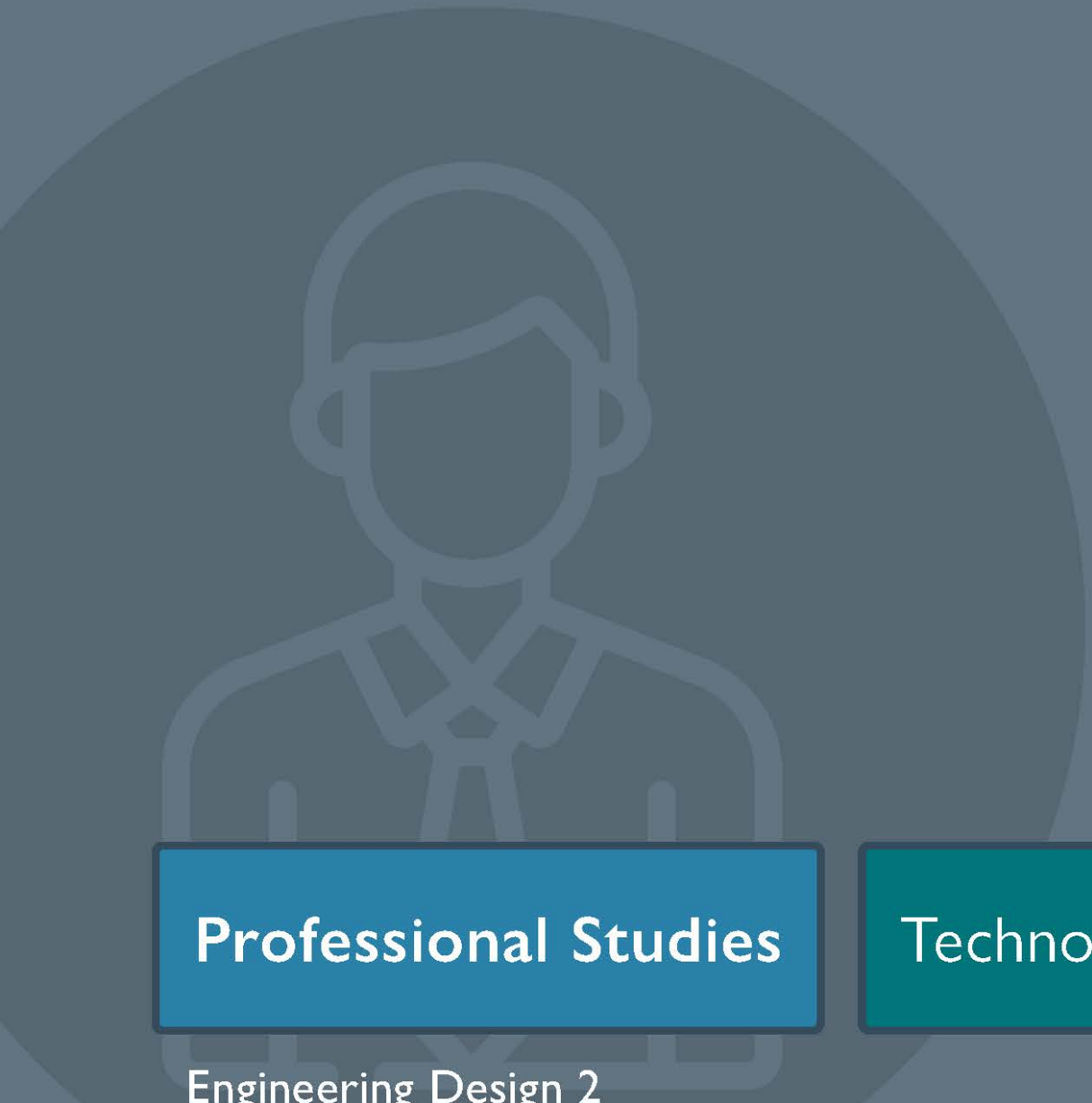
DEPARTMENT OF EDUCATION
learners first



Professional Studies

Technologies

Engineering Design 2

COURSE DOCUMENT

DRAFT

PHASE 3 CONSULTATION

Catholic Education Tasmania

INDEPENDENT SCHOOLS TASMANIA

Years 9 to 12 Learning

Tasmanian Government

Table of Contents

Phase 3 Consultation Draft Published: March 2021

Engineering Design, 150 hours – Level 2

This course is the Level 2 component of the Engineering Design program.

Aims

The purpose of Years 9 to 12 Education is to enable all students to achieve their potential through Years 9 to 12 and beyond in further study, training or employment.

Years 9 to 12 Education enables: Personal Empowerment, Cultural Transmission, Preparation for Citizenship and Preparation for Work.

This course supports the principles of Access, Agency, Excellence, Balance, Support and Achievement as part of a range of programs that enables students to access a diverse and highly flexible range of learning opportunities suited to their level of readiness, interests and aspirations.

Courses aligned to the Years 9 to 12 Curriculum Framework belong to one of the five focus areas of Discipline-based Study, Transdisciplinary Projects, Professional Studies, Work-based Learning and Personal Futures.

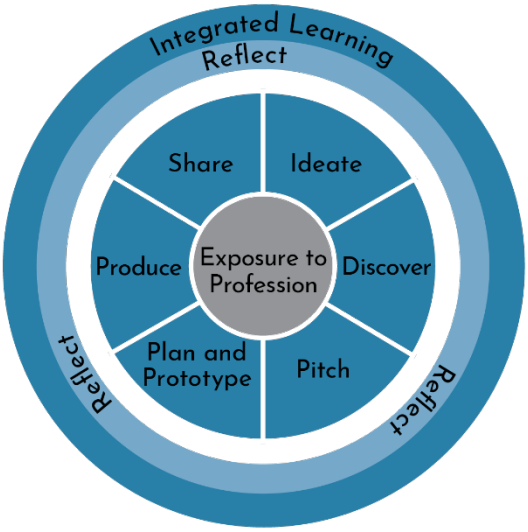
Engineering Design Level 2 is a Professional Studies course.

Focus Area – Professional Studies

Professional Studies bridges academic courses and career-related study to provide students with a combination of academic and practical knowledge, skills and understanding to pursue a particular pathway of interest. Courses integrate exposure to professional environments, processes and practice through inquiry based learning. Professional Studies reflect professional processes and standards and provide learners with an equivalent experience to that of someone working within that profession Professional Studies enhances students cognitive capacity, efficacy, creativity and craftsmanship in readiness for higher education, internships, apprenticeships, or work in a designated field of interest. Professional Studies courses connect with recognised professional study pathways and contextually align with key Tasmanian industry sectors.

Professional Studies courses have three key features that guide teaching and learning:

- exposure to professional practice
- ideation, research, discovery and integrated learning
- production and sharing replicating a professional paradigm.



In this course learners will do this by engaging in opportunities to research and appraise existing ideas, products, processes, and solutions to problems. They will learn to generate imaginative and creative solutions of their own and communicate their ideas within the parameters and requirements of engineering-based tasks whilst gaining and applying knowledge of industry standards of design, manufacture, and safety. Through practical, experiences, learners will learn to use technology to design, test and appraise products, systems and solutions and have the opportunity identify and articulate further improvements and developments.

Rationale

Engineering Design programs enables learners to engage with engineering principles and systems through integrated Science, Technologies, Engineering and Mathematics (STEM) inquiry. STEM education integrates concepts that are usually delivered as separate subjects in different classes and emphasises the application of knowledge to real-life situations. STEM learning is typically based around finding a solution to a real-world problem and focuses on project-based learning.

Engineering Design programs encourage students to become aware of factors that influence innovation and enterprise, and the subsequent success or failure of a product. Through these courses, learners will have the opportunity to research and appraise existing ideas, products, processes, and solutions to problems. Learners will learn to generate imaginative and creative solutions of their own. They will communicate their ideas within the parameters and requirements of engineering-based tasks whilst gaining and applying knowledge of industry standards of design, manufacture, and safety. Through practical experiences, learners will learn to use technology to design, test and appraise products, systems and solutions and have the opportunity to identify and articulate further improvements and developments.

Engineering Design programs will provide learners with a specific skill set that will enable them to confidently explore a challenge or identify an existing problem and develop a well-structured and well-thought-out solution in an engineering context. This will be achieved through a rigorous design process. This means that learners will not only gain valuable experience in designing engineered components but also gain experience in project management.

Integration of General Capabilities and Cross-Curriculum Priorities

The general capabilities addressed specifically in this course are:

- Critical and creative thinking
- Ethical understanding
- Information and communication technology capability
- Literacy
- Numeracy
- Personal and social capability

The cross-curriculum priorities are enabled through this course are:

- Aboriginal and Torres Strait Islander Histories and Cultures
- Asia and Australia's Engagement with Asia
- Sustainability

Course Description

Engineering Design Level 2 introduces learners to engineering principles and systems through an integrated Science, Technologies, Engineering and Mathematics (STEM) inquiry.

STEM education integrates concepts that are usually delivered as separate subjects in different classes and emphasises the application of knowledge to real-life situations. STEM learning is typically based around finding a solution to a real-world problem and tends to emphasise project-based learning.

Engineering Design Level 2 encourages students to become aware of factors that influence innovation and enterprise, and the subsequent success or failure of a product.

Learners will develop skills in collaboration, creativity, critical thinking, and problem solving and have opportunities to shape their learning experience through their interests, questions they want to explore and products they choose to create in response to authentic challenges.

Pathways

This course is designed for learners who are interested in studying the design life cycle as it relates to the engineering process. *Engineering Design* Level 2 builds on students' learning in Years 9-10 Australian curriculum: Technologies and Science.

Engineering Design Level 2 provides a foundation for *Engineering Design* Level 3.

It may provide background and support for vocational programs within training packages, where some engineering knowledge and experience is useful. It may also provide links with VET (Vocational Education and Training) programs, traineeships, and apprenticeships.

This foundation course may also provide pathways to several Level 3 courses including: *Agricultural Systems; Computer Science; Electronics; Housing and Design; Information Systems and Design Technologies*; and *Physical Sciences*.

Course Requirements

Delivery of this course requires specialised workspace(s) and associated facilities for prototypes to be created and tested safely and effectively. Learners need to be able to access a wide range of reliable sources of information about the uses and applications of engineering within the wider community.

This course requires learners to collaborate with others. This could include peers, community members, and/or industry professionals.

Work submitted for assessment must be:

- produced over the duration of one calendar year
- be unique to this course

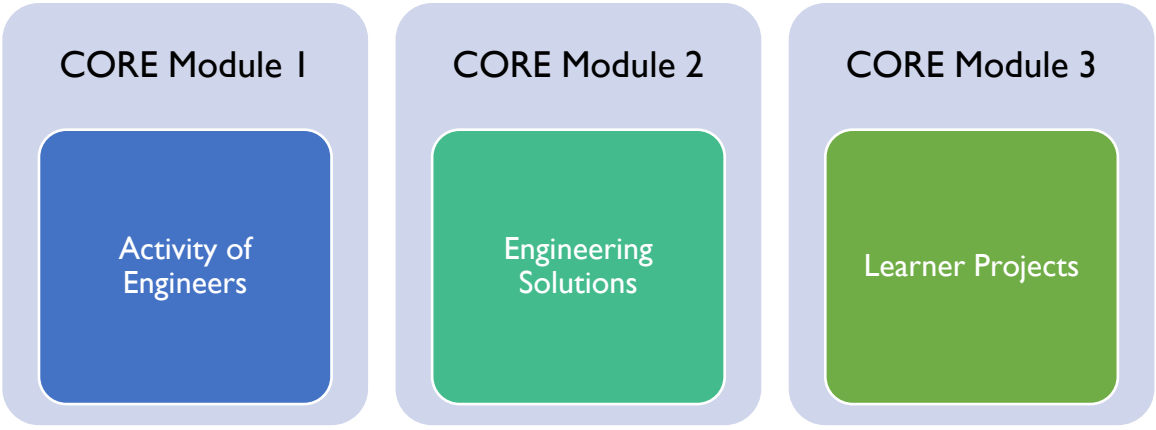
and not be work submitted for assessment in any other course.

Course Structure, Delivery and Progression

Structure

This course consists of three 50-hour modules.

Modules available
Core Module 1: Activity of Engineers
Core Module 2: Engineering Solutions
Core Module 3: Learner Projects



Delivery

Modules 1 and 2 should be delivered before Module 3.

Module 1 and 2 may be delivered concurrently.

Developmental Progression

Module 1 introduces the learner to key ideas, concepts, skills, knowledge and understanding. Module 2 enables the learner to build upon these key ideas, concepts, skills, knowledge and understanding. Module 3 enables the learner to further build on these key ideas, concepts, skills, knowledge and understanding.

The progression of learning is evidenced through assessment opportunities which provide feedback to promote further learning. A culminating performance of understanding is reflected in the final work requirements.

Module 1 - Activity of Engineers

This Module builds the foundation for the work of Engineers. Through a problem/project-based approach, students develop the core understanding, knowledge and skills that underpin an engineering design process and an engineering design cycle, which may include the role of failure in innovative design cycles.

Module 1 Learning Outcomes

On successful completion of this module, learners will be able to:

1. use design thinking to apply a process to empathise, define and ideate in response to an engineering design challenge
2. apply a design process and use time management strategies in the development of prototypes
3. apply a process to test, review and refine engineered solutions against success criteria
4. describe and analyse the impact of existing, new and emerging technologies on people and engineering practice.

Module 1 Content

Exposure to professional practice

- engineering design challenges
- investigating existing, new and emerging technologies.

Ideation, research, discovery and integrated learning

- design thinking and engineering design cycles.

Production and sharing replicating professional paradigm

- communication
- problem solving
- prototyping
- teamwork
- design journal.

Learners will be immersed in the engineering design process and practices through a variety of engineering design challenges. They will unpack the elements of an engineering design cycle and develop an understanding of iterative problem solving. Learners will work with established safety protocols when using a variety of tools and equipment and will develop visual communication skills to communicate their ideas and understandings through the process of design development and the presentation of a final product. In this Module learners will investigate the impact of existing, new and emerging technologies on people and engineering practice.

Key Knowledge:

- engineering design thinking processes (brief, research and prototype, production, and appraisal)
- design elements and principles
- ergonomics and function in engineering design
- the role of visual communication in engineering design
- the role of failure in the engineering design process
- basic systems functioning
- production processes
- success criteria
- existing, new and emerging technologies
- roles of members of teams.

Key Skills:

- critical and creative thinking
- techniques for recording and reflecting on decision making
- research techniques
- visual communication skills including sketching and graphic communication
- relevant prototype production skills (soldering, cutting, coding etc.)
- operate a range of hand and machine tools, equipment, and processes to produce practical projects safely
- analysis using success criteria

- teamwork
- project management skills including time management and self-imposed deadlines

Module 1 Work Requirements

The work requirements of a course are processes, products or performances that provide a significant demonstration of achievement that is measurable against the course's standards. Work requirements need not be the sole form of assessment for a module.

This module includes:

- one (1) project and an accompanying production diary or equivalent (e.g., folio or blog)
- one (1) extended response - research task

as work requirements.

See Appendix 3 for summary of Work Requirement specifications for this course.

Module 1 Assessment

This module will assess criteria 1, 2, 3, 4.

Module 2 - Engineering Solutions

In Module 2 students develop and apply their core understanding and skills using specialist area theory to better understand the scientific, mathematical, and technical concepts that explains how engineered products function. They study the interrelationships between engineering products and society and investigate the varied roles of engineers.

Module 2 Learning Outcomes

On successful completion of this module, learners will be able to:

1. use design thinking to apply a process to empathise, define and ideate in response to an engineering design challenge
2. apply a design process and use time management strategies in the development of prototypes
3. apply a process to test, review and refine engineered solutions against success criteria
5. investigate and describe the roles and responsibilities of engineers.

Module 2 Content

Exposure to professional practice

- engineering design briefs
- roles and responsibilities of engineers.

Ideation, research, discovery and integrated learning

- design thinking and engineering design cycles.

Production and sharing replicating professional paradigm

- communication
- engineered solutions
- teamwork
- design journal.

Learners will explore the varied roles and responsibilities of engineers. They will investigate the role played by engineering in supporting communities and improving peoples' lives and respond to engineering design briefs focussing on a local or global problem. Learners will communicate using engineering drawing and technical information and identify the science, technology, and mathematics that is used to explain the key function of their engineering solutions.

Key Knowledge:

- interpret and respond to a design brief
- identify and represent the operation of components and systems in diagrammatic and symbolic form, referring to the applicable science, technology, and mathematics principles
- know how engineering solutions are used by people and communities, the impacts it has and how the impacts are managed.

Key Skills:

- collect data and perform appropriate manipulations
- apply materials, technique, and technologies to achieve solutions
- apply suitable communication techniques in the development, planning, production and presentation of ideas and projects
- initiative and organisational skills to work both independently and collaboratively
- project management skills including time management and self-imposed deadlines.

Module 2 Work Requirements

The work requirements of a course are processes, products or performances that provide a significant demonstration of achievement that is measurable against the course's standards. Work requirements need not be the sole form of assessment for a module.

This module includes:

- one (1) poster/infographic
- a design process and solution

as work requirements.

See Appendix 3 for summary of Work Requirement specifications for this course.

Module 2 Assessment

This module will assess criteria 1, 2, 3, 5.

Module 3 - Learner Projects

In this, Module learners study an area of special interest as a class, group(s) or individual in consultation with the teacher.

Module 3 Learning Outcomes

On successful completion of this module, learners will be able to:

1. use design thinking to apply a process to empathise, define and ideate in response to an engineering design challenge
2. apply a design process and use time management strategies in the development of prototypes
3. apply a process to test, review and refine engineered solutions against success criteria
6. describe and analyse how engineering solutions are utilised and their impact on society.

Module 3 Content

Learners design and produce an engineered solution to a specified design problem/challenge/situation/opportunity.

Learners will develop a design brief, conduct their own research, design, and construct a prototype and then perform an evaluation of their final product.

Key Knowledge:

- identify and appraise essential information to be included in a design brief
- compare and consider effectiveness of different strategies to achieve an objective
- iterative engineering design process
- communicate in a range of modes and contexts to articulate the design process in an engineering context.

Key Skills:

- application of data collection
- application of iterative engineering design processes
- production processes
- test, review, refine engineered solutions
- reflection on actions and processes
- project management skills including time management and self-imposed deadlines
- collaborate in teams.

Module 3 Work Requirements

The work requirements of a course are processes, products or performances that provide a significant demonstration of achievement that is measurable against the course's standards. Work requirements need not be the sole form of assessment for a module.

This module includes one (1) learner-initiated design project as a work requirement.

as work requirements.

See Appendix 3 for summary of Work Requirement specifications for this course.

Module 3 Assessment

This module will assess criteria 1, 2, 3, 6.

Assessment

Criterion-based assessment is a form of outcomes assessment that identifies the extent of learner achievement at an appropriate end-point of study. Although assessment – as part of the learning program – is continuous, much of it is formative, and is done to help learners identify what they need to do to attain the maximum benefit from their study of the course. Therefore, assessment for summative reporting to TASC will focus on what both teacher and learner understand to reflect end-point achievement.

The standard of achievement each learner attains on each criterion is recorded as a rating 'A', 'B', or 'C', according to the outcomes specified in the standards section of the course.

A 't' notation must be used where a learner demonstrates any achievement against a criterion less than the standard specified for the 'C' rating.

A 'z' notation is to be used where a learner provides no evidence of achievement at all.

Internal assessment of all criteria will be made by the provider. Providers will report the learner's rating for each criterion to TASC.

Criteria

	Module 1	Module 2	Module 3	Notes
Criteria assessed	1, 2, 3, 4	1, 2, 3, 5	1, 2, 3, 6	Three common in all modules and one focus criterion per module.

The assessment for *Engineering Design* Level 2 will be based on the degree to which the learner can:

1. apply critical and creative thinking to the design of a solution
2. apply an iterative design cycle to prototype engineering design solutions
3. test, evaluate and refine engineered solutions against success criteria
4. investigate and describe the roles and responsibilities of engineers
5. describe and analyse the impact of existing, new, and emerging technologies on people and engineering practice
6. analyse and describe how engineering solutions are utilised and their impact on society.

Standards

Criterion 1: apply critical and creative thinking to the design of a solution

Rating C	Rating B	Rating A
investigates and identifies a limited range of needs and opportunities and applies critical & creative thinking to the design of an engineering solution	investigates and identifies a range of needs and opportunities and applies critical & creative thinking to the design of an engineering solution that meets most of the requirements of a brief	investigates and identifies a wide range of needs and opportunities and applies critical & creative thinking to the design of a solution that meets the requirements of a brief
communicates ideas using a limited range of evidence, metalanguage, and appropriate referencing	communicates ideas appropriately using a range of evidence, metalanguage, and appropriate referencing	communicates ideas with clarity using a wide range of evidence, metalanguage, and appropriate referencing
identifies appropriate criteria for success to appraise design ideas, processes, and solutions	develops criteria for success that include sustainability to evaluate design ideas, processes, and solutions	develops suitable criteria for success that include sustainability to iteratively evaluate design ideas, processes, and solutions
modifies a given engineering production proposal to meet an identified need or opportunity.	develops a basic engineering production proposal identifying timelines, resources, and protocols to meet an identified need or opportunity	develops a detailed engineering production proposal identifying timelines, resources, and protocols to meet an identified need or opportunity

Criterion 2: apply an iterative design cycle to prototype engineering design solutions

Rating C	Rating B	Rating A
uses familiar engineering drawings and technical information	effectively interprets engineering drawings and technical information and applies graphics as a communication tool	uses informed and accurate interpretation of engineering drawings and technical information and effective application of graphics as a communication tool
uses familiar technological, scientific, and mathematical concepts related to observations and theories	explains and applies familiar and some unfamiliar technological, scientific, and mathematical concepts related to observations and theories	synthesises and applies familiar and unfamiliar technological, scientific, and mathematical concepts related to observations and theories
produces a prototype that could solve a relevant problem and makes some conclusions about the suitability and appropriateness of the solution using success criteria	produces a prototype that could solve a relevant problem and evaluates the suitability and appropriateness of the solution using success criteria	produces a prototype that could solve a relevant problem and critically evaluates the suitability and appropriateness of solution using success criteria
applies an iterative design process to manage the production of an engineered solution.	competently applies and adapts an iterative design process to effectively manage the production of an engineered solution that meets many of the brief requirements.	proficiently applies and adapts an iterative design process to effectively manage the production of an engineered solution that meets most of the brief requirements.

Criterion 3: use success criteria to review, reflect and refine the design process

Rating C	Rating B	Rating A
collects, records, and interprets data and information accurately in given formats	collects, records, and interprets data and information accurately	collects, records, and interprets data accurately and systematically
reflects on thinking, actions, and processes and explains inter and intrapersonal skills including planning, time management, use of appropriate techniques and strategies	reflects on thinking, actions and processes and analyses inter and intrapersonal skills including planning, time management, use of appropriate techniques and strategies	reflects with insight on thinking, actions and processes and evaluates inter and intrapersonal skills including planning, time management, use of appropriate techniques and strategies
responds to feedback from others and provides limited justification for design choices and actions taken	assesses and responds to feedback from others and provides some justification for design choices and actions taken	evaluates and responds to feedback from others and provides justification for design choices and actions taken
performs tasks to contribute to the completion of individual and group activities.	performs tasks and demonstrates initiative when contributing to the completion of individual and group activities.	performs tasks, demonstrates initiative, and guides others in their contribution to the completion of group activities.

Criterion 4: analyse the impact of existing, new, and emerging technologies on people and engineering practice

Rating C	Rating B	Rating A
describes the influence of technological change on engineering and its effect on people	explains the influence of technological change on engineering and its effect on people	analyses the influence of technological change on engineering and its effect on people
investigates existing, new, and emerging tools, technologies, and systems	investigates existing, new, and emerging tools, technologies, and systems to evaluate suitability for design interests	analyses existing, new, and emerging tools, technologies, and systems to evaluate suitability for design interests
identifies current and future opportunities in an engineering profession.	examines current and future opportunities in an engineering profession.	analyses current and future opportunities in an engineering profession.

Criterion 5: describe the roles and responsibilities of engineers

Rating C	Rating B	Rating A
identifies and apply relevant Australian Industry Standards for safe processes and production	describes and apply relevant Australian Industry Standards for processes and production	describes, applies, and evaluates relevant Australian Industry Standards for processes and production
identifies the roles and responsibilities of engineers in an engineering context	describes the roles and responsibilities of engineers in multiple engineering contexts	explains the roles and responsibilities of engineers in multiple engineering contexts
identifies the role played by engineering in supporting communities and improving peoples' lives.	describes the role played by engineering in supporting communities and improving peoples' lives.	analyses the role played by engineering in supporting communities and improving peoples' lives.

Criterion 6: analyse how engineering solutions are utilised and their impact on society

Rating C	Rating B	Rating A
identifies ethical, economic, environmental, and sustainable considerations in engineered solutions	describes ethical, economic, environmental, and sustainable considerations in engineered solutions	analyses ethical, economic, environmental, and sustainable considerations in engineered solutions
identifies impacts, including unintended negative consequences, of choices made about technology use	describes impacts, including unintended negative consequences, of choices made about technology use	analyses impact, including unintended negative consequences, of choices made about technology use
identifies the role of innovation in an engineering context.	describes the role of innovation in an engineering context.	analyses the role of innovation in an engineering context.

Quality Assurance

- This will be determined by TASC at time of accreditation.

Qualifications and Award Requirements

The final award will be determined by the Office of Tasmanian Assessment, Standards and Certification from 6 ratings.

The minimum requirements for an award in *Engineering Design* Level 2 are as follows:

EXCEPTIONAL ACHIEVEMENT (EA)
5 'A' ratings, 1 'B' rating

HIGH ACHIEVEMENT (HA)
3 'A' ratings, 2 'B' ratings, 1 'C' rating

COMMENDABLE ACHIEVEMENT (CA)
3 'B' ratings, 3 'C' ratings

SATISFACTORY ACHIEVEMENT (SA)
5 'C' ratings

PRELIMINARY ACHIEVEMENT (PA)
3 'C' ratings

A learner who otherwise achieves the ratings for an SA (Satisfactory Achievement) award but who fails to show any evidence of achievement in one or more criteria ('z' notation) will be issued with a PA (Preliminary Achievement) award.

Course Evaluation

- This will be confirmed by time of accreditation.

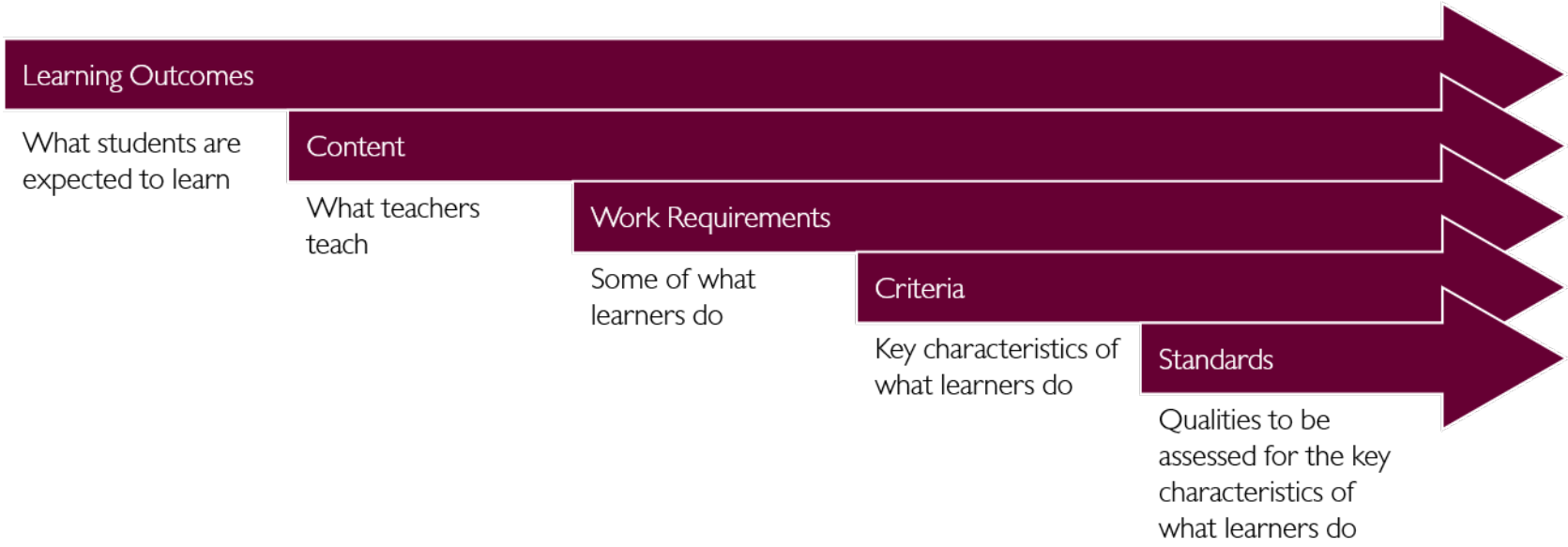
Course Developer

This course has been developed by the Department of Education's Years 9 to 12 Learning Unit in collaboration with Catholic Education Tasmania and Independent Schools Tasmania.

Accreditation and Version History

- Details to be determined by TASC at time of accreditation.

Appendix 1 - Line of Sight



Learning Outcomes	Course Content	Work Requirements	Criteria	Standards	General Capabilities (GC)
1. use design thinking to apply a process to empathise, define and ideate in response to an engineering design challenge.	Module 1, 2, 3	Module 1, 2, 3	C 1	E 1, 2, 3, 4	GC:
2. apply a design process and use time management strategies in the development of prototypes.	Module 1, 2, 3	Module 1, 2, 3	C 2	E 1, 2, 3. 4	GC:

3. apply a process to test, review and refine engineered solutions against success criteria.	Module 1, 2, 3	Module 1, 2, 3	C 3	E 1, 2, 3, 4	GC: 
4. describe and analyse the impact of existing, new and emerging technologies on people and engineering practice.	Module 1	Module 1	C 4	E 1, 2, 3	GC: 
5. investigate and describe the roles and responsibilities of engineers.	Module 2	Module 2	C 5	E 1, 2, 3	GC: 
6. describe and analyse how engineering solutions are utilised and their impact on society.	Module 3	Module 3	C 6	E 1, 2, 3	GC: 

Appendix 2 - Alignment to Curriculum Frameworks

Links to Foundation to Year 10

- Progression from the F-10 Australian Curriculum: Science

As a STEM discipline, this course component provides a progression to develop student understanding and skills from both subjects within the F-10 Australian Curriculum: Technologies curriculum:

- Design and Technologies
- Digital Technologies

alongside further developing student understanding and skills from F-10 Australian Curriculum: Science and Mathematics Curricula.

Appendix 3 - Work Requirements

Module 1 Work Requirements Specifications

Focus Area: Professional Studies
Title of Work Requirement: Research task – existing, new, and emerging technologies
Mode /Format: Extended response
Learning Outcomes: 1, 3, 4
Description: Investigation of the impacts of existing, new, and emerging technologies, for example, the development of the mobile phone.
Size: 1000 words or 6 min of recorded oral communication, or equivalent in multimodal form.
Timing: no specified timing
External agencies: Not required
Relevant Criterion/criteria:

- Criterion 1: elements 2
- Criterion 3: element 4
- Criterion 4: all standard elements

Focus Area: Professional Studies
Title of Work Requirement: Engineering Design Challenge
Mode /Format: Maintain a folio/blog. Design process presentation (team) + individual reflection on teamwork and project management
Learning Outcomes: 1, 2, 3
Description: Learners experience the design process by responding to engineering design challenges. Frameworks such as:

- Rapid prototyping
- Lean product development
- Agile product development
- Design sprints

provide students with the opportunity to fail forward by learning from prototypes and iterating to design & build a better product.

Through this area of study, learners develop an understanding of effective teams and how they as individuals, contribute to team success. They also develop skills in project management within in specific constraints such as resource and time.

Students will document their experiences using a production diary or equivalent (e.g. a folio or blog) to capture their design process including ideation, sketching and annotated photos.

Students will present an engineering design challenge response detailing their design process journey and produce an individual reflection on teamwork and project management.

Teachers will scaffold initial design challenges more heavily and provide more significant support in sections for learners as they develop their knowledge and skills of working through the design process.

Size: The size, complexity and scale of the engineering solution will be appropriate to a guided figure of 50 hours for this Unit.

1500 words or 9min of recorded oral communication, or equivalent in multimodal form.

Timing: no specified timing
External agencies: none required
Relevant Criterion/criteria:

- Criterion 1: all standard elements
- Criterion 2: all standard elements
- Criterion 3: all standard elements
- Criterion 4: element 2

Module 2 Work Requirements Specifications

Focus Area: Professional Studies
Title of Work Requirement: Roles & Responsibilities of Engineers
Mode /Format: Poster or infographic
Learning Outcomes: 1, 3, 5
Description: Identify the key characteristics of engineers, describe how these characteristics apply to the engineer's role in a particular engineering context i.e. civil engineering, software engineering.
Size: 1 single sided A3 page (digital/non-digital)

Timing: no specified timing
External agencies: [add details of required/optional engagement with external agencies if required]
Relevant Criterion/criteria:

- Criterion 1: elements 2
- Criterion 3: element 4
- Criterion 5: elements 1 and 3

Focus Area: Professional Studies
Title of Work Requirement: Learner selected engineering design project
Mode /Format: Project and accompanying journal
Learning Outcomes: 1, 2, 3, 5
Description:
Learners are required to keep a journal of the process of explanation, planning, testing, and interpretation of the engineering process when examining their chosen engineering solution including:

- a detailed description of the science, technology, and mathematics (using scientific symbols, diagrams, and formula where appropriate) that is used to explain the key function of the engineering solution.
- a plan to collect data to assess the system, including why the data will improve the system and the expected results
- data collected and represented to enable interpretation and the creation of useful information
- reasoned conclusions made from the testing process using scientific, technological, and mathematical theory and the data collected
- where the engineering solution is used in society, the impacts it has, and how those impacts are managed.

It is expected that this process will form an inquiry cycle where the application of science, technology and mathematics are used to refine the explanations, data collected and conclusions through an iterative process. The completed diary entries should reflect this process and document the learner's evolution of knowledge and exploration, including the role and value of failure of engineering systems to behave as expected.

Size: The size, complexity and scale of the engineering solution will be appropriate to a guided figure of 50 hours for this Unit.

Maximum 1500 words or 9min of recorded oral communication, or equivalent in multimodal form.

Timing: No specified timing
External agencies: none required
Relevant Criterion/criteria:

- Criterion 1: all standard elements
- Criterion 2: all standard elements
- Criterion 3: all standard elements
- Criterion 5: elements 1 and 3

Module 3 Work Requirements Specifications

Focus Area: Professional Studies
Title of Work Requirement: Learner initiated engineering design project
Mode /Format: Project
Learning Outcomes: 1, 2, 3, 6
Description:
Design and production of an engineered solution to a specified project brief as provided by the course instructor.

The process that learners have followed must be documented in a production diary. The production diary must be presented as a design folio, including:

- Problem identification and analysis
  - clear statement identifying the problem
  - in depth analysis of the problem including:
  - identification of stake holders
  - identification of existing solutions
- Project plan – including:
  - projected timeline
  - initial designs and thoughts on a new solution
  - prototype and appropriate documentation
  - analysis of chosen design

- identification of flaws in design
- suggested improvements given ideal circumstances.

- Iterative testing plans and implementation
  - documenting each step of each cycle of the Engineering Inquiry Cycle.

This is to be presented in an appropriate format including evidence of design development sketching and annotated photos of production process and documentation of testing processes.

Size: The size, complexity and scale of the engineering solution should be appropriate to a guided **figure of 50 hours for this Unit.**
Timing: no specified timing

Appendix 4 – General Capabilities and Cross-Curriculum Priorities

Learning across the curriculum content, including the cross-curriculum priorities and general capabilities, assists students to achieve the broad learning outcomes defined in the *Alice Springs (Mparntwe) Education Declaration* (December 2019).

General Capabilities:

The general capabilities play a significant role in the Australian Curriculum in equipping young Australians to live and work successfully in the twenty-first century.

In the Australian Curriculum, capability encompasses knowledge, skills, behaviours and dispositions. Students develop capability when they apply knowledge and skills confidently, effectively and appropriately in complex and changing circumstances, in their learning at school and in their lives outside school.

The general capabilities include:

- Critical and creative thinking
- Ethical understanding
- Information and communication technology capability
- Intercultural understanding
- Literacy
- Numeracy
- Personal and social capability

Cross-Curriculum Priorities:

Cross-curriculum priorities enable students to develop understanding about and address the contemporary issues they face, for their own benefit and for the benefit of Australia as a whole. The priorities provide national, regional and global dimensions which will enrich the curriculum through development of considered and focused content that fits naturally within learning areas. Incorporation of the priorities will encourage conversations between students, teachers and the wider community.

The cross-curriculum priorities include:

- Aboriginal and Torres Strait Islander Histories and Cultures
- Asia and Australia's Engagement with Asia
- Sustainability

Appendix 5 – Glossary

- A central glossary will be added to the final draft of the course for consultation.