DEPARTMENT OF EDUCATION
learners first

Professional Studies

Technologies

Engineering Design 3

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 3

This course is the Level 3 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.

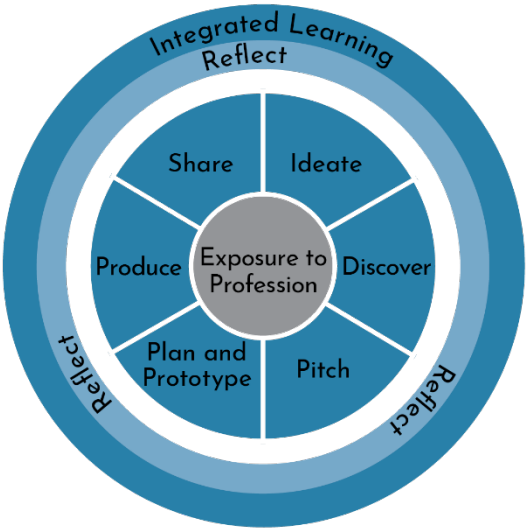
Engineering Design Level 3 is a Professional Studies course.

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 investigate the role of engineers and engineering in society and researching and appraising 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 engineered products, systems and solutions and have the opportunity to identify and articulate further improvements and developments.

Rationale

The *Engineering Design* program 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 focus on project-based learning.

The *Engineering Design* program encourages 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 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 use technology to design, test and appraise products, systems and solutions and have the opportunity to identify and articulate further improvements and developments.

The *Engineering Design* programs will impart a specific skill set upon learners 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 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 3 extends learners understanding of 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 encourages students to become aware of factors that influence innovation and enterprise, and the subsequent success or failure of a product.

Learners will further 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 produce in response to authentic challenges.

Pathways

This course is designed for learners who are interested in studying an iterative design process to explore possible solutions to a problem or opportunity.

Engineering Design Level 2 provides a foundation for *Engineering Design* Level 3. *Engineering Design* Level 3 furthers learner understandings established through the Engineering principles and systems context of the *Australian Curriculum: Technologies* (p – 10).

This course complements senior secondary courses in mathematics, science, computing, electronics, automotive and mechanical technologies and computer graphics.

Engineering Design Level 3 may lead to further studies at tertiary level, with courses such as Bachelor of Engineering, Bachelor of Science, or related technical trades.

Studying *Engineering Design* provides learners with transferable skills useful in any occupation and for the future world of work, education and training.

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

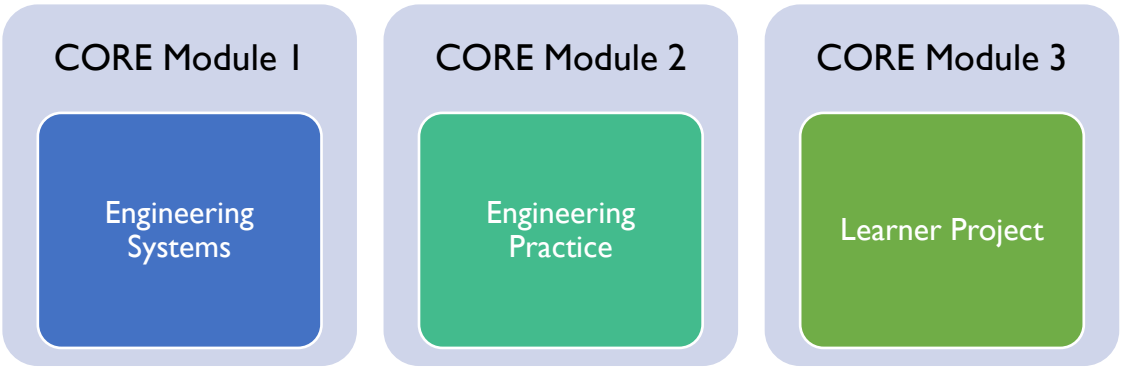
and not be work submitted for assessment in any other course.

Course Structure, Delivery and Progression

Structure

This course consists of three 50-hour modules.

Modules available
Core Module 1: Engineering Systems
Core Module 2: Engineering Practice
Core Module 3: Learner Project



Delivery

Modules 1and 2 should be delivered before Module 3.

Modules 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 - Engineering Systems

This module develops the learners understanding of the work of Engineers. Students learn how engineering design processes are applied to solve existing problems. They explore real world problems of increasing complexity requiring project-based solutions. Students use guidelines and a context to apply knowledge of the engineering process and theory, to develop and respond to design briefs.

Module 1 Learning Outcomes

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

1. apply design and systems thinking to effectively apply a process to empathise, define and ideate in response to an engineering design brief
2. select and apply appropriate engineering methodologies and use targeted project management strategies in the development and refinement of prototypes
3. apply a rigorous process to test, evaluate and refine engineered solutions against robust success criteria
4. describe and analyse the role of creativity, innovation and enterprise in engineering careers

Module 1 Content

Exposure to professional practice

- authentic design briefs
- collaborative teams.

Ideation, research, discovery and integrated learning

- design and systems thinking methodologies.

Production and sharing replicating professional paradigm

- rapid prototyping
- design pitch
- design journal.

Learners will work in teams to respond to authentic design briefs. They will apply design and systems thinking methodologies to propose and/or design a feasible solution. Learners will be challenged to use lean and agile design principles to problem solve and rapidly prototype as well as undertake sustained engineering design processes to optimise solutions for the client or end users.

Key Knowledge:

- design and systems thinking
- engineering design process
- ideation strategies
- collaborative teams
- project management strategies

Key Skills:

- analyse real world problems
- research and synthesis
- concept generation and design considerations
- prototyping and testing
- use success criteria to review and evaluate designed solutions
- manage engineering design projects
- use teamwork
- communicate and justify ideas coherently using the language of engineering reflection and metacognition.

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) rapid prototype and design pitch
- one (1) design journal

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 Practice

This Module asks the question - What skills and knowledge will today's engineers need to solve tomorrow's problems? Learners will apply industry practices and professional standards to respond to design briefs related to authentic, real-world problems related to emerging needs.

Module 2 Learning Outcomes

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

1. apply design and systems thinking to effectively apply a process to empathise, define and ideate in response to an engineering design brief
2. select and apply appropriate engineering methodologies and use targeted project management strategies in the development and refinement of prototypes
3. apply a rigorous process to test, evaluate and refine engineered solutions against robust success criteria
5. demonstrate knowledge and understanding of developments in technology and an appreciation of their influence on people and engineering practice.

Module 2 Content

Exposure to professional practice

- authentic design briefs
- intra and interpersonal skills
- new and emerging technology
- Australian Industry and Professional Standards for engineers.

Ideation, research, discovery and integrated learning

- design and systems thinking methodologies.

Production and sharing replicating professional paradigm

- case study analysis
- engineered solution
- production diary.

Learners will engage in solving real world problems relating to emerging needs such as smart cities, Industry 4.0, Internet of Things (IoT) and sustainability goals. Students will apply industry and professional standards for engineers when creating a product, communicating (designing and reporting) and working in teams.

Key Knowledge:

- concepts of engineering communication for:
  - planning and production
  - recording and reporting
- properties of materials as they relate to their use, selection and application
- role of technology and its impact on society and the environment
- role of creativity, innovation and enterprise in engineering careers
- scientific concepts, mathematical tools and computer-based techniques

- Australian Industry and Professional Standards
- engineering design constraints.

Key Skills:

- critical and creative thinking
- communication
- problem-solving
- production techniques
- evaluation of engineering design solutions against criteria
- teamwork
- analysis of the impact of emerging technologies on people and engineering practice.

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) case Study analysis addressing the impact of emerging technologies on people and engineering practice analyse the interrelationships between engineering projects and society)
- one (1) project and accompanying documentation in response to an engineering design brief

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 Project

In Module 3, students undertake a systems engineering project. Projects emphasise teamwork, communication skills, team and personal management and a professional approach to engineering design, all of which are highly valuable traits for an engineer.

Module 3 Learning Outcomes

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

1. apply design and systems thinking to effectively apply a process to empathise, define and ideate in response to an engineering design brief
2. select and apply appropriate engineering methodologies and use targeted project management strategies in the development and refinement of prototypes
3. apply a rigorous process to test, evaluate and refine engineered solutions against robust success criteria
6. demonstrate knowledge and understanding of ethical, legal, economic, and/or sustainability issues related to an engineered solution.

Module 3 Content

Exposure to professional practice

- identify a problem/need/opportunity/situation and create a design brief
- intra and interpersonal skills

- ethical, legal, economic, and/or sustainability issues.

Ideation, research, discovery and integrated learning

- design and systems thinking methodologies.

Production and sharing replicating professional paradigm

- concept pitch
- engineering project report detailing problem solving, project planning, implementation, testing, refining and management.

Learners will replicate a professional paradigm by establishing a team with clearly defined roles. The team will ideate and identify a problem, need, opportunity or situation that has an achievable engineering design solution and create a design brief. Learners will pitch their concept to an audience before reviewing feedback and undertaking a systems design process to plan, create and evaluate an optimised engineering design solution.

Key Knowledge:

- factors that influence the creation and use of an engineered solution
- systems design processes
- critical and creative design thinking techniques
- production techniques for the use of materials, tools, equipment and machines, including risk management, to make a product safely
- the role of scheduled production plans for collaborative work
- methods of testing and checking the finished product against evaluation criteria
- methods used to record and report progress, including decisions and modifications made during the production process.

Key Skills:

- analyse the interrelationships between engineering projects and society
- develop a design brief and identify aspects that require research develop and use evaluation criteria
- generate and select ideas using creative and critical design thinking techniques
- identify and allocate responsibilities within the team to conduct and share research
- research and synthesis
- create innovative and high-quality design solutions/products using engineering techniques and approaches
- use tools, equipment and machines, and materials competently and safely
- justify selection of materials
- determine and recommend improvements to the product
- communicate complex ideas and insights in a range of mediums to a variety of audiences using appropriate evidence, metalanguage and accurate referencing
- use digital technologies appropriately to support collaboration in the product design process
- work individually and as a team member to make a product or components safely
- use risk management strategies and safely use materials, tools, equipment and machines
- record progress individually, decisions made and modifications to the preferred design option and production plans
- evaluate the finished product or components to determine how they satisfy the design brief.

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) extended learner project as work requirement.

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 endpoint 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.

TASC will supervise the external assessment of designated criteria which will be indicated by an asterisk (*). The ratings obtained from the external assessments will be used in addition to internal ratings from the provider to determine the final award.

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 3 will be based on the degree to which the learner can:

1. apply critical and creative thinking to the design of a solution(s) and justify choices*
2. apply an iterative design cycle to develop engineering design solutions *
3. use success criteria to review, reflect and refine the design process and make justified recommendations*
4. demonstrate understanding of the role of creativity, innovation and enterprise in engineering careers
5. analyse the impact of emerging technologies on people and engineering practice
6. analyse the interrelationships between engineering projects and society.

*denotes criteria that are both internally and externally assessed.

Standards

Criterion 1*: apply critical and creative thinking to the design of a solution(s) and justify choices

This criterion is both internally and externally assessed.

Rating C	Rating B	Rating A
analyses problems and challenges to meet a limited range of needs and requirements	analyses problems and challenges to meet a range of needs and requirements	analyses problems and challenges to meet a wide range of needs and requirements
creates a basic design brief that includes key criteria and/or constraints such as function and/or aesthetics	creates a detailed design brief that includes key criteria and/or constraints such as function and/or aesthetics	creates a comprehensive design brief that includes key criteria and/or constraints such as function and/or aesthetics
generates basic engineering production proposals to provide optimised solutions	generates detailed engineering production proposals to provide optimised solutions	generates comprehensive engineering production proposals to provide optimised solutions
communicates ideas logically using evidence, technical language, and appropriate referencing.	communicates ideas effectively using evidence, technical language, and appropriate referencing accurately.	communicates complex ideas effectively using evidence, technical language, and appropriate referencing accurately.

Criterion 2*: apply an iterative design cycle to develop engineering design solutions

This criterion is both internally and externally assessed.

Rating C	Rating B	Rating A
synthesises and applies technological, scientific and mathematical concepts	synthesises and accurately applies technological, scientific and mathematical concepts	synthesises and accurately applies complex technological, scientific and mathematical concepts
produces a refined solution that could solve a relevant problem and evaluates using success criteria	produces an optimised solution that could solve a relevant problem and evaluates using success criteria	produces an optimised solution that could solve a relevant problem and critically evaluates using success criteria
implements engineering-field specific methodologies to create and design engineered solutions/systems	effectively implements engineering-field specific methodologies to create and design engineered solutions/systems that meets most of the requirements of a brief	effectively implements engineering-field specific methodologies to create and design engineered solutions/systems that meets the requirements of a brief
explains strategies, methodologies and procedures and describes their validity and reliability	analyses strategies, methodologies and procedures and explains their validity and reliability	critically analyses strategies, methodologies and procedures and evaluates their validity and reliability

*A solution could be fully realised or a model, prototype, system, part, process (i.e., procedures to output a product), or product.

Criterion 3*: use success criteria to review, reflect and refine the design process and make justified recommendations

This criterion is both internally and externally assessed.

Rating C	Rating B	Rating A
thinks critically, drawing on data and information at times to solve problems and explains opportunities for application of technology	thinks critically, drawing on data and information to solve complex problems and analyses opportunities for application of technology	thinks critically and creatively, drawing on data and information to solve complex problems and evaluates opportunities for application of technology
reflects on own thinking and that of others and explains inter and intrapersonal skills including planning, time management, use of appropriate techniques and strategies and capacity to work both independently and collaboratively	reflects on their own thinking and that of others and analyses inter and intrapersonal skills including planning, time management, use of appropriate techniques and strategies and capacity to work both independently and collaboratively	reflects with insight on their own thinking and that of others and evaluates inter and intrapersonal skills including planning, time management, use of appropriate techniques & strategies and capacity to work independently and collaboratively
creates feasible evaluation and adequate refinement of ideas and a solution using some success criteria to make fundamental recommendations justified by data and research evidence.	creates reasoned evaluation and effective refinement of ideas and a solution using success criteria to make considered recommendations justified by data and research evidence.	creates critical evaluation and discerning refinement of ideas and a solution using success criteria to make astute recommendations justified by data and research evidence.
selects and applies suitable communication techniques in the development, planning, production and presentation of ideas and projects.	selects, interprets and applies a range of suitable communication techniques in the development, planning, production and presentation of ideas and projects.	selects, analyses and applies a range of targeted communication techniques in the development, planning, production and presentation of ideas and projects.

Criterion 4: demonstrate understanding of the role of creativity, innovation and enterprise in engineering careers

Rating C	Rating B	Rating A
regularly applies relevant Australian Industry Standards for processes and production and explains the responsibilities of engineers in society	frequently applies relevant Australian Industry Standards for processes and production and analyses the responsibilities of engineers in society	consistently applies relevant Australian Industry Standards for processes and production and critically analyses the responsibilities of engineers in society
examines the scope of engineering and describes current innovations	investigates the scope of engineering and analyses current innovations	investigates the scope of engineering and critically analyses current innovations
describes how enterprise can help drive the development of new product ideas.	explains how enterprise can help drive the development of new product ideas.	analyses how enterprise can help drive the development of new product ideas.

Criterion 5: analyse the impact of emerging technologies on people and engineering practice

Rating C	Rating B	Rating A
examines the extent of technological change in engineering*	investigates the extent of technological change in engineering*	analyses the extent of technological change in engineering*
evaluates impacts, including unintended negative consequences, of choices made about technology use in an engineering context	analyses impacts, including unintended negative consequences, of choices made about technology use in an engineering context	critically analyses impacts, including unintended negative consequences, of choices made about technology use in an engineering context
explains the role of circular economy in sustainable engineering design.	analyses the role of circular economy in sustainable engineering design.	critically analyses the role of circular economy in sustainable engineering design.

*(use and impact of ICT; automation; components; modern materials; and control technology)

Criterion 6: analyse the interrelationships between engineering projects and society

Rating C	Rating B	Rating A
explains ethical, legal, economic, and/or sustainability issues related to technology, materials selected, processes used, and/or solution design	analyses ethical, legal, economic, and/or sustainability issues related to technology, materials selected, processes used, and/or solution design	critically analyses ethical, legal, economic, and/or sustainability issues related to technology, materials selected, processes used, and/or solution design
identifies the implications of intellectual property (IP), registered designs, registered trademarks, copyright, design rights and patents, in relation to ethics in design practice and consumer rights	describes the implications of intellectual property (IP), registered designs, registered trademarks, copyright, design rights and patents, in relation to ethics in design practice and consumer rights	explains the implications of intellectual property (IP), registered designs, registered trademarks, copyright, design rights and patents, in relation to ethics in design practice and consumer rights
evaluate the features and methods used in existing products and design solutions to inform opportunities and constraints that may influence design decisions to offer product enhancement.	analyse and evaluate the features and methods used in existing products and design solutions to inform opportunities and constraints that may influence design decisions to offer product enhancement.	critically analyse and evaluate the features and methods used in existing products and design solutions to inform opportunities and constraints that may influence design decisions to offer product enhancement.

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 the 9 ratings (6 ratings from the internal assessment and 3 ratings from the external assessment).

The minimum requirements for an award in *Engineering Design* Level 3 are as follows:

EXCEPTIONAL ACHIEVEMENT (EA)
8'A' ratings, 1 'B' rating (2 'A' ratings, 1 'B' rating from external assessment)

HIGH ACHIEVEMENT (HA)
4 'A' ratings, 4 'B' ratings, 1 'C' ratings (1 'A' rating, 1 'B' rating and 1 'C' rating from external assessment)

COMMENDABLE ACHIEVEMENT (CA)
4 'B' ratings, 4 'C' ratings (1 'B' ratings, 2 'C' ratings from external assessment)

SATISFACTORY ACHIEVEMENT (SA)
7 'C' ratings (2 'C' ratings from external assessment)

PRELIMINARY ACHIEVEMENT (PA)
5 'C' ratings

A learner who otherwise achieves the ratings for a CA (Commendable Achievement) or 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.

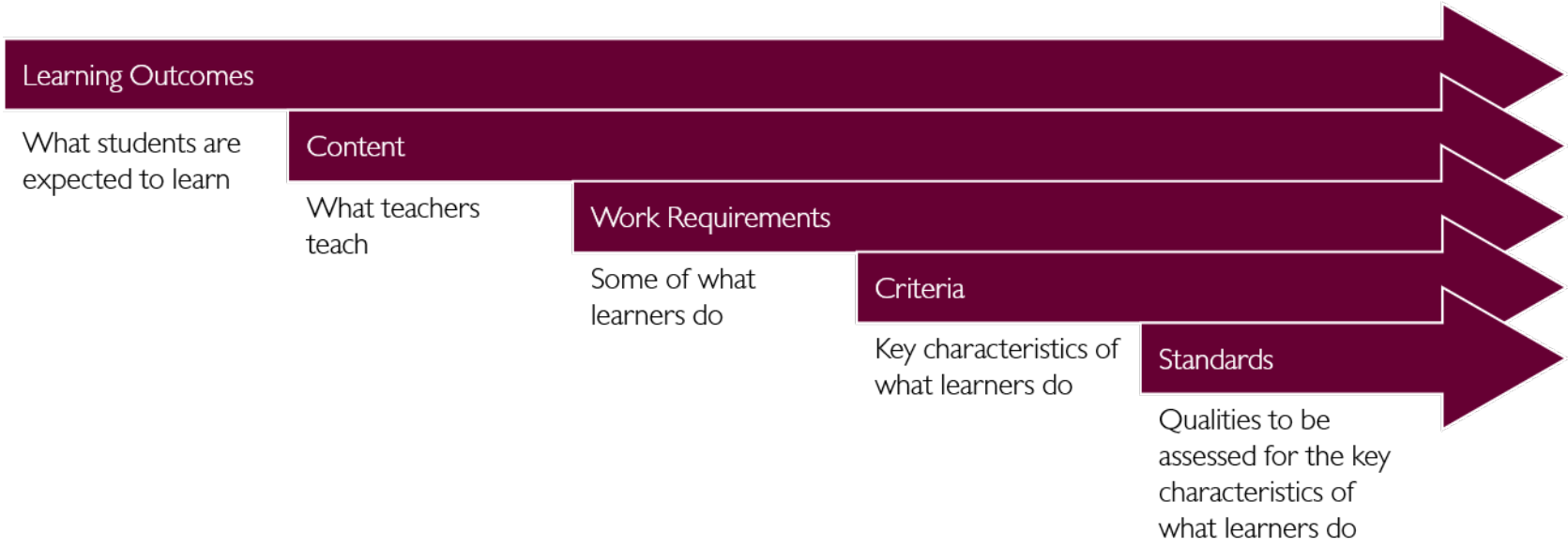
Course Developer

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. Apply design and systems thinking to effectively apply a process to empathise, define and ideate in response to an engineering design brief.	Module 1, 2, 3	Module 1, 2, 3	C 1	E 1, 2, 3, 4	GC:
2. Select and apply appropriate engineering methodologies and use targeted project management strategies in the development and refinement of prototypes.	Module 1, 2, 3	Module 1, 2, 3	C 2	E 1, 2, 3. 4	GC:

3. Apply a rigorous process to test, evaluate and refine engineered solutions against robust success criteria.	Module 1, 2, 3	Module 1, 2, 3	C 3	E 1, 2, 3, 4	GC: 
4. Describe and analyse the role of creativity, innovation and enterprise in engineering careers..	Module 1	Module 1	C 4	E 1, 2, 3	GC: 
5. Demonstrate knowledge and understanding of developments in technology and an appreciation of their influence on people and engineering practice.	Module 2	Module 2	C 5	E 1, 2, 3	GC: 
6. Demonstrate knowledge and understanding of ethical, legal, economic, and/or sustainability issues related to an engineered solution.	Module 3	Module 3	C 6	E 1, 2, 3	GC: 

Appendix 2 - Alignment to Curriculum Frameworks

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: Rapid Prototype and Design Pitch
Mode /Format: Project/Performance
Learning Outcomes: 1, 2, 3, 4
Description: Plan, build, user test and share a prototype in response to a design brief.
Size: A recommended maximum of 15-minutes multimodal
Timing: Complete prior to commencing Module 3
External agencies: none required
Relevant Criterion/criteria:

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

Relationship to External Assessment: Internal assessment

Focus Area: Professional Studies
Title of Work Requirement: Design Journal
Mode /Format: Minor project
Learning Outcomes: 1, 2, 3 & 4
Description: Design and production of an engineered solution to a specified real world project brief as provided by the course provider.
Through this area of study, learners apply skills in documentation and communication. In particular, they will record the creation of an engineering solution through a production diary or equivalent (e.g., a folio or blog), that includes:

- The original brief
- Evidence of project management strategies
- The initial research
- Initial designs and thoughts on a solution
- Prototyping and appropriate testing
- Final analysis of product for effectiveness.

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

Size: The size, complexity and scale of the engineering solution will be appropriate to a guided figure of 50 hours for this module. Noting students may undertake multiple systems design challenges within this module.
Timing: Complete prior to commencing Module 3.
External agencies: none required
Relevant Criterion/criteria:

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

Relationship to External Assessment: Internal assessment

Module 2 Work Requirements Specifications

Focus Area: Professional Studies
Title of Work Requirement: Case Study
Mode /Format: Extended response
Learning Outcomes: 1, 2, 3 & 5
Description: Students respond to real world or hypothetical case study/studies relating to the impact of emerging technologies on people and engineering practice analyse the interrelationships between engineering projects and society.

Size: 800 -1000 words
Timing: Complete prior to commencing Module 3
External agencies: none required
Relevant Criterion/criteria:

- Criterion 1: elements 1, 4
- Criterion 2: element 1
- Criterion 3: element 1, 3
- Criterion 5: all standard elements

Relationship to External Assessment: Internal assessment

Focus Area: Professional Studies
Title of Work Requirement: Design and Solution
Mode /Format: Project
Learning Outcomes: 1, 2, 3 & 5
Description: Design and production of an engineered solution to a brief addressing an emerging need, as provided by the course provider.
Through this area of study, learners apply skills in documentation and communication. They will record the creation of an engineering solution through a production diary or equivalent (e.g., a folio or blog), that includes:

- the original brief
- evidence of project management strategies
- the initial research
- initial designs and thoughts on a solution
- prototyping and appropriate testing
- final analysis of product for effectiveness.

This is to be presented in an appropriate format including evidence of design development though sketching and annotated photos of production process and documentation of testing processes.
Size: The size, complexity and scale of the engineering solution will be appropriate to a guided figure of 50-hours for this module. Noting students may undertake multiple systems design challenges within this module.
Timing: Complete prior to commencing Module 3
External agencies: none required
Relevant Criterion/criteria:

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

Relationship to External Assessment: Internal assessment

Module 3 Work Requirements Specifications

Focus Area: Professional Studies
Title of Work Requirement: Learner Project folio
Mode /Format: Extended project
Learning Outcomes: 1, 2, 3, 6
Description:
Learners will replicate a professional paradigm.
Proposal (internal)

- Identified engineering design problem
- Background research to inform design brief
- Work plan (timeline/risk mitigation/role allocation)
- Pitch/Presentation

Design Brief (external)

- Introduction
- Design Statement
- Design specifications, constraints and limitations
- Design Process
    - Analysis of engineering design problem
    - Investigation of possible solutions
    - Criteria for selection of student's solution
    - Production drawings/plans
    - Testing and evaluation

Reflective Journal (internal)-– demonstrating how the learner:

- monitored the effectiveness of the plans for their inquiry using appropriate strategies (e.g., developing criteria to measure effective implementation, checking progress according to a timeline, providing progress reports on action taken and decisions made during the process)
- addressed problems encountered
- analysed how perspectives were shaped by the sources of information they used
- effectiveness of the collaborative strategies they used in planning and implementing their inquiry
- evaluated the effectiveness of the inquiry including their research sources, methods, findings and plans and by revising their plans as problems arose.

The reflective journal serves an important function. The journal assists with ongoing support and supervision and is a formal record enabling authentication of the learner's work. The journal documents the result of collaborative work, reflecting the importance of teamwork to successful engineering projects.
It may be maintained in print or electronic form. All items in the journal must be dated and legible.
Size:
Internal

- Proposal 750 – 1000 words or multimodal equivalent
- Reflective journal – 1000 – 1500 words or multimodal equivalent

External

- Folio - Maximum of 40 A4 equivalent pages (includes research, evidence of planning, concept sketches with annotations, photographs, charts/diagrams, etc) no larger than 100 megabytes in total size.

Timing: 50hrs of dedicated class time.
External agencies: none required
Relevant Criterion/criteria:

- Criterion 1: all standard elements
- Criterion 2: all standard elements
- Criterion 3: all standard elements
- Criterion 6: all standard elements

Relationship to External Assessment: Externally assessed

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.