Install and test internet protocol devices in convergence networks ICTWHS204 Follow work health and safety and environmental policy and procedures are from the **ICT - Information and Communications Technology Training Package** administered by the Commonwealth of Australia © Commonwealth of Australia The following units of competency: UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace UEENEEK112A Provide basic sustainable energy solutions for energy reduction in residential premises

	UEENEEK114A Promote sustainable energy practices in the community UEENEEK142A Apply environmentally and sustainable procedures in the energy sector are from the **UEE11 - Electrotechnology Training Package** administered by the Commonwealth of Australia © Commonwealth of Australia The following units: VU22340 - Use 3D printing to create products VU22338 - Configure and program a basic robotic system are from **22470VIC - Certificate II in Engineering Studies** Copyright of this material is reserved to the Crown in the right of the State of Victoria. © State of Victoria (Department of Education and Training) 2018. This work is licensed under a Creative Commons Attribution-NoDerivs 3.0 Australia licence (see website here). The following unit: VU22324 – Build a simple network and establish end to end connectivity is from **22263VIC - Certificate IV in Integrated Technologies** Copyright of this material is reserved to the Crown in the right of the State of Victoria. © State of Victoria (Department of Education and Training) 2014. This work is licensed under a Creative Commons Attribution-NoDerivs 3.0 Australia licence (see website here). The following unit: VU22674 – Explore applications and operation of the Internet of Things (IoT) is from **22499VIC - Certificate II in Electrotechnology (Pre-vocational)** Copyright of this material is reserved to the Crown in the right of the State of Victoria. © State of Victoria (Department of Education and Training) 2018. This work is licensed under a Creative Commons Attribution-NoDerivs 3.0 Australia licence (see website here). The following units: VU21990 – Recognise the need for cyber security in an organisation VU21993 – Secure a networked personal computer

	are from **22334VIC - Certificate IV in Cyber Security** Copyright of this material is reserved to the Crown in the right of the State of Victoria. © State of Victoria (Department of Education and Training) 2017. This work is licensed under a Creative Commons Attribution-NoDerivs 3.0 Australia licence (see website here).	
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6. Course accrediting body	Victorian Registration and Qualifications Authority	
7. AVETMISS information	**ANZSCO Code**	899914 Electrical or Telecommunications Trades Assistant
	ASCED Code	0313 Electrical and Electronic Engineering and Technology
	National course code	22527VIC
8. Period of accreditation	1 July 2020 to 30 June 2022	

Section B: Course information

1. Nomenclature	*Standard 1 AQTF Standards for Accredited Courses*
1.1 Name of the qualification	Certificate II in Integrated Technologies (Pre-vocational)
1.2 Nominal duration of the course	370 - 515 hours
2. Vocational or educational outcomes	***Standard 1 AQTF Standards for Accredited Courses***
2.1 Purpose of the course	This is a pre-vocational course which will prepare learners with the knowledge and skills required to work in various technical roles in industries where there is an integration of technologies to provide a range of goods and/or services. The target group for the course is any person wishing to gain a traineeship, apprenticeship or employment as a technical support person.
3. Development of the course	***Standards 1 and 2 AQTF Standards for Accredited Courses***
3.1 Industry/enterprise/ community needs	Increasingly, the impact of integrated technologies is being felt across a number of industry sectors such as building and construction, manufacturing/engineering, electrical/electronics, renewable energy, information technology and telecommunications, transport etc. The integration of technologies is changing the nature of work, the way people work and the skills they need for work. Currently, sixty percent (60%) of all occupations have at least thirty (30%) of the activities that are technically automatable. This percentage figure is increasing and the knowledge and skills required for work is changing to match the increasing applications of technology. Currently, there is no one training package qualification available that provides the spread of technology coverage or the degree of flexibility in its' structure, to address the wide range of knowledge and skills requirements for work in an integrated technologies environment. This pre-vocational course has been developed to introduce secondary school students to a range of technologies that have been blended and applied in new and innovative integrated applications in a number of industry areas. The vocational/educational outcomes of this course are: – demonstrate basic knowledge and skills in the fundamentals of a range of technologies – apply safe work practices in a workplace where technologies are applied

	– undertake project work involving the integration/blending of technologies to achieve a specified outcome – service and maintain existing integrated technologies applications Department of Education and Training (DET) data indicates that secondary school students undertaking this course as part of their VCE/VCAL program are the primary users of this qualification. There were 713 enrolments over the past 4 years. The Victorian Curriculum & Assessment Authority (VCAA) continues to support the ongoing availability of this course as a VET for secondary school students program. The course also continues to be supported by two major industry enterprises e.g. Telstra and CISCO and three organisations which represent skills development and training for the technologies industry at both the State-wide and national levels. The organisations are : – Communication and Information Technology Training Ltd.(CITT) – Australian Digital and Telecommunications Industry Association Inc. (ADTIA) – Future Energy Skills Each of the above enterprises and organisations are represented on the course steering committee. Graduates of this course are qualified to: – enter further study in integrated technologies such as the Certificate IV in Integrated Technologies or related fields – seek employment and further training through an traineeship, apprenticeship or cadetship such as the Certificate III in Electrotechnology (Electrical) – seek employment in a technical support role in industry areas where there is a blend of technologies applied. This course has been reviewed and redeveloped under the guidance of a project steering committee consisting of the following persons: Anna Henderson (Chairperson) — Business Skills Viability (BSV) Dominic Schipano — Communication & Information Technology Training Ltd (CITT) Gabriele Giofre — Australian Digital & Telecommunications Industry Association Inc. (ADTIA) Emma McDonald — Telstra Emma Broadbent — CISCO Systems

	Alan Bradley — Engineers Australia Alex Newman — Future Energy Skills Ian Turnbull — Applied Technology Training and Consulting Australia Husnen Rupani — Infinispark Pty Ltd In attendance: George Adda (Project manager) CMM-Engineering Industries Trevor Lange (Writer/minutes) CMM-Engineering Industries This course: – does not duplicate, by title or coverage, the outcomes of an endorsed training package qualification – is not a subset of a single training package qualification that could be recognised through one or more statements of attainment or a skill set – does not include units of competency additional to those in a training package qualification that could be recognised through statements of attainment in addition to the qualification – does not comprise units that duplicate units of competency of a training package qualification
3.2 Review for reaccreditation	As a consequence of the course review process for reaccreditation, some changes have been made to the core and elective units within the course structure to ensure the currency of the content. Core units: Each of the VU units have been reviewed and where required updated. The wording of some unit titles has been amended to more adequately reflect their content. The unit VU 22324 - *Build a simple network and establish end to end connectivity* was added to the list of core units to address an identified gap. The previous OH&S unit: MEM13014A is now obsolete and has been replaced with unit UEENEEE101A. Students are required to complete seven core units – one more than in the previous qualification. Elective streams and units: Enrolment data from the current course indicated none of the units in the Multimedia and Games Systems Stream were being used with the exception of unit VU21706 – *Create products using 3D printing.* This stream has been removed from the revised course structure and the above unit has been transferred to the Robotics Control Stream.

	Each imported training package units was checked to ensure only the latest version is listed and all elective VU units have been reviewed and updated where required. There are minor changes to some VU unit titles in the Wireless Communication stream. To address the need for cyber security and network protection awareness two units have been added to the Computing Network stream. Selection rules for the elective units have been amended and are now based on a required number of units rather than meeting a minimum number of hours. This course is deemed to be equivalent to the current course (22289VIC Certificate II in Integrated Technologies). However, it is recommended all new enrolments should be in the new course from 1st July 2020. The Transition Table below provides a detailed unit by unit comparison between the current and new course.

Transition Table

Units in the superseded 22289VIC - Certificate II in Integrated Technologies		**Units in the new 22527VIC - Certificate II in Integrated Technologies (Pre-vocational)**		**Relationship**
MEM13014A	Apply principles of occupational health and safety in the work environment			Unit deleted
		UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	New unit
VU21702	Prepare for working in the integrated technology sector	VU22819	Prepare to work in an integrated technologies environment	Equivalent
VU21703	Work in an integrated technology environment	VU22820	Use routine work practices in an integrated technologies environment	Equivalent
VU21704	Use electrotechnology skills in integrated technology work	VU22821	Apply electrotechnology knowledge and skills in integrated technologies work	Equivalent
VU21705	Use software applications in integrated technology work	VU22822	Use CAD software applications in integrated technologies work	Equivalent
VU21701	Carry out an integrated technology project	VU22821	Carry out an integrated technologies project	Equivalent
		VU22324	Build a simple network and establish end to end connectivity	New unit
ICAICT302A	Install and optimise operating system software	ICTICT302	Install and optimise operating system software	Equivalent
ICAICT303A	Connect internal hardware components	ICTICT303	Connect internal hardware components	Equivalent
ICANWK302A	Identify and resolve network problems	ICTNWK302	Determine and action network problems	Equivalent
ICANWK305A	Install and manage network protocols	ICTNWK305	Install and manage network protocols	Equivalent
ICAPRG301A	Apply introductory programming techniques	ICTPRG301	Apply introductory programming techniques	Equivalent
ICAPRG404A	Test applications			Unit deleted

ICAPRG406A	Apply introductory object-oriented language skills			Unit deleted
ICASAS202A	Apply problem-solving techniques to routine IT malfunctions	ICTSAS202	Apply problem-solving techniques to routine ICT malfunctions	Equivalent
ICASAS203A	Connect hardware peripherals	ICTSAS203	Connect hardware peripherals	Equivalent
ICASAS206A	Detect and protect from spam and destructive software	ICTSAS206	Detect and protect from spam and destructive software	Equivalent
ICASAS301A	Run standard diagnostic tests	ICTSAS308	Run standard diagnostic tests	Equivalent
ICASAS303A	Care for computer hardware	ICTSAS303	Care for computer hardware	Equivalent
ICASAS304A	Provide basic system administration	ICTSAS304	Provide basic system administration	Equivalent
ICASAS306A	Maintain equipment and software	ICTSAS306	Maintain equipment and software	Equivalent
ICASAS307A	Install, configure and secure a small office home office network	ICTSAS307	Install, configure and secure a small office or home office network	Equivalent
VU21554	Perform basic network and computer assembly	VU22824	Perform basic network and computer assembly	Equivalent
VU21555	Perform basic computer system and network maintenance and upgrades	VU22825	Perform basic computer system and network maintenance and upgrades	Equivalent
VU21556	Install and configure basic network and computer operating systems			Unit deleted
VU21565	Install and test a home entertainment system	VU22826	Install and test a home entertainment system	Equivalent
VU20906	Configure and program a basic robotic system	VU22338	Configure and program a basic robotic system	Equivalent
VU21352	Implement a digital circuit using a programmable logic device (PLD)	VU22827	Implement a digital circuit using a programmable logic device (PLD)	Equivalent
VU21387	Test and verify correct operation of a “by-wire” control system	VU22828	Install, test and verify correct operation of a “by-wire” control system	Equivalent
VU21388	Set up and test an embedded control system	VU22829	Install, set up and test an embedded control system	Equivalent
VU21706	Create products using 3D printing			Unit deleted
		VU22340	Use 3D printing to create products	New unit
CPPSEC2021A	Install security equipment and systems	CPPSEC2021A	Install security equipment and systems	Same unit
CPPSEC2023A	Install CCTV equipment and system	CPPSEC2023A	Install CCTV equipment and system	Same unit
CPPSEC2026A	Perform routine maintenance on security equipment and system	CPPSEC2026A	Perform routine maintenance on security equipment and system	Same unit
ICTCBL2136B	Install, maintain and modify customer premises communications cabling – ACMA restricted rule	ICTCBL246	Install, maintain and modify customer premises communications cabling: ACMA restricted rule	Equivalent
		UEENEEK112A	Provide basic sustainable energy solutions for energy reduction in residential premises	New unit
		UEENEEK114A	Promote sustainable energy practices in the community	New unit

		UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	New unit
		VU22830	Set up and operate a small scale stand-alone photovoltaic energy system with battery storage	New unit
VU21541	Maintain rechargeable battery systems			Unit deleted
VU21542	Identify and locate building blocks of a centralised power generation system			Unit deleted
VU21543	Set up an extra low voltage emergency power supply system (not exceeding 32v)			Unit deleted
VU21544	Install a sustainable extra low voltage energy power system			Unit deleted
VU21552	Operate a small power supply system			Unit deleted
VU21553	Assemble and connect an extra low voltage battery power source			Unit deleted
		ICTWHS204	Follow work health and safety and environmental policy and procedures	New unit
		ICTTEN208	Use electrical skills when working with telecommunications networks	New unit
ICTCMP2239B	Perform restricted customer premises broadband cabling work: ACMA Restricted Rule			Unit deleted
ICTDRE3156B	Install digital reception equipment	ICTDRE301	Install digital reception equipment	Equivalent
ICTDRE3157B	Locate and rectify digital reception equipment faults	ICTDRE302	Locate and rectify digital reception equipment faults	Equivalent
ICTEDU3053A	Train customers in new technology			Unit deleted
ICTTEN2219A	Install and test internet protocol devices in convergence networks	ICTTEN207	Install and test internet protocol devices in convergence networks	Equivalent
VU20177	Plan and build a system using fibre optic equipment	VU22831	Plan and build a system using fibre optic equipment	Equivalent
VU20178	Use fibre optic equipment in engineering technology	VU22832	Integrate fibre optic technology into an engineering process	Equivalent
VU20179	Use fibre optic equipment in communication technology	VU22833	Integrate fibre optic technology into a communication process	Equivalent
VU21566	Install and test a wireless intercom system	VU22834	Install and test a wireless intercom system	Equivalent
VU21567	Conduct site survey for a wireless network	VU22835	Conduct site survey for a wireless network	Equivalent
VU21568	Set up and operate a wireless communication link	VU22836	Set up and operate a wireless communication link	Equivalent
VU21569	Install communications antennae	VU22837	Install communications antennae	Equivalent
VU21581	Build a small wireless LAN			Unit deleted
		ICTNWK405	Build a small wireless local area network	New unit

		VU22674	Explore applications and operation of the Internet of Things (IoT)	New Unit
		VU21990	Recognise the need for cyber security in an organisation	New unit
		VU21993	Secure a networked personal computer	New unit
CUFANM301A	Create 2D digital animations	CUAANM301	Create 2D digital animations	Equivalent
CUFANM302A	Create 3D digital animations	CUAANM302	Create 3D digital animations	Equivalent
ICAGAM301A	Apply simple modelling techniques	ICAGAM301	Apply simple modelling techniques	Equivalent
ICAGAM302A	Design and apply simple textures to digital art			Unit deleted
ICAGAM303A	Review and apply the principles of animation	ICAGAM303	Review and apply the principles of animation	Equivalent
ICAICT404A	Use online learning tools			Unit deleted

4. Course outcomes	*Standards 1, 2, 3 and 4 AQTF Standards for Accredited Courses*
4.1 Qualification level	The *Certificate II in Integrated Technologies* is a pre- vocational course and is developed to be consistent with AQF level 2 of the Australian Qualifications Framework in that: ***Knowledge:*** • Graduates will have basic factual, technical and procedural knowledge in a wide range of technical activities spanning electrotechnology, computing networking, telecommunications, renewable energy and security systems and information technology. ***Skills:*** Graduates will have: • cognitive skills to access, record and act on a defined range of technical information from a range of sources • cognitive and communication skills to apply and communicate known solutions to a limited range of predictable problems in the use of integrated technologies • technical skills to use a limited range of equipment to complete tasks involving known routines and procedures with a limited range of technology options ***Application of knowledge and skills:*** Graduates will be able to demonstrate the application of knowledge and skills in the use of integrated technologies: • with some accountability for the quality of their own outcomes and with some responsibility for their own outputs in work and learning • with limited autonomy and judgement in the completion of their own defined and routine tasks in known and stable integrated technologies contexts • with limited autonomy and judgement to complete routine, but variable tasks in the use of integrated technologies, in collaboration with others in a team environment Specifically a graduate of this course may: • undertake a work-based apprenticeship or traineeship leading into a range of careers in the electrotechnology, telecommunications, renewable energy installations, security systems or information technology industries; • enroll directly into another qualification leading to Certificate III/IV, Diploma or Advanced Diploma outcome in a range of technology areas.

	Volume of learning: Typically the Certificate II in Integrated Technologies requires 0.5 - 1 year to complete. This is made up of the structured learning component of the course combined with self-directed learning activities such as research activities and project work.
4.1 Employability Skills	Standard 4 AQTF Standards for Accredited Courses See Table 1 below.

Table 1 Employability Skills Summary:

Employability Skill	Industry/enterprise requirements for this qualification include the following facets:
Communication	• collect, collate and interpret information related to the work, such as verbal or written standard operating procedures, work related instructions, equipment specifications, safety signs and symbols. • communicate ideas and information to enable confirmation of work requirement • report outcomes and/or any issues of concern or problems • access, read and comprehend instructions and procedures • share verbal and written technical information with others
Teamwork	• work with others to generate and evaluate ideas • work effectively as a member of a team • work with others to identify work needs and review ideas • work cooperatively with people from diverse cultural backgrounds • contribute to a positive culture of compliance within an organisation • provide feedback to a range of stakeholders
Problem solving	• take corrective action to ensure that work meets quality standards and requirements as appropriate • respond to and/or report equipment failure within level of responsibility • seek assistance from relevant personnel when difficulties arise • recognise limitations, ask for help and seek clarification or information about work requirements and procedures

Employability Skill	Industry/enterprise requirements for this qualification include the following facets:
Initiative and enterprise	• safely shut down equipment in emergency situations • apply enterprise best practice and quality systems • ask questions of appropriate personnel to confirm unusual practice/s • report problems outside area of responsibility to designated personnel • identify variation in equipment performance and report maintenance requirements according to enterprise procedures
Planning and organisation	• manage time and priorities to complete work • prepare and plan daily or weekly work • identify and obtain equipment, materials and consumables to undertake designated tasks • establish clear implementation goals and deliverables • collect, analyse and organise work task information • check work requirement specifications and identify the priority in which tasks need to be undertaken and completed.
Self-management	• plan own work within given task parameters • set, monitor and satisfy personal work goals • accept responsibility for given tasks • operate within appropriate time constraints and work standards • seek assistance where appropriate
Learning	• ask questions to gain information and to ensure understanding of own work requirements • maintain current knowledge of tools, devices, instruments, materials, work practices and systems • seek learning opportunities • take control and manage own learning • adopt an open approach to new ideas and techniques • commit to and promote a culture of continuous learning • set realistic learning goals for self-development
Technology	• use workplace technology related to the particular work tasks including tools, devices, instruments and materials • attain and maintain required technical accreditation/authority under the industry standards • attain and maintain IT skills relevant to work requirements • be willing to gain knowledge and skills relevant to new and emerging technologies

4.3 Recognition given to the course	Not applicable
4.4 Licensing/ regulatory requirements	Successful completion of elective unit *ICTCBL236 - Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule* meets Australian Communications and Media Authority (ACMA) requirements for registration.
5. Course rules	***Standards 2, 6, 7 and 9 AQTF Standards for Accredited Courses***
5.1 Course structure	To be awarded the *Certificate II in Integrated Technologies (Pre-vocational)* participants are required to complete a minimum of ten (10) units consisting of: • seven (7) core units • three (3) elective units The elective units: – may be chosen from any streams – where a unit appears in more than one stream it can only be **counted once** – up to two (2) of the elective units can be replaced with other training package or accredited course units provided each unit is consistent with the vocational outcomes and does not jeopardise the AQF integrity of this course. (See **Table 2** below for list of core and elective units) Learners who do not successfully complete all required units will be issued with a Statement of Attainment listing those units they have completed.

Table 2

Unit of competency/ module code	Field of Education code (6-digit)	Unit of competency title	Pre-requisite	Nominal Hours
Core Units: (complete all units)				
UEENEEE101A	061301	Apply Occupational Health and Safety regulations, codes and practices in the workplace	None	20
VU22819	031399	Prepare to work in an integrated technologies environment	None	20
VU22820	031399	Use routine work practices in an integrated technologies environment	UEENEEE101A	40
VU22821	031399	Apply electrotechnology knowledge and skills in integrated technologies work	UEENEEE101A	80

VU22822	031399	Use CAD software applications in integrated technologies work	None	20
VU22324	020113	Build a simple network and establish end to end connectivity	None	80
VU22823	031399	Carry out an integrated technologies project	UEENEEE101A VU22820	60
			Nominal hours sub-total - core hours	**320**
Elective Units: (see selection advice above)				
Computer Network Stream				
CUAANM301	100399	Create 2D digital animations	None	35
CUAANM302	100399	Create 3D digital animations	None	75
ICTGAM301	020103	Apply simple modelling techniques	None	50
ICTGAM303	020115	Review and apply the principles of animation	None	60
ICTICT302	020113	Install and optimise operating system software	None	20
ICTICT303	031305	Connect internal hardware components	None	20
ICTNWK302	020113	Determine and action network problems	None	50
ICTNWK305	020113	Install and manage network protocols	None	40
ICTPRG301	020103	Apply introductory programming techniques	None	40
ICTSAS202	029999	Apply problem-solving techniques to routine ICT malfunctions	None	20
ICTSAS203	029999	Connect hardware peripherals	None	20
ICTSAS206	029901	Detect and protect from spam and destructive software	None	10
ICTSAS303	029999	Care for computer hardware	None	20
ICTSAS304	029999	Provide basic system administration	None	20
ICTSAS306	080905	Maintain equipment and software	None	20
ICTSAS307	020113	Install, configure and secure a small office or home office network	None	50
ICTSAS308	029999	Run standard diagnostic tests	None	20
VU22824	031305	Perform basic network and computer assembly	None	30
VU22825	031305	Perform basic computer system and network maintenance and upgrades	None	30
VU22826	031317	Install and test a home entertainment system	None	30
VU21990	029901	Recognise the need for cyber security in an organisation	None	60
VU21993	029901	Secure a networked personal computer	None	60
Robotics Control Stream				
VU22338	030703	Configure and program a basic robotic system	None	60
VU22827	031303	Implement a digital circuit using a programmable logic device (PLD)	None	30

VU22828	031303	Install, test and verify correct operation of a “by-wire” control system	None	30
VU22829	031305	Install, set up and test an embedded control system	None	30
VU22340	030103	Use 3D printing to create products	None	40
VU22674	020113	Explore applications and operation of the Internet of Things (IoT)	None	20
Security Systems Stream				
CPPSEC2021A	099905	Install security equipment and systems	None	40
CPPSEC2023A	099905	Install CCTV equipment and system	None	20
CPPSEC2026A	099905	Perform routine maintenance on security equipment and system	None	32
ICTWHS204	061301	Follow work health and safety and environmental policy and procedures	None	40
ICTTEN208	031313	Use electrical skills when working with telecommunications networks	None	40
ICTCBL246	031309	Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule	ICTWHS204 ICTTEN208	60
Sustainable Energy Stream				
UEENEEK112A	031301	Provide basic sustainable energy solutions for energy reduction in residential premises	None	40
UEENEEK114A	080317	Promote sustainable energy practices in the community	None	40
UEENEEK142A	031311	Apply environmentally and sustainable procedures in the energy sector	None	20
VU22830	031301	Set up and operate a small scale stand-alone photovoltaic energy system with battery storage	None	60
Telecommunication Stream				
ICTWHS204	061301	Follow work health and safety and environmental policy and procedures	None	40
ICTTEN208	031313	Use electrical skills when working with telecommunications networks	None	40
ICTCBL246	031309	Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule	ICTWHS204 ICTTEN208	60
ICTDRE301	031309	Install digital reception equipment	None	30
ICTDRE302	031309	Locate and rectify digital reception equipment faults	None	40
ICTTEN207	031309	Install and test internet protocol devices in convergence networks	None	50
VU22831	031303	Plan and build a system using fibre optic equipment	None	30
VU22832	030703	Integrate fibre optic technology into an engineering process	None	30

VU22833	031307	Integrate fibre optic technology into a communication process	None	30
Wireless Communications Stream				
VU22834	031309	Install and test a wireless intercom system	None	30
VU22835	031307	Conduct site survey for a wireless network	None	30
VU22836	031309	Set up and operate a wireless communication link	None	30
VU22837	031309	Install communications antennae	None	30
ICTNWK405	020113	Build a small wireless local area network	None	30
			Nominal hours sub-total range - elective units =	**50 - 195**
			Total nominal hours range =	**370 - 515**

5.2 Entry requirements	There are no essential entry requirements for this course. However, learners are best equipped to achieve the course outcomes if they have as a minimum, language, literacy and numeracy skills that are equivalent to Level 2 of the Australian Core Skill Framework. Details can be found on website: http://www.acsf.deewr.gov.au Learners with language, literacy and numeracy skills at levels lower than suggested above may require additional support to successfully undertake this course.
6. Assessment	***Standards 10 and 12 AQTF Standards for Accredited Courses***
6.1 Assessment strategy	All assessment, including Recognition of Prior Learning (RPL) must be compliant with the requirements of: • Standard 1 of the Australian Quality Training Framework (AQTF): Essential Conditions and Standards for Initial/Continuing Registration and Guidelines 4.1 and 4.2 of the VRQA Guidelines for VET Providers or • the Standards for Registered Training Organisations 2015 (SRTOs) or • the relevant standards and guidelines for Registered Training Organisations in effect at the time of assessment Assessment strategies must therefore ensure that: • all assessments are valid, reliable, flexible and fair • learners are informed of the context and purpose of the assessment and the assessment process • feedback is provided to learners about the outcomes of the assessment process and guidance given for future options

	• time allowance to complete a task is reasonable and reflect the industry expectations of a junior operator Assessment strategies should be designed to: • cover a range of skills and knowledge required to demonstrate achievement of the course aim • collect evidence on a number of occasions to suit a variety of contexts and situations • be appropriate to the knowledge, skills, methods of delivery and needs and characteristics of learners • assist assessors to interpret evidence consistently • be equitable to all groups of learners Assessment methods are included in each unit and include: • oral and/or written questioning • inspection of final process/product outcomes • portfolio of documented evidence • demonstration of required physical tasks A holistic approach to assessment is encouraged. This may be achieved by combining the assessment of more than one unit where it better replicates working practice. It is recommended that the assessment of unit *VU22823 – Carry out an integrated technologies project,* should not occur until the completion and assessment of the other core units. Assessment of the imported units must conform to the Assessment Requirements of the unit as provided in the relevant training package or the Evidence Guide provided in the accredited course.
6.2 Assessor competencies	*Standard 12 AQTF Standards for Accredited Courses* Assessment must be undertaken by a person or persons with competencies compliant with: • Standard 1.4 of the Australian Quality Training Framework (AQTF): Essential Conditions and Standards for Initial/Continuing Registration and Guidelines 3 of the VRQA Guidelines for VET Providers or • the Standards for Registered Training Organisations 2015 (SRTOs), or • the relevant standards and guidelines for Registered Training Organisations in effect at the time of assessment Assessors of the imported units must meet the requirements for assessors specified in the relevant training package or accredited course.

7. Delivery	*Standards 11 and 12 AQTF Standards for Accredited Courses*
7.1 Delivery modes	Units of competency in this course may be delivered using a variety of modes: classroom/workshop instruction, workplace projects, practical exercises and tasks, self-paced learning, case studies, role play and guest speakers. It is recommended that the course be conducted using workplace project-based delivery and assessment methods to maximise opportunities for learners to have learning experiences as close as possible to a real workplace environment. Any on-the-job learning opportunities should be conducted with an experienced mentor working in the industry. The training provider will coordinate the assessment of workplace demonstration, according to the relevant unit/units requirements. Delivery options, including grouping of learners and learning activities, should recognise the varying learning needs, educational backgrounds, preferred learning styles and constraints of the individual learner and the specific requirements of each unit. Some areas of content may be common to more than one unit and therefore integration may be appropriate. Delivery strategies should actively involve the learner and learning should be experiential, and appropriate for the age group. This course can be delivered either full-time or part-time. Training providers should be flexible in the way the training is delivered to ensure they meet the needs of the client group. Units of competency can be contextualised to meet the needs of different groups of students and employers. Contextualisation of imported units must be consistent with the guidelines provided in the relevant training package or delivery advice provided in the accredited course.
7.2 Resources	*Standard 12 AQTF Standards for Accredited Courses* The resources that should be available for this course relate to normal work practice using procedures, information and resources typical of a workplace. This should include access to: • relevant WHS/OHS and electrical safety policies/procedures and codes of practice; • an actual or simulated integrated technologies workplace; • relevant testing/diagnostic equipment, tools, materials and consumables;

	• computer hardware and relevant software including but not limited to Microsoft Office suite, Web search programs and computer aided drawing and design software • relevant plans, drawings and instructions to the level of operation Training must be undertaken by a person or persons with competencies compliant with: • Standard 1.4 of the Australian Quality Training Framework AQTF: Essential Conditions and Standards for Initial/Continuing Registration and Guidelines 3 of the VRQA Guidelines for VET Providers, or • the Standards for Registered Training Organisations 2015 (SRTOs), or • the relevant standards and guidelines for Registered Training Organisations in effect at the time of assessment. Imported units must reflect the requirements of trainers specified in the relevant training package or accredited course.
8. Pathways and articulation	*Standard 8 AQTF Standards for Accredited Courses* There are no formal articulation arrangements into other VET or higher education qualifications. When arranging articulation providers should refer to the: *AQF Second Edition 2013 Pathways Policy* Participants must negotiate their own individual study pathway arrangements with other training providers. Applicants who have already successfully completed any endorsed unit of competency from previous study will receive direct credit transfer for the same unit/s in this course. Likewise, graduates of this course will also gain direct credit transfer for unit/s successfully completed in any future course containing the same unit/s.

9. Ongoing monitoring and evaluation	*Standard 13 AQTF Standards for Accredited Courses* The Certificate II in Integrated Technologies (Pre-vocational) is monitored and maintained by the Curriculum Maintenance Manager (CMM) - Engineering Industries. A review will take place at the mid-point during the accreditation period. The review will be informed through feedback and consultation with teaching staff and graduates of the course and will also consider any changes required to meet emerging technologies or developing needs in the industries served by this course. Any significant changes to the course resulting from course monitoring and evaluation procedures will be reported to the VRQA.

Appendix 1
Knowledge and Skills requirements - Certificate II in Integrated Technologies (Pre-vocational)

Required Knowledge:

WHS/OHS requirements in the electro - engineering work environment	UEENEEE101A
Range of technologies such as: • Electrotechnology • Computer system networks • Telecommunication systems • Robotics control systems • Sustainable energy systems • Wireless communication systems • Security systems	VU22821
	VU22324, VU22824 plus ICT electives
	VU22819 plus telecommunication elective units
	VU22829 plus other robotics control units
	UEENEEK112A plus other sustainable elective units
	ICTNWK405 plus other wireless elective units
	CPPSEC2021A plus other security elective units
Examples of the application of integrated technologies in a range of industries such as: • Automotive/transport • Engineering/manufacturing • Medical • Security • Renewable energy • Electrotechnology	VU22819, VU22820,VU22821,VU22822, and VU22823
Employment/career opportunities in industries where integrated technologies are applied	VU22819
Handling and installing electrotechnology equipment	VU22821
Basic engineering principles and techniques	VU22820
Software applications in integrated technology work	ICTICT302, ICTSAS306
Principles, different types and examples of wireless technology	VU22674,VU22834, VU22835,VU22836
Application of fibre optic technology	VU22831, VU22832 and VU22833
Working in a project team	VU22823
Programming and coding	ICTPRG301
Cyber security awareness and network protection	VU21990, VU21993, ICTSAS206

Required Skills:

Apply relevant WHS/OHS requirements in the electro - engineering work environment	UEENEEE101A
Applying computer tools and networking in an integrated technology context	VU22324, and ICT unit elective units
Ability to undertake an integrated technology project	VU22823
Use a range of equipment, plant and technologies in an electro–mechanical work environment	VU22820, VU22821
Install, set up and program a basic electrotechnology equipment/systems	VU22821
Diagnosis and rectifying basic faults within electrotechnology equipment/systems	VUIT003
Use CAD software applications	VU22822
Use hand tools, hand held power tools and testing equipment	VU22819, VU22820, VU22821, VU22823

Section C - Units of competency

Nationally accredited units are available to download from the national data base – http://training.gov.au/
Training.gov.au is the National Register on Vocational Education and Training (VET) in Australia. To download a unit of competency, enter the unit code in the Quick search window. Units that have a Unit Code commencing with the letter "V" are Victorian accredited units and are reproduced in the following pages of this document.

Endorsed training package units:

CUA Creative Arts and Culture Training Package		**Hours**
CUAANM301	Create 2D digital animations	35
CUAANM302	Create 3D digital animations	75
CPP07 Property Services Training Package		**Hours**
CPPSEC2021A	Install security equipment and systems	40
CPPSEC2023A	Install CCTV equipment and system	20
CPPSEC2026A	Perform routine maintenance on security equipment and system	32
ICT Information and Communications Technology Training Package		
ICTCBL246	Install, maintain and modify customer premises communications cabling: ACMA Restricted Rule	60
ICTDRE301	Install digital reception equipment	30
ICTDRE302	Locate and rectify digital reception equipment faults	40
ICTGAM301	Apply simple modelling techniques	50
ICTGAM303	Review and apply the principles of animation	60
ICTICT302	Install and optimise operating system software	20
ICTICT303	Connect internal hardware components	20
ICTNWK302	Determine and action network problems	50
ICTNWK305	Install and manage network protocols	40
ICTNWK405	Build a small wireless local area network	20
ICTPRG301	Apply introductory programming techniques	40
ICTSAS202	Apply problem-solving techniques to routine ICT malfunctions	20
ICTSAS203	Connect hardware peripherals	20
ICTSAS206	Detect and protect from spam and destructive software	10
ICTSAS303	Care for computer hardware	20
ICTSAS304	Provide basic system administration	20
ICTSAS306	Maintain equipment and software	20
ICTSAS307	Install, configure and secure a small office or home office network	50
ICTSAS308	Run standard diagnostic tests	20
ICTTEN208	Use electrical skills when working with telecommunications networks	40
ICTTEN207	Install and test internet protocol devices in convergence networks	50
ICTWHS204	Follow work health and safety and environmental policy and procedures	40

UEE11 Electrotechnology Training Package		
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace	20
UEENEEK112A	Provide basic sustainable energy solutions for energy reduction in residential premises	40
UEENEEK114A	Promote sustainable energy practices in the community	40
UEENEEK142A	Apply environmentally and sustainable procedures in the energy sector	20

Accredited course units:

Unit Code	Unit Title	Hours
VU22819	Prepare for working in the integrated technologies environment	20
VU22820	Use routine work practices in an integrated technologies environment	40
VU22821	Apply electrotechnology knowledge and skills in integrated technologies work	80
VU22822	Use CAD software applications in integrated technologies work	20
VU22324	Build a simple network and establish end to end connectivity	80
VU22823	Carry out an integrated technologies project	60
VU22824	Perform basic network and computer assembly	30
VU22825	Perform basic computer system and network maintenance and upgrades	30
VU22826	Install and test a home entertainment system	30
VU22338	Configure and program a basic robotic system	60
VU22827	Implement a digital circuit using a programmable logic device (PLD)	30
VU22828	Install, test and verify correct operation of a “by-wire” control system	30
VU22829	Install, set up and test an embedded control system	30
VU22340	Use 3D printing to create products	40
VU22830	Set up and operate a small scale stand-alone photovoltaic energy system with battery storage	60
VU22831	Plan and build a system using fibre optic equipment	30
VU22832	Integrate fibre optic technology into an engineering process	30
VU22833	Integrate fibre optic technology into a communication process	30
VU22834	Install and test a wireless intercom system	30
VU22835	Conduct site survey for a wireless network	30
VU22836	Set up and operate a wireless communication link	30
VU22837	Install communications antennae	30
VU22674	Explore applications and operation of the Internet of Things (IoT)	20
VU21990	Recognise the need for cyber security in an organisation	60
VU21993	Secure a networked personal computer	60

VU22819 - Prepare to work in an integrated technologies environment			
Unit Descriptor		This unit describes the performance outcomes, skills and knowledge required to prepare a person for working with integrated technologies in an industry environment. It includes investigating industries where the application of integrated technologies has been significant, identifying potential career opportunities for working with integrated technologies, assessing own aptitude and capabilities and developing a career development plan. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.	
Employability Skills		This unit contains Employability Skills.	
Application of the Unit		This unit of competency applies to a young person such as a school leaver investigating pathways for a career in the applications of integrated technologies. It also applies to a person seeking employment in industries where the application of integrated technologies forms a significant part in the products and/or services provided	
ELEMENT		**PERFORMANCE CRITERIA**	
Elements describe the essential outcomes of a unit of competency.		*Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.*	
1	Investigate personal career options within an integrated technologies context	1.1	Identify ***industries*** where the application of ***integrated technologies*** has brought about significant improvement to the products and services provided
		1.2	Identify ***employment opportunities*** in the application of integrated technologies
		1.3	Make contact with ***key organisations*** which promote and support the application of integrated technologies in an industrial context
		1.4	Seek ***guidance and support*** to align personal strengths with possible career pathway in integrated technologies
		1.5	Utilise ***career self-assessment resources*** to identify personal strengths and weaknesses in relation to preferred career pathway

		1.6	Identify ***study pathway opportunities*** for career in the application and maintenance of integrated technologies in a range of industry areas
2	Develop a strategy to address personal career needs	2.1	Prioritise areas of integrated technologies for further investigation
		2.2	Relate self-assessment outcomes to job profiles, training pathway requirements and employment opportunities
		2.3	Formulate a ***personal development plan*** that will maximise the potential to achieve selected goals
		2.4	Seek information and/or advice from relevant industry organisations or other professionals to complete the development of the career plan
		2.5	Investigate the range of support services that are available to assist with the development and/or implementation of the strategy
		2.6	Evaluate and validate the career development plan with an ***appropriate person***

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- Researching and information gathering to gain an overview of the application of integrated technologies, industries involved, job roles and career path opportunities
- Using paper based and computer generated aptitude and career assessment tools
- Interviewing relevant personnel and seeking industry information and career advice
- Preparing a personal development plan for a career in the application and use of integrated technologies

Required knowledge:

- Information gathering options
- Types of technologies and connectivity requirements
- Scope and application of integrated technologies in industry and commerce
- Study pathways and employment opportunities in the application, use and maintenance of integrated technologies
- Career assessment testing tools
- Components of a career development plan

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording in the Performance Criteria is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.	
Industries may include:	• Automotive/transport manufacturing • Aircraft manufacturing • Textiles, clothing and footwear industry • Building construction industry • Telecommunication industry • Multimedia industry • Civil construction industry • Rail (public transport) industry • Electro technology industry • Mechanical engineering • Security industry • Renewable energy industry
Integrated technologies may include:	• Robotics and mechatronics control systems • Renewable energy systems • Security systems • Telecommunication and fibre optic systems • Wireless communication systems • Simulators including virtual and augmented reality systems • CAD and advanced manufacturing systems
Employment opportunities may include:	• Tradesperson e.g. electrician, vehicle mechanic • Technician e.g. telecommunications technician, rail signalling technician • Para professional e.g. software/network engineer, • Professional e.g. infrastructure design engineer
Key organisations may include:	• Communications and Information Technology Training Ltd • Australian Digital & Telecommunications Industry Association Inc. • Future Energy Skills

	• Innovation Manufacturing Corporative Research Centre (IMCRC) • World Skills Australia • Advanced Manufacturing Growth Centre Ltd • Telstra (Career Centre) • CISCO (Careers) • National Electrical and Communications Association (NECA)
Guidance and support may include:	• Industry experts • Major enterprise career centres • Industry exhibitions and conferences • Career guidance counsellors • Teacher/supervisor
Career self-assessment resources may include:	• Myers Briggs Type indicator (MBTI) • What Career is Right for Me • Motivational, Appraisal or Personal Potential (MAPP test) • Career fitter • My Next Move • Sokanu Career test
Study pathway opportunities may include:	• Industry traineeship • Trade apprenticeship • Industry cadetship • Technician level courses e.g. Cert IV in Integrated Technologies • Para professional courses e.g. Diploma/Advanced Diploma of Telecommunication Network Design • Professional qualifications e.g. Bachelor Degree in Engineering and Information Technology
Personal development plan may include:	• Career goals • Where you are now • Self - assessment outcomes • Technology areas of interest • career level options – trade/technical, para professional/professional • study pathway options (VET vs University)

	• Financial considerations • Potential companies/enterprise • Job search strategy • Resume • Timeline considerations
Appropriate person may include:	• Supervisor • Teacher • Trainer/assessor • Parent/guardian

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit	To be competent in this unit assessors must be satisfied the candidate can demonstrate the achievement of each element to the level defined in the performance criteria. Specifically, they must be able to provide evidence of the ability to: – Collect, analyse and organise information on potential career opportunities working with integrated technologies – Seek guidance from appropriate persons on career opportunities, training pathways and relevant qualifications – complete at least one career self - assessment test – Prepare a personal career development plan and validate with an appropriate person
Context of and specific resources for assessment	Skills will be demonstrated in a safe learning environment with access to: – Internet/career assessment tools – Overhead data projector and screen – Reference materials
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: – direct observation of the candidate performance – written and oral questioning to test underpinning knowledge – inspection of the final career development plan – portfolio of materials such as results of career assessment tests, relevant industry and training information, notes from interviews and industry visits

VU22820 - Use routine work practices in an integrated technologies environment			
Unit Descriptor		This unit describes the performance outcomes, skills and knowledge required to apply routine work practices in an integrated technologies environment. It encompasses carrying out work instructions, safe use of hand and power tools, dismantling, tagging and reassembling components and the utilisation of technologies to achieve a required outcome. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.	
Prerequisite Unit		UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	
Application of the Unit		This unit of competency applies to persons preparing to work with integrated technologies and is therefore suitable for use in secondary school programs such as VETIS or VCAL with appropriate supervision.	
ELEMENT		**PERFORMANCE CRITERIA**	
Elements describe the essential outcomes of a unit of competency.		*Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.*	
1	Select components, accessories and materials in accordance to work instructions	1.1	Interpret work instructions and clarify any issue of concern with ***appropriate person***
		1.2	Identify the ***components***, accessories and materials required for the job and source them in accordance with workplace procedure
		1.3	Confirm the correct selection and quality of components, accessories and materials with an appropriate person
		1.4	Deal with contingency problems that may arise in accordance with normal work practices
2	Dismantle and assemble industry apparatus	2.1	Check that plant/machines circuits are isolated before commencing work, in accordance with WHS/OHS requirements

		2.2	Select ***appropriate tools*** to correctly and safely dismantle and assemble apparatus
		2.3	Utilise manufacturer's apparatus dismantling and assembling guides, where applicable
		2.4	Mark or tag components during dismantling to help ensure correct and efficient re-assembly
		2.5	Store dismantled components and parts to protect them against loss or damage
3	Integrate technologies to meet work requirement	3.1	Follow relevant WHS/OHS policies and procedures and safe work practices to eliminate or minimise incidents
		3.2	Select the appropriate technologies to use in order to achieve the required work outcomes
		3.3	Follow the schedule for using ***relevant technologies*** to achieve the desired outcome
		3.4	Refer contingencies to the appropriate person for further instructions
		3.5	Monitor the quality of the work in accordance with instructions and workplace requirements
4	Evaluate integrated technologies outcomes	4.1	Conduct final checks to ensure the use of ***integrated technologies*** complies with instructions and requirements
		4.2	Notify appropriate personnel of the completion in the use of integrated technologies
		4.3	Document any suggested improvements that could be made to the work procedures to improve the quality of outcomes
5	Clean up the work area	5.1	Clean, check and store tools, equipment and any surplus materials in accordance with established procedures
		5.2	Dispose of any waste in an environmentally sustainable manner
		5.3	Update ***appropriate records*** in accordance with instructions and established work procedures

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- Interpreting and following work instructions
- Interpreting and following relevant WHS/OHS processes and procedures
- Selecting and safely using a range of hand and power tools and basic workshop equipment for disassembling and assembling technical apparatus
- Correctly disassembling and tagging and storing parts and components for correct reassembly
- Dealing with contingency problems that may arise in accordance with normal work practices
- Using technologies according to manufacturers' instructions to achieve a required outcome
- Cleaning up work area and updating work records according to established procedures

Required knowledge:

- Safe work practices in a workshop environment
- Tools and equipment commonly found in electrical workshop environment
- Disassembling and reassembling procedures
- Basic component tagging techniques
- Tool maintenance procedures
- Cable joining techniques such as soldering, brazing, crimping
- Range of technologies
- Sources of technical information

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording in the Performance Criteria is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Appropriate person may include:	• Teacher • Supervisor • Trainer • Team leader

Components may include:	• Transistors • Resistors • Batteries • Transducers • Transformers • Capacitors • Motors • Switches • Diodes • Condensers
Appropriate tools may include:	• Hand tools such as: • screwdrivers • spanners • pliers • vice grips • Allen keys • soldering iron • Hand held power tools, such as: • drill and driver • grinder • brazing equipment
Relevant technologies may include:	• Electrical/electronic devices • 3D printer • Solar array • Telecommunication device • Security camera/alarm • Robot/s • Mobile phone • Computer software
Integrated technologies may include:	• Computer network system • Telecommunication systems • 3D printing system • Robotics control systems • Sustainable energy systems • Wireless communication systems • Security systems • Lighting systems
Appropriate records may include:	• Maintenance requisitions • Logs • Asset registers • Machine handover sheets

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	To be considered competent in this unit assessors must be satisfied the participant can demonstrate the achievement of each element to the level defined in the performance criteria. Specifically, they must be able to provide evidence of the ability to: – Read work instructions and select appropriate components and materials for allocated integrated technologies task – Safely disassemble tag, store and re-assemble components using a various hand and hand held power tools – Utilise technologies as required to complete allocated task to achieve the required outcome – Clean the work area and update records in accordance with workplace procedures
Context of and specific resources for assessment	Skills will be demonstrated in a real or simulated workshop environment. If simulated it should reflects real workshop conditions with suitable facilities, tools and equipment. Assessment must ensure access to: – job instructions – computer hardware with relevant software and internet connection – relevant technology components and materials – relevant specifications and diagrams
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: – direct observation of the candidate's workplace performance – written and oral questioning to test underpinning knowledge – inspection of the final product or outcome – portfolio of documented evidence such as research information on the technologies being applied, diagrams, relevant mathematical calculations etc.

VU22821 - Apply electrotechnology knowledge and skills in integrated technologies work			
Unit Descriptor		This unit describes the performance outcomes required for an entry-level person to use basic electrotechnology knowledge and skills in an integrated technologies environment. It encompasses the application of mathematical principles, and a range of basic electrical/electronic skills including basic testing and fault finding procedures relevant to integrated technologies work. The unit also includes the cable selection and connecting skills. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.	
Employability Skills		This unit contains Employability Skills.	
Prerequisite Unit		UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace	
Application of the Unit		This unit of competency applies to persons preparing to work with integrated technologies and is suitable for use in secondary school programs such as VETIS or VCAL with appropriate supervision.	
ELEMENT		**PERFORMANCE CRITERIA**	
Elements describe the essential outcomes of a unit of competency.		*Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.*	
1	Determine the work requirements	1.1	Establish the required work outcomes from the job instructions
		1.2	Follow relevant WHS/OHS policies and procedures for the ***integrated technologies*** work environment
		1.3	Identify any hazards and/or WHS/OHS issues for the work site and notify ***appropriate personnel***
		1.4	Determine the appropriate formulae and ***calculations*** required for the particular application
2	Apply appropriate formulae and calculations for work requirement	2.1	Transpose the formula, if required, to facilitate the required outcome for the calculation
		2.2	Identify and ensure the units are consistent with those required for each term in the chosen formula, and if necessary convert given units to those required for the chosen formula.

		2.3	Use estimating and approximating techniques to check the appropriateness of calculations.
		2.4	Apply the concepts of ratio and proportion, if necessary, to the selected formula.
3	Connect up, test and verify low voltage (LV) DC and extra low voltage (ELV) AC circuitry	3.1	Connect a series and a parallel ***LV DC and ELV AC circuit configuration*** following ***safe work practices***
		3.2	Choose the appropriate ***test equipment*** and measure the values of ***electrical quantities*** of the circuits
		3.3	Utilise the correct formulae to calculate and verify the measured values of the electrical quantities in a series and in a parallel circuit configuration
		3.4	Compare the measured values to the calculated values and determine the reason for any variations
		3.5	Measure LV and ELV voltages to determine that the value is within equipment or power supply specifications
		3.6	Use appropriate test equipment to measure AC voltage (multimeter) in a safe manner that does not require the LV circuit to be disconnected
		3.7	Employ encoding and modulation techniques and their application in relevant wired, wireless and optical communication systems.
		3.8	Evaluate results and determine ***probable faults***.
4	Produce charts and graphs from the information gathered	4.1	Compare the range of charts and/or graphs used in integrated technologies.
		4.2	Transpose the data accurately to produce charts and graphs for the different circuits.
		4.3	Determine the scales applicable for the axis of the charts and/or graphs to be produced.
		4.4	Identify the upper and lower limits of acceptability for the charts and/or graphs to be produced.
		4.5	Utilise the charts and graphs produced to verify the relationship between the electrical quantities in the circuits
		4.6	Interpret trends indicated by the slope or gradient of a graph.

5	Evaluate analogue and digital signals	5.1	Compare the ***characteristics of an analogue signal*** and ***characteristics of a digital signal***
		5.2	Produce a layout using ***building blocks*** to represent a typical analogue and a digital circuit showing the different characteristics
		5.3	Produce 4-bit binary codes with their decimal equivalent to represent output voltages of a digital to analogue converter
		5.4	Choose appropriate test equipment and measure the output voltage of a digital device for “high” and “low” logic states
6	Perform cable selection	6.1	Compare basic ***transmission characteristics*** of different **types of cables** used in telecommunications and select the most appropriate cable type to suit the ***application characteristics***
		6.2	Connect two devices with a patch cable and test the connection

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- Applying communication skills for requesting technical information, clarifying work instructions and working with others
- Interpreting work instructions, technical documentation and data
- Applying mathematical skills to:
  - converting fractions to decimals and vice versa
  - interpreting technical data
  - selecting and applying electrical formulae for a given application and problem solving
  - transpose formulae, as required
  - substitute the correct values for each term in the relevant formula
  - produce simple charts or graphs from given information
  - determine required information from appropriate graphs or charts
  - checking calculated answers for accuracy and round off estimates

- Applying AC and DC fault-finding techniques to different situations
- Selecting appropriate test equipment to preform AC and DC testing and fault finding tasks
- Applying relevant WHS/OHS procedures and work safety awareness skills to identify real and potential hazards
- Utilising relevant personal protective equipment

Required knowledge:

- AC and DC theory
- AC and DC electrical quantities, encompassing SI units, OHS/WHS issues and application of Ohms Law
- AC and DC fault finding techniques and the use of test equipment
- Techniques for estimating approximate answers
- Sources of appropriate formulae
- Analogue and digital principles
- Application of binary to decimal conversion and vice versa
- Distinction between analogue and digital signals and devices
- Encoding techniques and their application in wired, wireless and optical communication systems
- Modulation techniques used in wired, wireless and optical communication systems
- Techniques to convert analogue to digital and vice versa
- Types of charts and/or graphs used in integrated technology
- Mathematical techniques for:
  - estimating approximate answers
  - ensuring that the units of each term are consistent with the formula selected
  - converting given units to those required in the formula
  - applying concepts of ratio and proportion
  - determining the scales applicable to the axis of the graphs or charts
  - identifying the upper and lower limits of acceptability applicable to data entered on a graph or chart
  - interpreting trends indicated by the slope or gradient of a graph

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording in the Performance Criteria is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.	
Integrated technologies may include:	• Electrotechnology • Computer system networks • Telecommunication systems • Multimedia and games systems • Robotics control systems • Renewable energy systems • Wireless communication systems • Security systems • Lighting system
Appropriate personnel may include:	• Teacher • Trainer • Supervisor • Leading hand • Team leader
Calculations may include:	• Application of Ohm's Law • Power calculations • Power consumption and efficiencies • Voltage dividers • Voltage, resistance and current calculations • Gradients of graphs
****LV DC and *ELV AC circuit configuration*** may include:	• AC to DC supply • DC circuits including: – Resistances – Single DC voltage source, such as: – Battery – DC voltage supply – Solar panel – Power loads • AC circuit including: – Inductors, capacitors and resistances – Single AC voltage source, such as: – AC generator – AC voltage supply

	– Alternator – Low voltage AC source *LV DC - Low voltage is defined by the International Electrotechnical Commission (IEC) as 120-1500 Volts *ELV AC - Extra low voltage is defined by the International Electrotechnical Commission (IEC) as being <50 Volts
Safe work practices may include:	• Component tolerances are not exceeded • Correct use of power supply and test equipment • Identifying electrical safety hazards • Current overloads protection • Power isolation during set-up procedure • Well laid out circuitry avoiding: – contact with external sources – shorting of components
Test equipment may include:	• Multimeters, including digital multimeters • Ohmmeters • Voltmeters
Electrical quantities may include:	• Current • Power • Voltage • Resistance
Probable faults may include:	• Cracked circuit board • Failed components • Faulty power supply • Intermittent faults • Loose connections • Open circuit • Short circuit • Short to ground • Split pairs • Water damage
Characteristics of an analogue signal may include:	• Continuously variable, infinite number of states • Intelligence based on recreating exact wave shape • Signal to noise ratio increase with amplification

Characteristics of a digital signal may include:	• Error detection and correction • Finite number of discrete states • High noise immunity • Intelligence based on ability to discern only two states • Regeneration • Type of square wave (complex waveform)
Building blocks may include:	• Analogue: – Amplifiers – Attenuators – Displays – Filters – Oscillators – Transducers • Digital: – ADC and DAC – Computers – Counter – Data routers, switches and bridges – Digital amplifier – Digital display – Input and output transducers – Multiplexer
Transmission characteristics may include:	• Attenuation • Balanced • Characteristic impedance (Z) • Crosstalk • Frequency range • Transmission windows for glass optical fibre • Unbalanced • Waveguide cut-off frequency
Types of cables may include:	• Coaxial cable • Multi-pair communications cable • Optical fibre • Performance data cable CAT 5 and higher • Rack and sub-rack alarm and power distribution cables • Shielded twisted pair (STP) communications cable • UTP communications cable

Application characteristics may include:	• Audio • Data • Digital subscriber line (DSL) • Ethernet • Microwave • Optical/laser • Power • Radio frequency (RF) • Satellite • Video

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	To be considered competent in this unit the participant must be able to demonstrate the knowledge and skills required to achieve all of the elements of competency and associated performance criteria. Specifically they must be able to: – select appropriate formulae and perform simple mathematical calculations – prepare charts and graphs to represent technical data – apply fundamental electrical principles to solve basic ELV AC and LV DC electrical problems – connect and test and ELV AC and a LV DC circuit – identify cable types and select the appropriate cable/s for a given application devices
Context of and specific resources for assessment	Skills will be demonstrated in a real or simulated workshop environment. If simulated it should reflects real workshop conditions with suitable facilities, tools and equipment. Assessment must ensure access to: – job instructions – relevant electrical/electronic components and cabling – relevant specifications and reference charts – testing equipment

Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: – direct observation of the process and procedures – written and oral questioning to test underpinning – inspection of final product/s – portfolio of documented evidence such as researched information, prepared charts /graphs, mathematical calculations etc.

VU22822 - Use CAD software applications to support integrated technologies work			
Unit Descriptor		This unit describes the performance outcomes, skills and knowledge required to use computer aided drawing and design (CAD) software to support the use of technology in an integrated environment. Skills include preparing charts and diagrams, generating two and three dimensional drawings, performing calculations and simulations No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.	
Employability Skills		This unit contains Employability Skills.	
Application of the Unit		This unit of competency applies to persons preparing to work with integrated technologies and is suitable for use in secondary school programs such as VETIS or VCAL with appropriate supervision.	
ELEMENT		**PERFORMANCE CRITERIA**	
Elements describe the essential outcomes of a unit of competency.		*Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.*	
1	Determine the job requirements	1.1	Establish the required outcomes from the job instructions with the ***appropriate person***
		1.2	Obtain suitable ***software application*** needed to carry out the job instructions
		1.3	Use appropriate commands to load and run the software application
		1.3	Identify and source information/data required for the job
2	Use software application to generate the job requirements	2.1	Navigate the software program to access the required information/data for the job
		2.2	Retrieve the information/data using organisational procedures and check it for relevance to the job
		2.3	Manipulate information/data by performing ***application tasks*** in accordance with established procedures
		2.4	Employ drawing aids to generate block diagrams, flowcharts and engineering drawings

		2.5	Perform calculations and apply appropriate simulation techniques to confirm that job specifications have been met
		2.6	Produce and save appropriate files using suitable techniques relevant to the particular software package
		2.7	Apply standard conventions to meet design requirements
		2.8	Access assistance from appropriate person, if required
3	Complete the software application task	3.1	Store completed files appropriately and in accordance with enterprise requirements
		3.2	Follow appropriate procedures for shutting down/logging off and exiting the computing technology
		3.3	Obtain job completion approval from appropriate person

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- Communicating with appropriate person to establish job instructions and seek advice
- Organising job requirements and planning work activities to meet a timeline
- Using computing skills and software application to
  - apply appropriate commands to load and run the software
  - enter, manipulate and retrieve data
  - identify, place and interconnect symbols as appropriate
  - perform calculations and simulations tasks
  - produce diagrams, charts, 2D/3D drawings layout that complies with drafting conventions/rules and meets job specifications
  - save and store created files

Required knowledge:

- Functions and capabilities of various types of CAD software applications
- Hazards and control measures associated with using computing technology
- User interfaces:
  - Working with commands
  - Cartesian workspace
  - Help menu
  - Search tools

• Technical drawing interpretation • Shapes used in technical drawings • Dimensioning conventions	
RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording in the Performance Criteria is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.	
Appropriate person made include:	• Teacher • Trainor • Supervisor • Manager
Software application may include:	• Visio • AutoCAD • Altium Designer • Network simulator • Electronic workbench
Application tasks may include:	• Generating an electrical/electronic/computer system block diagram • Performing calculations • Generating flow charts and diagrams to comply with specifications • Performing simulations • Generating 2D and 3D drawings
EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	To be considered competent in this unit the participant must be able to demonstrate the knowledge and skills required to achieve all of the elements of competency and associated performance criteria. Specifically they must be able to: – select, load and use a CAD software application to perform various drawing tasks, make calculations and create simulations – save and store created files to meet organisational requirements

Context of and specific resources for assessment	Skills will be demonstrated in a real or simulated workplace environment. If simulated it should reflects real workplace conditions with suitable facilities, and equipment. Assessment must ensure access to: – job instructions – relevant task information and data – computing hardware and CAD software applications
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: – direct observation of the process and procedures – written and oral questioning to test underpinning – inspection of final product/s – portfolio of documented evidence such as researched information, prepared charts /graphs, mathematical calculations etc.

VU22324 - Build a simple network and establish end to end connectivity		
Unit Descriptor	This unit of competency describes the knowledge and skills required to apply an understanding of the architecture, structure, functions, protocols and components of a computer network in order to build a simple network and establish end to end connectivity. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication	
Employability Skills	This unit contains Employability Skills	
Application of the Unit	The unit applies to IT practitioners who are required to build and maintain small to medium networks using a range of client server applications and services	
ELEMENT	**PERFORMANCE CRITERIA**	
Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.	
1. Identify the elements of an interconnected computer network	1.1	Use and methods of connecting multiple computer networks are explained
	1.2	Devices and topologies used in a small to medium sized network are investigated
	1.3	Characteristics of a computer network that facilitates data communication are recognised
	1.4	Trends and developments in computer networking are explored
2. Configure an internetwork operating system enabling connectivity of a simple network	2.1	***Network devices*** for a small computer network are identified
	2.2	***Computer operating system*** commands or utilities required to program the Network Interface Card (NIC) are obtained from manufacturer's manuals, data books or online resources
	2.3	Internet Protocol (IP) addresses for the network interface card (NIC) are configured
	2.4	Function and structure of the ***Internetwork Operating System (IOS)*** is defined
	2.5	Relevant commands of an Internetwork Operating System that facilitate connection to a LAN are selected and configured

	2.6	Physical network devices and components are identified from a network topological drawing
	2.7	A ***simple network topology*** is cabled
	2.8	IOS testing commands are identified and utilised to verify end to end connectivity
	2.9	***Base level troubleshooting*** skills and procedures are utilised to establish or re-establish network connectivity
3. Explain the operation of network protocols and layered communication models	3.1	Rules to facilitate data communication across the computer network are defined
	3.2	Role of protocols and standards in facilitating communication between networks is defined
	3.3	Methods of how devices access resources in a small to medium network are explained
	3.4	Open Source Interconnection (OSI) and Transport Control Protocol/Internet Protocol (TCP/IP) layered models of communication are compared
4. Recognise protocols that facilitate access to the computer network	4.1	Relationship between physical layer protocols and services that facilitate and support communication across a data network is defined
	4.2	Function and operation of the data link layer to support communication across a data network is recognised
	4.3	Media access control techniques are defined
	4.4	Role and operation of the ethernet protocol is defined
	4.5	Fundamental operation of a switch is explained
	4.6	Function and operation of the Address Resolution Protocol (ARP) to enable communication on a network is recognised
5. Outline the function and operation of the network layer	5.1	Operation of network layer protocols and services to support data communication across a network is explained
	5.2	Operation of routers to support end to end connectivity is explained
	5.3	Methods used by network devices to route data traffic are defined
	5.4	***Basic configurations for a router*** are configured
6. Implement IPv4 and IPv6 addressing	6.1	***Network addressing*** scheme is developed utilising IPv4 addresses
	6.2	Network addressing scheme is developed utilising IPv6 addresses

	6.3	Testing commands for end to end connectivity are identified and utilised
	6.4	Subnetting IPv4 network is demonstrated and implemented
	6.5	Subnetting IPv4 network utilising Variable Length Subnet Mask (VLSM) is demonstrated and implemented
	6.6	Design considerations for implementing IPv6 addresses are defined
7. Identify the function of and the protocols utilised for transport and application layers	7.1	Function and operation of transport layer protocols and services that support data communication across a network are developed
	7.2	Operation of the Transport Control Protocol (TCP) and User Datagram Protocol (UDP) transport layer protocols are explained
	7.3	Well known transport layer port numbers are described
	7.4	Function and operation of application layer protocols that facilitate end to end data communication across a network are defined
	7.5	Function and operation of well-known TCP/IP application layer protocols are defined
8. Build and verify a simple network	8.1	Addressing scheme for a small to medium network is designed
	8.2	Network routers and switches are selected and configured to establish end to end connectivity
	8.3	Base level troubleshooting skills and procedures are utilised to establish or repair network connectivity
	8.4	Network router and switch base level security functionality is configured
	8.5	***Network resources*** are set up, configured and shared between network devices
	8.6	IOS commands to establish baseline performance are utilised

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- using appropriate tools to develop and test network addressing
- translating paper network designs into a sketch of physical devices and connections
- using internetworking operating systems commands
- reading and interpret documents such as manufacturer's manuals, data books, online resources

- implementing basic network connectivity between devices
- configuring monitoring tools available for small to medium sized business networks
- configuring initial settings on a network device configuring router interfaces and testing and verifying correct functionality
- configuring applications and to verify their connection to provide network services

Required knowledge:

- switch interface configuring and tests to verify correct functionality
- setting IP addresses on end points and network devices
- network devices
    - routers
    - switches
- network access
    - physical layer protocols
    - network media
    - data link protocols
    - medial access control
    - Ethernet
- network layer
    - network layer protocols
    - routing protocols
    - routers
    - configuring routers and switches
- Transport Layer Protocols (TCP)
- User Datagram Protocol (UDP)
- Application Layer Protocols (ALP)
- computer operating system commands
- network operating system commands
- computer network architecture
- internet and computer network communication
- OSI layered communication model
- TCP/IP layered communication model
- comparing similarities and differenced between the OSI and TCP/IP models
- encapsulation and de-encapsulation concepts as they relate to data flow in a network
- network addressing schemes
    - Classful & VLSM
    - IPv4 and IPv6 addressing
    - Network Address Translation (NAT) concepts
- subnetting IPV4 networks

• subnetting IPv6 networks • cabling LANs • base level troubleshooting procedures • use testing commands e.g. ping, Trace Route
RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording in the Performance Criteria is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Network devices includes but not limited to:	• hubs • switches • routers • workstations • IPads • android tablets
Computer operating system includes but not limited to:	• Windows versions • Linux • MacOS
Internetwork Operating System (IOS) includes but not limited to:	• Cisco IOS • Huawei IOS • Palo Alto IOS • HP IOS • VMWare IOS

Simple network topology includes but not limited to:	• routers • switches • end points

Base level troubleshooting includes but not limited to:	• ping
	• traceroute
	• examination of router routing table
	• examination of ARP table
	• inspection of interface configuration:
	  • Ipconfig
	  • show CDP Neighbors
	  • show IP interface brief
	  • show interface

Basic configurations for a router includes but not limited to:	• configuring an IP address to an Ethernet interface • enabling the interface • checking the interface address • configuring an IP address to an Ethernet interface • enabling the interface • checking the interface address
Network addressing includes but not limited to:	• static addresses • dynamic addressing • subnets
Network resources includes but not limited to:	• files • software • TFTP Server • Wireshark
EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	To be considered competent in this unit assessors must be satisfied the candidate can demonstrate the achievement of all of the elements of the competency to the level defined by the associated performance criteria Specifically they must be able to: • identify the elements of an interconnected computer network • explain the operation of the OSI and TCP/IP layered communication models • identify the operation of and utilise relevant protocols at the Data link, Network, Transport and Application layers • construct IP addresses and subnets for a small to medium sized network

	• configure routers and switches and assign IP addresses to end points for a small to medium sized network • utilise test and troubleshooting commands and procedures for a small to medium sized computer network.
Context of and specific resources for assessment	Evidence should show competency working in a realistic environment and a variety of conditions. The candidate will have access to all tools, equipment, materials and documentation required. The candidate will be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials. This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate
Method of assessment	Evidence can be gathered through a variety of ways including: – observation of processes and procedures – oral and/or written questioning – testimony from supervisors, colleagues, clients and/or other appropriate persons – inspection of the final product or outcome – portfolio of documented evidence. Where performance is not directly observed and/or is required to be demonstrated over a period of time and/or in a number of locations, any evidence should be authenticated by colleagues, supervisors, clients or other appropriate persons

VU22823 - Carry out an integrated technologies project			
Unit Descriptor		This unit of competency sets out the knowledge and skills required to carry out an integrated technologies project by merging distinct electrotechnology domains to achieve an integrated technical solution. This includes determining the required outcome, preparing an action plan, accessing the required resources, carrying out the project in accordance with the project plan and evaluating the process. Application of appropriate mathematical techniques is required to determine system parameters. It is envisaged this competency will be achieved with a small project team consisting of two or three individuals. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.	
Employability Skills		This unit contains Employability Skills.	
Pre-requisite Unit		UEENEEE101A - Apply Occupational Health and Safety regulations, codes and practices in the workplace VU22820 – Use routine work practices in an integrated technologies environment	
Application of the Unit		This unit of competency applies to persons preparing to work with integrated technologies and is suitable for use in secondary school programs such as VETIS or VCAL with appropriate supervision.	
ELEMENT		**PERFORMANCE CRITERIA**	
Elements describe the essential outcomes of a unit of competency.		*Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.*	
1	Plan and prepare for an integrated technologies project	1.1	Project team is established and the scope of the ***integrated technologies project*** is determined in accordance with the knowledge and skills of team members
		1.2	Potential project outputs are calculated as required using ***mathematical processes***
		1.3	***Project action plan*** is prepared specifying the outcome and approved by ***appropriate person***

		1.4	Any feedback from the appropriate person is reviewed by the team and incorporated into the action plan
		1.5	Resources and equipment for the project are purchased or accessed as required
2	Conduct an integrated technologies project	2.1	Any electrical equipment, machines or plant being used is checked in accordance with WHS/OHS requirements to ensure isolation
		2.2	Project activities are carried out by relevant team members in accordance with the requirements of the action plan
		2.3	Project progress is reviewed in accordance with action plan timelines and variance noted and discussed with appropriate person
		2.4	Decisions for dealing with unexpected situations and timeline variations are discussed with appropriate person
		2.5	Method/s selected for dealing with unexpected situation are guided by safety consideration and specified project outcomes
3	Finalise project and review outcomes	3.1	Performance of the integrated technologies is tested/trailed and evaluated against specified outcome
		3.2	Required adjustments and/or modifications are implemented and a retrial is performed
		3.3	Final project outcome is demonstrated to appropriate person for approval
		3.5	Project team in conjunction with appropriate person review the team's performance and project outcomes against specified outcomes
		3.6	Project activities and outputs that worked well are identified and areas of weakness are noted for improvement for further project work

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- Working cooperatively with team members to achieve a project outcome
- Assessing the merits and difficulties of integrated technologies options
- applying mathematical calculations to assess potential variables and outputs
- Developing a project action plan
- Accessing the required resources and equipment for a specific project
- Undertaking project activities in accordance with project action plan
- Dealing with unexpected situations and timeline variances
- Finalising project in line with the specified outcomes of a project action plan
- Evaluating project activities to determine what worked well and areas for improvement

Required knowledge:

- Real world applications of integrated technologies
- Technology options and connectivity considerations
- Components of a project action plan
- Working with others
- Basic mathematical process such as multiplication, percentages, trigonometry
- Safety considerations in a workshop environment
- Use of hand tools and hand held power tools
- Project evaluation processes

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording in the Performance Criteria is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Integrated technologies project examples include:	• Basic robotic protype
	• Small renewable energy system
	• Automated ELV lighting system
	• Alarmed ELV warning system
	• ELV security system
	• Basic IoT connectivity system eg:
	  – smart watering system
	  – personalised lighting system

Mathematical processes may include:	• addition • subtraction • multiplication • division • percentage • geometry • trigonometry • algebra
Project action plan may include:	• Statement of project outcomes • Start and end dates • Stages/steps in the project including: – timelines – resources – who is responsible – costs – expected outcome/milestones for each stage/step • Project review points
Appropriate person may include:	• Supervisor • Teacher • Trainer • Mentor

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit	To be competent in this unit assessors must be satisfied the candidate can demonstrate the achievement of each element to the level defined in the performance criteria. Specifically, they must be able to provide evidence of the ability to: – Prepare an action plan and execute an integrated technologies project that demonstrates the ability to merge distinct technology fields to achieve an integrated technical solution or outcome – Work in a team environment to achieve a specified outcome in accordance with a project action plan

Context of and specific resources for assessment	Skills will be demonstrated in a safe workshop environment that reflects workplace conditions with access to suitable equipment tools and resources. Assessment must also ensure access to: – Technical specifications of relevant technologies – Computer hardware/software and programming resources – Technological equipment and resources – Reference texts
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: – direct observation of processes and procedures – written and/or oral questioning to test underpinning knowledge – inspection of performance of final project – portfolio of documented evidence such as technology research, mathematical calculations, prepared diagrams/drawings etc.

VU22824 - Perform basic network and computer assembly			
Unit Descriptor		This competency unit sets out the knowledge and skills required to construct and configure basic stand-alone computers and small networks consisting of a maximum of five computers linked by a network. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.	
Employability Skills		This unit contains Employability Skills.	
Application of the Unit		This unit of competency applies to a person working freelance or for an enterprise providing computer installation, set up and maintenance services	
ELEMENT		**PERFORMANCE CRITERIA**	
Elements describe the essential outcomes of a unit of competency.		*Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.*	
1	Plan for computer system and network assembly	1.1	Established WHS/OHS requirements and risk control measures and procedures are followed in the preparation of the work area.
		1.2	Computer system and network assembly requirements are identified from documentation, work sheets or consultation with ***appropriate personnel*.**
		1.3	Appropriate network topology is selected to meet job requirements and checked with appropriate personnel.
		1.4	Appropriate personnel are consulted to ensure that work is coordinated effectively with others involved at the work site.
		1.5	***Resources and equipment*** needed for the task are obtained in accordance with enterprise procedures and checked as fit for purpose.
2	Assemble and set up stand-alone computers	2.1	Computer components are selected and assembled to manufacturers' specifications

		2.2	The computers are tested and the desktops are customised to job requirements.
		2.3	Basic computer system information is checked and, if appropriate, adjusted to specified requirements.
		2.4	Decisions for dealing with unexpected situations are made from discussions with appropriate personnel, job specifications and enterprise procedures***.***
3	Assemble and configure a local area network	3.1	Local area network computers are connected to the network using required network interfaces and connections according to manufacturers' specifications and enterprise procedures
		3.2	The network server is configured for a dynamic host configuration protocol in accordance with manufacturers' specifications and enterprise procedures
		3.3	Assembled and configured network is tested for operation and, if required, faults are corrected.
		3.4	Decisions for dealing with unexpected situations are made from discussions with appropriate personnel, job specifications and enterprise procedures.
4	Complete computer system and computer network assembly	4.1	Equipment and tools used in assembly task are cleaned and stored in accordance with enterprise procedures
		4.2	Worksite is cleared and made safe in accordance with WHS/OHS requirements and enterprise procedures.
		4.3	Specifications of assembled systems are documented and stored in accordance with enterprise procedures
		4.4	The ***computer system and network*** is checked to verify overall correct functioning and problems if any, are rectified as required.
		4.5	Appropriate personnel are informed of completion of work and provided with a demonstration of the network system.

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- starting, shutting down and restarting a computer
- recognising application windows and working with icons
- resizing a desktop window
- viewing basic system information
- connecting computer systems
- creating a computer inventory
- installing motherboard, optical drive and video card
- fitting the computer case together
- connecting keyboard, mouse, monitor and power cord
- booting system for the first time
- adding a network interface card (NIC) and set the IP address
- connecting to the internet
- problem solving for a defined range of predicable problems
- troubleshooting common computer, computer network and peripheral device problems

Required knowledge:

- computer types, systems and programs
- basic features of a graphical user interface environment
- software applications including: work processing; spreadsheets; databases; graphics applications; presentation applications; web browser and email.
- number systems
- laboratory safety and tools including electrostatic discharge (ESD)
- workplace practices to reduce ESD potential
- appropriate tools for networking and computer assembly work
- workspace cleaning supplies
- workplace testing equipment
- computer system overview including: input process, output and storage
- network system boot process
- hardware components including: case; power supply; cooling systems, motherboard, motherboard form factors; motherboard components, CPUs; BIOS; expansion slots, riser cards, bus types
- Other computer components including: memory, display, connector, storage, network

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording in the Performance Criteria is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.	
Appropriate personnel may include:	• supervisor • client/customer • enterprise staff • business/enterprise owner/manager
Resources and equipment may include:	• appropriate tools • test equipment • consumables • network cards/ connectors • appropriate software licences • manufacturers' specifications and manuals • diagnostics software
Computer system and network may include	• Systems using the following or similar operating systems: – DOS – Windows 9x – Windows NT, 2010 and XP – Mac Os – UNIX – Linux – Novell – Cisco Systems • System hardware from various manufacturers including: – mother boards – optical and hard disk and other drives – power supplies – memory • computer cases and internal / external connections and expansion slots • various cards such as video cards • cooling systems • peripherals devices including mice, keyboards, printers etc.

	• network interface cards • routers • switches • hubs
EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	To be considered competent in this unit the participant must be able to demonstrate the knowledge and skills required to achieve all of the elements of competency and associated performance criteria. Specifically they must be able to: – follow established WHS/OHS requirements and risk control measures and procedures for the work area – plan, determine required resources, assemble and set-up a small office computer network system according to job instructions *The small office computer network system must consist of between two (2)] and five (5) interconnected workstations*
Context of and specific resources for assessment	Skills will be demonstrated in a real or simulated office environment. If simulated it should reflects real workplace conditions with suitable facilities, tools and equipment. Assessment must ensure access to: – job specifications/instructions – relevant tools and equipment – relevant computer hardware and software components and cabling. This unit could be assessed in conjunction with any other units covering computer system or computer networking assembly or other units requiring the exercise of the skills and knowledge covered by this unit.

Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: – direct observation of processes and procedures – written and oral questioning to test underpinning – inspection and demonstration of computer system and network assembly – portfolio of documented evidence verified by an appropriate person.

VU22825 - Perform basic computer system and network maintenance and upgrades			
Unit Descriptor		This unit describes the performance outcomes, skills and knowledge required to maintain, upgrade and troubleshoot basic stand-alone computers and small networks consisting of a maximum of five computers linked by a network. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.	
Employability Skills		This unit contains Employability Skills.	
Application of the Unit		This unit of competency applies to a person working freelance or for an enterprise providing computer installation, set up and maintenance services.	
ELEMENT		**PERFORMANCE CRITERIA**	
Elements describe the essential outcomes of a unit of competency.		*Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.*	
1	Plan for computer systems and network maintenance and upgrades	1.1	Established WHS/OHS requirements and risk control measures and procedures are followed in the preparation for the work
		1.2	Preventative maintenance task for computer systems and networks are planned in accordance with manufacturers' specifications and *enterprise procedures*.
		1.3	Computer systems and network corrective maintenance tasks and ***upgrades*** are planned in accordance with manufacturers' specifications and enterprise procedures.
		1.4	Computer systems and network components requiring upgrading are identified and appropriate upgrade components are selected in accordance with manufacturers' specifications and enterprise procedures*.*
		1.5	***Appropriate personnel*** are consulted to ensure that work is coordinated effectively with others involved at the work site

		1.6	***Resources and equipment*** needed for the task are obtained in accordance with enterprise procedures and checked as fit for purpose.
2	Perform computer systems and network upgrades	2.1	Select, install and configure upgrades to computer systems and network in accordance with enterprise procedures.
		2.2	The upgraded computer systems and network is tested and all functions are verified in accordance with manufacturers' specifications and enterprise procedures.
		2.3	Inoperative functions if any, are identified and rectified.
		2.5	Decisions for dealing with unexpected situations are made from discussions with appropriate personnel, job specifications and enterprise procedures.
3	Perform preventative and corrective maintenance on computer systems and networks	3.1	Preventative and corrective maintenance on computer systems and network is carried out in accordance with enterprise procedures.
		3.2	Faults in computer systems and networks are identified and rectified
		3.3	Decisions for dealing with unexpected situations are made from discussions with appropriate personnel, job specifications and enterprise procedures.
4	Complete computer systems and network upgrades and maintenance	4.1	Tools, resources and equipment are maintained and stored in accordance with enterprise procedures.
		4.2	Work area is cleared and made safe in accordance with WHS/OHS requirements and enterprise procedures.
		4.3	Specifications of upgraded computer systems and networks are documented in accordance with enterprise procedures.
		4.4	Outcomes of preventative and corrective maintenance are documented in accordance with enterprise procedures.

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- Using a range of hand tools and relevant test equipment
- Following enterprise/workplace WHS/OHS processes and procedures
- Reading and interpreting equipment manuals
- Undertaking preventative maintenance for computer system such as:
  - resizing a desktop window
  - setting clock and date
  - setting and altering desktop settings
  - characterise computer displays
  - upgrading video with a video acceleration board
  - adding audio capabilities with a sound card
- Undertaking preventative maintenance of a computer network such as:
  - configuring external peripherals
  - adding hardware to a server
  - upgrading server components
  - adding a network interface card (NIC) and set the IP address
  - adding and connecting a network printer
- Troubleshooting common computer, computer network and peripheral device problems

Required knowledge:

- IT fundamentals including: computer systems and programs, computer types, connecting computer systems
- Basic features of graphical user interface (GUI) environment
- Laboratory safety and tools including: electrostatic discharge (ESD); basic safety principles, practices to reduce ESD; tools, cleaning supplies, testing equipment; safety agreement
- Computer system overview including: boot process; hardware components; memory components; display components; connector components, storage components; network components; network interface card (NIC); system resources; portable devices
- Basic hardware for multimedia upgrades including: video adapter; sound cards and speaker systems, common media file formats used in multimedia applications; MPEG hardware versus software, optical drives

- Network server overview including hardware RAID versus software RAID; hardware based RAID configuration
- Networking fundamentals including: file, print and application services; mail services; directory and name services; internet
- Network administration
- Simplex, half-duplex and full-duplex transmission
- Types of networks
- Dynamic Host Configuration Protocol (DHCP) servers
- Network components including: network topologies, physical versus logical topology; networking media; common devices; server components
- LAN architectures including networking protocols, OSI model; TCP/IP utilities
- Printers and printing
- Elements of a preventative maintenance program including: tools and equipment; environmental guidelines; electrostatic discharge
- Basic trouble shooting techniques

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording in the Performance Criteria is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Upgrades may include	• Computer system upgrades: – multimedia capabilities such as sound cards or video cards – optical and hard drives – mother boards – memory – peripheral device upgrades such as printers or external disk drive upgrades – network interface cards • Computer network upgrades: – redundant array of inexpensive disks (RAID) – network peripheral device upgrades such as printers or external disk drives upgrades – server processor upgrades – hubs – routers – switches

Appropriate personnel may include:	• Supervisor • client/customer • enterprise staff • business/enterprise owner/manager
Resources and equipment may include:	• appropriate tools • test equipment • consumables • network cards/connectors • appropriate software licences • manufacturers' specifications and manuals • diagnostics software • spare parts • catalogues

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit	To be considered competent in this unit the participant must be able to demonstrate the knowledge and skills required to achieve all of the elements of competency and associated performance criteria. Specifically they must be able to: – follow established WHS/OHS requirements and risk control measures and procedures for the work area – plan, and undertake preventative and corrective maintenance on a computer system and network in a home, business or similar environment – plan and undertake upgrades of a computer system and network in a home, business or similar environment
Context of and specific resources for assessment	Skills will be demonstrated in a real or simulated office environment. If simulated it should reflects real workplace conditions with suitable facilities, tools and equipment. Assessment must ensure access to: – job specifications/instructions – relevant tools and equipment – relevant computer hardware and software components and cabling.

	This unit could be assessed in conjunction with any other units covering computer system or computer networking assembly or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: – written and oral questioning to test underpinning – direct observation of processes and procedures to perform preventative and corrective maintenance and upgrades on computer system and network – portfolio of documented evidence verified by an appropriate person.

VU22826 - Install and test a home entertainment system			
Unit Descriptor		This competency unit sets out the knowledge and skills required to install and test a home entertainment system. This includes interconnecting domestic video, audio and control equipment to create an integrated home entertainment system. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.	
Employability Skills		This unit contains Employability Skills.	
Application of the Unit		This unit of competency applies to person working as a freelance technician or for an enterprise providing entertainment systems installation and maintenance services to customers and clients	
ELEMENT		**PERFORMANCE CRITERIA**	
Elements describe the essential outcomes of a unit of competency.		*Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.*	
1	Plan to install a home entertainment system	1.2	Established WHS/OHS requirements and risk control measures and procedures are followed in the work area
		1.3	***Home entertainment equipment*** installation requirements are determined from documentation, job sheets or discussions with ***appropriate personnel***.
		1.4	Suitability of the installation site is assessed and the installation task is planned in consultation with appropriate personnel.
		1.5	***Resources and equipment*** needed for the task are obtained in accordance with enterprise procedures and checked as being fit for the purpose.
2	Install and test a home entertainment system	2.1	Equipment is checked as being isolated, where necessary, in strict accordance with WHS/OHS requirements***.***
		2.2	Home entertainment equipment, unpacked and checked for damage prior to installation.

		2.3	Home entertainment equipment is installed, connected and configured according to requirements appropriate personnel, and manufacturers' specifications/instructions.
		2.4	Home entertainment system is tested for functionality any problems if any, are rectified.
		2.5	Decisions for dealing with unexpected situations are made based on discussions with appropriate personnel and job specifications.
		2.6	Customer/client is trained how to operate the home entertainment system
3	Complete and document installation	3.1	Equipment and tools used for the installation task are collected and stored and the work area tidied up and made safe
		3.2	Appropriate personnel are informed of completed installation task and documentation is completed in accordance with enterprise procedures.

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- Using relevant hand and hand held power tools and test equipment correctly
- Following relevant WHS/OHS processes and procedures for work area and work task
- Reading and interpreting equipment manuals and installation instructions
- Installing domestic entertainment systems and individual components
- Testing installations for functionality
- Troubleshooting connection, picture and sound issues
- Providing client training on the operation of the system
- Completing relevant workplace documentation

Required knowledge:

- Input devices including: DVD players; CD players; turntables; electronic game players; VCRs; cable television receivers; computers; satellite dishes; DVD recorders; wireless input devices
- Connectors including: SCART; AV; coaxial; S video; wireless links
- Surround sound including: components (receivers, amplifiers, speakers); data decoding; dolby decoding; dolby surround sound; prologic; digital theatre systems; MPEG; MP3
- Output devices including: televisions (CRT, LCD, plasma, rear projection, digital, overhead projectors); speakers (wired, wireless; in wall speaker systems, sub woofers); surround sound formats (5.1, 7.1)
- Control devices including remote controls; universal remotes
- Troubleshooting methodology
- Safe work practices when working with electrical powered devices
- WHS/OHS requirements and safe work practices

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording in the Performance Criteria is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Home entertainment equipment may include:	• televisions • speaker, connector and power cable • DVD, CD player, VCR and other input devices, amplifier and speaker • surround sound receivers
Appropriate personnel may include:	• workplace supervisor • customer/client • retail sales manager • retail store manager
Resources and equipment may include:	• appropriate tools and equipment • cables and connectors • manufacturers' manuals and specifications • test equipment • consumables

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	To be considered competent in this unit the participant must be able to demonstrate the knowledge and skills required to achieve all of the elements of competency and associated performance criteria. Specifically they must be able to: – follow established WHS/OHS requirements and risk control measures and procedures for the work area and work tasks – plan, install and configure at least two types of home entertainment systems or at least four different pieces of home entertainment equipment
Context of and specific resources for assessment	Skills will be demonstrated in a workplace or simulated workplace environment. If simulated it should reflects real workplace conditions with suitable facilities, tools and equipment. Assessment must ensure access to: – job specifications/instructions – relevant tools and equipment – relevant system equipment and components
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: – direct observation of processes and procedures – written and oral questioning to test underpinning – inspection and demonstration of final system or system components installations – portfolio of documented evidence verified by an appropriate person.

VU22338 - Configure and program a basic robotic system	
Unit Descriptor	This unit of competency describes the knowledge and skills required to configure and program a basic robotic system. Typical tasks for basic robotic system operation include pick and place, motion and navigation. Code development will include testing code and producing code to control robotic systems. No licensing or certification requirements apply to this unit at the time of accreditation.
Employability Skills	This unit contains Employability Skills.
Application of the Unit	This unit would be applied by entry level engineering workers required to undertake basic operations with robotic systems for a range of repetitive and routine tasks. This unit does not include large, complex industrial robotic systems used in manufacturing operations.
ELEMENT	**PERFORMANCE CRITERIA**
Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.
1. Plan the configuration and programming of a basic robotic system	1.1 ***Workplace Health and Safety/Occupational, health and safety (WHS/OHS) requirements*** and ***environmental requirements*** for a given work area are obtained and understood.
	1.2 Established WHS/OHS requirements and risk control measures and procedures in preparation for the work area are followed.
	1.3 Safety hazards, which have not previously been identified, are documented and risk control measures devised and implemented in consultation with ***appropriate personnel.***
	1.4 Routine tasks that may be performed by a robotic system are analysed, documented and discussed with appropriate personnel.
	1.5 ***Robotic system*** configuration and programming requirements are determined from documentation, construction briefs and discussions with appropriate personnel.
	1.6 Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved at the work site.
	1.7 ***Resources and equipment*** needed for the task are obtained in accordance with enterprise procedures and checked for correct operation and safety.

2. Configure and program a robotic system	2.1 WHS/OHS requirements for carrying out the work are followed.
	2.2 Equipment/machines/plant is checked as being isolated where necessary in strict accordance with WHS/OHS requirements.
	2.3 Robotic system is constructed and programmed in accordance with requirements, manufacturers' specifications and ***enterprise procedures***.
	2.4 Robotic system is configured for the intended task according to manufacturers' specifications and enterprise procedures.
	2.5 Robotic system is tested for correct operation and, if required, incorrect hardware and software functions are identified and rectified.
	2.6 Decisions for dealing with unexpected situations are made from discussions with appropriate personnel, job specifications and enterprise procedures.
	2.7 Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
3. Verify and document robotic system	3.1 WHS/OHS requirements for completing the work are followed.
	3.2 Work site is made safe in accordance with established safety procedures.
	3.3 Hardware and software tools used in configuration and programming tasks are maintained and stored according to enterprise procedures.
	3.4 Robotic system overall function and requirements are verified, documented and information stored according to enterprise procedures.
	3.5 Appropriate personnel are informed of the completion of work and, if required, provided with a demonstration of the operation of hardware and software aspects of the robotic system.

REQUIRED SKILLS AND KNOWLEDGE

Required skills:

- using tools and equipment to configure and program a robotic system
- following enterprise and WHS/OHS procedures
- reading and interpreting robotics equipment manuals
- completing workplace documentation
- making decisions within a limited range of options
- installing and configuring integrated programming environments (IPE)
- saving, editing, documenting and compiling code
- defining and documenting a basic robotic task including requirement list; task steps; input requirements; output requirement; logic states
- testing code including systematic fault finding and documentation; debuggers and simulation; fault isolation; input checking; output checking; diagnostic code
- troubleshooting robotic system operation

Required knowledge:

- types of robotic devices including mobile robots; autonomous robots; robotic arms
- robot axis and degrees of movement
- robot power requirements and movement e.g. stationary robots with mains derived power; mobile robots with batteries; battery duration and recharging
- DC motor types including permanent magnet DC motors; brushed motors; brushless motors; stepper motor
- DC motor controls including speed control (pulse width modulation); forward and reverse control; 'H' drive
- positional feedback and servo systems including potentiometers; encoders (incremental and absolute)
- solenoid actuators
- basic input transducers including switches; potentiometers; IR infra-red sensors; ultra-sonic sensors
- robot electronics fundamentals including CPU/controller; input interfaces, analogue, digital; output interfaces, analogue, digital, drive capabilities, protection
- drive mechanisms including gearboxes; belts; chains
- robot construction materials including metal; wood; plastics; composites
- download interfaces such as RS232; USB; IEEE1394 or similar
- flowchart symbols
- flowchart decisions and logic
- program code including input statements; output statements; logical operators (AND, OR, NOT, XOR, SHiFT); mathematical operators; flow control (IF THEN, FOR, WHILE); program modules (CALL, RETURN)
- code download including programming interfaces; isolation; programming mode; operational mode e.g. Programming Raspberry Pi with Python and Open Computer Vision (CV)
- WHS/OHS considerations applicable to robotic systems

RANGE STATEMENT	
This describes the essential skills and knowledge and their level, required for this unit. Bold italicised wording in the Performance Criteria is detailed below.	
Workplace Health and Safety/Occupational, health and safety (WHS/OHS) requirements may include but not limited to:	• legislation • protective equipment • material safety management systems • hazardous substances and dangerous goods code • local safe operation procedures
Environmental requirements may include but not limited to:	• liquid waste • solid waste • gas, fume, vapour, smoke emissions, including fugitive emissions • excessive energy and water use • excessive noise
Appropriate personnel may include but not limited to:	• supervisor • leading hand • foreman • manager • site engineer • trainer • mentor • teacher • team member
Robotic system may include but not limited to:	• mobile robots • autonomous robots • robotic arms
Resources and equipment may include but not limited to:	• appropriate tools • test equipment • consumables • appropriate software licenses • manufacturers' specifications and manuals • diagnostics software • personal computer • programming tools

Enterprise procedures may include but not limited to:	• the use of tools and equipment • instructions, including job sheets, cutting lists, plans, drawings and designs • reporting and communication • manufacturers' specifications and operational procedures

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit	To be considered competent in this unit assessors must be satisfied the candidate can demonstrate the achievement of all of the elements of the competency to the level defined by the associated performance criteria Specifically they must be able to: • plan, and construct a robotic system for a routine task using hardware and software tools • configure, program, test and rectify robotic system to achieve optimum performance of routine task • apply relevant WHS/OHS procedures and safe work practices during construction, programming and testing of a robotic system.
Context of and specific resources for assessment	Evidence should show competency working in a realistic environment and a variety of conditions. The candidate will have access to all tools, equipment, materials and documentation required. The candidate will be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Methods of assessment	Evidence can be gathered through a variety of ways including: • observation of processes and procedures • oral and/or written questioning • testimony from supervisors, colleagues, clients and/or other appropriate persons • inspection of the final product or outcome • portfolio of documented evidence. Where performance is not directly observed and/or is required to be demonstrated over a period of time and/or in a number of locations, any evidence should be authenticated by colleagues, supervisors, clients or other appropriate persons.

VU22827 - Implement a digital circuit using a programmable logic device (PLD)			
Unit Descriptor		This unit of competency sets out the knowledge and skills required to implement, from a given design file, digital circuits on programmable logic devices (PLD). The unit includes planning for and programing a PLD and verifying the digital circuit functionality. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.	
Employability Skills		This unit contains Employability Skills.	
Application of the Unit		This unit of competency applies in a home or commercial environment where programmable logic devices are required for a range of electronic control applications.	
ELEMENT		**PERFORMANCE CRITERIA**	
Elements describe the essential outcomes of a unit of competency.		*Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.*	
1	Plan for programing a PLD	1.1	Established ***WHS/OHS requirements*** and risk control measures and procedures are determined and followed in preparation for the work task.
		1.2	PLD programming requirements are established from documentation, job sheets and discussion with ***appropriate personnel***.
		1.3	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved at the work site.
		1.4	***Resources and equipment*** needed for the task are obtained in accordance with enterprise procedures and checked for correct operation and safety.
2	Program a PLD	2.1	Equipment/machines/plant are checked as being isolated where necessary in strict accordance with WHS/OHS requirements.
		2.2	PLD is programmed according to requirements, manufacturers' specifications and enterprise procedures.
		2.3	PLD circuit implementation is tested for functionality, according to requirements and enterprise procedures.

		2.4	Decisions and methods for dealing with unexpected situations are made from discussions with appropriate personnel, job specifications and enterprise procedures.
3	Verify and document PDL circuit implementation	3.1	Work site is made safe in accordance with established safety procedures.
		3.2	Equipment and tools used in the implementation task are maintained and stored according to enterprise procedures.
		3.3	Digital circuit function and requirements are verified, documented and information stored according to enterprise procedures.
		3.4	Appropriate personnel are informed of the completion of work and, if required, provided with a demonstration of the operation of the digital circuit.

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- Following relevant workplace WHS/OHS policies and procedures
- Reading and interpreting job instructions and planning for programing PLD
- Programming PLD and verifying the functionality of the digital circuit
- Making decisions within a limited range of options
- Using relevant hand and diagnostic tools
- Documenting program information in accordance to enterprise procedures

Required knowledge:

- Programmable logic devices including; CPLDs; FPGAs
- Programmable logic device characteristics including size; macro cells; speed
- Integrated software environment (ISE) e.g. Xilinx; Altera; Lattice
- Hardware description languages e.g. VHDI, VHSIC
- Electronic design automation netlist capture and schematic capture

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording in the Performance Criteria is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.	
WHS/OHS requirements may include:	• legislation • protective equipment • material safety management systems • hazardous substances and dangerous goods code • local safe operation procedures
Appropriate personnel may include:	• supervisor • leading hand • foreman • manager • site engineer • trainer • mentor • team member
Resources and equipment may include:	• appropriate tools • appropriate spare parts • cables and connectors • test equipment • consumables • appropriate software licences • manufacturers' specifications and manuals • diagnostics software • personal computer • programming tools • PLD device and board • input devices and output devices

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	To be considered competent in this unit the participant must be able to demonstrate the knowledge and skills required to achieve all of the elements of competency and associated performance criteria. Specifically they must be able to on at least two (2) occasions: – determine and follow established WHS/OHS requirements and risk control procedures for a work area – demonstrate implementation of a digital circuit by programming a programmable logic device – verify functionality and document PDL circuit implementation Each occasion must be in a different context or situation.
Context of and specific resources for assessment	Skills will be demonstrated in a real or simulated workshop environment. If simulated it should reflects real workplace conditions with suitable facilities, tools and equipment. Assessment must ensure access to: – job specifications/instructions – relevant tools and diagnostic equipment – relevant programmable logic devices and related components. The competencies covered by this unit could be demonstrated by an individual working alone or as part of a team.
Method of assessment	Assessment must include the demonstration of practical skills and may also include: – observation of processes and procedures; – oral and/or written questioning on required knowledge and skills; – inspection of the final product or outcome; – portfolio of documented evidence. This unit could be assessed in conjunction with any other units covering control concepts or other units requiring the exercise of the skills and knowledge covered by this unit

VU22828 – Install, test and verify correct operation of a ‘by-wire’ control system			
Unit Descriptor		This unit of competency sets out the knowledge and skills required to install, test and verify correct operation of a ‘by-wire’ control system. The unit includes planning for the installation of a “by-wire” control system, installing the system in accordance with job instructions and diagnostic testing and verification of the control systems functionality. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.	
Employability Skills		This unit contains Employability Skills.	
Application of the Unit		This unit applies to a person working in an industry where “by-wire” technology is utilised for a range of control applications.	
ELEMENT		**PERFORMANCE CRITERIA**	
Elements describe the essential outcomes of a unit of competency.		*Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.*	
1	Plan to install and test a “by-wire” control system	1.1	Established ***WHS/OHS requirements*** and risk control measures and procedures are followed in preparation of the work area.
		1.2	Safety hazards, which have not previously been identified, are documented and risk control measures devised and implemented in consultation with ***appropriate personnel***.
		1.3	***Control application*** that may be performed by a “by-wire” system is analysed, documented and discussed with appropriate personnel.
		1.4	Control application installation and testing requirements are determined from documentation, job sheets and discussions with appropriate personnel.
		1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved at the work site.
		1.6	***Resources and equipment*** needed for the task are obtained in accordance with enterprise procedures and checked for correct operation and safety.

2	Install and test “by-wire” control system	2.1	Equipment, machines or plant are checked as being isolated, where necessary, in strict accordance with WHS/OHS requirements.
		2.2	“By-wire” control system is installed in accordance with requirements, manufacturers’ specifications and enterprise procedures.
		2.3	By-wire control system is tested for functionality and, if necessary, faults are located and rectified.
		2.4	Decisions and methods for dealing with unexpected situations are made from discussions with appropriate personnel, job specifications and enterprise procedures.
3	Verify and document by wire control system	3.1	Work site is made safe, in accordance with established safety procedures
		3.2	Equipment and tools used in construction task are maintained and stored according to enterprise procedures.
		3.3	By-wire control system function and requirements are verified, documented and information stored according to enterprise procedures.
		3.4	Appropriate personnel are informed of the completion of work and, if required, provided with a demonstration of the operation of the “by-wire” control system.

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- Determining and following relevant WHS/OHS requirements and procedures
- Reading and interpreting manufacturers’ instructions, equipment manuals and work related documentation
- Reading and interpreting job instructions and planning the installation of the “by-wire” control system
- Installing “by-wire” control system in accordance to job instructions
- Conducting diagnostic testing to determine and verify correct functionality of the installation
- Using tools and test equipment in accordance with manufacturers’ requirements
- Completing relevant enterprise documentation following completion of task.

Required knowledge:

- Control input fundamentals including positional information; potentiometers; incremental (feedback requirements) and absolute

- Control output fundamentals including motors; servos; solenoids; valves; pneumatics; hydraulics
- Control channel media including wire; fibre; wireless RF; remote control
- Serial bus fundamentals including serial data asynchronous and synchronous; closes – separate and embedded; device addressing
- Serial bus technology e.g. CAN bus;I^2C bus; 1-wire bus
- Multiplexing including TDM time division; STDM statistical time division; FDM frequency division
- Control technology applications e.g. aviation (fly-by-wire); automotive; home automation; remote control
- Control setup and testing procedures including isolation; safety requirements; interlocks; documentation

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording in the Performance Criteria is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

WHS/OHS requirements may include:	• legislation • protective equipment • material safety management systems • hazardous substances and dangerous goods code • enterprise safe work procedure
Appropriate personnel may include:	• supervisor • leading hand • foreman • manager • site engineer • workplace trainer • mentor • team member
Control application may include:	• aerospace • automotive • industrial • building control • remote control

Resources and equipment may include:	• appropriate tools • appropriate spare parts • cables and connectors • test equipment • consumables • appropriate software licences • manufacturers’ specifications and manuals • diagnostics software • personal computer • programming tools • input devices • output devices • control system

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	To be considered competent in this unit the participant must be able to demonstrate the knowledge and skills required to achieve all of the elements of competency and associated performance criteria. Specifically, they must be able to on at least two (2) occasions: – determine and follow established WHS/OHS requirements and risk control procedures for a work area – demonstrate the ability to install, a “by-wire” control system in accordance with job instructions – test and verify the correct operation of a “by-wire” control system Each occasion must be in a different context or situation.
Context of and specific resources for assessment	Skills will be demonstrated in a real or simulated workshop environment. If simulated it should reflects real workplace conditions with suitable facilities, tools and equipment. Assessment must ensure access to: – job specifications/instructions – relevant tools and diagnostic equipment – relevant “by-wire” control system components. The competencies covered by this unit could be demonstrated by an individual working alone or as part of a team.

Method of assessment	Assessment must include the demonstration of practical skills and may also include: – observation of processes and procedures; – oral and/or written questioning on required knowledge and skills; – inspection of the final product or outcome; – portfolio of documentary evidence. This unit could be assessed in conjunction with any other units covering control concepts or other units requiring the exercise of the skills and knowledge covered by this unit.

VU22829 – Install, set up and test an embedded control system			
Unit Descriptor	This unit of competency sets out the knowledge and skills required to install, set up and test an embedded control system used for automatic or semi-automatic operations of a wide range of consumer and industrial equipment. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.		
Employability Skills	This unit contains Employability Skills.		
Application of the Unit	This unit applies to a person working in an environment where embedded control systems are utilised to operate a range of consumer and industrial equipment.		
ELEMENT		**PERFORMANCE CRITERIA**	
Elements describe the essential outcomes of a unit of competency.		*Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.*	
1	Plan to install, set up and test an embedded control system	1.1	Established ***WHS/OHS requirements*** and risk control measures and procedures are followed in preparation of the work area.
		1.2	***Embedded control system*** installation and set up requirements are determined from documentation, job sheets or discussions *with* ***appropriate personnel***.
		1.3	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved at the work site.
		1.4	***Resources and equipment*** needed for the task are obtained in accordance with enterprise procedures and checked for correct operation and safety.
2	Install and test an embedded control system	2.1	Equipment, machines or plant are checked as being isolated, where necessary, in strict accordance with WHS/OHS requirements.
		2.2	Embedded control system is installed and configured according to given requirements, manufacturers' manuals and enterprise procedures.
		2.3	Embedded control system is programmed either in circuit or in a programmer according to requirements, manufacturers' specifications and enterprise procedures.

		2.4	Decisions and methods for dealing with unexpected situations are made from discussions with appropriate personnel, job specifications and enterprise procedures.
3	Verify operation and complete documentation	3.1	Work site is made safe in accordance with established safety procedures
		3.2	Equipment and tools used in installation task are maintained and stored in accordance with enterprise procedures.
		3.3	Embedded control system is tested for correct operation in accordance with requirements, manufacturers' specifications and enterprise procedures.
		3.4	Embedded control system installation and configuration is documented and stored, in accordance with enterprise procedures.
		3.5	Appropriate personnel are informed of the completion of work and, if required, provided with a demonstration of the operation of the embedded control system.

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- Determining and following relevant WHS/OHS requirements and procedures
- Reading and interpreting manufacturers' instructions, equipment manuals and work related documentation
- Reading and interpreting job instructions and planning the installation of an embedded control system
- Installing embedded control system in accordance to job instructions
- Conducting diagnostic testing to determine and verify correct functionality of the installation
- Using tools and test equipment in accordance with manufacturers' requirements
- Completing relevant enterprise documentation following completion of task.

Required knowledge:

- Embedded controller applications including industrial; commercial; domestic
- Micro controller features including fabrication techniques; architecture; memory features and options; power management; input and output features; interrupts; special features (e.g. watchdog timers, digital signal processors, clock monitor, resident program loader)

• Micro controller software including machine language, assembler language, interpreters; compilers; development tools; simulators; debuggers • Test procedures for micro controllers including power up routine; resetting; booting; reprogramming; functional testing
RANGE STATEMENT
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording in the Performance Criteria is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

WHS/OHS requirements may include:	• legislation • protective equipment • material safety management systems • hazardous substances and dangerous goods code • local safe operation procedures
Embedded control system includes:	• controller board • micro controller • memory devices • input sensors • output devices
Appropriate personnel may include, but are not limited to:	• supervisor • leading hand • foreman • manager • site engineer • workplace trainer • mentor • team member
Resources and equipment may include:	• appropriate tools • appropriate spare parts • cables and connectors • test equipment • consumables • appropriate software licences • manufacturers' specifications and manuals • diagnostics software • personal computer • programming tools

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	To be considered competent in this unit the participant must be able to demonstrate the knowledge and skills required to achieve all of the elements of competency and associated performance criteria. Specifically they must be able to on at least two (2) occasions: – determine and follow established WHS/OHS requirements and risk control procedures for a work area – demonstrate the ability to install and set-up and test an embedded control system in accordance with job instructions - reprogram an embedded control system Each occasion must be in a different context or situation.
Context of and specific resources for assessment	Skills will be demonstrated in a real or simulated workshop environment. If simulated it should reflects real workplace conditions with suitable facilities, tools and equipment. Assessment must ensure access to: – job specifications/instructions – relevant tools and diagnostic equipment – relevant embedded control system components. The competencies covered by this unit could be demonstrated by an individual working alone or as part of a team.
Method of assessment	Assessment must include the demonstration of practical skills and may also include: - observation of processes and procedures; - oral and/or written questioning on required knowledge and skills; - inspection of the final product or outcome; - portfolio of documentary evidence. This unit could be assessed in conjunction with any other units covering control concepts or other units requiring the exercise of the skills and knowledge covered by this unit.

VU22340 - Use 3D printing to create products	
Unit Descriptor	This unit describes the skills and knowledge to utilise a three dimensional (3D) printer to produce basic products. It encompasses the use of current 3D printing software applications, manipulation of hardware and software features, managing files and directories, file storage requirements and relevant safety procedures. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.
Employability Skills	This unit contains Employability Skills.
Application of the Unit	This unit applies to persons preparing to enter the manufacturing and engineering industry and may be used in school based programs under appropriate supervision.
ELEMENT	**PERFORMANCE CRITERIA**
Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold/italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide
1. Determine the job requirements	1.1 ***Requirements*** and ***purpose*** for 3D printing are clarified by referring to the job specifications. 1.2 Relevant ***Workplace Health and Safety/Occupational Health and Safety (WHS/OHS)*** procedures are accessed and followed. 1.3 ***Relevant personnel*** are consulted to organise work flow sequences. 1.4 Computer software that suits the type of 3D printing product being created is selected. 1.5 ***3D printer*** suitable for the product being created and the material being used is selected. 1.6 Relevant ***reference materials*** to help with the visualisation of the 3D product are accessed and analysed.
2.Create the 3D printing product	2.1 Models are blocked out using software features to determine correct proportions in relation to the reference materials. 2.2 Lighting and shading software features are manipulated as required.

	2.3 ***Integrity*** of the product design is ***refined*** and checked against the job requirements and specifications. 2.4 Product design is rendered and output is downloaded in the required ***format***.
3. Produce and evaluate the 3D printed product	3.1 Product design is tested to identify any faults and modified as required. 3.2 Product design is submitted to relevant personnel for approval and final adjustments to the 3D printing program are made. 3.3 Sample 3D product is produced and checked for faults. 3.4 Computer files are saved and back-up copies are made in accordance with enterprise procedures. 3.5 Complete workplace documentation is completed in accordance to enterprise procedures.

REQUIRED SKILLS AND KNOWLEDGE

Required skills:

- manipulating industry-current 3D digital printing hardware and software application to create and produce a product
- managing 3D digital printing files and directories by applying standard naming conventions and version control protocols
- making back-up copies of files and storing them appropriately
- interpreting and clarifying written or verbal instructions for the production of a 3D digital printed product
- seeking expert assistance to address problems and responding constructively to feedback
- using relevant materials/resources to assist with the development and visualisation of a 3D digital printed product

Required knowledge:

- 3D digital printing techniques
- functions and features of a range of delivery platforms
- stages in the production process from initial design through to finished product
- issues and challenges in the context of creating 3D digital printed products
- WHS/OHS standards and procedures relevant to 3D digital printing operations
- resources useful for the development and creation of 3D digital printed products
- quality assurance considerations relevant to creation of 3D digital printed products

RANGE STATEMENT

This describes the essential skills and knowledge and their level, required for this unit. Bold italicised wording in the Performance Criteria is detailed below.

Requirements may include but not limited to::	• assets for integration • collaboration with others • creative expectations • design specifications • output format • technical specifications
Purpose may include but not limited to:	• architectural models • rapid prototyping • rapid manufacturing • small batch custom manufacturing
Workplace Health and Safety/Occupational Health and Safety (WHS/OHS) may include but not limited to***:***	• legislation • safety management systems • enterprise safe work procedures • protective equipment • hazardous substances and dangerous goods code
Relevant personnel may include but not limited to::	• supervisor • trainer/teacher • project Manager
3D printer may include but not limited to:	• RepRap • Ultimaker • Airwolf • RoBo • Solidoodle
Reference materials may include but not limited to:	• concept drawings and sketches • real object on which the product is to be based • photo images • video images
Integrity may include but not limited to:	• double faces • isolated vertices • pivot points • resetting transforms • scale of product relative to other components

Refined may include but not limited to:	• required shape • required topology • required functionality
Format may include but not limited to:	• Standard Tessellation Language (STL) • Audio Video Interleave (AVI) • Interchange File Format (IFF) • Joint Photographic Experts Group (JPEG) • Tagged Image File Format (TIFF) • Quicktime • Moving Pictures Experts Group (MPEG) • Portable Network Graphics

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit	To be considered competent in this unit assessors must be satisfied the candidate can demonstrate the achievement of all of the elements of the competency to the level defined by the associated performance criteria Specifically they must be able to: • use and manipulate 3D digital printing technology to develop and produce at least one (1) simple product to specification • manage 3D digital printing files and directories by applying standard naming conventions and version control protocols • apply relevant WHS/OHS procedures and work practices while using 3D digital printing technology.
Context of and specific resources for assessment	Evidence should show competency working in a realistic environment and a variety of conditions. The candidate will have access to all tools, equipment, materials and documentation required. The candidate will be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials

Methods of assessment	Evidence can be gathered through a variety of ways including: • observation of processes and procedures • oral and/or written questioning • testimony from supervisors, colleagues, clients and/or other appropriate persons • inspection of the final product or outcome • portfolio of documented evidence. Where performance is not directly observed and/or is required to be demonstrated over a period of time and/or in a number of locations, any evidence should be authenticated by colleagues, supervisors, clients or other appropriate persons.

VU22830 – Set up and operate a small scale stand-alone photovoltaic energy system with battery storage			
Unit Descriptor		This unit of competency sets out the knowledge and skills required to set up and operate a small scale (not to exceed 32V), stand-alone, photovoltaic (PV) energy system with battery storage. The unit includes the identification of the relevant Australian Standards and clean energy guidelines, site assessment, planning an installation, component selection, set up and operational requirements. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.	
Employability Skills		This unit contains Employability Skills.	
Application of the Unit		This unit of competency applies to a person preparing to work in the renewable energy industry or undertake further study in the design and installation of renewable energy systems	
ELEMENT		**PERFORMANCE CRITERIA**	
Elements describe the essential outcomes of a unit of competency.		*Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.*	
1	Plan to set up and install a PV energy system	1.1	***Relevant WHS/OHS requirements*** and risk control measures and procedures are determined for the work area and system installation
		1.2	***Relevant Australian Standards and clean energy guidelines*** for renewable energy installations and battery storage are identified and followed
		1.3	System energy output requirement is estimated (not to exceed 32V) and suitable ***system components*** are investigated, discussed with ***appropriate personnel*** and selected
		1.4	***Battery type***, storage capacity and location requirements are determined
		1.5	System installation site is located and assessed for it's suitability for the installation
		1.6	Any ***actual or potential hazards*** are identified and discussed with appropriate personnel

		1.7	An installation layout diagram is prepared for approval by the appropriate person
2	Install a PV energy system	2.1	***Resources and equipment*** needed for the installation are obtained and checked for correct operation.
		2.2	System components are sourced, assembled and installed in accordance with the layout diagram and manufacturers' requirements.
		2.3	Storage battery is installed in a protected location in accordance to layout diagram
		2.4	System cabling is installed, connected and tested in accordance with lay out diagram and manufacturers' specifications
		2.5	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
3	Test and operate PV energy system	3.1	Final checks are undertaken to ensure the installed system is consistent with the layout diagram
		3.2	System is charged and trialled to test its' operation and ability to meet output requirements
		3.3	Modifications are implemented if required and final operation of the system is demonstrated to the appropriate personnel
		3.4	Tools and equipment are checked, cleaned and returned to storage in accordance to workplace procedure
		3.5	Work area is cleaned and made safe in accordance with relevant WHS/OHS requirements and workplace procedures.

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- Establishing and following relevant work area and work tasks WHS/OHS policies and procedures
- Reading and interpreting manufacturers component specifications and installation requirements, Australian Standards and renewable energy installation guidelines

- Planning and preparing the layout of a small scale stand-alone PV energy system with battery storage to meet specified output requirements
- Researching and selecting suitable system components including battery requirements
- Undertaking a site inspection and identifying actual and potential hazards
- Installing the components of the system in accordance to the layout diagram and manufacturer's requirements
- Trialling and troubleshooting the system to ensure it is meeting specified output requirements

Required knowledge:

- Relevant industry Australian Standards and renewable energy guidelines
- Relevant WHS/OHS Standards/requirements and safe workplace guidelines and practices
- Economic and environmental benefits of sustainable energy systems
- Inverters including types, output waveforms and efficiency
- Controllers including blocking diode; low voltage disconnect; charge regulators; over-voltage shunt; connections
- Photovoltaic modules including types, efficiency and applications
- Photovoltaic fundamentals including IV curves; irradiance and temperature effects; blocking and bypass diodes; wiring diagrams and configurations; specifications

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording in the Performance Criteria is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Relevant WHS/OHS requirements may include	• legislation • protective equipment • material safety management systems • hazardous substances and dangerous goods code • workplace safe operating procedures
Relevant Australian Standards and clean energy guidelines may include	• AS/NZS 5139, 5033 • Clean Energy Council (CEC) guidelines • Energy Storage Council (ESC) guidelines

System components may include:	• photovoltaic (PV) panels • charge controller • inverter • isolators • cabling and electrical infrastructure • metering equipment • battery and enclosure
Appropriate personnel may include	• supervisor • leading hand • foreman • manager • site engineer • workplace trainer • mentor • team member
Battery type may include	• lithium ion • lead acid • saltwater
Actual or potential hazards may include	• available space for the solar array and other system components/infrastructure • actual and potential shading • surface level and drainage considerations for ground level PV array • mounting material, angle and orientation considerations for elevated PV array • location to other assets e.g. water, gas, electricity • access to installation site • safe location and protection for battery
Resources and equipment may include	• cables/wiring and connectors • test equipment • hand and hand held power tools • personal computer/laptop • consumables • personal protective equipment (PPE)

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	To be considered competent in this unit the participant must be able to demonstrate the knowledge and skills required to achieve all of the elements of competency and associated performance criteria. Specifically they must be able to: – determine and follow established WHS/OHS requirements and risk control procedures for a work area – demonstrate the ability to plan, set up and operate a small scale, stand-alone photovoltaic energy system with battery storage to meet a specific energy requirement.
Context of and specific resources for assessment	Skills will be demonstrated in a real or simulated workshop environment. If simulated it should reflects real workplace conditions with suitable facilities, tools and equipment. Assessment must ensure access to: – job specifications/instructions – relevant tools and diagnostic equipment – relevant photovoltaic system components and installation instructions The competencies covered by this unit could be demonstrated by an individual working alone or as part of a small team.
Method of assessment	Assessment must include the demonstration of practical skills and may also include:: – observation of processes and procedures – oral and/or written questioning on required knowledge and skills – inspection of the final product or outcome – portfolio of documented evidence such as system component research, output calculations, battery technologies, capacity requirements and safe handling techniques This unit could be assessed in conjunction with other units covering sustainable energy practices.

VU22831 - Plan and build a system using fibre optic equipment			
Unit Descriptor		This unit describes the performance outcomes, skills and knowledge required to plan and build systems using fibre optics equipment. This includes identifying fibre optic components and equipment, interconnecting them and performing measurements on the operating circuits. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.	
Employability Skills		This unit contains Employability Skills.	
Application of the Unit		This unit of competency applies to person working in an industrial environment where fibre optics is used for telecommunications or industrial control purposes.	
ELEMENT		**PERFORMANCE CRITERIA**	
Elements describe the essential outcomes of a unit of competency.		*Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.*	
1	Plan a fibre optics circuit	1.1	Established ***WHS/OHS requirements*** and risk control measures and procedures in preparation for the work area are followed.
		1.2	The requirements for building a fibre optic circuit are identified from documentation, job sheets or discussions with ***appropriate personnel.***
		1.3	A diagram of the circuit meeting established requirements, is prepared according to enterprise procedures and approved by appropriate personnel.
		1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved at the work site.
		1.5	***Resources and equipment*** needed for the task are obtained in accordance with enterprise procedures and checked for correct operation and safety.
2	Build a fibre optics circuit	2.1	Machines or plant are checked as being isolated where necessary in strict accordance with WHS/OHS requirements.

		2.2	***Fibre optic circuit components*** are interconnected according to a connections diagram, manufacturers' specifications and enterprise procedures.
		2.3	The fibre optic circuit is checked for functionality and if necessary, faults rectified in accordance with enterprise procedures***.***
		2.4	Decisions and methods for dealing with unexpected situations are selected on the basis of safety, specified work outcomes and discussion with the appropriate personnel.
3	Perform functional measurements and finalise task	3.1	Required circuit parameters are measured, verified against requirements and documented in accordance with enterprise procedures***.***
		3.2	Appropriate personnel are informed of the completion of work and, provided with a demonstration of the operation of the fibre optic circuit.
		3.3	Equipment, tools used in implementation task are maintained and stored according to enterprise procedures
		3.4	Work site is made safe in accordance with established safety procedures.

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- determining and following relevant workplace WHS/OHS processes and procedures
- selecting, using and maintaining relevant hand tools and equipment
- planning and preparing a fibre optic circuit diagram in-line with job instructions
- sourcing and interconnecting fibre optic circuit components according to a connections diagram, manufacturers' specifications and enterprise procedures.
- Using testing equipment to check fibre optic circuits for functionality and rectifying faults
- using measuring equipment to verify fibre optic circuit parameters

Required knowledge:

- relevant workplace WHS/OHS requirements and procedures
- fibre optics circuit components and their function/application
- light sources in fibre optics including lasers and LEDs
- light receivers in fibre optics including photo diodes and photo transistors
- wave guides and transmission media including air, water and optical fibre
- measurement and testing equipment use in fibre optic circuit installations
- power sources for fibre optic circuits

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording in the Performance Criteria is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

WHS/OHS requirements may include:	• legislation • use of protective equipment • material safety management systems • hazardous substances and dangerous goods codes • enterprise specific workplace safety/operational procedures
Appropriate personnel may include:	• foreman/supervisor • manager • site engineer • workplace trainer • team leader

Resources and equipment may include:	• fibre optics test equipment:
	  ○ power meters
	  ○ fibre amplifiers
	  ○ bit rate testers
	  ○ bandwidth testers
	• appropriate hand and hand held power tools
	• manufacturers' manuals and data sheets
	• vendor catalogues

Fibre optic circuit components may include:	• optical fibre cabling • lasers • optical connectors • couplers • attenuators • wavelength division multiplexers • patch cords • optical sensors • splitters

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	To be considered competent in this unit the participant must be able to demonstrate the knowledge and skills required to achieve all of the elements of competency and associated performance criteria. Specifically they must be able to on at least two (2) occasions: – determine and follow established WHS/OHS requirements and risk control procedures for a work area – plan and prepare a fibre optic circuit diagram in-line with job specifications/instructions – source and interconnect fibre optic circuit components according to a connections diagram, manufacturers' specifications – use test and measuring equipment to check fibre optic circuits for functionality and rectify faults Each occasion must be in a different context or situation.
Context of and specific resources for assessment	Skills will be demonstrated in a real or simulated workshop environment. If simulated it should reflects real workplace conditions with suitable facilities, tools and equipment. Assessment must ensure access to: – job specifications/instructions – relevant measuring and testing equipment – relevant fibre optic components and cabling.

Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: – direct observation of the process and procedures – written and oral questioning to test underpinning – inspection and demonstration of final product – portfolio of documented evidence verified by an appropriate person.

VU22832 - Integrate fibre optic technology into an engineering process			
Unit Descriptor		This unit describes the performance outcomes, skills and knowledge required to integrate fibre optic technology into an engineering process to perform a specific requirement. The requirement may include calculating and detecting distance, movement, size, colour or shape. The unit includes safe work practices, planning and setting up for the installation according to job instructions, assembling the fibre optic devices and components in accordance with the connection/circuit diagram and using diagnostic tools to problem solve for a range of predictable problems No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication	
Employability Skills		This unit contains Employability Skills.	
Application of the Unit		This unit of competency applies to a person working in an industrial environments where fibre optic technology is used in engineering tasks or for engineering control purposes	
ELEMENT		**PERFORMANCE CRITERIA**	
Elements describe the essential outcomes of a unit of competency.		*Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.*	
1	Prepare to install fibre optic technology within an engineering process	1.1	Established ***WHS/OHS requirements*** and risk control measures and procedures in preparation for the work task are followed.
		1.2	***The requirement*** for the use of ***fibre optic devices and components*** in an engineering process are identified from documentation, job sheets or discussions with ***appropriate personnel***.
		1.3	A detailed work schedule for the task is drawn up according to enterprise procedures and approved by appropriate personnel.
		1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved at the work site.

		1.5	***Resources and equipment*** needed for the task are obtained in accordance with enterprise procedures and checked for correct operation and safety.
2	Assemble fibre optic devices and components within an engineering process	2.1	Machines or plant are checked as being isolated where necessary in strict accordance with WHS/OHS requirements.
		2.2	Using connection diagrams and relevant documentation fibre optic devices and components are incorporated into the engineering process according to manufacturers' specifications and enterprise procedures.
		2.3	The fibre optic devices and components are checked for functionality and if necessary, faults rectified in accordance with enterprise procedures.
		2.4	Decisions and methods for dealing with unexpected situations are selected on the basis of safety, specified work outcomes and discussion with the appropriate personnel.
3	Test for functionality and finalise task	3.1	The engineering process is tested for functionality against requirements and documented according to enterprise procedures.
		3.2	Equipment, tools used in assembly tasks are maintained and stored according to enterprise procedures.
		3.3	Work site is made safe in accordance with established safety procedures.

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- determining and following relevant workplace WHS/OHS processes and procedures
- selecting, using and maintaining relevant hand tools and equipment
- planning and preparing to installing fibre optic devices and components in an engineering process
- assembling and installing fibre optic devices and components according to a connection diagram and job instructions to meet a specific requirement
- using diagnostic tools to test functionality of the installation and problem solve for a range of predictable problems

Required knowledge:

- relevant workplace WHS/OHS requirements and procedures
- parameter selection including optical spectrum for the application and angle of detection
- types of fibre optic devices including detectors (e.g. LDR; LDT; photo transistors; photo diodes) and light sources (LEDs, ILDs, lasers)
- interfacing including electronics systems; communications systems; computer systems; mechanical systems
- control technology including positional information; input/output; control media; feedback technology

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording in the Performance Criteria is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

WHS/OHS requirements may include:	• legislation • use of protective equipment • material safety management systems • hazardous substances and dangerous goods codes • enterprise specific workplace safety/operational procedures
The requirement may include:	• measure, calculate and detect: – distance, – movement – size – colour – shape
Fibre optic devices and components may include:	• optical fibre cabling • lasers • detectors • optical connectors • couplers • attenuators • wavelength division multiplexers • patch cords • optical sensors • splitters

Appropriate personnel may include:	• foreman/supervisor • manager • site engineer • workplace trainer • team leader

Resources and equipment may include:	• fibre optics test equipment:
	  ○ power meters
	  ○ fibre amplifiers
	  ○ bit rate testers
	  ○ bandwidth testers
	• appropriate hand and hand held power tools
	• manufacturers' manuals and data sheets
	• vendor catalogues

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit	To be considered competent in this unit the participant must be able to demonstrate the knowledge and skills required to achieve all of the elements of competency and associated performance criteria. Specifically they must be able to on at least two (2) occasions: – determine and follow established WHS/OHS requirements and risk control procedures for a work area – integrate fibre optic devices and components within an engineering process according to job instructions – use diagnostic tools to test functionality of the installation and rectify predictable problems Each occasion must be in a different context or situation.
Context of and specific resources for assessment	Skills will be demonstrated in a real or simulated workshop environment. If simulated it should reflects real workplace conditions with suitable facilities, tools and equipment. Assessment must ensure access to: – job specifications/instructions – relevant testing and diagnostic equipment – relevant fibre optic devices and components.

Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: – direct observation of the process and procedures – written and oral questioning to test underpinning – inspection and demonstration of final product/outcome – portfolio of documented evidence verified by an appropriate person.

VU22833 - Integrate fibre optic technology into a communication process			
Unit Descriptor		This unit describes the performance outcomes, skills and knowledge required to integrate fibre optic technology into a communication process to generate, transmit and detect data. The unit includes safe work practices, planning and setting up for the installation according to job instructions, assembling the fibre optic devices and components in accordance with the connection/circuit diagram and using diagnostic tools to problem solve for a range of predictable problems No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication	
Employability Skills		This unit contains Employability Skills.	
Application of the Unit		This unit of competency applies to a person working in an industrial environments where fibre optic technology is used in communication systems	
ELEMENT		**PERFORMANCE CRITERIA**	
Elements describe the essential outcomes of a unit of competency.		*Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.*	
1	Prepare to install fibre optic technology into a communications process	1.1	Established ***WHS/OHS requirements*** and risk control measures and procedures in preparation for the work area are followed.
		1.2	The requirement for the use of ***fibre optic devices and components*** within an communications process are identified from documentation, job sheets or discussions with ***appropriate personnel***.
		1.3	A detailed work schedule for the task is drawn up according to enterprise procedures and approved by appropriate personnel.
		1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved at the work site.

		1.5	***Resources and equipment*** needed for the task are obtained in accordance with enterprise procedures and checked for correct operation and safety.
2	Assemble fibre optic devices and components into a communications process	2.1	Machines or plant are checked as being isolated where necessary in strict accordance with WHS/OHS requirements.
		2.2	Using connection diagrams and relevant documentation fibre optic devices and components are incorporated into the communication process according to manufacturers' specifications and enterprise procedures.
		2.3	The fibre optic devices and components are checked for functionality and if necessary, faults rectified in accordance with enterprise procedures.
		2.4	Decisions and methods for dealing with unexpected situations are selected on the basis of safety, specified work outcomes and discussion with the appropriate personnel.
3	Test for functionality and finalise task	3.1	The installation is tested for functionality against requirements and documented according to enterprise procedures.
		3.2	Equipment, tools used in assembly tasks are maintained and stored according to enterprise procedures.
		3.3	Work site is made safe in accordance with established safety procedures.

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- determining and following relevant workplace WHS/OHS processes and procedures
- selecting, using and maintaining relevant hand tools and equipment
- planning and preparing to install fibre optic devices and components into a communication process
- assembling and installing fibre optic devices and components according to connection diagrams and job instructions to meet a specific requirement
- using diagnostic tools to test functionality of the installation and problem solve for a range of predictable problems

Required knowledge:

- relevant workplace WHS/OHS requirements and procedures
- parameter selection including optical spectrum for the application and angle of detection
- types of fibre optic devices including detectors (e.g. LDR; LDT; photo transistors; photo diodes) and light source (LEDs, ILDs, lasers)
- interfacing including electronics systems; communications systems; computer systems; mechanical systems
- data transfer including bit rate and optical and electrical conversions
- test equipment and diagnostic testing including bit error rate, fibre damage

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording in the Performance Criteria is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

WHS/OHS requirements may include:	• legislation • use of protective equipment • material safety management systems • hazardous substances and dangerous goods codes • enterprise specific workplace safety/operational procedures
Fibre optic devices and components may include	• optical fibre cabling • lasers • detectors • optical connectors • couplers • attenuators • wavelength division multiplexers • patch cords • optical sensors • splitters
Appropriate personnel may include:	• foreman/supervisor • manager • site engineer • workplace trainer • team leader

Resources and equipment may include:	• fibre optics test equipment:
	  ○ power meters
	  ○ fibre amplifiers
	  ○ bit rate testers
	• bandwidth testers
	• appropriate hand and hand held power tools
	• manufacturers' manuals and data sheets
	• vendor catalogues

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	To be considered competent in this unit the participant must be able to demonstrate the knowledge and skills required to achieve all of the elements of competency and associated performance criteria. Specifically they must be able to on at least two (2) occasions: – determine and follow established WHS/OHS requirements and risk control procedures for a work area – integrate fibre optic devices and components into a communication process according to job instructions – use diagnostic tools to test functionality of the installation and rectify predictable problems Each occasion must be in a different context or situation.
Context of and specific resources for assessment	Skills will be demonstrated in a real or simulated workshop environment. If simulated it should reflects real workplace conditions with suitable facilities, tools and equipment. Assessment must ensure access to: – job specifications/instructions – relevant testing and diagnostic equipment – relevant fibre optic devices and components.

Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: – direct observation of the process and procedures – written and oral questioning to test underpinning – inspection and demonstration of final product/outcome – portfolio of documented evidence verified by an appropriate person.

VU22834 - Install and test a wireless intercom system			
Unit Descriptor		This competency unit sets out the knowledge and skills required to install, configure and test a wireless intercom system. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.	
Employability Skills		This unit contains Employability Skills.	
Application of the Unit		This competency unit applies to a person working for an enterprise which installs and services electrical/electronic equipment for domestic or commercial applications.	
ELEMENT		**PERFORMANCE CRITERIA**	
Elements describe the essential outcomes of a unit of competency.		*Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.*	
1	Plan for wireless intercom system installation	1.1	Established ***WHS/OHS requirements*** and risk control measures and procedures are followed in the preparation of the work area.
		1.2	Safety hazards, which have not previously been identified, are documented and risk control measures devised and implemented in consultation with ***appropriate personnel***.
		1.3	***Wireless intercom system*** requirements are determined from documentation, job sheets or discussions with appropriate personnel.
		1.4	Wireless intercom system components are selected and the installation is planned taking operational requirements into consideration.
		1.5	***Resources and equipment*** needed for task are obtained in accordance with enterprise procedures and checked for correct operation and safety.
2	Install and configure a wireless intercom system	2.1	Established ***WHS/OHS requirements*** and risk control measures and procedures for the work tasks are followed

		2.2	***Wireless intercom equipment components*** are installed and configured in accordance with manufacturers' specifications.
		2.3	Wireless intercom system is tested for functionality and, if appropriate, faults are corrected.
		2.4	Wireless intercom system is interfaced with wired communication systems where identified in the job specifications.
		2.5	Decisions for dealing with unexpected situations are made based on discussions with appropriate personnel, job specification and enterprise procedures.
3	The wireless intercom system is completed	3.1	Intercom system is checked to verify overall correct functioning and initial problems are rectified as required.
		3.2	Client is provided with operating instructions and demonstration of the system
		3.3	Equipment and tools used are maintained and stored in accordance with enterprise procedures.
		3.4	Wireless intercom system installation and configuration details are documented and stored in accordance with enterprise procedures.

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- Identifying and following established WHS/OHS policies and procedures for workplace and work tasks
- Reading and interpreting job requirements and equipment installation instructions
- Installing and configuring a wireless intercom system in accordance to job requirements and manufacturer installation instructions
- Using relevant hand tools and diagnostic equipment correctly
- Making decisions within a limited range of options
- Troubleshooting connection and sound issues relevant to a wireless intercom system
- Completing installation documentation in accordance with workplace requirements
- Providing client with training in the operation of a wireless intercom system

Required knowledge:

- Wireless intercom components including: base stations; antennas; head and handsets; belt packs; microphones; repeaters; computer interfaces; network interfaces
- Wireless theory including: essential mathematics; electromagnetic waves; signals in time; signals in frequency; radio systems; multiple access; radio wave propagation; signal strength (gain/attenuation); noise; sampling; error rates
- Wireless protocols and standards including: voice activated; push to talk; multi-channel systems; full and half duplex; DECT; 2-way radio; network compatibility; internet protocol compatibility
- Troubleshooting methodology

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording in the Performance Criteria is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

WHS/OHS requirements may include	• legislation • protective equipment • material safety management systems • workplace safe operating procedures
Appropriate personnel may include	• supervisor • leading hand • foreman • manager • site engineer • workplace trainer • mentor • team member
Wireless intercom system may include	• analogue systems • digital systems • full duplex • low cost systems • high quality systems • door phone intercoms • cue monitoring • interfaces to other communication systems

Resources and equipment may include	• appropriate tools • test equipment • consumables • cables and connectors • manufacturers' specifications and manuals
Wireless intercom equipment components may include	• base stations • antennas • head and handsets • belt packs • microphones • repeaters • computer interfaces • network interfaces

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	To be considered competent in this unit the participant must be able to demonstrate the knowledge and skills required to achieve all of the elements of competency and associated performance criteria. Specifically they must be able to on at least two (2) occasions: – determine and follow established WHS/OHS requirements and risk control procedures for a work area and work tasks – install and configure a wireless intercom system in accordance with job specifications and manufacturers' installation instructions – check system for correct functionality and demonstrate the operation of the system Each occasions must be in a different context or situation.
Context of and specific resources for assessment	Skills will be demonstrated in a real or simulated workshop environment. If simulated it should reflects real workplace conditions with suitable facilities, tools and equipment.

	The candidate will have access to: all tools, equipment, materials and documentation required and will be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials. This unit could be assessed in conjunction with any other units covering wireless network installations and set ups.
Method of assessment	Assessment must include the demonstration of practical skills and may also include:: – observation of processes and procedures – oral and/or written questioning on required knowledge and skills – inspection of the final product or outcome – portfolio of documented evidence related to wireless technology installation experience and equipment research. This unit could be assessed in conjunction with any other units covering wireless communications systems.

VU22835 - Conduct a site survey for a wireless network			
Unit Descriptor		This competency unit sets out the knowledge and skills required to conduct a site survey for a wireless network and produce documentation for network implementation or upgrade. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.	
Employability Skills		This unit contains Employability Skills.	
Application of the Unit		This competency unit applies to a person working for an enterprise where wireless network communications is installed and serviced.	
ELEMENT		**PERFORMANCE CRITERIA**	
Elements describe the essential outcomes of a unit of competency.		*Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.*	
1	Plan a wireless site survey	1.1	Established ***WHS/OHS requirements*** and specific safety requirements for conducting a site survey are identified and followed.
		1.2	Wireless network requirements are determined from documentation, job sheets or discussions with ***appropriate personnel***.
		1.3	Facilities floor plan diagram is obtained and interpreted or, if required, drawn depicting the location of walls, walkways etc.
		1.4	Site survey is planned in consultation with appropriate personnel and according to enterprise procedures.
		1.5	Current ***wireless networking equipment*** layout, parameters and other relevant information, if existing, are obtained.
		1.6	Appropriate personnel are consulted to ensure that work is coordinated effectively with others involved at the work area.
		1.7	***Resources and equipment*** needed for survey are obtained in accordance with enterprise procedures and checked for correct operation and safety.

2	Conduct site survey	2.1	WHS/OHS requirements and specific safety requirements for conducting a site survey are followed
		2.1	Current wireless network performance, if available, is documented according to enterprise procedures
		2.2	The survey area is visually inspected and potential barriers to radio frequency (RF) propagations identified and discussed with appropriate personnel.
		2.3	Areas for fixed and mobile users are identified and noted on facilities diagram.
		2.4	Access point locations are identified provisionally using appropriate RF site survey tools and/or software.
		2.5	Locations of access points are verified by temporary installation and operational testing.
		2.6	Appropriate contingency actions are taken if site survey is hindered by lack of access, or other issues.
		2.7	Decisions for dealing with unexpected situations are made based on discussions with appropriate personnel, job specification and enterprise procedures.
3	Document site survey	3.1	Findings of the site survey are documented and final location of access points recorded on the facilities diagram in accordance with enterprise procedures.
		3.2	Equipment and tools used are maintained and stored in accordance with enterprise procedures.
		3.3	Worksite is cleaned and made safe in accordance with WHS/OHS requirements and enterprise procedures.
		3.4	Appropriate personnel are notified of completion of site survey.

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- Following established WHS/OHS policies and workplace procedures
- Reading and interpreting job requirements and equipment installation instructions
- Preparing a facilities floor plan which includes current wireless networking equipment layout if any, walls, walkways etc.
- Conducting visual inspection of survey area and noting:
    - potential barriers to radio frequency (RF) propagations
    - areas for fixed and mobile users
    - access point locations using appropriate RF site survey tools and/or software.
    - locations of access points are verified by temporary installation and operational testing.
- Documenting the findings of the site survey in accordance with enterprise procedures.

Required knowledge:

- Protocols and network interface cards (NIC) including: 802.11 standard; 802.11 MAC layer; physical layer; client adaptors; client utility
- Wireless radio technology including: essential mathematics; electromagnetic waves; signals in time; signals in frequency; radio systems; multiple access; radio wave propagation
- Wireless topologies including: components; WLAN topologies; channel set up; bridge topologies
- Access points including: access point connection; basic configuration; management navigation, Ethernet port configuration; AP radio configuration
- Bridges and ports
- Troubleshooting methodology and diagnostic tools
- Wireless organisations and certifications including: standards bodies; vendors and products

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording in the Performance Criteria is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

WHS/OHS requirements may include	• legislation • use of personal protective equipment (PPE) • material safety management systems

	• enterprise safe operating procedures including:
	  • working safely with tools and equipment
	  • risk and hazard recognition
	  • emergency procedures
	  • awareness of electrical hazards

Appropriate personnel may include	• supervisor • department personnel • department supervisors • workplace trainer • team leader
***Wireless networking equip*ment** may include	• routers, switches and hubs • network cable • uninterruptible power supply (UPS) • antennas (ceiling, mast, pillar, integrated, Yagi and dish) • lightning arrestors • bridges • amplifiers • wireless network interface cards (NICs) • desk top and lap top computers networked and stand alone
Resources and equipment may include	• appropriate tools • test equipment • consumables • network cards/connectors • appropriate software and licenses • manufacturers' specifications and manuals • diagnostic software • routers, switches and hubs • network cable • antennas (ceiling, mast, pillar, integrated, yagi and dish) • lightning arrestors

	• bridges • amplifiers • desk top and lap top computers networked and stand alone

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	To be considered competent in this unit the participant must be able to demonstrate the knowledge and skills required to achieve all of the elements of competency and associated performance criteria. Specifically they must be able to: – determine and follow established WHS/OHS requirements and risk control procedures for a work area and conducting the site survey – demonstrate the ability to plan, conduct and document a wireless network site survey on at least two (2) occasion each in a different context or situation.
Context of and specific resources for assessment	Skills will be demonstrated in a real or simulated workshop environment. If simulated it should reflects real workplace conditions with suitable facilities, tools and equipment. The candidate will have access to: all tools, equipment, materials and documentation required and will be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials. This unit could be assessed in conjunction with any other units covering wireless network installations and set ups.
Method of assessment	Assessment must include the demonstration of practical skills and may also include:: – observation of processes and procedures – oral and/or written questioning on required knowledge and skills – inspection of the final product or outcome – portfolio of documented evidence of survey work verified by an appropriately qualified person

VU22836 - Set up and operate a wireless communications link			
Unit Descriptor		This competency unit sets out the knowledge and skills required to set up and operate a wireless communications link. This includes point to point links for a range of purposes using a range of frequency bands and may extend into the infrared and visible portion of the electromagnetic spectrum. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.	
Employability Skills		This unit contains Employability Skills.	
Application of the Unit		This competency unit applies to a person working for an enterprise where wireless network communications is installed and serviced.	
ELEMENT		**PERFORMANCE CRITERIA**	
Elements describe the essential outcomes of a unit of competency.		*Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.*	
1	Plan for setting up a wireless communications link	1.1	Established ***WHS/OHS requirements and risk control measures*** and procedures for the work area are obtained and followed.
		1.2	***Wireless communications link requirements*** are determined from documentation, job sheets or discussions with ***appropriate personnel***.
		1.3	Regulatory requirements for setting up and operating the wireless communication link are established, and followed
		1.4	***Wireless communications link components*** are selected and the installation is planned taking operational requirements into consideration.
		1.5	Appropriate personnel are consulted to ensure that work is coordinated effectively with others involved in the work area.
		1.6	***Resources and equipment*** needed for task are obtained in accordance with enterprise procedures and checked for correct operation and safety.

2	Set up and operate a wireless communications link	2.1	WHS/OHS requirements and specific safety requirements for conducting the work tasks are followed
		2.2	Wireless communications link components are installed and configured in accordance with manufacturers' specifications and enterprise procedures.
		2.3	Wireless communications link is tested for functionality and, if appropriate, faults are corrected.
		2.4	Wireless communications link is interfaced with any existing wireless communication system if required.
		2.5	Decisions for dealing with unexpected situations are made based on discussions with appropriate personnel, job specification and enterprise procedures.
3	The wireless communications link is tested and completed	3.1	Wireless communications link is checked to verify overall correct functioning and initial problems are rectified as required.
		3.2	Wireless communications link installation, configuration and operation details are documented and stored in accordance with enterprise procedures.
		3.3	Equipment and tools used are maintained and stored in accordance with enterprise procedures.
		3.4	Appropriate personnel are informed of the completion of work and, if required, provided with a demonstration of the wireless intercom system.

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- Following established WHS/OHS policies and workplace procedures
- Reading and interpreting job requirements and equipment installation instructions
- Selecting wireless communications link components for a planned installation to meet a designated operational need

- Installing and configuring in accordance with manufacturers' specifications and enterprise procedures the wireless communications link components.
- Making decisions within a limited range of options to deal with unexpected situation during the installation
- Using tools and equipment correctly when carrying out the wireless communications link installation
- Interfacing and configuring the wireless communications link installation with existing system
- Testing wireless communications link functionality and using diagnostic tools to problem solve for a range of predictable problems

Required knowledge:

- Wireless fundamentals including essential mathematics; electromagnetic waves; signals in time; signals in frequency; radio systems; multiple access; radio wave propagation; antennas; modulation; signal strength e.g. gain and attenuation; noise sampling; error rates
- Wireless links including communications channel; regulations; limited bandwidth; power issues; security issues; equipment (e.g. fixed, mobile, base); applications, operating protocols
- Wireless intercom components including transmitters and receivers; antennas; head and handsets; microphones; repeaters; computer interfaces; network interfaces
- Wireless network troubleshooting methodology
- Established WHS/OHS policies and workplace procedures

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording in the Performance Criteria is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

WHS/OHS requirements and risk control measures may include:	• legislation
	• protective equipment
	• material safety management systems
	• workplace safe operating procedures including:
	  • working safely around machinery
	  • working safely with tools and equipment
	  • risk and hazard recognition

	• emergency procedures • awareness of electrical hazards • first aid • follow confined spaces procedures
Wireless communications link requirements may include:	• analogue systems • digital systems • full duplex • low cost systems • high quality systems • interfaces to other communication systems
Appropriate personnel may include:	• supervisor • foreman • manager • site engineer • workplace trainer • workplace mentor • team leader
Wireless communications link components may include:	• transmitter • receiver • antennas • head and handsets • belt packs • microphones • repeaters • computer interfaces • network interfaces
Resources and equipment may include:	• appropriate tools • test equipment • consumables • cables and connectors • manufacturers specifications and manuals • communications link equipment

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	To be considered competent in this unit the participant must be able to demonstrate the knowledge and skills required to achieve all of the elements of competency and associated performance criteria. Specifically they must be able to: – determine and follow established WHS/OHS requirements and risk control procedures for the work area and work tasks – demonstrate the ability to plan, install, set up and operate a wireless communications link on at least two (2) occasions and in different situations or contexts.
Context of and specific resources for assessment	Skills will be demonstrated in a real or simulated workshop environment. If simulated it should reflects real workplace conditions with suitable facilities, tools and equipment. The candidate will have access to:all tools, equipment, materials and documentation required and will be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials. This unit could be assessed in conjunction with any other units covering wireless network installations and set ups.
Method of assessment	Assessment must include the demonstration of practical skills and may also include:: – observation of processes and procedures – oral and/or written questioning on required knowledge and skills – inspection of the final product or outcome – portfolio of documented evidence of survey work verified by an appropriately qualified person

VU22837 - Install communications antennae			
Unit Descriptor		This competency unit sets out the knowledge and skills required to install communications antennas. This includes basic receiving and transmitting antennas for mainly domestic, small commercial and short distance communications application. This unit is not intended to cover the installation of antennas in complex communications networks and broadcasting applications and where the installation requires substantial mechanical support structures. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.	
Employability Skills		This unit contains Employability Skills.	
Application of the Unit		This competency unit applies to a person working for an enterprise which undertakes the installation and servicing of wireless communications systems for both domestic and commercial applications.	
ELEMENT		**PERFORMANCE CRITERIA**	
Elements describe the essential outcomes of a unit of competency.		*Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.*	
1	Plan for antenna installation	1.1	***Established WHS/OHS requirements and risk control measures*** and procedures are determined in the preparation of the work task.
		1.2	Installation requirements are identified from documentation, work sheets or consultation with ***appropriate personnel***.
		1.3	Installation is planned taking operational requirements into consideration.
		1.4	Relevant Australian Communications Authority regulations are taken into account when planning installation task, if appropriate.
		1.5	Appropriate personnel are consulted to ensure that work is coordinated effectively with others involved at the work site.

		1.6	***Resources and equipment*** needed for task are obtained in accordance with enterprise procedures and checked for correct operation and safety.
2	Install and configure antennas	2.1	WHS/OHS and specific safety requirements for carrying out the work are followed.
		2.1	***Communications antenna equipment*** is selected according to job requirements and, if required, future needs are taken into account.
		2.2	Communications antenna equipment are installed and configured in accordance with manufacturer's documentation and enterprise procedures.
		2.3	For installation above ground all necessary precautions are taken to ensure safe installation at heights.
		2.4	Antenna is connected to associated communications equipment, tested and communications link verified.
		2.5	Decisions for dealing with unexpected situations are made from discussions with appropriate personnel, job specifications and enterprise procedures.
3	Complete the installation task	3.1	Equipment and tools used in installation task are cleaned and stored in accordance with enterprise procedures.
		3.2	Worksite is cleared and made safe in accordance with WHS/OHS requirements and enterprise procedures.
		3.3	Documentation is completed in accordance with enterprise procedures.
		3.4	Appropriate personnel are notified of completion of installation task.

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- Following established WHS/OHS policies/requirements and workplace safety practices and procedures

- Reading and interpreting job requirements and equipment installation instructions
- Selecting and correctly using relevant tools and equipment for the installation task
- Planning the antenna installation and selecting the component to meet the work task requirements
- Installing and configuring the communication antenna to meet the work task requirements and in accordance with established procedure
- Making work related decisions within a limited range of options
- Using diagnostic tools to problem solve for a range of predicable problems
- Completing workplace documentation relating to the installation of the communication antenna

Required knowledge:

- WHS/OHS legislation and requirements for working at heights; precautions around electro-magnetic radiation sources
- Wireless radio technology including electromagnetic waves; signals in time; signals in frequency; radio systems; multiple access; radio wave propagation
- Wireless topologies including components; WLAN topologies; channel set up; bridge topologies
- Antenna applications including wireless networks; short and long range communications; radio and television communications; microwave communications; satellite communications
- Antenna fundamentals including theory and physics; omni directional antennas; directional antennas; cable and accessories; link engineering
- Wireless organisations and certifications including standards bodies; regulators; vendors and products
- Radio frequency (RF) connectors including types, uses; conventions
- RF cables including coaxial; balanced; antenna wire
- Grounding materials

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording in the Performance Criteria is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.	

Established WHS/OHS requirements and risk control measures may include:	• legislation
	• protective equipment
	• material safety management systems
	• workplace safe operating procedures including:
	  • working safely with tools and equipment
	  • risk and hazard recognition
	  • emergency procedures
	  • awareness of electrical hazards
	  • follow confined spaces procedures
	  • working at heights

Appropriate personnel may include:	• workplace supervisor • business/enterprise owner/manager • workplace trainer • client • customer
Resources and equipment may include:	• work requests/sheets • plans, drawings and sketches • measuring equipment • multi-meters • measurement instruments • gauges • cable testers • installation tools • crimpers • consumables • laptop computer and relevant software

Communications antenna equipment may include:	• cables and connectors • mast • pillar • integrated • Yagi • TV and FM antennas • vertical antennas • microwave antennas • dish • lightning arrestors • bridges • splitters • attenuators • amplifiers

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	To be considered competent in this unit the participant must be able to demonstrate the knowledge and skills required to achieve all of the elements of competency and associated performance criteria. Specifically they must be able to: – determine and follow established WHS/OHS requirements and risk control procedures for a work area and installation task – plan and install a antenna in accordance to job instructions on at least two (2) occasions and in a different situation or context. Each installation is to be a different type of antenna.
Context of and specific resources for assessment	Skills will be demonstrated in a real or simulated workshop environment. If simulated it should reflects real workplace conditions with suitable facilities, tools and equipment. The candidate will have access to tools, equipment, materials and documentation required and will be permitted to refer to any relevant workplace procedures, product and

	manufacturing specifications, codes, standards, manuals and reference materials. This unit could be assessed in conjunction with any other units covering wireless network installations and set ups.
Method of assessment	Assessment must include the demonstration of practical skills and may also include:: - observation of processes and procedures - oral and/or written questioning on required knowledge and skills - inspection of the final product or outcome - portfolio of documented evidence of survey work verified by an appropriately qualified person

VU22674 - Explore applications and operation of the Internet of Things (IoT)

Unit Descriptor	This unit describes the performance outcomes, skills and knowledge required to recognise the current applications and potential of the Internet of Things (IoT) including its application in the electrotechnology industry. Typical IoT devices are examined and an example IoT system is set up to familiarise the learner with the basic components and wireless technology required for operating the system. The unit also examines the function of Bluetooth and Wi-Fi technologies, their applications and the difference between the two technologies. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.
Employability Skills	This unit contains Employability Skills.
Application of the Unit	This unit of competency is intended for use in an entry level qualification and applies to a person who is seeking introductory knowledge of the real world and potential applications of the Internet of Things (IoT).

ELEMENT		**PERFORMANCE CRITERIA**	
Elements describe the essential outcomes of a unit of competency.		Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.	
1	Identify the function and operation of the IoT	1.1	***Applications of IoT systems*** are explored and the impact of their connectivity is assessed
		1.2	***Typical IoT devices*** are identified and their function and application in the system are defined
		1.3	***Types of wireless technologies for the IoT networks*** are identified and examples of their application are provided
		1.4	Potential areas of vulnerability and security risks associated IoT devices and systems are recognised
2	Set up an example IoT system	2.1	***Example IoT system*** is determined and approved by ***appropriate person***
		2.2	Physical components and ***operating system software*** for the example IoT system are selected and sourced

		2.3	Operating system software is loaded to a smartphone, tablet or IoT device and its operation is verified
		2.4	Physical components of the system are assembled and programmed to operate in accordance with predetermined requirements
		2.5	Example IoT system is set to operate in accordance with project requirements
		2.6	***Basic troubleshooting methodologies*** are applied to the IoT system to verify functional operation
3	Utilise Bluetooth technology	3.1	Bluetooth technology is defined and its ***applications*** are recognised
		3.2	Bluetooth compatible devices are paired according to manufacturer instructions
		3.3	Operation of the Bluetooth compatible devices is demonstrated
4	Utilise Wi-Fi (WLAN) technology	4.1	Wi-Fi technology is defined and its applications are recognised
		4.2	The difference between Bluetooth and Wi-Fi technologies and their application is recognised and explained
		4.3	***Connecting securely to Wi Fi devices*** is defined and demonstrated
		4.4	Signal level and connectivity to Wi-Fi hot spot is assessed
		4.3	Access to the internet using Wi-Fi technology is demonstrated

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- investigate a range of real world applications of IoT and identify its potential within the electrotechnology industry
- identify typical IoT devices
- set up and operate an simple IoT system
- pair compatible devices using Bluetooth technology
- access the internet using Wi-Fi technology
- recognise the difference in the applications of Bluetooth and Wi-Fi technologies

Required knowledge:

- real world and potential applications of IoT
- IoT devices
- types of wireless technologies used for the IoT
- Bluetooth technology and its applications
- Wi-Fi technology and its applications
- applications of wireless technologies in the electrotechnology industry

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording in the Performance Criteria is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Applications of IoT systems may include:	• smart home • wearables • connected cars • industrial internet • smart cities • smart farming • smart retailing • energy management • healthcare
Typical IoT devices may include:	• Rasberry PI • AWS (Amazon Web Services) IoT Button • Intel Quark SoCX1000 • Samsung Smarthings • Google Nest devices • Amazon Echo • Arduino
Types of wireless technologies for the IoT networks may include	• Bluetooth • Wi-Fi hot spots • WiMAX • ZigBee

Example IoT system may include:	• smart watering system • personalised light switch system • power on/off home appliances system • other systems
Appropriate person may include:	• supervisor • teacher • trainer • IT personnel
Operating system software may include:	• Google's Brillo • Microsoft's Windows 10 IoT Series • Samsung's Artik • Intel's Edison • Apple's HomeKit • IBM Bluemix
Basic troubleshooting methodologies may include:	• checking power connections to verify device has power • checking physical connections • turning system off and on • following suggested manual troubleshooting guidelines
Applications may include:	• smart phones • headsets • printers • computer keyboards/mouse • in-car speaker system • in-home speaker system • television • various data sharing devices
Connecting securely to Wi Fi devices may include:	• Service Set Identifier (SSID) • passwords

EVIDENCE GUIDE	
The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	A person who demonstrates competency in this unit must be able to provide evidence of the ability to: – recognise the applications of the Internet of Things (IoT) and their connectivity benefits – identify IoT devices and their functions – set up a simple example of a IoT system – demonstrate the application of Bluetooth and Wi-Fi technologies
Context of and specific resources for assessment	Skills will be demonstrated in a workplace or simulated environment that reflects workplace conditions using suitable facilities, equipment and resources. Assessment must ensure access to: – electronic components, software and equipment reflecting the technologies covered in this unit – relevant WHS/OHS procedures and requirements – equipment operating instructions/manuals – hand tools and hand held power tools normally used in a electrotechnology work environment
Method of assessment	A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit: – direct observation of the candidate performing specified tasks such as pairing wireless devices, assembling electronic components, uploading software, operating a smartphone using Wi-Fi technology – written and oral questioning to test underpinning knowledge. For example, IoT connectivity applications and security awareness, basic difference and applications of Bluetooth and Wi-Fi technologies.

VU21990 - Recognise the need for cyber security in an organisation		
Unit Descriptor	This unit provides introductory knowledge and skills to recognize threats, risks and vulnerabilities to cyber security in an organisation. It includes the threats an organisation encompasses such as networks, machines, applications, data, users and infrastructure. The unit also covers an introduction to common cyber security attack mechanisms and an introduction to identity and threat management as well as security issues surrounding Internet of Things (IOT) devices. Finally, the unit introduces the implementation of tools and systems an organisation can use to protect from cyber-attacks. No licensing or certification requirements apply to this unit at the time of accreditation.	
Employability skills	This unit contains employability skills	
Application of the Unit	This unit is applicable to individuals intending to work as a cyber-security practitioner	
ELEMENT	**PERFORMANCE CRITERIA**	
1. Define a cyber-security framework for an organisation	1.1	Definition of information security is developed
	1.2	***Threat sources*** for an organisation are identified
	1.3	Relationship between data, networks, machines, users and applications in an enterprise is defined
	1.4	Introduction to identity and access management (IAM) is clarified
	1.5	Security of physical infrastructure of the enterprise is identified and evaluated
2. Identify the need for cyber security	2.1	Reasons to protect online identity and personal data are clarified
	2.2	Reasons to protect an organisation's data are explained
	2.3	Concept of ***cyber threat*** is defined
	2.4	Reasons for the need of cyber security professionals are explained

3 Identify common and emerging cyber security attacks, and techniques	3.1	Security vulnerabilities and malware are identified and demonstrated
	3.2	***Threat actors, threat vectors and threat goals*** are defined
	3.3	Techniques used by attackers to infiltrate a system are described and demonstrated
	3.4	Characteristics and operation of a cyber-attack are explained
	3.5	Trends of cyber threats are investigated
	3.6	Cyber-attacks on ***enterprise infrastructure*** are identified
	3.7	Examples of IOT devices are described and demonstrated
	3.8	Security vulnerabilities for IOT devices are defined
4 Implement methods to protect your data and privacy	4.1	Techniques to protect personal devices and data are described and implemented
	4.2	***Authentication techniques*** are identified and demonstrated
	4.3	Methods to protect personal devices from threats are implemented
	4.4	Methods and tools to safeguard personal privacy are defined
	4.5	Logical and physical access controls are defined and implemented
5 Implement methods to protect an organisation's data	5.1	Common equipment used to protect an organisation from cyber security attacks is identified
	5.2	Terms such as botnets, the cyber kill chain process and behavior based security in the context of cyber security protection methodologies are explained.
	5.3	Methods for protecting an organisation from cyber-attacks are developed and evaluated
	5.4	Introduction to behavior based approach to cyber security is presented
	5.5	***Incident response standards*** are defined

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit

Required skills

- Using a PC or Laptop computer and software tools
- Implementing methods to protect personal data and privacy
- Communicating and working in a team environment
- Problem solving threats and vulnerabilities
- Interpreting and following documented material and procedures
- Evaluating an organisation's security policy document

Required knowledge:

- An enterprise security framework
- Current types of security vulnerabilities and malware
- Methods of cyber security attacks
- Methods to protect your own data and privacy
- Methods and tools used to protect an organisation's data
- Internet of Things (IOT) devices
- Access management techniques
- Access controls
- Overview of the responsibilities and resources that standards and organisation bodies provide for an enterprise
- Cyber security risk

Range Statement

The Range Statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance.

Threat sources may include but not limited to:	• network • data • applications • users • machines
Cyber threat may include but not limited to:	• Phishing • malicious coding • passwords attacks

	• outdated software vulnerabilities • removable media

Threat actors, threat vectors and threat goals may include but not limited to:	• *Threat actors* examples:
	  o Criminals
	  o Nation State
	  o Hactivist
	  o Insider etc.
	• *Threat vectors* examples:
	  o Malware
	  o Phishing
	  o DOS attacks etc.
	• *Threat goals* examples:
	  o Data steal
	  o Data disrupt
	  o Embarrass organisation etc.

Enterprise infrastructure may include but not limited to:	• Lighting • HVAC • programmable logic controllers (PLC's) • IOT devices
Authentication techniques may include but not limited to:	• Authentication, Authorizing and Accounting (AAA) • RADIUS
Incident response standards may include but not limited to:	• Standard ISO27035 • National Institute of Standards and Technology (NIST) • European Union Agency for Network and Information Security (ENSISA) • Information Security Forum (ISF) • Standards for Information Assurance for Small to Medium Enterprises Consortium (IASME) • National Cyber Security Centre - Australia (NCSC)

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment section in Section B of the accreditation submission.

Critical aspects for assessment and evidence required to assess competency in this unit	Assessors must be satisfied that the candidate can: • define a cyber security framework for an organisation • explain the need for cyber security for an enterprise • recognise current and emerging cyber security attack methods and techniques • implement methods to protect personal data and privacy • implement methods to protect an organisation's data.
Context of and specific resources for assessment	Evidence should show competency working in a realistic environment and a variety of conditions. The candidate will have access to all tools, equipment, materials and documentation required. The candidate will be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials. This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.
Method of assessment	Evidence can be gathered in a combination of ways including: – observation of processes and procedures – oral and/or written questioning on required knowledge and skills – testimony from supervisors, colleagues, clients and/or other appropriate persons – inspection of the final product or outcome – portfolio of documented evidence. Where performance is not directly observed and/or is required to be demonstrated over a period of time and/or in a number of locations, any evidence should be authenticated by colleagues, supervisors, clients or other appropriate persons.

VU21993 - Secure a networked personal computer		
Unit Descriptor	This unit provides base level skills and knowledge to configure an operating system on a personal computer, adding security, setting user level passwords and privileges to limit and identify user access – all required to increase protection of the end point from cyber security attacks. The unit also provides an overview of internet of things (IOT) devices, an introduction to computer networking virtualisation and base level Linux commands – deemed to be invaluable in using cyber security tools. No licensing or certification requirements apply to this unit at the time of accreditation.	
Employability skills	This unit contains employability skills.	
Application of the Unit	This unit is applicable to individuals intending to work as a cyber security practitioner.	
ELEMENT	**PERFORMANCE CRITERIA**	
1. Identify the role of personal computers and other computing devices in cyber security	1.1	Computer system components are identified and how they work together is explained.
	1.2	Identification and selection of appropriate components for a computer system are selected
	1.3	Configuration of specialised computer systems is described and demonstrated
	1.4	Role of security relevant peripherals is defined
	1.5	Common computer input output devices are identified
	1.6	Emerging Internet of Things (IOT) devices are identified and demonstrated
2. Undertake preventative maintenance and base level troubleshooting procedures for a computer	2.1	***Preventative maintenance*** procedures for a personal computer are described and demonstrated
	2.2	Base level troubleshooting procedures are demonstrated
3 Configure and use a computer operating system and relevant applications	3.1	Operating system (OS) installation is performed
	3.2	Operating system structure is examined
	3.3	Appropriate security applications are installed and configured

	3.4	Routine system management tasks with appropriate operating system tools are demonstrated
	3.5	Common preventative maintenance techniques for operating systems are described and demonstrated
	3.6	***Configuring access controls for the workstation*** is described and implemented
	3.7	Setting passwords and allocating privileges are described and implemented
	3.8	Basic operating system troubleshooting processes are explained and demonstrated
4. Configure and use virtualised images	4.1	Environmental requirements for installing the virtualisation software are reviewed
	4.2	Required services and ports, according to virtualisation software vendors are installed
	4.3	Environmental requirements to ensure virtual machines function are configured
	4.4	Remote client access to virtual machines is configured
5. Identify key concepts in networking	5.1	Key components of a computer network are identified
	5.2	Purpose and characteristics of networking standards are explained
	5.3	Changing the IP address in an operating system is performed
	5.4	Network connectivity between computers is configured and tested
6. Connect devices to networks	6.1	Process of connecting a computer to a wired and wireless network is demonstrated
	6.2	Purpose and characteristics of internet service provider (ISP) connection technologies are defined
	6.3	Cloud concepts and network host services are examined
	6.4	Preventative maintenance procedures for networks are demonstrated
	6.5	Base level troubleshooting methods for networks are described and demonstrated

7. Demonstrate base level Linux commands	7.1	Structure and characteristics of the Linux operating system environment are defined
	7.2	Use of ***base level Linux commands*** is defined and demonstrated

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit

Required skills

- Identifying the components and explaining the operation of a personal computer
- Operating a personal computer
- Performing preventive maintenance and troubleshooting on personal computers.
- Installing Windows operating systems
- Performing management and maintenance of Windows operating systems
- Programing networking devices from provided scripts
- Reading and comprehending computer technology reports
- Securing user level access for a personal computer
- Identifying and using networking devices

Required knowledge:

- Hardware components of a personal computer
- Virtualisation concepts
- PC peripherals
- PC input output devices
- Internet of Things (IOT) devices
- Communication protocols for IOT devices
- Security issues relating to IOT devices
- Operating systems (Windows or Linux)
- Virtualization operation and structure
- Creating and configuring virtualised images
- Linux base level commands
- Networked device connections

Range Statement

The Range Statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance.

Preventative maintenance may include but not limited to:	• Hardware tasks such as: ▪ remove dust from fans, power supply, internal components and peripherals ▪ clean the mouse, keyboard & display ▪ check for loose cables. • Software tasks such as: ▪ review and install appropriate OS, security and driver updates ▪ regularly scan for viruses ▪ remove unwanted programs ▪ scan for hard drive errors.
Configuring access controls for the workstation may include but not limited to:	• Regular password changes which define minimum password length and strength, • Protecting key files with operating system features like group policies
Base level Linux commands may include but not limited to:	• Pwd (print current directory) • Cd (change directory) • Mkdir (make directory) • Rmdir (remove directory) • ls (list files) • Rm file (removes file) • lsblk (list block devices) • Chmod (change file mode bits)

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment section in Section B of the accreditation submission.

Critical aspects for assessment and evidence required to assess competency in this unit	Assessors must be satisfied that the candidate can: • demonstrate preventative maintenance and base level troubleshooting procedures for a computer • demonstrate the ability to configure and use a computer operating system and relevant applications • demonstrate the ability to configure and use virtualised images for a computer • identify key concepts in networking • connect devices to networks • demonstrate base level Linux commands.
Context of and specific resources for assessment	Evidence should show competency working in a realistic environment and a variety of conditions. The candidate will have access to all tools, equipment, materials and documentation required. The candidate will be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials. This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.
Method of assessment	Evidence can be gathered in a combination of ways including: – observation of processes and procedures – oral and/or written questioning on required knowledge and skills – testimony from supervisors, colleagues, clients and/or other appropriate persons – inspection of the final product or outcome – portfolio of documented evidence. Where performance is not directly observed and/or is required to be demonstrated over a period of time and/or in a number of locations, any evidence should be authenticated by colleagues, supervisors, clients or other appropriate persons.