Stage 6 Syllabus

Electrotechnology
Curriculum Framework

based on the Electrotechnology Training Package
(UEE11) version 1.3

for implementation from 2013
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1 Introduction to the Electrotechnology Curriculum Framework

Industry curriculum frameworks provide students with the opportunity to gain industry-recognised national vocational qualifications under the Australian Qualifications Framework (AQF) as part of their NSW Higher School Certificate (HSC).

HSC courses within Industry Curriculum Frameworks count as Board Developed unit credit for the HSC. Frameworks include an HSC examination which provides the opportunity for students to have this HSC examination mark contribute to the calculation of their Australian Tertiary Admission Rank (ATAR).

1.1 AQF VET qualifications available in the Electrotechnology Curriculum Framework

The Electrotechnology Curriculum Framework is based on qualifications and units of competency contained in the nationally endorsed Electrotechnology Training Package (UEE11).

The AQF VET qualifications available in the Electrotechnology Curriculum Framework are:

- Certificate II in Electrotechnology (Career Start) (UEE22011)
- Certificate II in Computer Assembly and Repair (UEE20511)
- Certificate II in Data and Voice Communications (UEE20711)
- Certificate II in Technical Support (UEE21711)
- Certificate II in Sustainable Energy (Career Start) (UEE22111)
- Certificate III in Data and Voice Communications (UEE30411) (Statement of Attainment only)
- Certificate III in Electrotechnology Electrician (UEE30811) (Statement of Attainment only)
- Certificate III in Electrical Fitting (UEE33011) (Statement of Attainment only).

1.2 Industry context – electrotechnology

The electrotechnology industry is responsible for harnessing electricity to meet a variety of business and individual applications, ranging from traditional light and power, hardware platforms and networking automation to virtual enterprise, the internet and fibreoptics. It underpins the operation of other industry sectors.

The industry includes the installation, servicing, repair and maintenance of electrical and electronic equipment for industrial, commercial and domestic purposes. It comprises communications, distribution and transmission, electrical generation and computer data and communications cabling systems and sustainable/renewable energies. Telecommunications and information technology aspects of the industry are becoming increasingly important as the knowledge economy alters the way businesses operate.

This spread of new information processing and communication technologies means that the industry is developing rapidly. Also, with Australia’s shift to a low carbon future, community and business acceptance of effective and efficient energy usage grows. Employees will be key disseminators of strategies and technologies for energy efficiency to end users, from business and government to individuals.
Workers operate in an environment characterised by procedural regulation and work health and safety compliance. They are expected to demonstrate high levels of competency, flexibility and capability across a wide range of equipment, technologies, processes and procedures. They are also expected to conduct continuous development of their knowledge and skills throughout their working life, in order to remain abreast of evolving technological and compliance related requirements.¹

1.3 HSC VET course and AQF VET qualification completion requirements

The requirements for the completion of an HSC VET course are different to the requirements for AQF VET qualification completion. Registered Training Organisations (RTOs) need to ensure that delivery of courses meets HSC course requirements and complies with Training Package rules.

1.3.1 HSC VET course requirements

HSC VET courses in the Electrotechnology Curriculum Framework are made up of:
- units of competency
  - HSC mandatory units of competency
  - HSC elective units of competency
- HSC outcomes and content
- mandatory HSC work placement requirements.

For a student to be considered to have satisfactorily completed a course within the Electrotechnology Curriculum Framework they must meet the:
- HSC VET course requirements (refer to Sections 2.2–2.5 of this Syllabus)
- requirements for satisfactory course completion (refer to the Board’s Assessment Certification Examination (ACE) website) – there must be sufficient evidence that the student has:
  - followed the course developed by the Board
  - applied themselves with diligence and sustained effort to the set tasks and experiences provided in the course
  - achieved some or all of the course outcomes
  - undertaken the mandatory work placement.

1.3.2 AQF VET qualification requirements

To receive AQF VET qualifications, students must meet the assessment requirements of the Electrotechnology Training Package (UEE11) (http://training.gov.au).

AQF VET qualifications are determined by the qualification rules for each Training Package, referred to as qualification packaging rules. The qualification packaging rules describe the number and range of core and elective units of competency required for eligibility for an AQF VET qualification.

Units of competency should be selected to meet qualification packaging rules for the intended qualification pathway. Selection of units of competency should also be guided by the job outcome sought and local industry requirements.

Qualification packaging rules for each AQF VET qualification available through the Electrotechnology Curriculum Framework are contained in the *Electrotechnology Training Package (UEE11)*. Associated documents have been developed to describe how qualifications can be achieved through the Framework. These are available on the Board’s website at www.boardofstudies.nsw.edu.au/syllabus_hsc/electrotechnology.html.

### 1.4 HSC VET course delivery

HSC VET courses can only be delivered by a Registered Training Organisation (RTO) with the relevant qualification and units of competency on their scope of registration. Scope of registration can be checked at http://training.gov.au.

RTOs offering training programs for the delivery and assessment of the Electrotechnology HSC VET courses must meet the requirements of the VET Quality Framework, the *Electrotechnology Training Package (UEE11)* and the HSC course.

Information about the delivery of HSC VET courses by RTOs other than school system RTOs or TAFE NSW institutes is contained on the Board’s Assessment Certification Examination (ACE) website.

Non-government schools outsourcing delivery of HSC VET courses to external providers also need to refer to the *Registered and Accredited Individual Non-government Schools (NSW) Manual* or *Registration Systems and Member Non-government Schools (NSW) Manual* which are available on the Board’s website at www.boardofstudies.nsw.edu.au/manuals/#regaccredsystemsmanuals.

### 1.5 Outcomes and content

The HSC outcomes and content for this industry curriculum framework are defined in:
- the units of competency (refer to Section 2.5 of this Syllabus)
- HSC Content focus areas (refer to Section 3 of this Syllabus).

### 1.6 Assessment requirements and advice

The HSC VET courses are competency-based. The Board of Studies and the VET Quality Framework require that a competency-based approach to assessment is used. Advice on appropriate assessment practice in relation to the Electrotechnology Curriculum Framework is contained in the *Assessment and Reporting in Electrotechnology Stage 6* document.

An integrated or holistic approach to course delivery and assessment should be adopted.
2 Course structures and requirements

2.1 Electrotechnology HSC VET courses

This Framework specifies the range of industry-developed units of competency from the Electrotechnology Training Package (UEE11) for inclusion in the HSC. It describes how these units of competency are arranged in HSC VET courses to gain unit credit for the HSC.

The Electrotechnology Curriculum Framework contains the following courses:
- Electrotechnology (120 indicative hours) – see Section 2.2 of this Syllabus
- Electrotechnology (240 indicative hours) – see Section 2.3 of this Syllabus
- Electrotechnology Specialisation Study (60 or 120 indicative hours)
  – see Section 2.4 of this Syllabus.

2.1.1 Unit credit for the Higher School Certificate

To facilitate flexibility of VET in the HSC, courses within the Electrotechnology Curriculum Framework may be delivered as Preliminary, as HSC or as a combination of Preliminary and HSC units.

The HSC credit units will be allocated to students’ Preliminary and/or HSC patterns of study as required.

The pattern of study (BOS course number) entered on Schools Online (Administration) should reflect the delivery of the HSC VET course over successive years. For example, delivery of the 240 HSC indicative hour course over two years should be entered as 2 units x 2 years. Students will be credentialled for the HSC credit units entered each calendar year, provided they have satisfactorily completed the course requirements for that calendar year as determined by the school, college or RTO.

Table 1 HSC credit units for Electrotechnology HSC courses

<table>
<thead>
<tr>
<th>HSC VET course</th>
<th>HSC credit units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrotechnology (120 indicative hours)</td>
<td>2</td>
</tr>
<tr>
<td>Electrotechnology (240 indicative hours)</td>
<td>4</td>
</tr>
<tr>
<td>Electrotechnology Specialisation Study (60 indicative hours)</td>
<td>1</td>
</tr>
<tr>
<td>Electrotechnology Specialisation Study (120 indicative hours)</td>
<td>2</td>
</tr>
</tbody>
</table>
### 2.1.2 Board of Studies course numbers

<table>
<thead>
<tr>
<th>BOS course name</th>
<th>Pattern of study</th>
<th>BOS course number</th>
<th>Schools Online (Administration) entry advice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrotechnology (120 hours)</td>
<td>2 units x 1 year</td>
<td>26300</td>
<td>Enter this course number for either Preliminary (Year 11) or HSC (Year 12)</td>
</tr>
<tr>
<td>Electrotechnology (240 hours)</td>
<td>2 units x 2 years</td>
<td>26301</td>
<td>Enter this course number for both Preliminary (Year 11) and HSC (Year 12)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>or</td>
</tr>
<tr>
<td></td>
<td>4 units x 1 year</td>
<td>26302</td>
<td>Enter this course number for either Preliminary (Year 11) or HSC (Year 12)</td>
</tr>
<tr>
<td>Electrotechnology Specialisation Study (60 hours)</td>
<td>1 unit x 1 year</td>
<td>26313</td>
<td>Enter this course number for either Preliminary (Year 11) or HSC (Year 12)</td>
</tr>
<tr>
<td>Electrotechnology Specialisation Study (120 hours)</td>
<td>2 units x 1 year</td>
<td>26314</td>
<td>Enter this course number for either Preliminary (Year 11) or HSC (Year 12)</td>
</tr>
<tr>
<td>Electrotechnology HSC Examination</td>
<td>n/a</td>
<td>26399</td>
<td>Enter this course number in the year the examination is to be undertaken – either Preliminary (Year 11) or HSC (Year 12)</td>
</tr>
</tbody>
</table>
2.1.3 Allocation of HSC indicative hours of credit

Units of competency drawn from Training Packages are not defined in terms of duration. The amount of time required by individual students to achieve competency will vary according to their aptitude and experience. Where a training program is designed for delivery by an RTO, the RTO will specify the length of the training program according to the delivery strategies and/or curriculum resources chosen.

However, for the purposes of the HSC, VET courses must be described in terms of their indicative hours. For this reason, indicative hours for unit credit towards the HSC have been assigned to each unit of competency within the Framework. It is emphasised that the assignment of indicative hours does not imply that all students will fulfil all requirements of a unit of competency within these hours. RTOs may determine that additional or fewer hours are required for the achievement of particular competencies. However, this does not alter the HSC indicative hours allocated, only the delivery hours.

Students may need to spend additional time practising skills in a work environment and completing projects and assignments, in order to fulfil Training Package assessment requirements.

The HSC indicative hours assigned to each unit of competency are listed in Section 2.5 of this Syllabus.

2.1.4 Work placement requirements

Work placement is a mandatory HSC requirement within this Framework and appropriate hours have been assigned to each HSC VET course.

Students must complete the following work placement for Electrotechnology Curriculum Framework courses.

<table>
<thead>
<tr>
<th>Electrotechnology Framework course</th>
<th>Minimum work placement requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrotechnology (120 indicative hours)</td>
<td>35 hours</td>
</tr>
<tr>
<td>Electrotechnology (240 indicative hours)</td>
<td>70 hours</td>
</tr>
<tr>
<td>Electrotechnology Specialisation Study (60 indicative hours)</td>
<td>no additional hours required</td>
</tr>
<tr>
<td>Electrotechnology Specialisation Study (120 indicative hours)</td>
<td></td>
</tr>
</tbody>
</table>

Work placement is to be undertaken in an appropriate electrotechnology/energy sector work environment.
For units of competency that must be assessed in an electrotechnology/energy sector work environment, work placement provides an opportunity to collect evidence required for a student to be deemed competent.

Students undertaking these courses as part of a school-based apprenticeship or traineeship will meet the mandatory work placement hour requirements through the on-the-job training component of the apprenticeship or traineeship.

Recognition of Prior Learning (RPL) may be granted for mandatory work placement requirements. Students’ outside employment (ie not under the auspices of the school) may be recognised towards the requirement for work placement in a VET course (ACE 8051 – Assessment Certification Examination (ACE) website).

Non-completion of work placement is grounds for withholding the HSC course. Schools and colleges are advised to follow the procedure for issuing ‘N’ determinations as outlined on the Board’s Assessment Certification Examination (ACE) website.

Refer to the Work Placement in Electrotechnology document for further information.
2.2 Electrotechnology (120 indicative hours)

AQF VET qualifications

The Electrotechnology (120 indicative hours) course provides a pathway to the following qualifications:

Statement of Attainment towards:
- Certificate II in Electrotechnology (Career Start) (UEE22011)
- Certificate II in Computer Assembly and Repair (UEE20511)
- Certificate II in Data and Voice Communications (UEE20711)
- Certificate II in Technical Support (UEE21711)

Course structure

This course comprises:
- a selection of units of competency from the HSC mandatory and/or elective pool to a minimum of 120 HSC indicative hours.

(See Section 2.5, Tables 3 and 4 of this Syllabus.)

Course requirements – Electrotechnology (120 indicative hours)

Students must attempt:

- a selection of units of competency from the HSC mandatory and/or elective pool to a minimum of 120 HSC indicative hours
  (Section 2.5, Tables 3 and 4)

- a minimum of 35 hours of work placement
  (Section 2.1.4)
2.3 Electrotechnology (240 indicative hours)

AQF VET qualifications

The Electrotechnology (240 indicative hours) course provides a pathway to the following qualifications:

- Certificate II in Electrotechnology (Career Start) (UEE22011)
- Certificate II in Computer Assembly and Repair (UEE20511)
- Certificate II in Sustainable Energy (Career Start) (UEE22111)

Statement of Attainment towards:

- Certificate II in Data and Voice Communications (UEE20711)
- Certificate II in Technical Support (UEE21711)
- Certificate III in Data and Voice Communications (UEE30411)
  - school-based apprentices only
- Certificate III in Electrotechnology Electrician (UEE30811)
  - school-based apprentices only
- Certificate III in Electrical Fitting (UEE33011)
  - school-based apprentices only.

Course structure

This course comprises:

- seven mandatory units of competency
- a range of elective units of competency (HSC elective pool)
- HSC Content mandatory focus areas.

(See Section 2.5, Tables 3 and 4 and Section 3 of this Syllabus.)

For students undertaking a school-based apprenticeship, additional elective units of competency are available. These are listed in Section 2.5, Table 5 of this Syllabus.

Electrotechnology HSC examination

An external written Higher School Certificate examination will be conducted for the 240 indicative hour course (refer to Section 4 of this Syllabus).

The HSC Content (focus areas) for the HSC examination is detailed in Section 3 of this Syllabus.
Course requirements – Electrotechnology (240 indicative hours)

Students **must** attempt:

- **SEVEN mandatory** units of competency
  (Table 3, Section 2.5)
  with the following focus areas
  - Components, tools and equipment
  - Direct current circuits
  - Drawings, diagrams and compliance
  - Safety
  - Sustainability
  - Working in the industry
  (Section 3)

- **HSC elective units of competency to a minimum of 65 HSC indicative hours**
  from the elective pool
  (Section 2.5, Table 4, also Table 5 – for SBAs only)

- **a minimum of 70 hours of work placement**
  (Section 2.1.4)
2.4 Electrotechnology Specialisation Study (60 or 120 indicative hours)

Purpose

The purpose of the Electrotechnology Specialisation Study is to provide students with the opportunity to either complete the Certificate II qualification commenced in the 240-hour course or, for school-based apprentices, to gain further credit towards their Certificate III qualification.

AQF VET qualifications

The Electrotechnology Specialisation Study (60 or 120 indicative hours) course provides a pathway to the following qualifications:

- Certificate II in Data and Voice Communications (UEE20711)
- Certificate II in Technical Support (UEE21711)

Statement of Attainment towards:

- Certificate III in Data and Voice Communications (UEE30411)
  - school-based apprentices only
- Certificate III in Electrotechnology Electrician (UEE30811)
  - school-based apprentices only
- Certificate III in Electrical Fitting (UEE33011)
  - school-based apprentices only.

Course eligibility

The Electrotechnology Specialisation Study is available only to students who:

- are currently entered in, or have completed, the Electrotechnology (240 indicative hours) course with an enrolment in Certificate II in Data and Voice Communications or Certificate II in Technical Support
  
or

- are currently entered in, or have completed, the Electrotechnology (240 indicative hours) course with an approved school-based apprenticeship training contract in Certificate III in Data and Voice Communications, Certificate III in Electrotechnology Electrician or Certificate III in Electrical Fitting.

Course structure

The Electrotechnology Specialisation Study consists of units of competency (not previously undertaken) drawn from the HSC elective pool.

(See Section 2.5, Table 4 of this Syllabus.)

For students undertaking a school-based apprenticeship, additional elective units of competency are available. These are listed in Section 2.5, Table 5 of this Syllabus.
Course requirements – Electrotechnology Specialisation Study
(60 or 120 indicative hours)

Students must attempt:

- a minimum of **60 or 120 HSC indicative hours** of units of competency not previously undertaken from the **HSC elective pool**
  (Section 2.5, Table 4 – also Table 5 for SBAs only)

- No additional work placement required
### 2.5 Electrotechnology units of competency


**Table 3  Mandatory for the 240-hour course**

Attempt the following units of competency:

<table>
<thead>
<tr>
<th>Weighting points</th>
<th>Unit code and title</th>
<th>HSC indicative hours of credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>UENEEE101A  Apply Occupational Health and Safety regulations, codes and practices in the workplace</td>
<td>15</td>
</tr>
<tr>
<td>40</td>
<td>UENEEE102A  Fabricate, assemble and dismantle utilities industry components</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: UENEEE101A</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>UENEEE104A  Solve problems in d.c. circuits</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: UENEEE101A</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>UENEEE105A  Fix and secure electrotechnology equipment</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: UENEEE101A</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>UENEEE107A  Use drawings, diagrams, schedules, standards, codes and specifications</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: UENEEE101A</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>UENEEE148A  Carry out routine work activities in an energy sector environment</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: UENEEE101A</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>UENEEK142A  Apply environmentally and sustainable procedures in the energy sector</td>
<td>15</td>
</tr>
</tbody>
</table>

Total HSC indicative hours for mandatory: 175
Table 4  HSC elective pool

<table>
<thead>
<tr>
<th>Weighting points</th>
<th>Unit code and title</th>
<th>HSC indicative hours of credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assembly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>UEENEEA101A</td>
<td>Assemble electronic components</td>
</tr>
<tr>
<td></td>
<td>Prerequisite:</td>
<td>UEENEEE101A</td>
</tr>
<tr>
<td>20</td>
<td>UEENEEA102A</td>
<td>Select electronic components for assembly</td>
</tr>
<tr>
<td></td>
<td>Prerequisite:</td>
<td>UEENEEE101A</td>
</tr>
<tr>
<td>Commercial</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>UEENEEC001B</td>
<td>Maintain documentation</td>
</tr>
<tr>
<td>20</td>
<td>UEENEEC002B</td>
<td>Source and purchase material/parts for installation or service jobs</td>
</tr>
<tr>
<td>20</td>
<td>UEENEEC008B</td>
<td>Receive and store materials and equipment for electrotechnology work</td>
</tr>
<tr>
<td>20</td>
<td>UEENEEC010B</td>
<td>Deliver a service to customers</td>
</tr>
<tr>
<td>Computer Systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>UEEENEE101A</td>
<td>Use computer applications relevant to a workplace</td>
</tr>
<tr>
<td></td>
<td>Prerequisite:</td>
<td>UEENEEE101A</td>
</tr>
<tr>
<td>80</td>
<td>UEEENEE102A</td>
<td>Assemble, set-up and test computing devices</td>
</tr>
<tr>
<td></td>
<td>Prerequisite:</td>
<td>UEENEEE101A</td>
</tr>
<tr>
<td>40</td>
<td>UEEENEE143A</td>
<td>Install and configure a client computer operating system and software</td>
</tr>
<tr>
<td></td>
<td>Prerequisite:</td>
<td>UEENEEE101A</td>
</tr>
<tr>
<td>40</td>
<td>UEEENEE146A</td>
<td>Set up and configure basic local area network (LAN)</td>
</tr>
<tr>
<td></td>
<td>Prerequisite:</td>
<td>UEEENEE102A, UEENEEE101A</td>
</tr>
<tr>
<td>Cross-discipline</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>UEEENEE020B</td>
<td>Provide basic instruction in the use of electrotechnology apparatus</td>
</tr>
<tr>
<td>20</td>
<td>UEEENEE038B</td>
<td>Participate in development and follow a personal competency development plan</td>
</tr>
</tbody>
</table>
### Table 4 cont/d

<table>
<thead>
<tr>
<th>Weighting points</th>
<th>Unit code and title</th>
<th>HSC indicative hours of credit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cross-discipline cont/d</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>UEENEEE108A <strong>Lay wiring/cabling and terminate accessories for extra-low voltage (ELV) circuits</strong></td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: UEENEEE101A  UEENEEE102A  UEENEEE105A  UEENEEE107A</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>UEENEEE122A <strong>Carry out preparatory energy sector work activities</strong></td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: UEENEEE101A  UEENEEE102A  UEENEEE105A</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>UEENEEE130A <strong>Provide solutions and report on routine electrotechnology problems</strong></td>
<td>25</td>
</tr>
<tr>
<td>20</td>
<td>UEENEEE137A <strong>Document and apply measures to control OHS risks associated with electrotechnology work</strong></td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: UEENEEE101A</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>UEENEEE141A <strong>Use of routine equipment/plant/technologies in an energy sector environment</strong></td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: UEENEEE101A</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>UEENEEE142A <strong>Produce products for carrying out energy sector work activities</strong></td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: UEENEEE101A  UEENEEE102A</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>UEENEEE143A <strong>Produce routine tools/devices for carrying out energy sector work activities</strong></td>
<td>20</td>
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<tr>
<td></td>
<td>Prerequisite: UEENEEE101A</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>UEENEEE179A <strong>Identify and select components, accessories and materials for energy sector work activities</strong></td>
<td>10</td>
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<tr>
<td></td>
<td>Prerequisite: UEENEEE101A  UEENEEE148A</td>
<td></td>
</tr>
<tr>
<td><strong>Data and Voice</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>UEENEEF102A <strong>Install and maintain cabling for multiple access to telecommunication services</strong></td>
<td>60</td>
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<tr>
<td></td>
<td>Prerequisite: UEENEEE101A  UEENEEE102A  UEENEEE104A  UEENEEE105A  UEENEEE107A</td>
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<tr>
<td>40</td>
<td>UEENEEF107A <strong>Set up and configure the wireless capabilities of communications and data storage devices</strong></td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: UEENEEE101A</td>
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### Table 4 cont/d

<table>
<thead>
<tr>
<th>Weighting points</th>
<th>Unit code and title</th>
<th>HSC indicative hours of credit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electrical</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>UENEEG111A Carry out basic repairs to electrical components and equipment</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: UENEEEE101A UENEEEE102A</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>UENEEG150A Wind electrical coils</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: UENEEEE101A UENEEEE102A UENEEEE107A</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>UENEEG151A Place and connect electrical coils</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: UENEEEE101A UENEEEE102A UENEEEE104A UENEEEE107A UENEEG150A</td>
<td></td>
</tr>
<tr>
<td><strong>Electronic</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>UENEEH101A Repair basic computer equipment faults by replacement of modules/sub-assemblies</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: UENEEEE101A UENEEEE102A UENEEEE104A UENEEEE107A</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>UENEEH102A Repairs basic electronic apparatus faults by replacement of components</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: UENEEEE101A UENEEEE102A</td>
<td></td>
</tr>
<tr>
<td><strong>Instrumentation and Industrial Control</strong></td>
<td></td>
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<tr>
<td>20</td>
<td>UENEEl116A Assemble, enter and verify operating instructions in microprocessor equipped devices</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: UENEEEE101A</td>
<td></td>
</tr>
<tr>
<td><strong>Refrigeration and Air Conditioning</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>UENEJJ102A Prepare and connect refrigerant tubing and fittings</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: UENEERE101A</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>UENEJJ103A Establish the basic operating conditions of vapour compression systems</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: UENEERE101A</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>UENEJJ104A Establish the basic operating conditions of air conditioning systems</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: UENEERE101A</td>
<td></td>
</tr>
</tbody>
</table>
Table 4 cont/d

<table>
<thead>
<tr>
<th>Weighting points</th>
<th>Unit code and title</th>
<th>HSC indicative hours of credit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Renewable and Sustainable Energy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>UEEEEK112A Provide basic sustainable energy solutions for energy reduction in residential premises</td>
<td>25</td>
</tr>
<tr>
<td>40</td>
<td>UEEEEK114A Promote sustainable energy practices in the community</td>
<td>25</td>
</tr>
<tr>
<td><strong>Restricted Electrical</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>UEEEEP024A Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: UEEEEE101A</td>
<td></td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>ICTTEN2207A Install and configure a home or small office network</td>
<td>25</td>
</tr>
<tr>
<td>60</td>
<td>ICTTEN2208A Install and configure a small to medium business network</td>
<td>25</td>
</tr>
<tr>
<td>80</td>
<td>ICTTEN2209A Build and maintain a secure network</td>
<td>25</td>
</tr>
<tr>
<td>10</td>
<td>CPCCOHS1001A Work safely in the construction industry</td>
<td>10</td>
</tr>
<tr>
<td>10</td>
<td>HLTCPR211A Perform CPR</td>
<td>10</td>
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</table>
### Table 5  Additional units of competency for school-based apprentices

<table>
<thead>
<tr>
<th>Weighting points</th>
<th>Unit code and title</th>
<th>HSC indicative hours of credit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assembly</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>UEEENEEA112A Fabricate and assemble bus bars</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: UEEENEEE101A  UEEENEEE102A  UEEENEEE105A  UEEENEEE107A</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>UEEENEEC003B Provide quotations for installation or service jobs</td>
<td>10</td>
</tr>
<tr>
<td>60</td>
<td>UEEENEEC020B Participate in electrical work and competency development activities</td>
<td>15</td>
</tr>
<tr>
<td><strong>Computer Systems</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>UEEENED104A Use engineering applications software on personal computers</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: UEEENEEE101A</td>
<td></td>
</tr>
<tr>
<td><strong>Cross-discipline</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>UEEENEE009B Comply with scheduled and preventative maintenance program processes</td>
<td>15</td>
</tr>
<tr>
<td><strong>Data and Voice</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>UEEENEF115A Assemble and connect telecommunication frames and cabinets</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: UEEENEEE101A  UEEENEEE102A  UEEENEEE105A  UEEENEEE107A</td>
<td></td>
</tr>
<tr>
<td><strong>Electrical</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>UEEENEG101A Solve problems in electromagnetic devices and related circuits</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: UEEENEEE104A</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>UEEENEG106A Terminate cables, cords and accessories for low voltage circuits</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: UEEENEEE101A  UEEENEEE102A  UEEENEEE105A  UEEENEEE107A</td>
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</tbody>
</table>
### Table 5 cont/d

<table>
<thead>
<tr>
<th>Weighting points</th>
<th>Unit code and title</th>
<th>HSC indicative hours of credit</th>
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</thead>
<tbody>
<tr>
<td><strong>Electrical cont/d</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td><strong>UEENEEG164A</strong> Repair and maintain mechanical components of electrical machines</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: [UEENEEE101A][UEENEEE102A][UEENEEE105A][UEENEEG111A]</td>
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</tr>
<tr>
<td>20</td>
<td><strong>UEENEEG181A</strong> Provide advice on effective and energy efficient lighting products</td>
<td>15</td>
</tr>
<tr>
<td>40</td>
<td><strong>UEENEEG182A</strong> Supply effective and efficient lighting products for domestic and small commercial applications</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: [UEENEEG181A]</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td><strong>UEENEEG183A</strong> Provide advice on the application of energy efficient lighting for ambient and aesthetic effect</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: [UEENEEG181A][UEENEEG182A]</td>
<td></td>
</tr>
<tr>
<td><strong>Instrumentation and Industrial Control</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td><strong>UEENEEI101A</strong> Use instrumentation drawings, specification, standards and equipment manuals</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: [UEENEEE101A][UEENEEE107A]</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td><strong>UEENEEI102A</strong> Solve problems in pressure measurement components and systems</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: [UEENEEI101A]</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td><strong>UEENEEI103A</strong> Solve problems in density/level measurement components and systems</td>
<td>30</td>
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<tr>
<td></td>
<td>Prerequisite: [UEENEEI101A][UEENEEI102A]</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td><strong>UEENEEI104A</strong> Solve problems in flow measurement components and systems</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: [UEENEEI102A]</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td><strong>UEENEEI105A</strong> Solve problems in temperature measurement components and systems</td>
<td>30</td>
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<tr>
<td></td>
<td>Prerequisite: [UEENEEI101A]</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td><strong>UEENEEI150A</strong> Develop, enter and verify discrete control programs for programmable controllers</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: [UEENEEE101A]</td>
<td></td>
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</tbody>
</table>
### Table 5 cont/d

<table>
<thead>
<tr>
<th>Weighting points</th>
<th>Unit code and title</th>
<th>HSC indicative hours of credit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Renewable and Sustainable Energy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td><strong>UEENEEK125A</strong> Solve basic problems in photovoltaic energy apparatus and systems</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Prerequisite: <strong>UEENEEE104A</strong>  <strong>UEENEEE137A</strong>  <strong>UEENEEE108A</strong> or <strong>UEENEEG106A</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td><strong>HLTFA311A</strong> Apply first aid</td>
<td>20</td>
</tr>
</tbody>
</table>
3 HSC Content

The HSC Content for this industry curriculum framework is organised into focus areas. Each focus area prescribes the scope of learning for the HSC. This is drawn from the associated units of competency.

Students undertaking the 240 indicative hour course from the Electrotechnology Curriculum Framework must address **all of the mandatory focus areas**.

The Electrotechnology Curriculum Framework **mandatory** focus areas are:
- Components, tools and equipment
- Direct current circuits
- Drawings, diagrams and compliance
- Safety
- Sustainability
- Working in the industry.

The HSC examination in Electrotechnology is based on the HSC Content and employability skills for the Certificate II qualifications in this Framework (refer to Section 4 of this Syllabus).

Details of the employability skills for the AQF VET qualification pathways in this Framework are contained in the *Electrotechnology Training Package (UEE11)*. They are also available in the *Employability Skills in Electrotechnology* document.

The following table outlines the associated units of competency for each focus area.

<table>
<thead>
<tr>
<th>Focus area</th>
<th>Unit code</th>
<th>Unit title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Components, tools and equipment</td>
<td>UEEENEEE102A</td>
<td>Fabricate, assemble and dismantle utilities industry components</td>
</tr>
<tr>
<td></td>
<td>UEEENEEE105A</td>
<td>Fix and secure electrotechnology equipment</td>
</tr>
<tr>
<td>Direct current circuits</td>
<td>UEEENEEE104A</td>
<td>Solve problems in d.c. circuits</td>
</tr>
<tr>
<td>Drawings, diagrams and compliance</td>
<td>UEEENEEE107A</td>
<td>Use drawings, diagrams, schedules, standards, codes and specifications</td>
</tr>
<tr>
<td>Safety</td>
<td>UEEENEEE101A</td>
<td>Apply Occupational Health and Safety regulations, codes and practices in the workplace</td>
</tr>
<tr>
<td>Sustainability</td>
<td>UEEENEEK142A</td>
<td>Apply environmentally and sustainable procedures in the energy sector</td>
</tr>
<tr>
<td>Working in the industry</td>
<td>UEEENEEE148A</td>
<td>Carry out routine work activities in an energy sector environment</td>
</tr>
</tbody>
</table>
3.1 Components, tools and equipment – mandatory focus area

3.1.1 Outcomes

The student:
- justifies the selection of appropriate components, tools and equipment for specific industry tasks
- explains a range of techniques used in the energy sector for fixing, securing and mounting accessories to hollow and solid walls and metal
- applies appropriate methods for accurately measuring and calculating quantities
- demonstrates knowledge of electrical fitting and fabrication techniques.

3.1.2 Associated units of competency

The scope of learning for the HSC must be read and delivered in conjunction with the following associated units of competency:
- UEENEEE102A Fabricate, assemble and dismantle utilities industry components
- UEENEEE105A Fix and secure electrotechnology equipment.

The unit descriptor, elements and critical aspects for assessment for each of these units of competency are provided below.

**UEENEEE102A Fabricate, assemble and dismantle utilities industry components**

**Descriptor**
This unit covers basic fitting and fabrication techniques as they apply in the various utilities industry work functions. It encompasses the safe use of hand, fixed and portable power tools; cutting, shaping, joining and fixing using metallic and non-metallic materials; dismantling and assembling equipment; basic mechanical measurement and marking-out and reading drawings/diagrams.

**Elements**
1. Prepare for dismantling, assembling and fabrication work
2. Dismantle and assemble utilities industry apparatus
3. Fabricate utilities industry components.

**Critical aspects for assessment and evidence required to demonstrate competency in this unit**

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the ‘Assessment Guidelines – UEE11’. Evidence shall also comprise:
- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.

Demonstrate an appropriate level of skills enabling employment.

Conduct work observing the relevant Anti Discrimination legislation, regulations, policies and workplace procedures.

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Fabricate, dismantle, assembly of utilities industry components including:
    A Selecting and using hand tools appropriate to a task correctly and safely
    B Selecting and using power tools appropriate to a task correctly and safely
    C Sharpening at least two drill bits each for use different types of material
    D Interpreting mechanical drawings/diagrams and instructions correctly
    E Dismantle and assemble an apparatus relevant to utilities industry discipline in which competency is sought
    F Fabricate a component relevant to the utilities industry discipline in which competency is sought
    G Dealing with unplanned events.

**UEENEEE105A Fix and secure electrotechnology equipment**

**Descriptor**

This unit covers fixing, securing and mounting techniques as apply in the various electrotechnology work functions. It encompasses the safe use of hand and portable power tools, safe lifting techniques, safe use of ladders and elevated platforms and the selection and safe application of fixing devices and supporting accessories/equipment.

**Elements**

1. Prepare to fix and secure equipment
2. Install fixing and support devices
3. Complete fixing and support work.

**Critical aspects for assessment and evidence required to demonstrate competency in this unit**

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the ‘Assessment Guidelines – UEE11’. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, policies and workplace procedures.
Demonstrated consistent performance across a representative range of contexts from the prescribed items below:

- Fix and secure electrical equipment including:
  A Selecting fixing for loads of <lt; 5 kg, <lt; 20 kg and <lt; 50 kg and suitable for the environment in which they are to be installed
  B Installing fixing devices in compliance with manufacturer’s instructions
  C Installing appropriate devices for fixing to a hollow wall, brick, concrete and steel
  D Installing fixing support accessories/equipment relevant the discipline in which competency is sought
  E Dealing with unplanned events.

3.1.3 Employability skills

The following employability skills have been considered in the development of the scope of learning for the HSC:
- communication
- initiative and enterprise
- planning and organising
- problem solving
- technology.
3.1.4 Scope of learning for the HSC

**mechanical/engineering drawings and sketches**

- a range of drawing and sketch types:
  - pictorial:
    - isometric
    - oblique
  - orthogonal
  - detail
  - assembly
  - freehand

- drawing mechanical components:
  - terminology
  - basic abbreviations and symbols
  - layout
  - standards and conventions as specified in AS 1100

- interpretation of a range of drawings and sketches:
  - version status
  - unit(s) of measurement used
  - object(s) represented
  - instruction(s) given
  - action(s) to be taken in response

**materials**

- types of materials used in the industry:
  - metallic and non-metallic
  - hazardous and non-hazardous

- handling, application, transport and storage of a range of materials

- measuring, calculating and determining quantities for a range of projects of varying complexity:
  - appropriate units of measurement
  - materials lists
  - minimisation of waste
  - scale drawings
  - stock sizes

- consequences of incorrect measurements and calculations for the:
  - client
  - organisation/company
  - environment
### Hand and Power Tools

- **For a range of tools:**
  - Name and general features
  - Purpose and limitations
  - Selection for task/job requirements
  - Safe use in the workplace:
    - Hazard(s) and appropriate risk control(s)
    - Use of personal protective equipment (PPE)
    - Standard operating procedures (SOP)
  - Use/operation
  - Cleaning and maintenance
  - Storage

- **Hand and portable electric power tools used in the industry, including those used for:**
  - General use:
    - Drill
    - Grinder
    - Hammer
    - Jigsaw
    - Screwdriver
    - Spanner and socket
  - Measuring and marking out:
    - Ruler
    - Scribe
    - Square
    - Tape measure
  - Holding:
    - Bench vice
    - Clamp
    - Multi-grip
    - Spanner
    - Vice grip
  - Cutting:
    - Chisel
    - File
    - Pliers
    - Saw
  - Tapping and threading:
    - Stock and die
    - Tap
    - Tap wrench

- **Measuring and marking out:**
  - Reasons for measuring and marking out
  - Work practices to reduce waste
  - Procedures for accurate measuring and marking
    - Use of low-tolerance measurement
    - Methods of expressing tolerance
### Hand and Power Tools Cont'd

- acceptable amounts of tolerance
  - manufacturing tolerance
  - how and where to use vernier calipers and micrometers
- holding, cutting, shaping and finishing:
  - safe work practices
  - standard work procedures and techniques
  - working with metallic and non-metallic components/materials
- drilling:
  - safe work practices
  - standard work procedures and techniques
  - working with metallic and non-metallic components/materials
  - sharpening drill bits
- tapping and threading:
  - thread types and sizes
  - tap types
  - safe work practices
  - standard work procedures and techniques
  - working with metallic and non-metallic components/materials

### Fixing, Securing and Mounting Accessories

- accessories that may be fixed to hollow and solid walls and metal
- different requirements for fixing, securing and mounting accessories to hollow and solid walls and metal
- types of devices used to fix and support accessories to:
  - hollow walls:
    - brackets:
      - behind plaster
      - stud
    - devices:
      - plasterboard
      - toggle
    - coach bolts
    - hollow wall anchors
    - screws:
      - metal thread
      - self-drilling
      - self-tapper
      - wood
  - solid walls:
    - devices:
      - expanding concrete fixing, such as dynabolics and loxins
      - chemical
    - wall-plugs
fixing, securing and mounting accessories cont/d

- metal:
  - coach bolts
  - hollow wall anchors
  - rivets
  - screws:
    - metal thread
    - self-tapper

- for a range of devices used to fix and support accessories:
  - application and limitations
  - selection for task/job requirements
    - for loads of <5 kg, <20kg and < 50kg
    - suitability for environment in which accessories are to be installed

- methods and techniques used to fix and support accessories to hollow and solid walls and metal according to:
  - manufacturers’ instructions
  - SOP
  - technical standards and job specifications

- for a range of tools used to fix and support accessories to hollow and solid walls and metal:
  - name and general features
  - purpose and limitations
  - selection for task/job requirements
  - safe use in the workplace:
    - hazard(s) and appropriate risk control(s)
    - use of PPE
    - SOP
  - use/operation
  - cleaning and maintenance
  - storage

- using adhesives and tapes to fix and support accessories:
  - accessories that may be fixed using adhesive or tape
  - types of adhesives and tape, including their application and limitations
  - selection for task/job requirements
  - techniques and tools used
  - hazard(s) and safety measure(s)

fabricating components

- sheet metal materials commonly used in electrotechnology work:
  - types and gauge
  - applications

- for a range of tools used in sheet metal work:
  - name and general features
  - purpose and limitations
Fabricating Components cont/d

- selection for task/job requirements
- safe use in the workplace:
  - hazard(s) and appropriate risk control(s)
  - use of PPE
  - SOP
- use/operation
- cleaning and maintenance
- storage

- tools used with sheet metals in electrotechnology work:
  - chisel
  - folding/bending machines
  - hacksaw
  - guillotine
  - notching
  - punch
  - tin snip

- methods and techniques used in fabricating sheet metal according to:
  - SOP
  - technical standards and job specifications

- work practices to reduce waste when fabricating sheet metal

Joining Components

- for a range of tools used in joining components:
  - name and general features
  - purpose and limitations
  - selection for task/job requirements
  - safe use in the workplace:
    - hazard(s) and appropriate risk control(s)
    - use of PPE
    - SOP
  - use/operation
  - cleaning and maintenance
  - storage

- methods and techniques used in joining components:
  - according to:
    - SOP
    - technical standards and job specifications
  - including:
    - using machine screws and nuts
    - soft and/or hard soldering
    - brazing
    - welding:
      - oxyacetylene
      - electric arc
### Dismantling and Assembling Equipment

- for a range of tools used to dismantle and assemble electrotechnology equipment:
  - name and general features
  - purpose and limitations
  - selection for task/job requirements
  - safe use in the workplace:
    - hazard(s) and appropriate risk control(s)
    - use of PPE
    - SOP
  - use/operation
  - cleaning and maintenance
  - storage
- standard procedures for dismantling and assembling electrotechnology equipment
- safe treatment of dismantled components:
  - marking/tagging
  - storage
3.2 Direct current circuits – mandatory focus area

3.2.1 Outcomes

The student:
- demonstrates an understanding of basic electrical terminology and concepts
- describes the differences between a single source d.c. series, parallel and series/parallel circuit
- analyses the characteristics and performance of d.c. circuits
- explains fault-finding and problem-solving strategies for solving routine problems in d.c. circuits.

3.2.2 Associated units of competency

The scope of learning for the HSC must be read and delivered in conjunction with the following associated unit of competency:
- **UEENEEE104A Solve problems in d.c. circuits**.

The unit descriptor, elements and critical aspects for assessment for this unit of competency are provided below.

**UEENEEE104A Solve problems in d.c. circuits**

*Descriptor*  
This unit covers determining correct operation of single source d.c. series, parallel and series/parallel circuits and providing solutions as they apply to various electrotechnology work functions. It encompasses working safely, problem solving procedures, including the use of voltage, current and resistance measuring devices, providing solutions derived from measurements and calculations to predictable problems in single and multiple path circuits.

*Elements*  
1. Prepare to work on d.c. electrical circuits
2. Solve d.c. circuit problems
3. Complete work and document problem solving activities.

*Critical aspects for assessment and evidence required to demonstrate competency in this unit*

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the ‘Assessment Guidelines – UEE11’. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
– Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements
– Demonstrate an appropriate level of skills enabling employment
– Conduct work observing the relevant Anti-Discrimination legislation, regulations, policies and workplace procedures.

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Solving problems in d.c. circuits including:
    A Using methodological techniques to solve d.c. circuit problems from measure and calculated values
    B Determining the operating parameters of an existing circuit
    C Altering an existing circuit to comply with specified operating parameters
    D Developing circuits to comply with a specified function and operating parameters
    E Dealing with unplanned events.

3.2.3 Employability skills

The following employability skills have been considered in the development of the scope of learning for the HSC:
- communication
- learning
- problem-solving
- planning and organising
- technology.
3.2.4 Scope of learning for the HSC

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<td>• conversion of units to multiple and sub-multiple units</td>
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</table>
### electrical concepts (basic) cont/d

- performing calculations using:
  - engineering prefixes
  - scientific notation
  - transposition of formulae

- measurements and calculations for a range of tasks/projects of varying complexity

### electrical current

- basic principles by which current produces:
  - heat
  - light
  - magnetic fields
  - chemical reactions, including corrosion of metals

- typical uses of the effects of current

- awareness of the physiological effects of current

- the fundamental principles as listed in AS/NZS 3000 for protection against:
  - physiological effects of current
  - damaging effects of current

### energy and power

- principle of conservation of energy

- basic principles of producing an electromotive force (EMF):
  - from the interaction of a conductor in a magnetic field
  - from the heating of one junction of a thermocouple
  - by the application of sunlight falling on surfaces of photovoltaic cells
  - when a mechanical force is applied to a crystal (piezo electric effect)

- principles of producing electrical current from chemical reactions involving primary, secondary and fuel cells

- electrical wiring, machines and systems:
  - input and output
  - efficiency
  - effect of losses

- relationship between force, power, work and energy

- calculation of power dissipated in a circuit from voltage, current and resistance values

- effects of power rating of various devices and resistors

- measurement of electrical power in d.c. circuits
### electrical circuit (basic)

- components of a simple circuit and their purpose:
  - conductor
  - energy source/power supply
  - load
  - over-current protection device, such as circuit breaker/fuse
  - switch
- symbols used to represent each component in a circuit diagram
- effects of an open circuit, a closed circuit and a short circuit
- terminology used

### Ohm’s Law

- principle of Ohm’s Law (V=IR)
- relationship between voltage, current and resistance
- graphical relationships of voltage, current and resistance
- basic d.c. single path circuit:
  - voltage and current levels
  - relationship between voltage and current from measured values
  - effects of open circuit, closed circuit and short circuit

### series circuits

- circuit diagram of a single source d.c. ‘series’ circuit and the identification of major components
- characteristics of ‘series’ circuits including:
  - current path
  - load connection
  - power dissipation
  - voltage drops
- effect of an open and short circuit in a ‘series’ circuit
- applications where ‘series’ circuits are used in the industry
- setting up and connecting single source d.c. series circuits
- relationship between voltage drops and resistance in a simple voltage divider network
- measuring, calculating and recording resistance, voltage, current and power values in a single source d.c. series circuit
### parallel circuits

- schematic diagram of a single-source d.c. ‘parallel’ circuit and the identification of major components

- characteristics of ‘parallel’ circuits including:
  - current path(s)
  - load connection
  - power dissipation
  - voltage drops

- effect of an open and short circuit in a ‘parallel’ circuit

- applications where ‘parallel’ circuits are used in the industry

- setting up and connecting single source d.c. parallel circuits

- relationship between branch currents and resistance in a two branch current divider network

- measuring, calculating and recording values in a single source d.c. parallel circuit:
  - resistance (total and branch)
  - voltage (total and individual voltage drops)
  - current (total and branch)
  - power

- relationship of current entering and leaving a junction

- output current and voltage levels of connecting cells in parallel

### series/parallel circuits

- schematic diagram of a single-source d.c. ‘series/parallel’ circuit and the identification of major components

- characteristics of ‘series/parallel’ circuits including:
  - current path(s)
  - load connection
  - power dissipation
  - voltage drops

- effect of an open and short circuit in a ‘series/parallel’ circuit

- applications where ‘series/parallel’ circuits are used in the industry

- setting up and connecting single source d.c. series/parallel circuits

- relationship between voltages, currents and resistances in a bridge network

- measuring, calculating and recording values in a single source d.c. series/parallel circuit:
  - resistance (total and branch)
  - voltage (total and individual voltage drops)
  - current (total and branch)
  - power
resistors

- types of resistors:
  - fixed
  - variable
  - temperature dependent
  - voltage dependent
  - light dependent

- identification by:
  - power rating
  - tolerance
  - colour coding or marking

- characteristics and typical applications of various types of resistors, including:
  - fixed
    - carbon film
    - tapped
    - wire wound
  - variable
    - adjustable
      - potentiometer
      - rheostat
    - light dependent resistor (LDR)
    - voltage dependent resistor (VDR)
    - temperature dependent resistors
      - positive temperature coefficient (PTC)
      - negative temperature coefficient (NTC)

- measurement of resistance of a range of resistors under varying conditions of light, voltage and temperature

- factors affecting resistance of a conductor:
  - type of material (resistivity)
  - length
  - cross-sectional area
  - temperature

- the resulting effect on resistance when there are changes to each of these factors

- calculation of the resistance of a conductor from each of the factors

- measuring change in resistance:
  - using a digital and an analogue ohmimeter
  - for a range of conductive materials, including copper, aluminium, nichrome and tungsten
  - when the materials undergo a change in length, cross-sectional area and temperature
### measuring and testing

- appropriate meter selection for a range of applications in terms of:
  - units to be measured:
    - voltage
    - current
    - resistance
    - insulation resistance
  - range
  - loading effect
  - accuracy

- potential hazards involved when using electrical instruments and safety control measures that should be taken

- operating characteristics of analogue and digital meters and typical circumstances in which they are used

- techniques for:
  - reading the scale of an analogue meter, zeroing and reducing parallax error
  - reading and interpreting digital readouts

- voltmeters and ammeters:
  - types, including bench, clamp and multimeter
  - characteristics and purpose
  - methods for use

- voltage indicator tester:
  - types:
    - LED
    - neon
    - series
    - solenoid
    - volt-stick
  - purpose, operation and advantages and disadvantages of each voltage indicator tester

- measuring resistance using direct, volt-ammeter (short and long shunt) and bridge methods

- insulation resistance (IR) test:
  - purpose, including where and why the IR test would be used in an electrical installation
  - analogue and digital IR testers:
    - parts and functions
    - operation:
      - why the supply must be isolated prior to use
      - voltage ranges and where each range may be used
      - AS/NZS 3000 Wiring Rules requirements
    - measurement of low and high values
    - purpose of regular calibration
measuring and testing cont/d

- continuity test:
  - purpose, including where and why the continuity test would be used in an electrical installation
  - AS/NZS 3000 Wiring Rules requirements

- dangers and consequences of incorrect connection and settings

- handling and storage of measuring and testing equipment

capacitance

- types of common capacitors:
  - fixed value:
    - ceramic
    - electrolytic
    - mica
    - rolled
    - stacked plate
  - variable value:
    - trimmer
    - tuning

- circuit symbol of various types of capacitors:
  - polarised
  - standard
  - trimmer
  - variable

- application of capacitors in the electrotechnology industry

- basic construction of a standard capacitor highlighting:
  - plates
  - dielectric
  - connecting leads

- different types of dielectric material and relative permittivity of each dielectric

- common faults in capacitors

- testing of capacitors to determine serviceability

- terms and units including:
  - capacitance (C) (farad)
  - electric charge (Q) (coulomb)
  - energy (W) (joule)

- relationship between capacitance, voltage and charge
capacitance cont/d

- factors affecting capacitance, including:
  - effective area of the plates
  - distance between the plates
  - type of dielectric
- explain how these factors are present in all circuits to some extent
- how a capacitor is charged in a d.c. circuit
- behaviour of a series d.c. circuit containing resistance and capacitance components (time constant and charge/discharge curves)
- term ‘time constant’ and its relationship to the charging and discharging of a capacitor and associated calculations (τ=RC)
- connection of a series d.c. circuit containing capacitance and resistance to determine the time constant of the circuit
- calculation of quantities from given information using:
  - capacitance (Q=VC)
  - energy (W=½CV^2)
  - voltage (V=Q/C)
- effects on the total capacitance of capacitors connected in series, parallel and series/parallel by calculating their equivalent capacitance
- safe handling of capacitors:
  - hazards involved in working with capacitance effects and the safety control measures that should be taken
  - methods of discharging various size capacitors:
    - dangers of a charged capacitor
    - consequences of discharging a capacitor through a person

problem-solving

- fault-finding and problem-solving including how to:
  - identify a problem
  - consider a solution
  - take corrective action
  - record
  - follow-up
- solving a range of routine problems in d.c. circuits:
  - using safe work procedures
  - utilising sustainable energy practices
  - without damage to apparatus, circuits and surrounding environment or services
  - within level of authority and with the approval of an authorised person
- established methodological techniques used to solve d.c. circuit problems from measured and calculated values as they apply to electrical circuits
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<td>– identifying loss of supply</td>
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<td>• known solutions to a range of common/predictable problems in relation to d.c. circuits</td>
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<tr>
<td>• apply workplace policy and regulatory requirements when recording and reporting solutions used to solve d.c. circuit problems</td>
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</table>
3.3 Drawings, diagrams and compliance – mandatory focus area

3.3.1 Outcomes

The student:

- explains the purpose and use of architectural and electrical drawings and diagrams
- interprets standard layouts, features and conventions used in drawings and diagrams in the industry
- applies information from drawings, diagrams, schedules and manuals for specific energy sector work functions
- demonstrates an understanding of the format, use and content of compliance standards, codes and job specifications applying to various energy sector work functions.

3.3.2 Associated units of competency

The scope of learning for the HSC must be read and delivered in conjunction with the following associated unit of competency:

- **UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications.**

The unit descriptor, elements and critical aspects for assessment for this unit of competency are provided below.

**UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications**

**Descriptor**

This unit covers the use of drawings, diagrams, cable schedules, standards, codes and specifications as they apply to the various electrotechnology work functions. It encompasses the rudiments for communicating with schematic, wiring and mechanical diagrams and equipment and cable/connection schedules, manuals, site and architectural drawings and plans showing the location of services, apparatus, plant and machinery and understanding the use and format of compliance standards and job specifications.

**Elements**

1. Prepare to use drawings, diagrams, schedules and manuals
2. Use drawings, diagrams, schedules and manuals to obtain job information
3. Use drawings, diagrams, schedules and manuals to convey information and ideas
4. Prepare to use compliance standards, codes and specifications.

**Critical aspects for assessment and evidence required to demonstrate competency in this unit**

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the ‘Assessment Guidelines – UEE11’. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement.
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement.
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment.
- Conduct work observing the relevant Anti Discrimination legislation, regulations, policies and workplace procedures.

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Use drawings, diagrams, schedules, standards, codes and specifications including:
    A Identifying drawings, diagrams, schedules and manuals relevant to the work to be undertaken
    B Interpreting drawings, diagrams, schedules and manuals correctly
    C Using correct conventions in freehand drawings
    D Giving correct information in freehand drawings
    E Obtaining compliance Standards and Codes applicable to particular disciplines
    F Reviewing and understanding the format of compliance Standards and Codes that apply to particular disciplines
    G Reviewing the format and content of typical job specifications
    H Dealing with unplanned events.

### 3.3.3 Employability skills

The following employability skills have been considered in the development of the scope of learning for the HSC:
- communication
- problem-solving
- planning and organising.
### 3.3.4 Scope of learning for the HSC

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**electrical drawings and diagrams cont/d**

- ladder
- wiring

- circuit and wiring diagrams:
  - sketching
  - connecting equipment
  - converting a circuit diagram to a wiring diagram

- cable schedules:
  - interpreting cable type, origin and route from a schedule
  - developing a schedule for a given installation

- developing switching charts to identify terminals of various types of switches

**relationship to building construction work**

- main structural elements in a building, and their representation in drawings and diagrams:
  - frames:
    - metal
    - timber
  - masonry:
    - brick veneer
    - double brick
  - footings
  - floors
  - roofs
  - walls:
    - interior
    - exterior

- typical cable routes through buildings, structures and premises

- sequence of constructional stages for brick, brick veneer and timber cottages

- stages at which the first and second fixing of electrical and communications installations occurs in the constructional sequence

- areas of cooperation between electrical and communications work and other building trades

**compliance**

- an understanding of the difference between a regulation, standard and code of practice
- scope of work in the industry covered by electrical licensing
- awareness of legislative requirements related to the safe installation of electrical and/or electronic equipment
## compliance cont/d

- technical standards that apply to electrical and/or electronic work
  - performance versus prescriptive requirements
  - types:
    - mandated under regulation or by an authority
    - deemed-to-comply
    - local service requirement
  - purpose and development
  - relationship to compulsory and accreditation compliance schemes
  - arrangement and use
  - how to read and apply

- primary role/function of:
  - Standards Australia
  - International Organisation for Standardisation (ISO)
  - International Electrotechnical Commission (IEC)

- codes of practice for electrical and/or electronic work related to:
  - installations
  - safe working practices
  - cable penetrations
  - fire protection

- purpose, format and content of job specifications typical to work functions undertaken in an energy sector workplace and specific job role, including the NATSPEC (trade name) specification system
3.4 Safety – mandatory focus area

3.4.1 Outcomes

The student:

- explains safe work practices and procedures for an energy sector work environment
- demonstrates an understanding of workplace health and safety (WHS) compliance in the industry
- applies risk management in an energy sector workplace
- proposes appropriate responses to emergency situations
- describes workplace policy and procedures that ensure the safety of the energy sector worker and others.

3.4.2 Associated units of competency

The scope of learning for the HSC must be read and delivered in conjunction with the following associated unit of competency:

- UEEEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

The unit descriptor, elements and critical aspects for assessment for this unit of competency are provided below.

**UEEEEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace**

*Descriptor*

This unit specifies the mandatory requirements of occupational health and safety and how they apply to the various electrotechnology work functions. It encompasses responsibilities for health and safety, risk management processes at all operative levels and adherence to safety practices as part of the normal way of doing work.

*Elements*

1. Prepare to enter a work area
2. Apply safe working practices
3. Follow workplace procedures for hazard identification and risk control.

*Critical aspects of evidence required to demonstrate competency in this unit*

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the ‘Assessment Guidelines – UEE11’. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement encompassing:
Apply sustainable energy principles and practices as specified in the performance criteria and range statement

Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements

Demonstrate an appropriate level of skills enabling employment

Conduct work observing the relevant Anti-Discrimination legislation, regulations, policies and workplace procedures.

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Applying OHS practices in the workplace including:
    A Preparing to enter the workplace including, the use of work permits and clearances and isolation permissions
    B Understanding and following risk control safe work methods
    C Applying work procedures and instructions as they apply to risk control measures
    D Dealing with accidents and emergencies within the scope of responsibility.
    E Participation in consultation processes, identifying hazards and implementing and monitoring control measures
    F Dealing with unplanned events.

Note: Ability to implement these Occupation Health and Safety measures shall be demonstrated on all occasions safety issues arise.

### 3.4.3 Employability skills

The following employability skills have been considered in the development of the scope of learning for the HSC:

- communication
- problem-solving
- planning and organising
- learning.
### 3.4.4 Scope of learning for the HSC

#### Work health and safety (WHS)

- Meaning of health and safety
- Implications of the cost of workplace injury:
  - Human
  - Social
  - Economic
  - Organisational
- Acknowledge that WHS is everyone’s responsibility in the workplace and the implications of this responsibility
- Concept of ‘participation’ and ‘consultation’ in relation to WHS
- Primary role/function of key bodies involved in WHS
- Importance of acting within the level of authority/scope of responsibility in relation to WHS in the workplace:
  - Taking initiative
  - Problem-solving
  - Decision-making

#### WHS Compliance

- Difference between an act, regulation, code of practice and industry/workplace standard
- WHS legislation and codes of practice and their application to the industry/workplace and a specific job role:
  - WHS legislation:
    - *Work Health and Safety Act 2011* (NSW) (as amended)
    - *Work Health and Safety Regulation 2011* (NSW) (as amended)
  - Codes of practice related to:
    - Dangerous goods and substances
    - First aid
    - Manual handling
    - Risk management
    - WHS consultation
    - Working with electricity
- WHS rights and responsibilities of the person conducting a business or undertaking (PCBU), officer and worker
- Awareness of the functions and powers given to WHS inspectors
- Awareness of electrical work requiring licensing
- Consequences of failure to observe WHS workplace policy and procedures and legislative requirements
WHS compliance cont/d

- safety signs, symbols and barricades used in the industry and their use in the workplace:
  - legislative requirements
  - meaning of colour and shape
  - appropriate placement and positioning

- requirements (including election/formation) of a health and safety committee or health and safety representative (HSR) and their role and responsibilities in the workplace

- industry and workplace requirements for monitoring and reporting in relation to workplace safety

- describe how, when and to whom to report:
  - types:
    - formal/informal
    - written
    - verbal
  - reporting to appropriate persons

- purpose and importance of monitoring and reporting

- apply workplace policy and protocols and regulatory requirements when recording and reporting in relation to WHS

risk management

- difference between a hazard and a risk

- risk management and its application in the workplace:
  - hazard identification:
    - potential hazards to self, colleagues and clients typical to the industry
    - range of hazards:
      - human factors (self, client and others)
      - manual handling
      - materials
      - tools and equipment
      - work environment
      - work processes and practices
      - working with electricity, at heights and in confined spaces
  - risk assessment
  - risk control:
    - eliminate the risk
    - minimise the risk
      - substitution
      - modification
      - isolation
      - engineering control
### Risk Management cont/d

- other controls:
  - administrative
  - safe work practices
  - personal protective equipment (PPE)
  - monitor and review

- basic understanding of the:
  - short and long-term effects of excessive noise and techniques to avoid damage to hearing
  - effects of vibration, thermal stress and ultraviolet (UV) radiation on the human body and work practices to protect the body
  - dangers associated with laser-operated tools and equipment and suitable PPE
  - occupational overuse syndrome, how it occurs and means to overcome it
  - factors that cause stress in the workplace, symptoms of a person suffering from stress and personal stress-management techniques
  - detrimental effects and dangers of drug and alcohol use in the workplace

### Safe Work Practices and Procedures

- safe work practices and procedures and their purposes:
  - WHS induction training
  - adherence to work instructions and workplace policy and procedures:
    - safe work method statement
    - job safety analysis (JSA)
    - standard operating procedure (SOP)
    - work area access permits, clearances and isolation permissions
    - Certificate of Compliance Electrical Work
  - selection, use and maintenance of PPE
  - manual handling techniques:
    - when working individually, in pairs and with a team:
      - lifting, carrying and placing items down
      - moving
      - loading and unloading
    - legal weight limits
  - hazardous substances and dangerous goods:
    - correct handling, application, labelling, transport and storage
    - safety data sheet (SDS)
  - working at heights:
    - ladders:
      - selection
      - safety check
      - precautions when ascending and working from and around
    - precautions when working on and around scaffold and elevated work platforms
  - tools and equipment:
    - appropriate selection, correct use and maintenance
    - safety and lockout tagging
  - working with electricity:
    - precautions to minimise the chance of electric shock, including the use of:
      - a circuit breaker
### safe work practices and procedures cont/d

- earthing
- extra-low voltage
- a fuse
- a residual current device (RCD)/safety switch
  - safe isolation of an electrical supply
- housekeeping:
  - clean-up procedures
  - waste disposal
  - consideration of WHS and the environment

- importance of safe work practices and procedures

- propose safe work practices and procedures for an energy sector workplace

### incidents, accidents and emergencies

- difference between an incident, accident and emergency

- a range of incidents, accidents and emergencies common to the industry

- distinguish between a manageable first aid situation and an emergency situation

- a range of potential injuries and their cause(s)

- strategies to reduce workplace accidents, injury or impairment

- procedures for responding to incidents, accidents and emergencies:
  - emergency situations
  - seeking assistance
  - emergency contact numbers
  - emergency signals, alarms and exits:
    - location
    - use of
  - basic process of fighting a fire
  - use of firefighting equipment:
    - fire blanket
    - fire extinguishers:
      - types
      - location, mounting and maintenance
    - fire hose and reel
  - procedures to follow:
    - notification
    - workplace policy and procedures:
      - evacuation
      - securing workplace/building
    - reporting
  - role of personnel in an emergency
incidents, accidents and emergencies cont/d

- awareness of the effects of electric shock on the human body
- common causes of electrical accidents in an energy sector workplace
- safe removal of an electric shock victim from a ‘live’ electrical situation
- meaning of ‘duty of care’ in relation to first aid
- awareness of legal and ethical issues which may impact on management of care
- personnel responsible for first aid
- responsibilities of a first aider

principles of first aid:
- DRSABCD:
  - danger
  - response
  - send for help
  - airway
  - breathing
  - CPR
  - defibrillator (if available)
- general:
  - assessment
  - management
  - seek assistance
  - access equipment/resources
  - monitor
  - reassure

- apply the principles of first aid in response to first aid scenarios
- apply workplace policy and protocols and regulatory requirements when recording and reporting in relation to first aid
3.5 Sustainability – mandatory focus area

3.5.1 Outcomes

The student:
- explains the fundamental principles of sustainability
- evaluates an energy sector workplace in relation to environmentally sustainable work practices
- proposes work practices for an energy sector work environment to minimise energy and material usage
- explains environmental compliance and best practice as they would apply in an energy sector workplace.

3.5.2 Associated units of competency

The scope of learning for the HSC must be read and delivered in conjunction with the following associated unit of competency:
- **UEENEEK142A Apply environmentally and sustainable procedures in the energy sector**.

The unit descriptor, elements and critical aspects for assessment for this unit of competency are provided below.

**UEENEEK142A Apply environmentally and sustainable procedures in the energy sector**

**Descriptor**
This competency standard requires the worker to undertake methods of work practice that minimises energy and material usage and to seek energy reduction strategies in the energy sector workplace. The unit seeks to minimise negative impacts on the environment.

**Elements**
1. Plan and prepare to apply sustainable work practice
2. Apply sustainable work practice
3. Complete the application of sustainable work practice.

**Critical aspects for assessment and evidence required to demonstrate competency in this unit**

Before the critical aspects of evidence are considered all prerequisites shall be met.

The evidence on which competency in this unit is based shall be considered holistically for each element on at least two occasions comprising:
- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range; and
  - Apply sustainable work practice principles and practices as specified in the performance criteria and range; and
– Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements; and
– Demonstrate an appropriate level of skills enabling employment; and
– Conduct work observing the relevant Anti-Discrimination legislation, regulations, policies and workplace procedures; and

• Demonstrated performance across a representative range of contexts from the prescribed items below:
  – Participate in environmentally sustainable work practices including:
    A Apply sustainable work practice in daily work activities
    B Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Note: Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed, in these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

3.5.3 Employability skills

The following employability skills have been considered in the development of the scope of learning for the HSC:
• communication
• teamwork
• problem-solving
• initiative and enterprise
• planning and organising
• self-management.
3.5.4 Scope of learning for the HSC

**environment – issues and sustainability**

- awareness of current environmental issues:
  - climate change
  - conservation
  - energy usage/efficiency
  - pollution
  - recycling
  - sustainability
  - waste management
  - water and other natural resource management

- concept of:
  - sustainability
  - an environmentally sustainable work practice
  - an environmentally sustainable workplace

- possible effects of neglecting environmentally sustainable work practices and consequences for the workplace and the environment

- concept of:
  - ‘carbon footprint’
  - ‘carbon neutral’
  - ‘renewable energies and clean technologies’

**climate change**

- outline the basics of climate change

- causes and consequences of the greenhouse effect

- awareness of national and international greenhouse imperatives to reduce carbon pollution and create a clean energy future

- main features of the Australian Government’s *Clean Energy Future*:
  - introduction of a carbon price
  - promoting innovation and investment in renewable energy
  - encouraging energy efficiency
  - creating opportunities in the land sector to cut pollution

**sustainable energy**

- difference between renewable and non-renewable energy

- a basic understanding of:
  - sustainable energy
  - sustainable energy practices:
    - changes in the way energy is supplied and used
    - use of renewable energy sources:
      - biomass
sustainable energy cont/d

- geothermal
- hydro
- solar
- tidal
- wave
- wind
- use of technologies that improve energy efficiency

compliance

- definition of:
  - ‘compliance’
  - ‘best practice’

- awareness of levels of compliance in relation to environmental requirements:
  - workplace
  - industry
  - government (local, State/Territory and Commonwealth)
  - international

- purpose and intent of environmental legislation and implications for work being undertaken in an energy sector workplace and specific job role:
  - *Protection of the Environment Operations Act 1997 (NSW)* (as amended)
  - *Clean Energy Act 2011 (Cth)* (as amended)

- primary role/function of regulators and key bodies involved in environmental protection, including:
  - NSW Environment Protection Agency (EPA)
  - NSW Department of Environment and Climate Change
  - Clean Energy Regulator (Cth)
  - Department of Climate Change and Energy Efficiency (Cth)
  - local council

energy sector workplace

- characteristics and potential environmental impact of materials, products and workplace practices used or found in an energy sector work environment

- work practices and domestic, commercial and industrial strategies in the energy sector that, directly and indirectly, minimise usage and wastage of:
  - energy:
    - efficient use
    - reduction in consumption
    - energy audits
    - opportunities for use of:
      - alternative forms of energy
      - renewable energy technologies
    - energy-saving activities
    - use of energy-efficient devices, equipment and technologies
    - energy-efficient retrofits
### energy sector workplace cont/d

- materials:
  - accurate measurements and calculations
  - recycling
  - purchase sustainable products
  - reduce amounts used
  - use of biodegradable/non-toxic materials
  - use of renewable, recyclable, reusable and recoverable resources

- environmental responsibilities of the energy sector workplace and individual worker

- propose improvements for environmentally sustainable work practices:
  - individual worker
  - team
  - workplace

- economic benefits of sustainable energy initiatives

- workplace policy, procedures and systems for environmental compliance and best practice
3.6 Working in the industry – mandatory focus area

3.6.1 Outcomes

The student:

- examines the nature and scope of the industry
- explains how to work effectively with colleagues and clients in an energy sector workplace
- applies workplace and industry standards to ensure quality work outcomes in an energy sector work environment.

3.6.2 Associated units of competency

The scope of learning for the HSC must be read and delivered in conjunction with the following associated unit of competency:

- **UEENEEE148A** Carry out routine work activities in an energy sector environment.

The unit descriptor, elements and critical aspects for assessment for this unit of competency are provided below.

**UEENEEE148A** Carry out routine work activities in an energy sector environment

**Descriptor**
This unit covers undertaking scheduled routine work activities in the energy sector in an agreed time, to a quality standard and with a minimum of waste. It encompasses working safely, applying knowledge of carrying out routine work activities in electrotechnology environments.

**Elements**

1. Prepare to undertake routine work activities
2. Carry out work as instructed
3. Check results of the completed work.

**Critical aspects for assessment and evidence required to demonstrate competency in this unit**

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the ‘Assessment Guidelines – UEE11’. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements
  - Demonstrate an appropriate level of skills enabling employment
Conduct work observing the relevant Anti-Discrimination legislation, regulations, policies and workplace procedures.

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Carry out routine work activities in an energy sector environment including:
    - A Understanding work instructions
    - B Obtaining and checking tools and equipment
    - C Following work instructions
    - D Returning tools and surplus resources as required
    - E Updating work records
    - F Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note: Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

3.6.3 Employability skills

The following employability skills have been considered in the development of the scope of learning for the HSC:
- communication
- teamwork
- problem-solving
- initiative and enterprise
- planning and organising
- self-management
- learning
- technology.
3.6.4 **Scope of learning for the HSC**

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careers and training cont/d

- vocational education and training and the industry:
  - difference between an apprenticeship and a traineeship
  - competency-based training and assessment:
    - Australian Qualifications Framework (AQF)
    - qualification(s)
    - qualification packaging rules
    - unit(s) of competency
  - registered training organisations (private providers and TAFE NSW)
  - classifications
  - licensing requirements
  - minimum requirements for a licensed electrician

- career pathways for a specific industry area/sector within the industry and the knowledge and skills required for different job roles

- preparation to enter a career path in the industry, including:
  - job application (research, letter and curriculum vitae)
  - job interview (preparation, presentation, performance and evaluation)

employment

- types of employment in the industry:
  - full-time
  - part-time
  - casual
  - contract

- the differences between an award, agreement and contract and how they apply to workers in the industry

- investigate the employment terms and conditions for a specific job role

- working knowledge of employer and employee rights and responsibilities in relation to employment and work

- primary role of a range of key industry bodies for both employers and employees:
  - industry stakeholders:
    - NSW Utilities & Electrotechnology Industry Training Advisory Body (NSW U&E ITAB)
  - unions and employee groups:
    - Communications, Electrical and Plumbing Union of Australia (CEPU)
    - Electrical Trades Union (ETU)
  - employer groups
  - professional associations:
    - Electrical Contractors Association (ECA)
    - Energy Networks Association (ENA)
    - National Electrical and Communications Association (NECA)
### employment cont/d

- training:
  - EE-Oz Training Standards (the ElectroComms and Energy Utilities Industry Skills Council)
- regulator:
  - Australian Communications and Media Authority (ACMA)
  - Electrical Regulatory Authorities Council (ERAC)

### energy sector worker

- personal attributes and work ethic valued by the industry
- interpersonal skills beneficial to an individual working in an energy sector workplace
- presentation standards for a specific energy sector workplace and job role
- behaviour to support a safe and sustainable energy sector work environment
- roles and responsibilities:
  - duties and responsibilities for a specific job role within the industry
  - relationship between individual roles and the role of the team or work group
- tasks typical to an energy sector workplace (routine, rostered and non-routine)
- access and use a range of sources for work instructions, including:
  - schedule of work/work plan
  - job card/sheet/specifications
  - standard operating procedures (SOP)
  - drawing/diagram/sketch
  - manufacturer and/or workplace manual(s)
  - workplace policy, procedures and guidelines
  - legislation, regulations and codes of practice
  - Australian Standards
- information provided in a schedule of work/work plan including:
  - designated work task(s)
  - tools, equipment and materials for use
  - procedures for pre-start and safety checks of tools and equipment
  - timeframe for work completion
  - quality measures
  - supervisor’s instructions
  - reporting procedures and requirements
- strategies for understanding and clarifying work instructions
- a range of opportunities to read, interpret and follow instructions for a range of work tasks of varying degrees of difficulty
- an awareness that work practices and experiences differ between workplaces
energy sector worker cont/d

- how work practices are implemented and maintained in accordance with industry standards and workplace policy and procedures
- safe and sustainable work practices and procedures for a workplace within the industry
- effect of poor work practices on colleagues, the organisation/company, the industry and clients
- time and task management:
  - principles
  - techniques
- work sequencing, including:
  - receiving instruction
  - organising for the task:
    - select tools and equipment
    - locate materials and/or parts
    - personal protective equipment (PPE)
  - carrying out the task:
    - in a logical order
    - within completion timeframes
    - according to quality measures
  - final checks and notification of completion
  - clean-up after task completion
- planning and preparation for a range of tasks/activities applicable to:
  - daily work routines in a general energy sector context
  - a specific industry area
- application of time management techniques to work tasks/activities in an energy sector context
- dealing with unplanned events:
  - the importance of acting within level of authority and scope of responsibility:
    - taking initiative
    - problem-solving
    - decision-making
  - identify when it is appropriate to seek assistance or refer to other appropriate personnel
- quality assurance:
  - definition
  - role of employees
  - implications of non-adherence
  - quality system procedures as they apply to the individual’s own job/task/duties
  - compliance tests/checks to be undertaken to ensure quality assurance of finished product
  - SOP for non-compliance of work outcome to specification(s)
  - workplace practices for final approval and ‘sign-off’ at work completion
energy sector worker cont/d

- acknowledgement of the importance of workers:
  - checking/clarifying work-related information and work instructions, including client requirements
  - taking responsibility for the quality of their own work
  - using accepted industry and workplace techniques/practices and procedures
  - producing work outcomes to specification(s)
  - using safe and sustainable work practices

- lines of communication and reporting typical to an energy sector workplace

- recording and reporting in the industry:
  - types of work records and their purpose, including those:
    - used in an energy sector work environment
    - required by legislative and/or regulative requirements
  - workplace policy and procedures applying to record-keeping and reporting, including:
    - methods used (manual and electronic)
    - expectations for the maintenance of work records

working with others

- communication in the workplace with colleagues and clients:
  - communication process/cycle
  - workplace examples of types of communication:
    - verbal
    - non-verbal
    - written
  - effective verbal, non-verbal and written communication
  - effective questioning and listening techniques
  - barriers to effective communication and strategies to overcome them

- importance of developing collegial work relationships

- importance of teamwork for the industry, including cross-trade cooperation

- teamwork:
  - meaning of ‘team’ and ‘teamwork’
  - characteristics of effective teamwork
  - benefits of teamwork to the energy sector workplace
  - examples of teams or work groups in an energy sector workplace and their area(s) of responsibility

- delivering quality work outcomes through teamwork and work groups

- causes of misunderstandings and conflict when working with others and conflict-resolution techniques
### anti-discrimination

- bullying and harassment in the workplace:
  - indirect
  - direct
  - types:
    - verbal
    - physical
    - psychological
    - sexual

- anti-discrimination:
  - principles
  - intent of anti-discrimination legislation
  - reciprocal rights and responsibilities of employers and employees
  - workplace policy and procedures relating to anti-discrimination

- strategies to eliminate bias and harassment in the workplace

- consequences, including legal ramifications, of inappropriate workplace behaviour

- recourse available to individuals in the event of inappropriate workplace behaviour
4  HSC examination

The Electrotechnology Curriculum Framework includes an HSC examination which provides the opportunity for students to have this HSC examination mark contribute to the calculation of their Australian Tertiary Admission Rank (ATAR).

The Electrotechnology HSC examination can contribute up to two units towards the calculation of a student’s ATAR.

Students who have completed the Electrotechnology (240 indicative hours) course are eligible to sit for the Electrotechnology HSC examination.

Students who want to sit for the Electrotechnology HSC examination must be entered for both the Electrotechnology (240 indicative hours) course and the Electrotechnology examination on Schools Online (Administration).

The HSC examination specifications, which describe the format of the external HSC examination, are contained in the Assessment and Reporting in Electrotechnology Stage 6 document.

The HSC examination is independent of the competency-based assessment undertaken during the course and has no impact on student eligibility for AQF VET qualifications.

4.1  Examinable outcomes and content

The HSC examination in Electrotechnology is based on the HSC Content and employability skills for the Certificate II qualifications in this Framework (refer to the Employability Skills in Electrotechnology document).

The HSC Content is detailed in Section 3 of this Syllabus.

4.2  Relationship of the Electrotechnology (240 indicative hours) course structure to the HSC examination

The relationship between the Electrotechnology (240 indicative hours) course structure, the HSC Content and the HSC examination is described in the Assessment and Reporting in Electrotechnology Stage 6 document.
5 Other important information

5.1 Exclusions

Where there is significant overlap between an HSC VET course and other HSC VET or general education courses, the Board has an exclusion between the courses. Exclusions are applied at a course level rather than at the unit of competency level.

In this Framework, students can only undertake the Electrotechnology (120 indicative hours) course or the Electrotechnology (240 indicative hours) course.

Schools should check all course exclusions when determining an appropriate pattern of study for their students.

VET course exclusions can be checked on the Board’s website at www.boardofstudies.nsw.edu.au/voc_ed/exclusions.html.

5.2 Recognition of Prior Learning (RPL) and credit transfer within VET courses

Students who have current knowledge, skills or experience relevant to a VET course may be granted credit towards the course requirements.

Arrangements for RPL and credit transfer within VET courses, including processes, application forms and examples of possible scenarios, are detailed on the Board’s website at www.boardofstudies.nsw.edu.au/voc_ed/rpl.html.

5.3 School-based apprentices and trainees

Information regarding provision for school-based apprentices and trainees within the HSC is available on the Board’s website at www.boardofstudies.nsw.edu.au/voc_ed/apprenticeships-traineeships.html.


5.4 Students with special education needs

Students with special education needs may access a VET course in one of two ways:
- by undertaking the course under regular course arrangements, or
- by undertaking selected units of competency within the course that have been identified through the collaborative curriculum planning process.

For more information, see the VET Courses and Students with Special Education Needs fact sheet on the Board’s website.
5.5   Access by students in Years 9 and 10 (Stage 5)

In certain circumstances students in Years 9 and 10 (Stage 5) may access Stage 6 VET courses. Further information is available on the Board’s website at www.boardofstudies.nsw.edu.au/voc_ed/stage-5.html.
6 Glossary

**Australian Qualifications Framework (AQF)**

The AQF is the policy framework that defines all qualifications recognised nationally in post-compulsory education and training in Australia. The AQF comprises titles and guidelines that define each qualification, as well as the principles and protocols covering cross-sectoral qualification links and the issuing of qualifications and statements of attainment.

**Australian Apprenticeships**

Australian Apprenticeships encompass all apprenticeships and traineeships. They combine time at work with training and can be full-time, part-time or school-based ([www.australianapprenticeships.gov.au](http://www.australianapprenticeships.gov.au)).

**Competency**

The broad concept of industry competency concerns the ability to perform particular tasks and duties to the standard of performance expected in the workplace. Competency requires the application of specified skills, knowledge and attitudes relevant to effective participation in an industry, industry sector or enterprise.

**Core Units of Competency**

Units of competency required by the Training Package to be eligible for an AQF VET qualification.

**Elements of Competency**

The basic building blocks of a unit of competency which describe the key activities or elements of the work covered by the unit.

**Focus Areas**

HSC Content is organised into focus areas. HSC Content prescribes the scope of learning for the HSC.

**Mandatory Units of Competency**

Units of competency that must be studied for an HSC VET course.

**Recognition of Prior Learning (RPL)**

The result of an assessment of an individual’s non-formal and informal learning to determine the extent to which that individual has achieved the required learning outcomes, competency outcomes, or standards for entry to, and/or partial or total completion of, a qualification.

**Registered Training Organisation (RTO)**

A training organisation registered by a registering body in accordance with the VET Quality Framework, within a defined scope of registration (include TAFE NSW institutes, private providers and school system RTOs).

**Scope of Registration**

The particular services and products an RTO is registered to provide. The RTO’s scope defines the specific AQF VET qualifications, units of competency and accredited courses it is registered to provide, and whether it is registered to provide:

- both training delivery and assessment services, and to issue the relevant AQF VET qualifications and statements of attainment, or
- only assessment services, and to issue the relevant AQF VET qualifications and statements of attainment.
Stage 5
In NSW, Stage 5 relates to Years 9 and 10 of schooling.

Stage 6
In NSW, Stage 6 relates to Years 11 and 12 of schooling.

Statement of Attainment
May be issued in the vocational education and training sector by an RTO when an individual has completed one or more units of competency from nationally recognised qualification(s)/course(s).

training.gov.au
http://training.gov.au
The national register for recording information about RTOs, Training Packages and accredited courses.

Training Package
A nationally endorsed, integrated set of competency standards, assessment guidelines and AQF VET qualifications for a specific industry, industry sector or enterprise.

training plan
A documented program of training and assessment required for an apprenticeship/traineeship training contract. It is developed by an RTO in consultation with the parties to the contract as the basis for training and assessing a person undertaking an apprenticeship or traineeship.

unit of competency
Specification of industry knowledge and skill and the application of that knowledge and skill to the standard of performance expected in the workplace.

VET
Vocational Education and Training

VET qualification
Formal certification in the VET sector by an RTO that a person has satisfied all requirements of the units of competency or modules that comprise an AQF VET qualification, as specified by:
- a nationally endorsed Training Package, or
- an accredited course that provides training for the qualification.

VET Quality Framework
The VET Quality Framework comprises:
- the Standards for NVR Registered Training Organisations
- the Fit and Proper Person Requirements
- the Financial Viability Risk Assessment Requirements
- the Data Provision Requirements, and
- the Australian Qualifications Framework.