

**22632VIC**

**Certificate II Engineering Studies**

**Version # 1 – September 2023**

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

**Accredited for the period: 01 January 2024 to 31 December 2028**



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## Section A – Copyright and course classification information

1. <b>Copyright owner of the course</b>	© State of Victoria (Department of Jobs, Skills, Industry and Regions) 2023
2. <b>Address</b>	<p>Executive Director Higher Education and Workforce Skills and Employment Department of Jobs, Skills, Industry and Regions (DJSIR) GPO Box 4509 Melbourne Vic 3001</p> <p><b>Organisational Contact:</b> Manager, Training and Learning Products Unit Higher Education and Workforce Skills and Employment Department of Jobs, Skills, Industry and Regions (DJSIR) Telephone: 131823 Email: <a href="mailto:course.enquiry@djsir.vic.gov.au">course.enquiry@djsir.vic.gov.au</a></p> <p><b>Day-to-day contact:</b> Curriculum Maintenance Manager – Engineering Industries Box Hill Institute Private Bag 2014, Box Hill, Victoria 3128 M: 0479 184 251 Email: <a href="mailto:steven.bryant@boxhill.edu.au">steven.bryant@boxhill.edu.au</a></p>
3. <b>Type of submission</b>	This submission is for re-accreditation of: 22470VIC Certificate II in Engineering Studies
4. <b>Copyright acknowledgement</b>	<p>The following units of competency: MEM30011 – Set up basic pneumatic circuits MEMPE006 – Undertake a basic engineering project have been imported from the MEM - Manufacturing and Engineering Training Package administered by the Commonwealth of Australia. © Commonwealth of Australia</p> <p>The following unit of competency: MSMENV272 - Participate in environmentally sustainable work practices has been imported from the MSM - Manufacturing Training Package administered by the Commonwealth of Australia. © Commonwealth of Australia</p>

## Section A – Copyright and course classification information

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<p><b>6. Course accrediting body</b></p>	<p>Victorian Registration and Qualifications Authority</p>
<p><b>7. AVETMISS information</b></p>	<p><b>ANZSCO code – 6 digit</b></p> <ul style="list-style-type: none"> <li><a href="#">Australian and New Zealand Standard Classification of Occupations</a></li> </ul> <p>712311 Engineering Production Worker</p> <p><b>ASCED Code – 4 digit</b></p> <ul style="list-style-type: none"> <li><a href="#">Field of Education</a></li> </ul> <p>1205 Employment Skills Programmes</p> <p><b>National course code</b></p> <p>22632VIC</p>
<p><b>8. Period of accreditation</b></p>	<p>01 January 2024 to 31 December 2028</p>



## Section B – Course information

<b>1. Nomenclature</b>	<b>Standard 4.1 and 5.8 AQTF 2021 Standards for Accredited Courses</b>
<b>1.1 Name of the qualification</b>	<b>Certificate II in Engineering Studies</b>
<b>1.2 Nominal duration of the course</b>	340 – 370 Hours
<b>2. Vocational or educational outcomes</b>	<b>Standard 5.1 AQTF 2021 Standards for Accredited Courses</b>
<b>2.1 Outcome(s) of the course</b>	<p>The course provides participants with the following educational and vocational outcomes:</p> <ul style="list-style-type: none"> <li>• knowledge of the scope and structure of the engineering, manufacturing and related industries</li> <li>• knowledge of the range of occupations and study pathways available for entry into the engineering, manufacturing and related industries</li> <li>• ability to apply safe work practices in an engineering, manufacturing and related industries work environment</li> <li>• ability to safely use a range of hand tools and hand held power tools</li> <li>• ability to apply a range of computations to meet engineering machine processes and metal fabrication requirements</li> <li>• knowledge and skills in a range of engineering processes such as machining operations, fabrication techniques, welding and thermal cutting processes</li> <li>• knowledge and skills in a range of engineering technical areas such as reading and interpreting technical drawings, configuring and programming robotic systems, operating a 3D printer to make basic parts and products.</li> </ul>
<b>2.2 Course description</b>	<p>The Certificate II in Engineering Studies is a pre-employment course designed to prepare participants for entry level employment such as an apprenticeship, in the engineering, manufacturing or related industries.</p> <p>The course is also a suitable prerequisite for persons who wish to undertake further study such as the Diploma of Engineering Technology.</p>
<b>3. Development of the course</b>	<b>Standards 4.1, 5.1, 5.2, 5.3 and 5.4 AQTF 2021 Standards for Accredited Courses</b>
<b>3.1 Industry, education, legislative, enterprise or community needs</b>	Engineering, manufacturing, and related industries encompass a broad range of areas including but not limited to automotive, electrotechnology, tools and machinery, aerospace, defence, white goods, chemicals, polymer products, pharmaceuticals, textiles and clothing, food processing.

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The Certificate II in Engineering Studies was initially developed in 2004 as a Victorian Curriculum and Assessment Authority (VCAA) approved Victorian Certificate of Education (VCE) Vocational Education and Training (VET) program to provide senior secondary school students with pre-employment training as a pathway into apprenticeship/traineeship or other entry level employment in the engineering, manufacturing and related industries.

The course structure and content has enabled the qualification to support scored assessment, by providing students who complete the course with a direct contribution towards their Australian Tertiary Admission Rank (ATAR) score. This adds to the attractiveness of the course for students wishing to undertake higher level VET Engineering courses or Higher Education qualifications in a range of Engineering or related industry disciplines.

The structure and content of *MEM20422 - Certificate II in Engineering Pathways* from the MEM - Manufacturing and Engineering Training Package, on the advice of the VCAA, is not suitable for the purpose of the VCE VET program. It does not have the same level of knowledge and content as the Victorian course for a scored VCE VET program.

Currently, twenty four (24) Registered Training Organisations (RTOs) have the course on scope and two hundred and ninety six (296) secondary school/colleges deliver the course as a VCE VET program.

The table below shows the enrolment totals for the past six (6) years for VCE VET program and Government funded places.

Year	2018	2019	2020	2021	2022	2023
*VCE VET enrolments	2089	1881	1786	1786	1826	***1993
**Gov. Funded enrolments	19	235	187	182	151	***245

\*Enrolment data provided by the Victorian Curriculum and Assessment authority (VCAA)

\*\*Enrolment data provided by the Dept. of Jobs, Skills, Industry and regions (DJSIR)

\*\*\*Up to May 2023

The review and redevelopment of the this course for accreditation was guided by a Course Steering Committee (CSC) consisting of the following personal:

Name	Representing:
Paul Kennett (Chairperson)	VSA - Industry Advisory Group (Manufact. Eng., and Auto.) appointed representative

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Matthew Braithwaite	VCAA - Engineering Studies and Furnishing VET DSS Program Manager
David Tate	AIGroup - Manager, Apprentice & Trainee Centre
David Wilson	Ringwood Training – Eng. Fab Co-ordinator - Secondary/College representative
Brad Knight	Chisholm Institute – Education Manager, Engineering - Tafe representative
In Attendance:	
Steven Bryant (Project manager)	CMM – Engineering Industries
Trevor Lange (Course writer)	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 re-accreditation

Provider representatives on the Course Steering Committee stated the now superceded course due to its' total hours was difficult for VCE students to complete. Their limited availability to attend their auspice training provider to complete projects work is an issue that needs to be addressed in the review. The concern was supported by the VCAA representative who indicated all current VCE VET programs are in the range of 320 – 400 hours. A reduced volume without impact on the vocational/educational/outcomes of the program would make it more fit-for-purpose as a VCE VET program.

The course duration would be further exacerbated if the latest version of the MEM – Manufacturing and Engineering Training Package units were adopted. The specific units of concern are the revised OH&S unit (MEM13015) which is now made up from merging five units into a



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single unit to replace (MEM13014A) and not all the revised content is considered appropriate for the primary target group of the course. The second issue is the addition of 3 prerequisites units now required for units MEM18001 – *Use of hand tools* and MEM18002 – *Use power tools/hand held operations*. The prerequisites units are the revised OH&S unit (MEM13015) and units MEM11011 *Undertake manual handling* and MEM16006 *Organise and communicate information*. The three units would need to be included in the core component of the course to retain MEM18001 – *Use of hand tools* as a core unit. The inclusion of the three requisites for MEM18001 would add an additional 70 hours to the core component.

Following consideration of the options the Course Steering Committee final decision was to recommend the development of a new OHS unit based on the now superseded MEM unit with some additional content covering manual handling. To address the required prerequisites for the hand tools and power tools units the steering committee opted for a new core unit combining both hand tools and hand held power tools as both types of tools are required for other core units. In addition, it was decided to reduce the number of required elective units. It was the view of the CSC the reduction in volume has not compromised the AQF integrity of this Cert II level qualification.

Another change is the inclusion of unit VU23480 *Perform intermediate engineering computations*, into the core component of the course to align the core units with the compulsory units of the VCAA delivery plan. To address the Victorian Government Clean Energy Economy initiative, unit MSMENV272 *Participate in environmentally sustainable work practices* was added as an elective unit.

All enterprise units (VU) were reviewed and redrafted to comply with the Standards for Accredited Courses 2021. Some unit titles were amended to more accurately reflect content and the nominal hours were adjusted for two core units VU23476 and VU23477 based on RTO feedback to more accurately align the unit duration with it's content.

The course 22632VIC Certificate II in Engineering Studies supersedes and is deemed not equivalent to 22470VIC Certificate II in Engineering Studies due to the changes to the core component of the course structure.

**Table 1 - Transition Table:**

<b>22632VIC Certificate II in Engineering Studies</b>	<b>22470VIC Certificate II in Engineering Studies</b>	<b>Relationship</b>
VU23476 Report on the sectors and employment in the manufacturing engineering and related industries	VU22329 Report on a range of sectors in manufacturing engineering and related industries	Equivalent (Minor change to unit title)
VU23477 Interpret and prepare basic two and	VU22330 Select and interpret drawings and	Equivalent

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	three dimensional engineering drawings	prepare three dimensional (3D) sketches and drawings	(Minor change to unit title)
	VU23478 Perform basic machining processes	VU22331 Perform basic machining processes	Equivalent
	VU23479 Apply basic fabrication techniques	VU22332 Apply basic fabrication techniques	Equivalent
	VU23480 Perform intermediate engineering computations	VU22333 Perform intermediate engineering computations	Equivalent
	VU23482 Produce basic engineering components and products using fabrication and machining operations	VU22334 Produce basic engineering components and products using fabrication and machining operations	Equivalent
	VU23483 Perform metal machining operations	VU22335 Perform metal machining operations	Equivalent
	VU23484 Perform metal fabrication operations	VU22336 Perform metal fabrication operations	Equivalent
	VU23485 Perform basic welding and thermal cutting processes	VU22337 Perform basic welding and thermal cutting processes to fabricate engineering structures	Equivalent (Minor change to unit title)
	VU23486 Configure and program a basic robotic system	VU22338 Configure and program a basic robotic system	Equivalent
	VU23487 Create engineering drawings using computer aided drafting system	VU22339 Create engineering drawings using computer aided systems	Equivalent (Minor change to unit title)
	VU23488 Use 3D printing to create products	VU22340 Use 3D printing to create products	Equivalent
		MEM13014A Apply principles of Occupational Health & Safety in work environment	Deleted
	VU23481 Apply occupational health and safety principles in an engineering environment		New unit

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		MEM18001C Use hand tools	Deleted
		MEM18002B Use power tools/hand held operations	Deleted
	VU23475 Safely use hand tools and hand held power tools for general engineering applications		New unit
	MEMPE006 Undertake a basic engineering project	MEMPE006A Undertake a basic engineering project	Equivalent
	MEM30011 Set up basic pneumatic circuits	MEM30011A Set up basic pneumatic circuits	Equivalent
	MSMENV272 Participate in environmentally sustainable work practices		Newly imported unit

<b>4. Course outcomes</b>	<b>Standards 5.5, 5.6 and 5.7 AQTF 2021 Standards for Accredited Courses</b>
<b>4.1 Qualification level</b>	<p>This course is consistent with the Australian Qualifications Framework (AQF) for a Certificate II level qualification in that graduates will have the following learning attributes.</p> <p><b>Knowledge</b></p> <p>Graduates of the Certificate II in Engineering Studies will have basic factual, technical and procedural knowledge in a defined area of work and learning covering engineering and manufacturing and related industries.</p> <p><b>Skills</b></p> <p>Graduates will have:</p> <ul style="list-style-type: none"> <li>• cognitive skills to access, record and act on a defined range of information from various sources to gain an understanding of the diversity and coverage of the engineering and manufacturing industries, together with employment opportunities and career pathways</li> <li>• cognitive and communication skills to apply and communicate known solutions to a limited range of predictable problems such as planning and organising to undertake a specified engineering project</li> <li>• technical skills to use a limited range of equipment to complete tasks involving known routines and procedures with a limited</li> </ul>

4. Course outcomes	Standards 5.5, 5.6 and 5.7 AQTF 2021 Standards for Accredited Courses
	<p>range of options such as performing basic machining operations and metal fabrication tasks.</p> <p><b>Application of knowledge and skills</b></p> <p>Graduates will demonstrate the application of knowledge and skills:</p> <ul style="list-style-type: none"> <li>• with some accountability for the quality of their own outcomes and some responsibility for their own outputs in work and learning such as clarifying work requirements and completing tasks in a required timeframe</li> <li>• with limited autonomy and judgment in the completion of their own defined and routine tasks in known and stable contexts such as selecting and preparing machines and accessories for use</li> <li>• with limited autonomy and judgment to complete routine but variable tasks in collaboration with others to develop and complete a basic engineering project.</li> </ul> <p><b>Volume of learning</b></p> <p>The volume of learning for this qualification is typically between 0.5 to 1 year and incorporates structured training and unstructured learning activities such as locating and gathering information for assignments and projects, investigating pathway options for further study and/or future employment in the engineering/manufacturing industry.</p>
4.2 Foundation skills	Foundation skills applicable to the outcomes of this course are identified in each unit of competency.
4.3 Recognition given to the course (if applicable)	The Certificate II in Engineering Studies is a VCAA approved VCE VET program and the structure allows the VCAA to award credit at units 1 – 4 into the VCE and VCE VM.
4.4 Licensing/regulatory requirements (if applicable)	Not applicable

**5. Course rules****Standards 5.8 and 5.9 AQTF 2021 Standards for Accredited Courses****5.1 Course structure**

To achieve the qualification *22632VIC Certificate in Engineering Studies* the learner must successfully complete a total of nine (9) units comprising:

- eight (8) core units
- one (1) elective unit selected from the list below.

Where the full qualification is not completed, a VET Statement of Attainment will be issued for each unit successfully completed.

**Table 2**

Unit of competency code	Unit of competency title	Field of Education code (six-digit)	Pre-requisite	Nominal hours
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**Core units: (all units to be completed)**

VU23475	Safely use hand tools and hand held power tools for general engineering applications	030101	Nil	40
VU23476	Report on the sectors and employment in the manufacturing, engineering and related industries	030199	Nil	20
VU23477	Interpret and prepare basic two and three dimensional engineering drawings	030199	Nil	30
VU23478	Perform basic machining processes	030707	Nil	40
VU23479	Apply basic fabrication techniques	030711	Nil	40
VU23480	Perform intermediate engineering computations	030199	Nil	40
VU23481	Apply occupational health and safety principles in an engineering environment	061301	Nil	20
MEMPE006	Undertake a basic engineering project		Nil	80
<b>Total nominal hours for core units =</b>				<b>310</b>

**Elective units (select one (1) units)**

MEM30011	Set up basic pneumatic circuits		Nil	40
MSMENV272	Participate in environmentally sustainable work practices		Nil	30

Unit of competency code	Unit of competency title	Field of Education code (six-digit)	Pre-requisite	Nominal hours
VU23482	Produce basic engineering components and products using fabrication and machining operations	030707	VU23478 VU23479	60
VU23483	Perform metal machining operations	030707	VU23478	60
VU23484	Perform metal fabrication operations	030707	VU23479	60
VU23485	Perform basic welding and thermal cutting processes	030711	VU23479	60
VU23486	Configure and program a basic robotic system	030199	Nil	60
VU23487	Create engineering drawings using computer aided drafting system	030199	VU23477	60
VU23488	Use 3D printing to create products	030199	Nil	40
<b>Total nominal hour range for elective units =</b>				<b>30 - 60</b>
<b>Total course nominal hour range =</b>				<b>340 - 370</b>

### Standard 5.11 AQTF 2021 Standards for Accredited Courses

#### 5.2 Entry requirements

There are no essential entry requirements for this course.

It is recommended applicants have as a minimum; language, literacy and numeracy skills that are equivalent to Level 2 of the Australian Core Skill Framework (ACSF).

Full details, descriptors and tests of the ACSF can be found on website [here](#).

Applicants who have a lower level of language and literacy will require additional support to complete the course.

## 6. Assessment

### Standard 5.12 and 5.14 AQTF 2021 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 AQTF: Essential Conditions and Standards for Initial/Continuing Registration and Guidelines 4.1 and 4.2 of the VRQA Guidelines for VET Providers,

or

## 6. Assessment

### Standard 5.12 and 5.14 AQTF 2021 Standards for Accredited Courses

- the Standards for Registered Training Organisations 2015 (SRTOs),
- or
- the relevant standards and Guidelines for RTOs 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 specified to reflect the industry context in which the task takes place.

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
- recognise prior learning
- be equitable to all groups of learners.

Assessment methods may include:

- direct observation of processes and procedures
- oral and/or written questioning
- inspection of final process outcomes
- documentary workplace evidence
- practical 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 and reduce the potential for over assessment.

Assessment of the imported training package units must reflect the requirements of the assessment guidelines of the relevant training package.



<b>6. Assessment</b>	<b>Standard 5.12 and 5.14 AQTF 2021 Standards for Accredited Courses</b>
<b>6.2 Assessor competencies</b>	<p>Assessment must be undertaken by a person or persons in accordance with:</p> <ul style="list-style-type: none"> <li>• Standard 1.4 of the AQTF: Essential Conditions and Standards for Initial/Continuing Registration and Guidelines 3 of the VRQA Guidelines for VET Providers,</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>• the Standards for Registered Training Organisations 2015 (SRTOs),</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>• the relevant standards and Guidelines for RTOs at the time of assessment.</li> </ul> <p>Assessment of units of competency imported from training packages must reflect the requirements for assessors specified in that training package.</p>
<b>7. Delivery</b>	<b>Standards 5.12, 5.13 and 5.14 AQTF 2021 Standards for Accredited Courses</b>
<b>7.1 Delivery modes</b>	<p>There are no restrictions on offering this course on either a full-time or part-time basis and may include online support. Providers should endeavor to be flexible in the way the training is delivered to ensure they meet the needs of the learner cohort.</p> <p>It is envisaged this course will primarily be delivered in a dedicated training environment rather than on-the-job. Therefore, it is important the facilities within the training environment reflect as close as possible, realistic workplace conditions for the benefit of the students.</p> <p>Suggested delivery strategies may include but not limited to:</p> <ul style="list-style-type: none"> <li>• classroom instruction including: <ul style="list-style-type: none"> <li>○ visits to engineering/manufacturing exhibitions</li> <li>○ visits to engineering/manufacturing enterprises</li> </ul> </li> <li>• range of workshop activities including instructor demonstrations and student's hands on experience.</li> </ul> <p>Although the core unit MEMPE006 - <i>Undertake a basic engineering project</i> has no prerequisites, it is recommended the unit is delivered and assessed in the later stage of the course or 2<sup>nd</sup> year in the case of VCE VET program. Students need to have gained sufficient background knowledge and skills in planning, drawing, engineering technical skills including machine processes and fabrication techniques to enable them to achieve the assessment outcomes on this unit.</p> <p>Some areas of content may be common to more than one unit therefore integration of delivery may be appropriate. (For VCE VET delivery refer to the VCAA - Supplementary Advice document for Engineering Studies).</p>
<b>7.2 Resources</b>	<p>For delivery of this course participants must have access to appropriately equipped engineering training facility which includes:</p> <ul style="list-style-type: none"> <li>• metalworking machines e.g. lathe, milling machine</li> </ul>



<b>7. Delivery</b>	<b>Standards 5.12, 5.13 and 5.14 AQTF 2021 Standards for Accredited Courses</b>
	<ul style="list-style-type: none"> <li>• metal fabrication equipment such as: metal bending/pan brake machines, guillotine</li> <li>• range of hand tools and hand held power tools used for metalwork</li> <li>• measuring equipment used in an engineering workshop e.g. micrometer, vernier caliper</li> </ul> <p>In addition to the above facility, access to a technical drawing area equipped with manual drafting and computer aided drafting hardware and software facilities.</p> <p>Whether supplied by the students or the training provider all students must wear personal protective equipment (PPE) such as safety glasses, protective clothing and appropriate footwear while in an engineering workshop/training facility.</p> <p>Training must be undertaken by a person or persons in accordance with:</p> <ul style="list-style-type: none"> <li>• Standard 1.4 of the AQTF: Essential Conditions and Standards for Initial/Continuing Registration and Guideline 3 of the VRQA Guidelines for VET Providers,</li> <li style="text-align: center;">or</li> <li>• the Standards for Registered Training Organisations 2015 (SRTOs),</li> <li style="text-align: center;">or</li> <li>• the relevant standards and Guidelines for RTOs at the time of assessment.</li> </ul> <p>The delivery of units imported from a training package/s. must reflect the requirements for trainers specified in the relevant training package/s.</p>

<b>8. Pathways and articulation</b>	<b>Standard 5.10 AQTF 2021 Standards for Accredited Courses</b>
	<p>There are no formal arrangements for articulation to other accredited courses or the higher education sector. However, the Certificate II in Engineering Studies provides a pathway into apprenticeship/traineeship or other entry level employment in the engineering, manufacturing and related industries at Certificate III level. Examples are:</p> <ul style="list-style-type: none"> <li>• MEM30219 Certificate III in Engineering – Mechanical Trade</li> <li>• MEM31922 Certificate III in Engineering – Fabrication Trade</li> <li>• MEM30522 Certificate III in Engineering - Technical</li> </ul> <p>When arranging articulation providers should refer to the AQF 2<sup>nd</sup> Edition, 2013 Pathway Policy.</p> <p>Graduates must negotiate individual pathway arrangements directly with the training provider.</p> <p>This course contains three imported units drawn from two training packages. Participants who successfully complete any of these units</p>

<b>8. Pathways and articulation</b>	<b>Standard 5.10 AQTF 2021 Standards for Accredited Courses</b>
	<p>will be able to gain credit into other qualifications containing these units in any future studies. Likewise, participants who have already completed relevant imported units from previous training, will be granted a credit for the unit/s.</p>
<b>9. Ongoing monitoring and evaluation</b>	<b>Standard 5.15 AQTF 2021 Standards for Accredited Courses</b>
	<p>The Curriculum Maintenance Manager - Engineering Industries (CMM-EI) is responsible for the ongoing monitoring and maintenance of this course during the accreditation period.</p> <p>The CMM-EI will undertake a review of the course midway through the accreditation period.</p> <p>The review will involve consultation with:</p> <ul style="list-style-type: none"> <li>• course participants and graduates</li> <li>• teaching staff from both the secondary and VET sectors</li> <li>• industry representatives e.g. Australia Industry Group (AIG)</li> <li>• Victorian Curriculum and Assessment Authority (VCAA)</li> </ul> <p>Any significant changes to the course resulting from the ongoing monitoring and review process will be reported to the Victorian Registrations and Quality Authority (VRQA) through the formal amendment process.</p>

## Section C – Units of competency

### Enterprise units:

VU23475	Safely use hand tools and hand held power tools for general engineering applications
VU23476	Report on the sectors and employment in the manufacturing, engineering and related industries
VU23477	Interpret and prepare basic two and three dimensional engineering drawings
VU23478	Perform basic machining processes
VU23479	Apply basic fabrication techniques
VU23480	Perform intermediate engineering computations
VU23482	Produce basic engineering components and products using fabrication and machining operations
VU23483	Perform metal machining operations
VU23484	Perform metal fabrication operations
VU23485	Perform basic welding and thermal cutting processes
VU23486	Configure and program a basic robotic system
VU23487	Create engineering drawings using computer aided system
VU23488	Use 3D printing to create products
VU23481	Apply occupational health and safety principles in an engineering environment

### Endorsed Training Package units:

These units can be download from the National Register of VET [here](#)

MEMPE006	Undertake a basic engineering project
MEM30011	Set up basic pneumatic circuits
MSMENV272	Participate in environmentally sustainable work practices

<b>Unit code</b>	<b>VU23475</b>
<b>Unit title</b>	<b>Safely use hand tools and hand held power tools for general engineering applications</b>
<b>Application</b>	<p>This unit describes the performance outcomes, skills and knowledge required to safely use a range of hand tools and hand held power tools for general engineering applications</p> <p>It requires the ability to select the correct hand tool/s and/or hand held power tool/s for specific engineering applications, identify unsafe or faulty tools, safely use the selected tool/s and undertake routine tool maintenance.</p> <p>The unit applies to a person working at entry level in the manufacturing or engineering industry undertaking a range of well-defined tasks.</p> <p>No licensing, legislative, regulatory or certification requirements apply to this unit of competency at the time of publication.</p>
<b>Pre-requisite Unit(s)</b>	Nil
<b>Competency Field</b>	N/A
<b>Unit Sector</b>	N/A

<b>Element</b>		<b>Performance Criteria</b>	
Elements describe the essential outcomes of a unit of competency.		Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the assessment requirements.	
1	Establish job requirements	1.1	Occupational health and safety (OHS) requirements, and workplace safety procedures are identified and followed
		1.2	Work instructions are reviewed and clarified with trainer/supervisor
		1.3	Personal protective equipment (PPE) is selected, condition checked and fitted
		1.4	Work tasks are determined from work instructions and the hand tools and/or hand held power tools required for the work tasks are identified
2	Use tools for required application	2.1	Hand tools and/or hand held power tools are selected and checked for safe use
		2.2	Hand tools and/or hand held power tools are used to achieve required work outcomes
		2.3	Any damaged or faulty tools are identified and marked for repair according to workplace procedure
3	Check, maintain and store tools	3.1	Each hand tool and/or hand held power tool is cleaned and checked for safe operation before being stored
		3.2	Basic maintenance is carried out according to workplace procedure

<b>Unit code</b>	<b>VU23475</b>
	3.3 Each hand tool and/or hand held power tool is safely stored to its correct location in accordance to workplace requirements

### Range of Conditions

Hand tools include:

- Measuring and marking out tools including and not limited to:
  - tape measure
  - metal rulers
  - dividers
  - jenny (odd-leg) callipers
  - inside callipers
  - outside callipers
  - spirit levels
  - engineer square
  - centre punch
  - prick punch
  - scribes
  - surface gauges.
- Low tolerance measurement tools including and not limited to:
  - verniers
  - micrometers
  - dial Indicators.
- Cutting and shaping tools including and not limited to:
  - safety knife
  - files
  - rasps
  - cold chisels
  - de-burrers
  - hack saws
  - tin snips
  - scrapers
  - taps and dies.
- Drilling tools including and not limited to:
  - hand drill
  - pedestal drill
  - drill bits
  - holesaws.
- Holding tools including and not limited to:
  - vices
  - clamps
  - pliers
- Fixing and securing tools including and not limited to:
  - hammers
  - screwdrivers
  - spanners
  - sockets
  - wrenches

- hex (Allen) keys
- ring (circlip) pliers.

Power tools include:

- Hand held power tools including and not limited to:
  - circular saw
  - nibblers
  - drills
  - grinders
  - jigsaws
  - air riveters/nutserts
  - air tapping machines
  - shears
  - spot welder

### Foundation Skills

Foundation skills essential to performance and not explicit in the performance criteria must be assessed.

Skill	Description
Reading skills to:	determine job/task requirements
Oral communication skills to:	seek clarification on job requirements to determine tools required
Planning and organising skills to:	sequence the work tasks and the tools required for each task
<b>Unit Mapping Information</b>	New unit, no equivalent unit

### Assessment Requirements

<b>Title</b>	Assessment Requirements for: <b>VU23475 Safely use hand tools and hand held power tools for general engineering applications</b>
<b>Performance Evidence</b>	<p>The learner must demonstrate the ability to completed the tasks outlined in the elements, performance criteria and foundation skills of this unit, including evidence of the ability to on at least three (3) occasions:</p> <ul style="list-style-type: none"> <li>• follow work instructions and safe work practices</li> <li>• select and use a range of hand tools and hand held power tools for a general engineering applications</li> <li>• follow workplace procedures for dealing with unsafe or faulty hand tools and hand held power tools</li> <li>• undertake routine maintenance and storage of hand tools and hand held power tools.</li> </ul>
<b>Knowledge Evidence</b>	<p>The learner must be able to demonstrate essential knowledge required to effectively do the task outlined in elements and performance criteria of this unit, manage the task and manage contingencies in the context of the work role. This includes knowledge of:</p> <ul style="list-style-type: none"> <li>• safe work practices and procedures and use of personal protective equipment (PPE)</li> <li>• features and applications of different hand tools and hand held power tools used in a general engineering context</li> <li>• clamping/securing methods when using hand held power tools</li> <li>• adjustments/alignments to a range of hand held power tools</li> <li>• common faults and/or defects in hand tools and hand held power tools</li> <li>• basic checks, including electrical test tags, before using hand held power tools</li> <li>• procedures for marking unsafe or faulty tools for repair</li> <li>• routine maintenance requirements for a range of hand tools and hand held power tools including lubricating, sharpening, and adjustments</li> <li>• storage procedures for a range of hand tools and hand held power tools.</li> </ul>
<b>Assessment Conditions</b>	<p>Both practical skills and knowledge must be assessed. Simulated assessment environment must replicate a real engineering working environment with access to:</p> <ul style="list-style-type: none"> <li>• job instructions and safety procedures</li> <li>• hand tools and hand held power tools suitable for a range of general engineering applications.</li> <li>• personal protective equipment (PPE).</li> </ul> <p><b>Assessor requirements</b></p> <p>No specialist vocational competency requirements for assessors apply to this unit.</p>

<b>Unit code</b>	<b>VU23476</b>
<b>Unit title</b>	<b>Report on the sectors and employment in the manufacturing, engineering and related industries</b>
<b>Application</b>	<p>This unit describes the performance outcomes, skills and knowledge required to source information and report on the coverage and diversity in the manufacturing, engineering and related industries.</p> <p>It requires the ability to investigate and identify the major sectors of the industry, the products produced and manufacturing processes applied. Included also is the range of occupations found in the various sectors of the industry and employment opportunities.</p> <p>The unit also includes the requirement to prepare a report of the findings using a suitable IT software package.</p> <p>The unit applies to a person preparing for further study and/or employment in the manufacturing, engineering and related industries such as an apprenticeship.</p> <p>No licensing, legislative, regulatory or certification requirements apply to this unit of competency at the time of publication.</p>
<b>Pre-requisite Unit(s)</b>	Nil
<b>Competency Field</b>	N/A
<b>Unit Sector</b>	N/A

<b>Element</b>		<b>Performance Criteria</b>	
Elements describe the essential outcomes of a unit of competency.		Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the assessment requirements.	
1	Investigate the coverage and diverse nature of the manufacturing, engineering and related industries	1.1	Sources of information on the major sectors of the manufacturing engineering and related industries are identified
		1.2	Sources of information on the products and productions processes utilised by each major sector are determined
		1.3	Sources of information on the industries/industry sectors applying advanced manufacturing technologies are identified
2	Source information on the range of occupations and career pathways found in the major sectors of the industry	2.1	Information on occupations/roles of personnel and employment opportunities within the major industry sectors is determined
		2.2	Required training and qualifications for the various occupational roles are identified
		2.3	Information on employment opportunities, career pathways within each industry sector is collected
3	Prepare a report on the sourced information	3.1	Sourced information is collated and the format of the report is planned



Unit code	VU23476
	3.2 Information technology (IT) software is selected and the collated information is arranged and keyed in as required
	3.3 Graphs, flow charts, diagrams and other software presentation features are utilised to enhance the report
	3.4 Report is either printed or saved on a storage device, reviewed and amended where required
	3.5 Final report either in hardcopy or electronic format is submitted within the specified timeframe

### Range of Conditions

Manufacturing, engineering and related industries may include but limited to:

- aerospace
- automotive/transport
- electrical/electronics
- biotech
- pharmaceutical
- heavy engineering
- product manufacturing
- mineral products
- plastics, rubber and cables
- textiles, clothing and footwear
- furniture
- whitegoods e.g. fridge's, washing machines etc.
- food products

Advanced manufacturing may include but not limited to:

- rapid prototyping
- robotics
- automation sensors and control systems
- Industry 4.0 and 5.0

Occupation/roles may include but not limited to:

- production staff e.g. worker, supervisor, manager
- trainees
- trade apprentices
- tradespersons e.g. electrician
- technicians – generally post trade
- cadets e.g. trainee para professional/professional
- para-professional e.g. assistant production manager
- professional e.g. robotics engineer, mechanical engineer
- administrative staff e.g. human resources manager
- sales/marketing e.g. salesperson
- information technology/cyber security e.g. IT specialist
- warehousing/logistics e.g. warehouse manager

## Foundation Skills

Foundation skills essential to performance and not explicit in the performance criteria must be assessed.

Skill	Description		
Reading skills to:	assess the usefulness of sourced information for the report		
Writing skills to:	key in text as part of preparation of a report on the manufacturing, engineering and related industries		
Oral communication skills to:	ask questions for information gathering		
Planning and organising skills to:	allow sufficient time to gather information and prepare a report on selected industry sectors		
Self-management skills to:	finalise and submit a report within a given time frame		
Digital literacy skills to:	Format the report utilising diagrams, graphs, chart and other software enhancements to present information on the scope and scale of manufacturing, engineering and related industries.		
Unit Mapping information	Code and Title Current Version	Code and Title Previous Version	Comments
	VU23476 Report on the sectors and employment in the manufacturing, engineering and related industries	VU22329 Report on a range of sectors in the manufacturing, engineering and related industries	Equivalent

### Assessment Requirements

<b>Title</b>	Assessment Requirements for: <b>VU23476 Report on the sectors and employment in the manufacturing, engineering and related industries</b>
<b>Performance Evidence</b>	<p>The learner must demonstrate the ability to completed the tasks outlined in the elements, performance criteria and foundation skills of this unit, including evidence of the ability to:</p> <ul style="list-style-type: none"> <li>• gather and interpret information which shows the diversity of the manufacturing, engineering and related industries</li> <li>• locate information on at least three (3) specific sectors** of the industry which includes: <ul style="list-style-type: none"> <li>○ size/structure of sector</li> <li>○ production activity and end product/s that defines the sector</li> <li>○ employment numbers, job roles/ of employees</li> <li>○ importance of the industry sector to the Australian economy</li> <li>○ training pathways for specific types of employment into the sector</li> </ul> </li> <li>• prepare a report on findings (hardcopy or softcopy) within a given timeframe.</li> </ul> <p>**At least one (1) of the industry sectors must utilise advanced manufacturing technology/ies in it's production/manufacturing process/es.</p>
<b>Knowledge Evidence</b>	<p>The learner must be able to demonstrate essential knowledge required to effectively do the task outlined in elements and performance criteria of this unit, manage the task and manage contingencies in the context of the work role. This includes knowledge of:</p> <ul style="list-style-type: none"> <li>• accessing sources of information on the manufacturing, engineering and related industries such as but not limited to: <ul style="list-style-type: none"> <li>○ internet</li> <li>○ trade exhibitions</li> <li>○ enterprise/company visits</li> <li>○ phone/email contact to enterprises/companies</li> <li>○ library</li> <li>○ face to face contact with industry personnel</li> </ul> </li> <li>• advanced manufacturing technologies (refer Range of Conditions)</li> <li>• diversity of the manufacturing, engineering and related industries including key sectors and products</li> <li>• occupations, roles and employment opportunities in the manufacturing, engineering and related industries</li> <li>• courses/qualifications (VET and/or university) including training pathways into and employment pathways within the manufacturing, engineering and related industries</li> <li>• planning, layout of collected information/materials and use of IT software enhancements for the production of the final report</li> </ul>
<b>Assessment Conditions</b>	Assessment environment must ensure access to:

## Assessment Requirements

- appropriate technology and software for conducting research and preparing a report
- sources of information required to research manufacturing, engineering and related industries
- suitable workspace.

### **Assessor requirements**

No specialist vocational competency requirements for assessors apply to this unit.

<b>Unit code</b>	<b>VU23477</b>		
<b>Unit title</b>	<b>Interpret and prepare basic two and three dimensional engineering drawings</b>		
<b>Application</b>	<p>This unit describes the performance outcomes, skills and knowledge required to interpret and prepare basic two dimensional (2D) and three dimensional (3D) engineering drawings.</p> <p>It requires the ability to read and interpret information from a basic engineering drawing as well as using conventional drafting materials and equipment to prepare basic 2D and 3D engineering drawings in accordance with the requirements of Australian Standard for Technical Drawing (AS1100).</p> <p>The unit applies to a person preparing for further study and/or employment in the manufacturing, engineering and related industries such as an apprenticeship.</p> <p>No licensing, legislative, regulatory or certification requirements apply to this unit of competency at the time of publication.</p>		
<b>Pre-requisite Unit(s)</b>	Nil		
<b>Competency Field</b>	N/A		
<b>Unit Sector</b>	N/A		
<b>Element</b>	<b>Performance Criteria</b>		
Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the assessment requirements.		
1	Read and Interpret a basic two dimensional (2D) and three dimensional (3D) technical drawing of an engineering component	1.1	Information in the technical drawing title block including version number is checked and confirmed against job requirements
		1.2	Scale, configuration and dimensions of the component are determined
		1.3	Drawing symbols, notations, abbreviations and material requirements are interpreted
2	Prepare a two dimensional (2D) drawing of a basic mechanical component	2.1	Drawing materials and equipment are selected and checked for the task
		2.2	Drawing scale, layout, including elevations and sectional view/s are determined and prepared in accordance with task instructions and Australian Standard for Technical Drawing
		2.3	Dimensions, tolerances and symbols are applied to the drawing elevations and sectional view/s
		2.4	Component parts and their material/s are determined and the details added on the drawing together with any other required notations

Unit code		VU23477	
		2.5	Relevant information for the title block is determined and added to complete the drawing
3	Prepare a three dimensional (3D) drawing of a basic mechanical component	3.1	Drawing materials and equipment are selected for the task
		3.2	Drawing scale, type of 3D view are determined and prepared in accordance with task instructions and Australian Standard for Technical Drawing
		3.3	Dimensions and notations are added in accordance task instructions and Australian Drafting Standard.
		3.4	Relevant information for the title block is determined and added to complete the drawing

### Range of Conditions

N/A

### Foundation Skills

Foundation skills essential to performance and *not explicit* in the performance criteria must be assessed.

Skill	Description
Reading skills to:	interpret drafting standards and conventions for preparation of engineering drawings
Numeracy skills to:	interpret measurements of engineering components and transcribe them to a 2D/3D drawing
Learning skills to:	interpret and prepare basic technical drawings to support practical engineering activities such as machining operations and fabrication techniques
Planning and organising skills to:	Set up drafting equipment, prepare and execute an engineering drawing within a given timeframe
Technology skills to:	use conventional drafting equipment and materials to prepare 2D/3D engineering drawings

Unit Mapping Information	Code and Title Current Version	Code and Title Previous Version	Comments
	VU23477 Interpret and prepare basic two and three dimensional engineering drawings	VU22330 Select and interpret drawings and prepare three dimensional (3D) sketches and drawings	Equivalent

### Assessment Requirements

<b>Title</b>	Assessment Requirements for: <b>VU23477 Interpret and prepare basic two and three dimensional engineering drawings</b>
<b>Performance Evidence</b>	<p>There must be evidence the learner has completed the tasks outlined in the elements, performance criteria and foundation skills of this unit and demonstrated the ability to use conventional drafting equipment in order to:</p> <ul style="list-style-type: none"> <li>• prepare two dimensional (2D) engineering drawing of two (2) basic mechanical components</li> <li>• prepare three dimensional (3D) engineering drawing of two (2) basic mechanical components</li> </ul> <p>Each drawing must comply with the current Australian Standard for Technical Drawing (AS1100)</p>
<b>Knowledge Evidence</b>	<p>The learner must be able to demonstrate essential knowledge required to effectively do the task outlined in elements and performance criteria of this unit, manage the task and manage contingencies in the context of the work role. This includes knowledge of:</p> <ul style="list-style-type: none"> <li>• function of technical drawings</li> <li>• drawing media – materials, sheet sizes and layout</li> <li>• types of lines and their application</li> <li>• letters, numerals and symbols</li> <li>• scales for engineering drawings</li> <li>• drawing skills and techniques</li> <li>• delineation of shape – projection (2D and 3D) and sectioning</li> <li>• conventional representation of common features</li> <li>• definition of size – dimensioning and tolerances</li> <li>• designation of welds – welding terms and symbols</li> <li>• Australian Standard for Technical Drawing (AS1100)</li> <li>• function and care of conventional drafting equipment</li> </ul>
<b>Assessment Conditions</b>	<p>Both practical skills and knowledge must be assessed with access to:</p> <ul style="list-style-type: none"> <li>• drawing media and equipment</li> <li>• examples of basic mechanical components</li> <li>• Australian Standard for Technical Drawing (AS1100) and other related drafting references such as: Australian Engineering Drawing Handbook</li> </ul> <p><b>Assessor requirements:</b></p> <p>No specialist vocational competency requirements for assessors apply to this unit.</p>

<b>Unit code</b>	<b>VU23478</b>
<b>Unit title</b>	<b>Perform basic machining processes</b>
<b>Application</b>	<p>This unit describes the performance outcomes, skills and knowledge required to carry out basic metal machining processes.</p> <p>It requires the ability to set up and machine components using machinery such as: metalwork lathe, milling machine, cut off saw, pedestal grinder and fixed position drilling machine.</p> <p>The unit also includes performing basic computations tasks related to machining processes.</p> <p>The unit applies to a person preparing for further study and/or employment in the manufacturing, engineering and related industries such as an apprenticeship.</p> <p>No licensing, legislative, regulatory or certification requirements apply to this unit of competency at the time of publication.</p>
<b>Pre-requisite Unit(s)</b>	Nil
<b>Competency Field</b>	N/A
<b>Unit Sector</b>	N/A

<b>Element</b>		<b>Performance Criteria</b>	
Elements describe the essential outcomes of a unit of competency.		Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the assessment requirements.	
1	Plan and set up for machining processes	1.1	Machining tasks are determined through work instructions and clarified with trainer/supervisor
		1.2	Occupational health and safety (OHS) requirements, and workplace safety procedures are identified and followed
		1.3	Relevant technical drawings are identified and interpreted
		1.4	Work plan is prepared identifying the sequence of machining tasks
		1.5	Materials, resources required for the machining tasks are identified and obtained in accordance with workplace procedure
		1.6	Personal protective equipment (PPE) is selected, condition checked and fitted
		1.7	Hand tools required for machine set up are selected and checked for safe use



Unit code		VU23478	
2	Perform measurement and calculation checks	2.1	Required outcomes are confirmed from work instructions and technical drawings and discussion with trainer/supervisor
		2.2	Measurements, tolerances and numerical information are interpreted on the drawing/s
		2.3	Calculations are made where required and checked for accuracy
		2.4	Material stock to be machined is marked out in accordance with calculations and/or drawing details and checked for accuracy
3	Conduct machining processes	3.1	Safe work practices are identified and applied throughout the machining tasks
		3.2	Machine set up and operating procedures are confirmed and followed
		3.3	Cutting lubricant is selected and used as required for machining tasks
		3.4	Material stock is secured in the machine in accordance with operating procedure
		3.5	Machine feed and speed are set and machining process is carried out in accordance with machining procedure and required specifications of the work piece
4	Complete machining processes	4.1	Any unexpected situations are safely dealt with and reported to the trainer/supervisor
		4.2	On completion of machining tasks machine is shut down in accordance with operating procedure
		4.3	Work piece is inspected for compliance with specifications and job requirements
5	Clean work area	5.1	Completed work is reported to trainer/supervisor in according with workplace procedure
		5.2	Work area cleaning and removal of waste is conducted in line with workplace environmental requirements
		5.3	Machine cutting tool, hand tools and PPE are checked, maintained where required and stored in accordance with workplace requirements

### Range of Conditions

Machining processes can be conducted in a technology teaching environment or an enterprise machine shop.

Machines may include but not limited to:

- metalwork lathe
- milling machine
- cut off saw
- pedestal grinder
- fixed position drilling machine

### Foundation Skills

Foundation skills essential to performance and *not explicit* in the performance criteria must be assessed.

Skill	Description
Reading skills to:	interpret work instructions, technical drawing details and OHS requirements for work area
Oral communication skills to:	request advice and clarification on machining tasks and operation
Numeracy skills to:	take and check measurements, perform basic calculations and estimations
Learning skills to:	safely carry out basic machine tasks in an engineering work environment
Planning and organising skills to:	prepare a work plan which sequences a range of engineering tasks to achieve a work piece which conforms with job instructions

Unit Mapping Information	Code and Title Current Version	Code and Title Previous Version	Comments
	VU23478 Perform basic machining processes	VU22331 Perform basic machining processes	Equivalent

## Assessment Requirements

<b>Title</b>	Assessment Requirements for: <b>VU23478 Perform basic machining processes</b>
<b>Performance Evidence</b>	<p>There must be evidence the learner has completed the tasks outlined in the elements, performance criteria and foundation skills of this unit and have demonstrated the ability to:</p> <ul style="list-style-type: none"> <li>• prepare work plan, safely set up and perform basic machining tasks consistent with work instructions and technical specification on at least two (2) occasions each with a different type of machine.</li> </ul>
<b>Knowledge Evidence</b>	<p>The learner must be able to demonstrate essential knowledge required to effectively do the task outlined in elements and performance criteria of this unit, manage the task and manage contingencies in the context of the work role. This includes knowledge of:</p> <ul style="list-style-type: none"> <li>• relevant occupational health and safety (OHS) regulation and safe work practices in an engineering workshop environment</li> <li>• personal protective equipment (PPE)</li> <li>• safe use of hand tools and hand held power tools</li> <li>• types of machines and their function</li> <li>• common materials used in the manufacturer of engineering components</li> <li>• safe operation of individual machines including but not limited to:             <ul style="list-style-type: none"> <li>○ planning and sequencing machining operations</li> <li>○ marking out of materials using appropriate marking medium and tools</li> <li>○ selecting and applying clamping devices for holding work piece</li> <li>○ mounting and positioning cutting tools</li> <li>○ calculating and adjusting machine settings such as speed and feed</li> <li>○ selecting and using lubricant</li> </ul> </li> <li>• cutting and grinding a range of materials</li> <li>• types of grinding wheel dressers and procedures for wheel dressing</li> <li>• techniques and tools for measuring and marking out materials for machining processes</li> <li>• environmental consideration and disposal of engineering workshop waste.</li> </ul>
<b>Assessment Conditions</b>	<p>Both practical skills and knowledge must be assessed. Simulated assessment environments must replicate a real-life working environment with access to:</p> <ul style="list-style-type: none"> <li>• work instructions</li> <li>• relevant machinery, equipment, tools and resources</li> <li>• personal Protective equipment (PPE)</li> </ul> <p><b>Assessor requirements:</b></p> <p>No specialist vocational competency requirements for assessors apply to this unit.</p>

<b>Unit code</b>	<b>VU23479</b>
<b>Unit title</b>	<b>Apply basic fabrication techniques</b>
<b>Application</b>	<p>This unit describes the performance outcomes, skills and knowledge required to apply basic metal fabrication techniques.</p> <p>It requires the ability to set up and operate equipment used for fabrication processes and carry out assembly techniques.</p> <p>The unit also includes basic computations and marking out skills related to various fabrication processes.</p> <p>The unit applies to a person preparing for further study and/or employment in the manufacturing, engineering and related industries such as an apprenticeship.</p> <p>No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.</p>
<b>Pre-requisite Unit(s)</b>	Nil
<b>Competency Field</b>	N/A
<b>Unit Sector</b>	N/A

<b>Element</b>		<b>Performance Criteria</b>	
Elements describe the essential outcomes of a unit of competency.		Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the assessment requirements.	
1	Plan and set up for fabrication processes	1.1	Fabrication tasks are determined through work instructions and clarified with trainer/supervisor
		1.2	Occupational health and safety (OHS) requirements, and workplace safety procedures are identified and followed
		1.3	Relevant technical drawings and are obtained and interpreted
		1.4	Work plan is prepared identifying the sequencing of the fabrication tasks and equipment requirements
		1.5	Materials, resources required for the fabrication tasks are identified and obtained in accordance with workplace procedure
		1.6	Personal protective equipment (PPE) is selected, condition checked and fitted
		1.7	Hand tools required for the fabrication equipment and tasks are selected and checked for safe use
2	Perform measurements and calculation checks	2.1	Required outcomes are determined from work instructions and confirmed with trainer/supervisor
		2.2	Measurements, tolerances and numerical information are interpreted on the drawing/s

Unit code		VU23479	
		2.3	Calculations are made where required and checked for accuracy
		2.4	Material stock is marked out in accordance with calculations and/or drawing details and checked for accuracy
3	Conduct fabrication processes	3.1	Specific safety requirements are followed for each fabrication process
		3.2	Fabrication equipment is set up and operated in accordance with workplace procedure
		3.3	Fabrication processes are carried out in accordance with the sequencing of tasks in the work plan
		3.4	Work output is inspected for compliance with job specifications
		3.5	Any unexpected situations are safely dealt with and reported to the trainer/supervisor
4	Complete fabrication processes and clean work area	4.1	Final work piece/s is assembled and inspected for compliance with drawing specifications and job requirements
		4.2	Final work piece is presented to trainer/supervisor for inspection
		4.3	Fabrication equipment and surrounding work area is cleaned and waste removal is carried out in accordance with workplace environmental requirements
		4.4	Hand tools and PPE are checked, maintained where required and stored in accordance with workplace requirements

### Range of Conditions

Fabrication processes can be conducted in a technology teaching environment or a metal fabricating workshop.

Fabrication equipment may including but not limited to:

- metal bending machine
- guillotine
- pedestal drill
- metal shears
- nibblers
- pan brake
- rivet fastening equipment
- spot welder
- air riveters/nutserts tool
- air tapping machines

Fabrication processes includes but is not limited to:

### Range of Conditions

- marking
- cutting
- forming
- fastening
- soldering
- assembling

### Foundation Skills

Foundation skills essential to performance and *not explicit* in the performance criteria must be assessed.

Skill	Description
Reading skills to:	interpret work instructions, technical drawing details and OHS requirements for a technology work area
Oral communication skills to:	request advice and clarification on metal fabrication tasks and operation of equipment
Numeracy skills to:	take and check measurements, perform basic calculations to mark out a work piece
Learning skills to:	safely carry out basic metal fabrication processes in a technology environment
Planning and organising skills to:	prepare a work plan which sequences of a range of metal fabrication tasks to achieve a work piece which conforms with job instructions

Unit Mapping Information	Code and Title Current Version	Code and Title Previous Version	Comments
	VU23479 Apply basic fabrication techniques	VU22332 Apply basic fabrication techniques	Equivalent

## Assessment Requirements

<b>Title</b>	Assessment Requirements for: <b>VU23479 Apply basic fabrication techniques</b>
<b>Performance Evidence</b>	<p>There must be evidence the learner has completed the tasks outlined in the elements, performance criteria and foundation skills of this unit and demonstrate the ability to:</p> <ul style="list-style-type: none"> <li>• prepare work plan, set up for and perform basic fabrication techniques using at least three (3) different types of metal fabrication equipment</li> <li>• fabricated components are assembled consistent with work plan.</li> </ul>
<b>Knowledge Evidence</b>	<p>The learner must be able to demonstrate essential knowledge required to effectively do the task outlined in elements and performance criteria of this unit, manage the task and manage contingencies in the context of the work role. This includes knowledge of:</p> <ul style="list-style-type: none"> <li>• occupational health and safety (OHS) regulation and safe work practices in a machine workshop environment</li> <li>• personal protective equipment (PPE)</li> <li>• fabrication tools and machinery in common use</li> <li>• basic fabrication processes and techniques</li> <li>• safe use of hand tools and hand held power tools</li> <li>• common materials used for fabrication processes</li> <li>• workshop cleaning and engineering materials waste disposal requirements</li> <li>• formula applicable to the determination of perimeter, area and volume of simple geometric shapes</li> </ul>
<b>Assessment Conditions</b>	<p>Both practical skills and knowledge must be assessed. Simulated assessment environments must replicate a real life working environment with access to:</p> <ul style="list-style-type: none"> <li>• work instructions</li> <li>• metal fabrication equipment, tools and resources</li> <li>• personal protective equipment (PPE)</li> </ul> <p><b>Assessor requirements</b></p> <p>No specialist vocational competency requirements for assessors apply to this unit.</p>

<b>Unit code</b>	<b>VU23480</b>		
<b>Unit title</b>	<b>Perform intermediate engineering computations</b>		
<b>Application</b>	<p>This unit describes the performance outcomes, skills and knowledge required to prepare and apply intermediate level engineering computations.</p> <p>It requires the ability to obtain and interpret data from job instructions, technical drawings or other relevant sources to establish required outcomes, determine the appropriate calculation method to suit the application and perform calculations and confirm answers. The unit also includes producing and interpreting basic graphs and charts applicable to a manufacturing/engineering workplace.</p> <p>The unit applies to a person preparing for further study and/or employment in the manufacturing, engineering and related industries such as an apprenticeship.</p> <p>No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.</p>		
<b>Pre-requisite Unit(s)</b>	Nil		
<b>Competency Field</b>	N/A		
<b>Unit Sector</b>	N/A		
<b>Element</b>	<b>Performance Criteria</b>		
Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the assessment requirements.		
1	Determine job computation requirements	1.1	Job requirements are identified from work instructions, job sheet and/or technical drawings
		1.2	Required calculations are established to meet job requirements
		1.3	Calculations are made and checked for accuracy
2	Determine and apply required formulae and establish estimate	2.1	Relevant formulae to suit the job requirement is determined.
		2.2	An estimation of the expected results, including rounding off is undertaken
		2.3	Estimates are confirmed from the outcome of the applied formulae
3	Perform calculations as required by job requirements	3.1	Calculation method is selected to suit the application
		3.2	Calculations is completed to obtain accurate answer
		3.3	Answer is confirmed against initial estimation



<b>Unit code</b>		<b>VU23480</b>	
4	Prepare graphs and charts from given information	4.1	Data is gathered and transposed to produce a graph or chart
		4.2	Upper and lower limits of acceptability applicable to the data are determined
		4.3	Trend indicated by the added data is interpreted

### Range of Conditions

Calculations can be performed using one (1) or more of the following:

- pen and paper
- mathematical calculator
- tables
- tablet
- computer

### Foundation Skills

Foundation skills essential to performance and *not explicit* in the performance criteria must be assessed.

Skill	Description		
Reading skills to:	interpret work instructions, technical drawing details and other job related information to determined required engineering computation tasks		
Oral communication skills to:	request advice and clarification on computation tasks		
Planning and organising skills to:	ensure relevant computations are preformed and checked for accuracy before metal work operations are commence		
Unit Mapping Information	Code and Title Current Version	Code and Title Previous Version	Comments
	VU23480 Perform intermediate engineering computations	VU22333 Perform intermediate engineering computations	Equivalent

## Assessment Requirements

<b>Title</b>	Assessment Requirements for: <b>VU23480 Perform intermediate engineering computations</b>
<b>Performance Evidence</b>	<p>There must be evidence the learner has completed the tasks outlined in the elements, performance criteria and foundation skills of the unit:</p> <ul style="list-style-type: none"> <li>• This includes the ability to on at least (4) occasions: <ul style="list-style-type: none"> <li>○ obtain and interpret data from job instructions and/or relevant sources to establish required outcomes</li> <li>○ determine the appropriate calculation method to suit the application</li> <li>○ perform calculations and confirm answers.</li> </ul> </li> <li>• Produce one chart (1) and one (1) graph from given information <ul style="list-style-type: none"> <li>○ illustrate upper and lower limits and determine trend</li> </ul> </li> </ul>
<b>Knowledge Evidence</b>	<p>The learner must be able to demonstrate essential knowledge required to effectively do the task outlined in elements and performance criteria of this unit, manage the task and manage contingencies in the context of the work role. This includes knowledge of:</p> <ul style="list-style-type: none"> <li>• formulae applicable to the determination of perimeter, area and volume of simple geometric shapes</li> <li>• techniques and procedures for rounding off figures when estimating approximate answers</li> <li>• features and use of mixed numbers, decimals, fractions and whole numbers</li> <li>• procedures for carrying out calculations involving fractions and using each of the four basic rules of addition, subtraction, multiplication and division</li> <li>• concept of percentage and procedures to be followed in converting a decimal and fraction to a percentage</li> <li>• concepts and calculations of ratio and proportion.</li> <li>• applications of graphs and charts in the manufacturing and engineering industries</li> <li>• preparing and interpreting graphs and charts</li> <li>• trigonometry: <ul style="list-style-type: none"> <li>○ basic functions, e.g. trigonometry ratios</li> <li>○ sine rule</li> <li>○ cosine rule</li> </ul> </li> <li>• Pythagoras theorem</li> </ul>
<b>Assessment Conditions</b>	<p>Both practical skills and knowledge must be assessed with access to:</p> <ul style="list-style-type: none"> <li>• technology training or workplace environment</li> <li>• work/job instructions, drawings and relevant specifications</li> <li>• pen and paper and/or electronic calculating devices.</li> </ul>

## Assessment Requirements

### Assessor requirements

No specialist vocational competency requirements for assessors apply to this unit.

<b>Unit code</b>	<b>VU23482</b>		
<b>Unit title</b>	<b>Produce basic engineering components and products using fabrication and machining operations</b>		
<b>Application</b>	<p>This unit describes the performance outcomes, skills and knowledge required to produce basic engineering components and products using fabrication and machining operations.</p> <p>It requires the ability to identify the required manufacturing method/s, plan the operations, prepare materials and tooling, produce and assemble components.</p> <p>The unit applies to a person working at entry level in the manufacturing, and engineering industries undertaking a range of well-defined tasks.</p> <p>No licensing, legislative, regulatory or certification requirements apply to this unit of competency at the time of publication.</p>		
<b>Pre-requisite Unit(s)</b>	<p>VU23478 Perform basic machining processes</p> <p>VU23479 Apply basic fabrication techniques</p>		
<b>Competency Field</b>	N/A		
<b>Unit Sector</b>	N/A		
<b>Element</b>	<b>Performance Criteria</b>		
Elements describe the essential outcomes of a unit of competency.		Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the assessment requirements.	
1	Plan to produce basic engineering components or products	1.1	Occupational health and safety (OHS) requirements, and workplace safety procedures are identified and followed
		1.2	Job requirements and specifications are determined through work instructions and clarified with trainer/supervisor
		1.3	Relevant technical drawings are selected
		1.4	Work plan is prepared identifying the sequence of operations, resources required and confirmed with trainer/supervisor
		1.5	Personal protective equipment (PPE) is selected, condition checked and fitted
2	Prepare materials and equipment	2.1	Materials and resources required for each operation are obtained in accordance with workplace procedure
		2.2	Hand tools and accessories are selected and checked for safe use
		2.3	Machines and fabrication equipment required are checked and set up for safe operation
3	Perform measure and	3.1	Measurements, tolerances and numerical information is interpreted from the drawing/s

Unit code		VU23482	
	calculation checks	3.2	Calculations are made where required and checked for accuracy
		3.3	Material stock to be machined or formed is marked out in accordance with calculations and/or drawing details and checked for accuracy
4	Machine and form basic engineering components or products	4.1	Safe work practices are applied throughout the cutting, machining and fabricating operations
		4.2	Machines and fabricating equipment are set up, material stock is secured where required and each operation is carried out in accordance with the work plan
		4.3	Unexpected situations if any, are safely dealt with and reported to the trainer/supervisor
		4.4	Regular quality checks are made throughout the manufacturing process
		4.5	Component quality issues are identified and rectified
5	Assemble basic engineering components or products	5.1	Assembly tools and equipment for the task are selected and working order checked
		5.2	Components are assembled using basic assembly and joining techniques
		5.3	Assembly is checked for operational performance and compliance with job specifications
6	Complete work and clean work area	6.1	Completed work is reported to the trainer/supervisor in accordance with workplace procedures
		6.2	Work area cleaning and removal of waste is conducted in line with workplace environmental requirements
		6.3	Machines, fabrication equipment, tools and PPE are checked, maintained where required and stored in accordance with workplace requirements

### Range of Conditions

Machining and fabrication operations can be conducted in a technology teaching environment or an enterprise machine shop.

Machines may include but not limited to:

- metalwork lathe
- milling machine
- cut off saw
- pedestal grinder
- fixed position drilling machine

Machining operations may include but not limited to:

- turning
- milling

### Range of Conditions

- grinding
- drilling
- cutting

Fabrication equipment may include but not limited to:

- metal bending machine
- guillotine
- pedestal drill
- metal shears
- nibblers
- pan brake
- rivet fastening equipment

Fabrication operations may include but is not limited to:

- marking
- cutting
- forming
- fastening
- soldering
- assembling

Assembly and joining may include but not limited to:

- fastenering
- riveting
- soldering
- spot welding
- glueing

### Foundation Skills

Foundation skills essential to performance and *not explicit* in the performance criteria must be assessed.

Skill	Description
Reading skills to:	interpret work instructions, technical drawing details and OHS requirements for work tasks
Oral communication skills to:	request advice and assistance regarding fabrication and machining operations
Numeracy skills to:	take and check measurements, preform basic calculations and estimations
Learning skills to:	safely operate fabrication equipment and static machines to make engineering components
Planning and organising skills to:	prepare a work plan which sequences a range of engineering tasks to achieve a work piece which conforms with job instructions

Range of Conditions

Unit Mapping Information	Code and Title Current Version	Code and Title Previous Version	Comments
	VU23482 Produce basic engineering components and products using fabrication and machining operations	VU22334 Produce basic engineering components and products using fabrication and machining operations	Equivalent

### Assessment Requirements Template

<b>Title</b>	Assessment Requirements for: <b>VU23482 Produce basic engineering components and products using fabrication and machining operations</b>
<b>Performance Evidence</b>	<p>There must be evidence the learner has completed the tasks outlined in the elements, performance criteria and foundation skills of this unit and have demonstrated on at least one (1) occasion the ability to :</p> <ul style="list-style-type: none"> <li>• plan and sequence the production of components or products using basic machining, fabrication operations and assembly techniques</li> <li>• produce basic engineering components or products using machining, fabrication operations and assembling techniques to meet job specifications and requirements.</li> </ul>
<b>Knowledge Evidence</b>	<p>The learner must be able to demonstrate essential knowledge required to effectively do the task outlined in elements and performance criteria of this unit, manage the task and manage contingencies in the context of the work role. This includes knowledge of:</p> <ul style="list-style-type: none"> <li>• occupational health and safety (OHS) regulations and safe work practices in an engineering workshop environment</li> <li>• personal protective equipment (PPE)</li> <li>• types and basic properties of materials used in the manufacturer of engineering components</li> <li>• marking tools and measuring equipment for fabrication tasks</li> <li>• types of fabrication equipment and their application</li> <li>• engineering computation for machining and fabrication operations</li> <li>• operation and maintenance of machining and fabrication equipment</li> <li>• assembly and fastening techniques</li> <li>• types and application of jigs, fixtures and clamping devices</li> <li>• safe use of hand tools and hand held power tools</li> <li>• environmental consideration for disposal of engineering workshop waste.</li> </ul>
<b>Assessment Conditions</b>	<p>Both practical skills and knowledge must be assessed. Simulated assessment environment must replicate a real engineering working environment with access to:</p> <ul style="list-style-type: none"> <li>• work instructions and job specifications</li> <li>• component raw materials and resources</li> <li>• relevant machinery and fabrication equipment</li> <li>• hand tools and hand held power tools</li> <li>• personal protective equipment (PPE)</li> </ul> <p><b>Assessor requirements:</b></p> <p>No specialist vocational competency requirements for assessors apply to this unit.</p>



<b>Unit code</b>	<b>VU23483</b>		
<b>Unit title</b>	<b>Perform metal machining operations</b>		
<b>Application</b>	<p>This unit describes the performance outcomes, skills and knowledge required to produce engineering components or products by metal machining operations such as cutting, grinding, milling and turning.</p> <p>It requires the ability to define component specifications from work instructions and technical drawings, determining the required machine operations, planning and sequencing the machining tasks.</p> <p>The unit applies to a person working at entry level in the manufacturing, and engineering industries undertaking a range of well-defined machining tasks.</p> <p>No licensing, legislative, regulatory or certification requirements apply to this unit of competency at the time of publication.</p>		
<b>Pre-requisite Unit(s)</b>	VU23478 Perform basic machining processes		
<b>Competency Field</b>	N/A		
<b>Unit Sector</b>	N/A		
<b>Element</b>	<b>Performance Criteria</b>		
Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the assessment requirements.		
1	Plan for machining operation	1.1	Occupational health and safety (OHS) requirements, and workplace safety procedures are identified and followed
		1.2	Documentation including work instructions, technical drawing/s and component/product specifications are accessed and clarified with trainer/supervisor
		1.3	Work plan is prepared identifying the sequence of each machining operation and confirmed with trainer/supervisor
		1.4	Material stock and resources required for the machining tasks are identified and obtained in accordance with workplace procedure
		1.5	Personal protective equipment (PPE) is selected and checked and fitted
		1.6	Hand tools required for machine set up are selected and checked for safe use
2	Prepare material stock and select machines	2.1	Measurements, tolerances and numerical information is interpreted from the drawing/s and job specifications
		2.2	Calculations are made where required and checked for accuracy

Unit code		VU23483	
		2.3	Material stock to be machined is marked out in accordance with calculations and/or drawing details and checked for accuracy
		2.4	Machine tooling and accessories are selected and set up for the each operation
3	Perform machining operations	3.1	Safe work practices are applied throughout each machining operation
		3.2	Each machine is set up in according to workplace procedure
		3.3	Cutting lubricant is selected and used as required for the machining operations
		3.4	Material stock is secured in each machine in accordance with operating procedures
		3.5	Machine feed and speed are set and machining operation is carried out in a manner that optimises tool life
		3.6	Any unexpected situations are safely dealt with and reported to the trainer/supervisor
4	Complete machining operations	4.1	On completion of each machining operation the machine is shut down in accordance with workplace procedure
		4.2	Work piece is inspected and checked for compliance with specifications and job requirements
		4.3	Any non-compliance is reported to trainer/supervisor and corrective action is determined and implemented
		4.4	Final work piece is presented to trainer/supervisor for inspection
5	Clean work area	5.2	Work area is cleaned and removal of waste is conducted in line with workplace environmental requirements
		5.3	Machine cutting tools, hand tools and PPE are checked, maintained where required and stored in accordance with workplace requirements.

### Range of Conditions

Machining processes can be conducted in a technology teaching environment or an enterprise machine shop.

Machining operations may include but not limited to:

- cutting
- turning
- milling
- grinding
- knurling
- boring
- reaming

### Range of Conditions

- thread cutting
- drilling

### Foundation Skills

Foundation skills essential to performance and *not explicit* in the performance criteria must be assessed.

Skill	Description
Reading skills to:	interpret work instructions, technical drawing details and OHS requirements for work area
Oral communication skills to:	request advice and clarification on machining operations using correct workplace terminology
Numeracy skills to:	take and check measurements, perform calculations and estimations
Learning skills to:	safely carry out machining operations in a technology environment
Planning and organising skills to:	prepare a work plan which sequences of a range of engineering tasks to achieve a work piece which conforms with job instructions

Unit Mapping Information	Code and Title Current Version	Code and Title Previous Version	Comments
	VU23483 Perform metal machining operations	VU22335 - Perform metal machining operations	Equivalent

### Assessment Requirements Template

<b>Title</b>	Assessment Requirements for: <b>VU23483 Perform metal machining operations</b>
<b>Performance Evidence</b>	<p>There must be evidence the learner has completed the tasks outlined in the elements, performance criteria and foundation skills of this unit and have demonstrated the ability to:</p> <ul style="list-style-type: none"> <li>Plan, sequence the tasks and produce engineering components or products to meet job specifications which includes setting up and operating at least three (3) different types of machines</li> </ul>
<b>Knowledge Evidence</b>	<p>The learner must be able to demonstrate essential knowledge required to effectively do the task outlined in elements and performance criteria of this unit, manage the task and manage contingencies in the context of the work role. This includes knowledge of:</p> <ul style="list-style-type: none"> <li>identifying components of machinery used for cutting, grinding, drilling and turning operations</li> <li>capabilities and safe operating parameters for cutting machines, grinding machines, drilling machines and centre lathes</li> <li>factors influencing feeds and speeds and depth of cut or material removal when operating a centre lathe</li> <li>machining used for other metal operations such as: boring, reaming, knurling, thread cutting</li> <li>principles of chip formation and control for centre lathe operation</li> <li>cutting fluids and coolants and their application for machining operations</li> <li>basic maintenance requirements of cutting, grinding, drilling machines and centre lathes</li> <li>hand tools and hand held power tools used in conjunction with machining operations</li> <li>care and fitting of personal protective equipment (PPE)</li> <li>safe work practices and procedures including hazards and risk control measures applicable to an engineering workshop environment.</li> </ul>
<b>Assessment Conditions</b>	<p>Both practical skills and knowledge must be assessed. Simulated assessment environments must replicate real engineering workplace conditions with access to:</p> <ul style="list-style-type: none"> <li>work instructions and job specifications</li> <li>component raw materials and resources</li> <li>range of metal machinery and supporting equipment</li> <li>hand tools and hand held power tools</li> <li>personal protective equipment (PPE)</li> </ul> <p><b>Assessor requirements:</b></p> <p>No specialist vocational competency requirements for assessors apply to this unit.</p>

<b>Unit code</b>	<b>VU23484</b>		
<b>Unit title</b>	<b>Perform metal fabrication operations</b>		
<b>Application</b>	<p>This unit describes the performance outcomes, skills and knowledge required to perform various fabrication operations such as cutting, forming, bending and shaping to produce components and/or products.</p> <p>It requires the ability to identify the required manufacturing methods, planning the operations, preparing materials and equipment, producing and assembling components.</p> <p>The unit applies to a person working at entry level in the manufacturing, and engineering industries undertaking a range of well-defined fabrication and assembly operations.</p> <p>No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.</p>		
<b>Pre-requisite Unit(s)</b>	VU23479 Apply basic fabrication techniques		
<b>Competency Field</b>	N/A		
<b>Unit Sector</b>	N/A		
<b>Element</b>	<b>Performance Criteria</b>		
Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the assessment requirements.		
1	Plan and set up for fabrication operations	1.1	Occupational health and safety (OHS) requirements, and workplace safety procedures are identified and followed
		1.2	Documentation including work instructions, job sheets technical drawings, and component/product specifications are clarified with trainer/supervisor
		1.3	Work plan identifying the sequencing of the fabrication operations and the resources required for each is prepared and confirmed with trainer/supervisor
		1.4	Personal protective equipment (PPE) is selected, condition checked and fitted
		1.5	Hand tools required for the fabrication equipment and tasks are selected and checked for safe use
2	Prepare materials and select equipment	2.1	Materials and resources are obtained in accordance with workplace procedure and checked as fit for purpose
		2.2	Calculations are made as required and component materials are marked out with appropriate allowances and tolerances for cutting, forming, bending and assembly operations
		2.3	Fabrication equipment is set up according to manufacturer instructions and safe operating procedures

Unit code		VU23484	
3	Fabricate components and/or parts	3.1	Safe work practices and procedures are followed and hazard control measures implemented where practicable
		3.2	Component materials are secured or clamped according to workplace practices
		3.3	Cutting, forming, bending and shaping tasks are performed in line with work plan and job specifications
		3.4	Work pieces are inspected at regular intervals for compliance with job specifications using appropriate measuring equipment
		3.5	Non-compliance is reported to trainer/supervisor and corrective action is implemented
4	Assemble fabricated components and/or parts	4.1	Tools and equipment are selected and prepared for assembly operations
		4.2	Components and/or parts are assembled using selected assembly operations
		4.3	Assembly is checked for operational performance and compliance with job specifications
5	Complete fabrication operations and clean work area	5.1	Final work piece is presented to trainer/supervisor for inspection
		5.2	Fabrication equipment and surrounding work area is cleaned and waste removal is carried out in accordance with workplace environmental requirements
		5.3	Hand tools and PPE are checked, maintained where required and stored in accordance with workplace requirements

## Range of Conditions

Fabrication operations can be conducted in a technology teaching environment or a metal fabricating workshop.

Fabrication equipment may including but not limited to:

- forming, shaping and bending equipment:
  - universal plate clamps
  - rolling and forming machine
  - pyramid and pinch rollers
  - folding and pressing machine
  - sheet metal press-brake and pan brake
- cutting equipment:
  - fixed:
    - band saw/power hack saw
    - guillotine
    - bench folder/press
    - shear crop and punch machine
    - pedestal grinder
    - pedestal drill
  - hand held:
    - nibbler
    - nibblers/notches
    - punches
    - shears
    - grinders
    - drills
- fastening equipment
  - air riveters/nutserts tool
  - air tapping machines
- spot welder

## Foundation Skills

Foundation skills essential to performance and *not explicit* in the performance criteria must be assessed.

Skill	Description
Reading skills to:	interpret work instructions, technical drawing details and OHS requirements for a technology work area
Oral communication skills to:	request advice and clarification on metal fabrication tasks and operation of equipment using correct industry terminology
Numeracy skills to:	take and check measurements, preform basic calculations and estimations to mark out work pieces
Learning skills to:	safely carry out basic metal fabrication operations in a technology environment

**Range of Conditions**

Planning and organising skills to:	prepare a work plan which sequences of a range of metal fabrication tasks to achieve a work piece which conforms with job specifications
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<b>Unit Mapping Information</b>	Code and Title Current Version	Code and Title Previous Version	Comments
	VU23484 Perform metal fabrication operations	VU22336 Perform metal fabrication operations	Equivalent



### Assessment Requirements Template

<p><b>Title</b></p>	<p>Assessment Requirements for: <b>VU23484 Perform metal fabrication operations</b></p>
<p><b>Performance Evidence</b></p>	<p>There must be evidence the learner has completed the tasks outlined in the elements, performance criteria and foundation skills of this unit and demonstrate the ability to:</p> <ul style="list-style-type: none"> <li>• plan and sequence the production of metal components or products using at least three (3) fabrication operations such as cutting, forming, bending and shaping techniques</li> <li>• fabricate and assemble metal components and/or products to conform with quality requirements and job specifications.</li> </ul>
<p><b>Knowledge Evidence</b></p>	<p>The learner must be able to demonstrate essential knowledge required to effectively do the task outlined in elements and performance criteria of this unit, manage the task and manage contingencies in the context of the work role. This includes knowledge of:</p> <ul style="list-style-type: none"> <li>• occupational health and safety (OHS) regulation and safe work practices in a metal fabrication workshop environment</li> <li>• care and fitting of personal protective equipment (PPE)</li> <li>• metal fabrication equipment and techniques and operations</li> <li>• sequencing metal fabrication operations</li> <li>• marking out medium for fabrication operations</li> <li>• calculations for fabrication operations</li> <li>• bend allowance/neutral axis</li> <li>• common materials used for fabricated component and parts</li> <li>• hand tools, hand held power tools and measuring equipment used in fabrication operations</li> <li>• metal joining methods</li> <li>• component assembly techniques</li> <li>• workshop cleaning, safe and environmental considerate waste disposal procedures</li> </ul>
<p><b>Assessment Conditions</b></p>	<p>Both practical skills and knowledge must be assessed. Simulated assessment environments must replicate a real metal fabrication workplace conditions with access to:</p> <ul style="list-style-type: none"> <li>• documentation such as work instructions/job specifications, technical drawings</li> <li>• component/product raw metals</li> <li>• metal fabrication equipment and resources</li> <li>• hand tools and hand held power tools</li> <li>• personal protective equipment (PPE)</li> </ul> <p><b>Assessor requirements</b></p> <p>No specialist vocational competency requirements for assessors apply to this unit.</p>

<b>Unit code</b>	<b>VU23485</b>		
<b>Unit title</b>	<b>Perform basic welding and thermal cutting processes</b>		
<b>Application</b>	<p>This unit describes the performance outcomes, skills and knowledge required to perform:</p> <ul style="list-style-type: none"> <li>• basic welding using manual metal arc welding (MMAW) and basic welding using gas metal arc welding (GMAW)</li> <li>• basic thermal cutting using fuel gas equipment</li> </ul> <p>It requires the ability to identify welding and thermal cutting equipment and consumables, prepare materials and equipment for welding and thermal cutting processes and apply safe welding and thermal cutting practices.</p> <p>The unit applies to a person working at entry level in the manufacturing, and engineering industries undertaking a range of well-defined welding and thermal cutting tasks.</p> <p>No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.</p>		
<b>Pre-requisite Unit</b>	VU23479 Apply basic fabrication techniques		
<b>Competency Field</b>	N/A		
<b>Unit Sector</b>	N/A		
<b>Element</b>	<b>Performance Criteria</b>		
Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the assessment requirements.		
1 Prepare and set up for welding and thermal cutting tasks	1.1	Relevant occupational health and safety (OHS) requirements and safe work practices for a welding and thermal cutting work environment are identified and followed	
	1.2	Welding and thermal cutting tasks are determined from work instructions and clarified with the trainer/supervisor	
	1.3	Personal protective equipment (PPE) is selected, condition checked and fitted	
	1.4	Hand tools and consumables required for the welding and thermal cutting tasks are selected and checked for safe use	
	1.5	Welding and thermal cutting equipment is set up according to operational requirements	
2 Perform routine welding using MMAW and GMAW	2.1	Safe work practices and procedures for a welding environment are applied	
	2.2	Equipment adjustments are made using standard operating procedures	

Unit code		VU23485	
		2.3	Materials are welded in accordance with work instructions
		2.4	Welds are cleaned according to standard operating procedures
		2.5	Completed work piece/s is checked for conformance with work instructions
		2.6	Any unexpected work situations are reported to and resolved with trainer/supervisor
3	Perform thermal cutting	3.1	Safe thermal cutting practices and procedures are applied
		3.2	Equipment adjustments are made using standard operating procedures
		3.3	Appropriate cutting allowances are made to ensure materials are used in the most economical way
		3.4	Cutting process and procedure appropriate for the material used are applied
4	Complete work requirements	4.1	Welds and thermal cutting work are inspected and defects and causes are identified
		4.2	Completed work is presented to trainer/supervisor for inspection
		4.3	Welding and thermal cutting equipment and hand tools are cleaned, inspected and stored in accordance with workplace procedure
		4.4	Unused consumables are stored in accordance with workplace requirements
		4.5	Work area is cleaned and waste is disposed of in accordance with workplace environmental requirements

### Range of Conditions

Welding is routine and the weld quality is not required to meet an Australian Standard. Fillet and butt welds would typically be performed on low carbon/mild steels. Thermal cutting is manual straight line cutting.

### Foundation Skills

Foundation skills essential to performance and *not explicit* in the performance criteria must be assessed.

Skill	Description
Reading skills to:	interpret work instructions and OHS requirements for a technology work area
Oral communication skills to:	discuss factors that may affect welding and thermal cutting task performance with trainer/supervisor using correct industry terminology

**Range of Conditions**

Numeracy skills to:	calculate appropriate cutting allowances to ensure materials are used in the most economical way make equipment sitting and adjustments to facilitate work requirements
Learning skills to:	set up and safely carry out basic MMAW and GMAW welding and thermal cutting tasks in accordance to work instructions

<b>Unit Mapping Information</b>	Code and Title Current Version	Code and Title Previous Version	Comments
	VU23485 Perform basic welding and thermal cutting processes	VU22337 Perform basic welding and thermal cutting processes to fabricate engineering structures	Equivalent

### Assessment Requirements Template

<b>Title</b>	Assessment Requirements for: <b>VU23485 Perform basic welding and thermal cutting processes</b>
<b>Performance Evidence</b>	<p>There must be evidence the learner has completed the tasks outlined in the elements, performance criteria and foundation skills of this unit and demonstrate the ability to:</p> <ul style="list-style-type: none"> <li>• set up and perform welding tasks using manual metal arc welding (MMAW) and gas metal arc welding (GMAW) equipment to complete work requirements on at least two (2) occasions for each welding process</li> <li>• set up and perform thermal cutting tasks according to work instructions on at least two (2) occasions</li> </ul>
<b>Knowledge Evidence</b>	<p>The learner must be able to demonstrate essential knowledge required to effectively do the task outlined in elements and performance criteria of this unit, manage the task and manage contingencies in the context of the work role. This includes knowledge of:</p> <ul style="list-style-type: none"> <li>• occupational health and safety (OHS) and safe work practices in a welding/thermal cutting workplace including the use of personal protective equipment (PPE)</li> <li>• manual metal arc welding (MMAW) and gas metal arc welding (GMAW) equipment and processes which includes: <ul style="list-style-type: none"> <li>○ different current and voltage settings, consumables and other variable to suit each welding process</li> <li>○ materials and process preparation</li> <li>○ welding consumables</li> <li>○ equipment set-up</li> <li>○ hand and hand held power tools used in conjunction with welding process</li> <li>○ basic properties and characteristics of common joining metal materials</li> <li>○ weld characteristics and post-welding treatment</li> </ul> </li> <li>• thermal cutting processes which include: <ul style="list-style-type: none"> <li>○ fuel gas properties and applications</li> <li>○ materials commonly used</li> <li>○ equipment, accessories and assembly procedures</li> <li>○ cutting skills including allowances and reasons for applying them</li> <li>○ minimising material wastage</li> <li>○ cutting defects and their causes</li> </ul> </li> </ul>
<b>Assessment Conditions</b>	<p>Both practical skills and knowledge must be assessed. Simulated assessment environments must replicate a real metal fabrication workplace conditions with access to:</p> <ul style="list-style-type: none"> <li>• documentation such as work and equipment set up instructions</li> <li>• MMAW and GMAW welding and thermal cutting equipment, materials and consumables</li> </ul>

### Assessment Requirements Template

- hand tools
- personal protective equipment (PPE)

#### **Assessor requirements**

No specialist vocational competency requirements for assessors apply to this unit.

<b>Unit code</b>	<b>VU23486</b>		
<b>Unit title</b>	<b>Configure and program a basic robotic system</b>		
<b>Application</b>	<p>This unit describes the performance outcomes, skills and knowledge required to configure and program a basic robotic system.</p> <p>It requires the ability to configure and program for typical tasks for basic robotic system operation which includes pick and place, motion and navigation. Code development will include testing code and producing code to control the robotic system.</p> <p>The unit applies to a person preparing for further study and/or employment in the manufacturing, engineering and related industries such as an apprenticeship.</p> <p>No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.</p>		
<b>Pre-requisite Unit</b>	N/A		
<b>Competency Field</b>	N/A		
<b>Unit Sector</b>	N/A		
<b>Element</b>	<b>Performance Criteria</b>		
Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the assessment requirements.		
1	Plan the configuration and programming of a basic robotic system	1.1	Relevant occupational health and safety (OHS) requirements and safe work practices for engineering work environment are identified and applied
		1.2	Routine tasks that can be performed by a robotic system are analysed and discussed with trainer/supervisor
		1.3	Robotic system configuration and programming requirements are determined from documentation, construction briefs and confirmed with trainer/supervisor
		1.4	Hand tools and equipment required for the construction and programming task are identified and accessed
2	Configure and program a robotic system	2.1	Robotic system is assembled in accordance with manufacturers' instructions and safe work practices
		2.2	Robotic system is configured and programmed for the intended tasks in accordance to manufacturer's instructions
		2.3	Robotic system is tested for correct operation and, if required, systematic fault finding is applied to identify and rectified hardware and/or software malfunction/s
		2.4	Decisions for dealing with unexpected situations are made from discussions with trainer/supervisor and job specifications

Unit code		VU23486	
3	Verify and document robotic system	3.1	Robotic system overall function and requirements are verified, documented and information stored in accordance with workplace requirements
		3.2	Trainer/supervisor is informed of the completed robotic system and provided with a demonstration of its operation
		3.3	Hand tools and equipment used to assemble, configuration and program the robotic system are maintained and stored in accordance with workplace procedure

### Range of Conditions

This unit does not include large, complex industrial robotic systems normally found in manufacturing operations.

### Foundation Skills

Foundation skills essential to performance and *not explicit* in the performance criteria must be assessed.

Skill	Description
Reading skills to:	interpret work instructions, robotic manual technical drawing details and OHS requirements for a technology work area
Oral communication skills to:	discuss robotic configuration and programming issues with trainer/supervisor
Problem-solving skills to:	systematically apply fault finding process to identify and rectified robotic hardware and/or software malfunction/s
Digital skills to:	successfully navigate digital software to facilitate robotic system operations

Unit Mapping Information	Code and Title Current Version	Code and Title Previous Version	Comments
	VU23486 Configure and program a basic robotic system	VU22338 Configure and program a basic robotic system	Equivalent



### Assessment Requirements Template

<b>Title</b>	Assessment Requirements for: <b>VU23486 Configure and program a basic robotic system</b>
<b>Performance Evidence</b>	<p>There must be evidence the learner has completed the tasks outlined in the elements, performance criteria and foundation skills of this unit and demonstrate the ability to on least one (1) occasion:</p> <ul style="list-style-type: none"> <li>• construct, configure and program a robotic system to perform basic routine tasks including pick and place, motion and navigation using appropriate hardware and software tools</li> <li>• test and rectify robotic system to achieve optimum performance of the routine tasks</li> </ul>
<b>Knowledge Evidence</b>	<p>The learner must be able to demonstrate essential knowledge required to effectively do the task outlined in elements and performance criteria of this unit, manage the task and manage contingencies in the context of the work role. This includes knowledge of:</p> <ul style="list-style-type: none"> <li>• types of robotic devices including mobile robots; autonomous robots; robotic arms</li> <li>• robot axis and degrees of movement</li> <li>• robot power requirements and movement e.g. stationary robots with mains derived power; mobile robots with batteries; battery duration and recharging</li> <li>• direct current (DC) motor types including permanent magnet DC motors; brushed motors; brushless motors; stepping motor</li> <li>• DC motor controls including speed control (pulse width modulation); forward and reverse control; 'H' drive</li> <li>• positional feedback and servo systems including potentiometers; encodes (incremental and absolute)</li> <li>• solenoid actuators</li> <li>• input basic transducers including switches; potentiometers; infra-red (IR) sensors; ultra-sonic sensors</li> <li>• robot electronics fundamentals including central processing unit (CPU)/controller; input interfaces, analogue, digital; output interfaces, analogue, digital, drive capabilities protection</li> <li>• drive mechanisms including gearboxes; belts; chains</li> <li>• robot construction materials including metal; wood; plastics; composites</li> <li>• downloadable interfaces</li> <li>• program code including input statements; output statements; logical operators</li> <li>• code download including programming interfaces; isolation; programming mode; operational mode.</li> </ul>
<b>Assessment Conditions</b>	<p>Both practical skills and knowledge must be assessed in a technology training environment or workplace with access to:</p> <ul style="list-style-type: none"> <li>• documentation such as work instructions/robotic construction manuals, technical drawings diagnosis flowchart</li> </ul>

### Assessment Requirements Template

- robotic system hardware and software
- hand tools and equipment
- personal protective equipment (PPE)

#### **Assessor requirements**

No specialist vocational competency requirements for assessors apply to this unit.

<b>Unit code</b>	<b>VU23487</b>		
<b>Unit title</b>	<b>Create engineering drawings using a computer aided drafting system</b>		
<b>Application</b>	<p>This unit describes the performance outcomes, skills and knowledge required to produce two dimensional (2D) and three dimensional (3D) engineering drawings using a computer aided drafting (CAD) system.</p> <p>It requires the ability to use CAD software commands to generate drawing elements used in the development of a detailed drawings and familiarisation with the use of macros, menus, default settings and file management functions.</p> <p>The unit includes the engineering drafting conventions and requirements of Australian Standard for Technical Drawings - AS1100.</p> <p>The unit applies to a person working at entry level in the manufacturing, and engineering industries undertaking a range of well-defined drawing tasks using a CAD system.</p> <p>No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.</p>		
<b>Pre-requisite Unit</b>	VU23477 Interpret and prepare basic two and three dimensional engineering drawings		
<b>Competency Field</b>	N/A		
<b>Unit Sector</b>	N/A		
<b>Element</b>	<b>Performance Criteria</b>		
Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the assessment requirements.		
1 Prepare CAD system environment to complete work tasks	1.1	Drawing instructions and specifications and are obtained and clarified with trainer/supervisor	
	1.2	CAD system is started in accordance with system start - up procedure	
	1.3	Screen display areas and basis files are accessed using system menu and commands	
	1.4	Basic parameters of the system are set up for the given tasks	
2 Create and 2D and 3D drawings	2.1	2D and 3D drawings are developed using the features of the software and in accordance with work instructions and drafting conventions of AS1100	
	2.2	Dimensions, symbols and text are applied consistent with work instructions and drafting conventions of AS1100	
	2.3	Completed 2D and 3D drawings are checked for conformance to work instructions and conventions of the drafting standard and amended as required	

Unit code		VU23487	
3	Complete CAD operations and close down system	3.1	Drawing files are saved in accordance with the systems operating procedure
		3.2	Drawing files are exported in the required format for presentation
		3.3	CAD system is closed down in accordance with the systems close down procedure

### Range of Conditions

No conditions apply

### Foundation Skills

Foundation skills essential to performance and *not explicit* in the performance criteria must be assessed.

Skill	Description
Reading skills to:	interpret work instructions, CAD software manual and engineering drafting conventions - AS1100
Oral communication skills to:	clarify work instructions and seek advice on the application of the various features of the CAD system in use
Numeracy skills to:	convert full size dimensions to a scaled 2D/3D drawings
Digital skills to:	successfully navigate and operate CAD software to create 2D and 3D engineering drawings and manage files

Unit Mapping Information	Code and Title Current Version	Code and Title Previous Version	Comments
	VU23487 Create engineering drawings using a computer aided drafting system	VU22339 Create engineering drawings using computer aided systems	Equivalent

### Assessment Requirements Template

<b>Title</b>	Assessment Requirements for: <b>VU23487 Create engineering drawings using a computer aided drafting system</b>
<b>Performance Evidence</b>	<p>There must be evidence the learner has completed the tasks outlined in the elements, performance criteria and foundation skills of this unit and demonstrate the ability on at least two (2) occasions to:</p> <ul style="list-style-type: none"> <li>• start up, operate the functions and close down a CAD system to produce 2D and 3D drawings to conform with work instructions and engineering drafting conventions of AS1100.</li> </ul>
<b>Knowledge Evidence</b>	<p>The learner must be able to demonstrate essential knowledge required to effectively do the task outlined in elements and performance criteria of this unit, manage the task and manage contingencies in the context of the work role. This includes knowledge of:</p> <ul style="list-style-type: none"> <li>• functions and features of a CAD software system</li> <li>• screen display areas and their functions</li> <li>• reasons for basic parameters</li> <li>• drawing scales</li> <li>• basic system variables and their customisation</li> <li>• engineering drafting standards conventions including - AS1100</li> <li>• types of 3D projections</li> </ul>
<b>Assessment Conditions</b>	<p>Both practical skills and knowledge must be assessed in a technology teaching environment or workplace with access to:</p> <ul style="list-style-type: none"> <li>• documentation including: work instructions, CAD drafting software manual and AS1100</li> <li>• CAD hardware and software</li> </ul> <p><b>Assessor requirements</b></p> <p>No specialist vocational competency requirements for assessors apply to this unit.</p>

<b>Unit code</b>	<b>VU23488</b>		
<b>Unit title</b>	<b>Use 3D printing to create products</b>		
<b>Application</b>	<p>This unit describes the performance outcomes, skills and knowledge required to utilise a three dimensional (3D) printer to produce basic products</p> <p>It requires the ability to use 3D printing software applications, manipulate hardware and software features, manage files and directories, as well as file storage requirements and apply safe work practices in a technology environment.</p> <p>The unit applies to a person preparing for further study and/or employment in the manufacturing, engineering and related industries such as an apprenticeship.</p> <p>No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.</p>		
<b>Pre-requisite Unit</b>	N/A		
<b>Competency Field</b>	N/A		
<b>Unit Sector</b>	N/A		
<b>Element</b>	<b>Performance Criteria</b>		
Elements describe the essential outcomes of a unit of competency.		Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the assessment requirements.	
1	Determine the job requirements	1.1	Relevant occupational health and safety (OHS) requirements and safe work practices for a technology work environment are identified and followed
		1.2	3D printing process and operational requirements to produce a product are determined and clarified with trainer/supervisor
		1.3	Details and specifications of the product to be produced are determined and approved by trainer/supervisor
		1.4	3D printer suitable for the product being created and the material being used is selected
		1.5	Computer software that suits the type of 3D printing product being created 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 relational to product requirements
		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

Unit code		VU23488	
		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 examined to identify any faults and modified as required
		3.2	Product design is submitted to trainer/supervisor for approval and final adjustments to the 3D printing program are made
		3.3	Product is produced using 3D printing hardware and software applications and checked for any irregularities
		3.4	Computer files are saved and back-up copies are made using standard naming conventions and version control protocols in accordance with workplace requirements

### Range of Conditions

No range of conditions apply

### Foundation Skills

Foundation skills essential to performance and *not explicit* in the performance criteria must be assessed.

Skill	Description
Reading skills to:	interpret work instructions, technical drawing details and safe work practices in a technology work area
Oral communication skills to:	ask questions and seek advice on issues related to the operational requirements of the 3D printing process
Numeracy skills to:	Interpret and apply dimensions to create an image for 3D printing
Digital skills to:	successfully navigate and operate complex digital software to produce 3D printed products and manage files

Unit Mapping Information	Code and Title Current Version	Code and Title Previous Version	Comments
	VU23488 Use 3D printing to create products	VU22340 Use 3D printing to create products	Equivalent

## Assessment Requirements

<p><b>Title</b></p>	<p>Assessment Requirements for: <b>VU23488 Use 3D printing to create products</b></p>
<p><b>Performance Evidence</b></p>	<p>There must be evidence the learner has completed the tasks outlined in the elements, performance criteria and foundation skills of this unit and demonstrate the ability to:</p> <ul style="list-style-type: none"> <li>• use and manipulate 3D digital printing technology to develop and produce at least two (2) basic products to specification</li> <li>• manage 3D digital printing files and directories by applying standard naming conventions and version control protocols</li> </ul>
<p><b>Knowledge Evidence</b></p>	<p>The learner must be able to demonstrate essential knowledge required to effectively do the task outlined in elements and performance criteria of this unit, manage the task and manage contingencies in the context of the work role. This includes knowledge of:</p> <ul style="list-style-type: none"> <li>• 3D digital printing technology and applications</li> <li>• functions and features of a range of delivery platforms</li> <li>• materials suitable for 3D printing</li> <li>• stages in the production process from initial design through to finished product</li> <li>• issues and challenges in the context of creating 3D digital printed products</li> <li>• resources useful for the development and creation of 3D digital printed products</li> <li>• quality assurance considerations relevant to creation of 3D printed products</li> </ul>
<p><b>Assessment Conditions</b></p>	<p>Both practical skills and knowledge must be assessed. Assessment must be conducted in a workplace or a technology teaching environment with access to:</p> <ul style="list-style-type: none"> <li>• documentation such as work instructions/job specifications, technical drawings, equipment manuals, reference materials</li> <li>• 3D printing equipment and software</li> <li>• product consumables</li> <li>• hand tools</li> <li>• personal protective equipment (PPE)</li> </ul> <p><b>Assessor requirements</b></p> <p>No specialist vocational competency requirements for assessors apply to this unit.</p>



<b>Unit code</b>	<b>VU23481</b>
<b>Unit title</b>	<b>Apply occupational health and safety principles in an engineering environment</b>
<b>Application</b>	<p>This unit describes the performance outcomes, skills and knowledge required to apply occupational health and safety (OHS) principles in an engineering or similar work environment</p> <p>It requires the ability to follow safety procedures, read and interpret safety signs and symbols, identify hazards and apply risk control measures, use safe manual handling procedures and correctly select and fit personal protective equipment (PPE).</p> <p>The unit applies to a person working at entry level in an engineering or manufacturing workplace undertaking a range of well-defined tasks.</p> <p>No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.</p>
<b>Pre-requisite Unit</b>	Nil
<b>Competency Field</b>	N/A
<b>Unit Sector</b>	N/A

<b>Element</b>		<b>Performance Criteria</b>	
Elements describe the essential outcomes of a unit of competency.		Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the assessment requirements.	
1	Prepare for engineering work	1.1	Relevant workplace WHS/OHS safety regulations and procedures for the engineering work area are identified
		1.2	Responsibilities and duties of employees are determined
		1.3	Correct functionality of safety equipment and devices required for the work are checked in accordance with workplace procedure
		1.4	Safety and correct functionality of all tools and equipment required for the work are checked in accordance with workplace procedure
2	Apply OHS principles in the workplace	2.1	Actively participate in the consultation process with supervisor and other employees to identify hazards and implement and monitor control measures
		2.2	Personal protective equipment (PPE) is selected and fitted in accordance with manufacturer's and workplace requirements
		2.3	Safe work practices are applied in accordance with workplace policy and procedure

Unit code		VU23481	
		2.4	Safety equipment and devices are used in accordance with manufacturers' and workplace procedures
		2.5	Workplace safety signs/symbols are identified and followed
		2.6	Manual handling tasks are carried out in accordance with workplace procedure and Safe Work Australia recommendations
		2.7	Housekeeping tasks in work area are carried out in accordance with workplace procedure
		2.8	Emergency equipment is identified and application demonstrated in accordance manufacturer's instructions and workplace procedure
		2.9	Workplace procedures for dealing with emergencies such as accidents and fire are followed within scope of responsibility
3	Report and document OHS incidents	3.1	Accidents and incidents are reported in accordance with workplace procedure
		3.2	OHS incident is documented in accordance with workplace procedure

### Range of Conditions

No range of conditions apply

### Foundation Skills

Foundation skills essential to performance and *not explicit* in the performance criteria must be assessed.

Skill	Description
Reading skills to:	Interpret safety information, signs and symbols in an engineering environment
Writing skills to:	document an OHS incident in work environment in accordance with workplace procedure
Problem-solving skills to:	develop hazards control measures
Self-management skills to:	follow safety signs and work safely in an engineering environment

<b>Unit Mapping Information</b>	New unit no equivalent unit
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## Assessment Requirements

<b>Title</b>	Assessment Requirements for: <b>VU23481 Apply occupational health and safety principles in an engineering environment</b>
<b>Performance Evidence</b>	There must be evidence the learner has completed the tasks outlined in the elements, performance criteria and foundation skills of this unit and have demonstrated the ability to: <ul style="list-style-type: none"> <li>• select, fit, wear and store at least three (3) examples appropriate personal protective equipment (PPE)</li> <li>• follow safe work practices in the workplace</li> <li>• maintain a safe and clean work area</li> <li>• use at least two (2) examples of safety equipment and devices</li> <li>• apply manual handling principles</li> <li>• use emergency equipment correctly</li> <li>• identify least three (3) workplace hazards and recommend control measure/s for each</li> <li>• follow emergency and evacuation procedures</li> <li>• interpret and communicate information appropriate to OHS within the scope of this unit</li> <li>• identify and follow information given by at least three (3) safety signs and/or symbols</li> </ul>
<b>Knowledge Evidence</b>	The learner must be able to demonstrate essential knowledge required to effectively do the task outlined in elements and performance criteria of this unit, manage the task and manage contingencies in the context of the work role. This includes knowledge of: <ul style="list-style-type: none"> <li>• The basic legal requirements covering occupational health and safety in the workplace encompassing:                         <ul style="list-style-type: none"> <li>○ underlying principles of OHS</li> <li>○ general aims and objectives of the relevant state or territory legislation relating to OHS.</li> <li>○ employer and employee responsibilities, rights and obligation</li> </ul> </li> <li>• The work environment encompassing:                         <ul style="list-style-type: none"> <li>○ procedures used to control the risks associated with hazards</li> <li>○ principles of risk assessment / management and the purpose of each</li> <li>○ hierarchy of OHS hazard control measures</li> <li>○ required documentation for risk assessment.</li> <li>○ typical hazards associated with a range of engineering work environments                                 <ul style="list-style-type: none"> <li>- physical:   <ul style="list-style-type: none"> <li>• machinery</li> <li>• hot metal</li> <li>• electricity</li> <li>• fire</li> <li>• noise and vibration</li> <li>• extremes of temperature and humidity</li> <li>• condition/design of equipment</li> </ul> </li> <li>- individual (behavioural):   <ul style="list-style-type: none"> <li>• skylarking and foolishness</li> <li>• substance abuse</li> </ul> </li> </ul> </li> </ul> </li> </ul>

## Assessment Requirements

- failure to follow procedures
- lack of training or experience
- carelessness
- poor personal health/hygiene
- using the wrong techniques/procedures
- ignoring safety rules and signs
- taking short cuts
- knowingly using unsafe equipment
- environmental hazards:
  - explosive materials
  - flammable materials
  - poor ventilation
  - poor lighting
  - dust
  - fumes
  - vapours
  - gases
  - liquids
  - mineral fibres
  - chemical spills
  - pollutants
  - other toxic or dangerous materials
  - material safety data sheets (MSDS/SDS)
- personal protective equipment (PPE) such as:
  - safety glasses
  - face and head protection
  - hard hats
  - protective footwear
  - protective clothing
  - breathing apparatus
  - ear protection
  - gloves
- housekeeping and potential hazards in relation to poor housekeeping:
  - spills
  - trip hazards such as congestion, clutter, waste build-up
  - cleanliness
- appropriate equipment and safety devices for particular workplace tasks:
  - safety harness
  - screens, barriers and shielding
  - extraction fans
  - machine guards
  - isolation devices
- commonly used workplace safety signs
- typical classes of relevant signs/symbols are:
  - mandatory
  - prohibition
  - danger

## Assessment Requirements

- caution
- general safety
- safety information
- fire safety equipment.
- o workplace emergencies that pose a threat to health and safety and suitable procedure for an emergency workplace evacuation.
- o appropriate fire extinguisher for a given type of fire.
- o basic process of fighting a fire.
- o standard work procedure/standard operating procedures.
- Manual Handling encompassing:
  - o typical manual handling injuries and the effect they can have on lifestyle
  - o situations that may cause manual handling injuries
  - o correct procedures for lifting and carrying to prevent manual handling injuries
  - o posture, weight limits, bending, twisting

### Assessment Conditions

Both practical skills and knowledge must be assessed. Assessment must be conducted in a workplace or a technology teaching environment with access to:

- relevant documentation such safety regulations, workplace safety procedures
- personal protective equipment (PE)
- safety equipment and devices

#### Assessor requirements

No specialist vocational competency requirements for assessors apply to this unit.