



Engineering Design Level 2-3

Overview and Key Features

Years 9 to 12 Learning 2020



The purpose of this paper

The purpose of this paper is to provide information regarding the overview and key features of the proposed *Engineering Design Level 2-3*.

It is designed to enable all interested stakeholders to reflect and provide feedback on key features including learning outcomes, structure, sequencing and likely content. This feedback will be considered in writing the draft course.

Consultation

Throughout the course development process there will be four opportunities for formal stakeholder consultation:

- Course Scope
- Structural Overview and Key features (Nov/Dec 2020)
- Initial Draft Course (March 2021)
- Final Draft Course (June 2021)

This paper represents the second of four course consultation points for teachers to engage in the course development process for *Engineering Design Level 2-3*.

Course Rationale

The Engineering Design suite pairing 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.

Engineering Design suite 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 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 identify and articulate further improvements and developments.

Engineering Design suite will impart a specific skill set upon learners that will enable them to confidently identify a 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.

Years 9 to 12 Curriculum Framework

[Years 9 to 12 Education Framework](#) informs the design of *Engineering Design* course and it fits within the Professional Studies focus area of the [Years 9 to 12 Curriculum Framework](#).

Pathways in

Engineering Design builds on students' learning in Years 9-10 Australian curriculum: Science and Technologies. Engineering Design, may be studied as a standalone course.





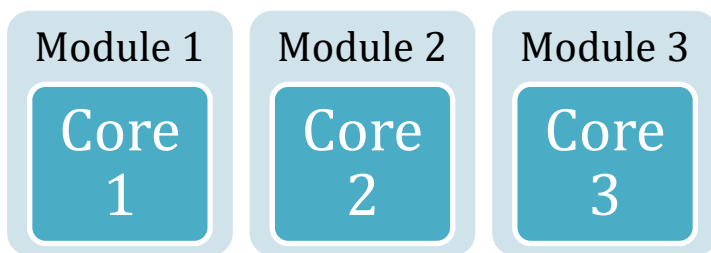
Level 2

Learning Outcomes

On successful completion of this course learners will be able to:

- apply and communicate a process to design, make and evaluate engineered products (Engineering Process)
- demonstrate understandings of materials, components and scientific and mathematical concepts used in the engineering context (Engineering Understandings)
- use materials, skills and technologies when undertaking an engineering challenge (Engineering Technology Skills)
- describe how engineering solutions are utilised and their impact on society (Engineering & Society)
- communicate in a range of modes and contexts to articulate the design process in an engineering context (Communication and Metacognition)
- use and communicate procedures to manage the iterative design process to produce a solution (Project Management).

Course Structure



Modules Available

Core 1: Activity of Engineers

Core 2: Engineering Solutions

Core 3: Learner Projects

Course Delivery

To be developed through consultation.

Module content:

Module 1 - Activity of Engineers

- **Engineering Design Process**
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, including the role of failure in innovative thought processes. Learners will develop visual communication skills to communicate their ideas and understandings through the process of design development and the presentation of a final product.



- **Engineering Practices**

This module develops students understanding of engineering practices. Through tutorial and project-based learning, students explore and investigate existing products, materials and components. Students work with established safety procedures to utilise a variety of tools and equipment and effectively manage manufacturing projects.

Module 2 - Engineering Solutions

In Module 2 students apply learning from Module 1 to further 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.

Module 3 - Learner Project(s)

In this, module students study an area of special interest as a class, group(s) or individual in consultation with the teacher. Students will conduct their own research, design and construct a prototype and then perform an evaluation of their final product.

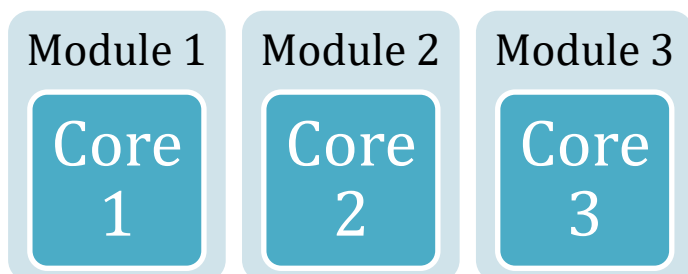
Level 3

Learning Outcomes

On successful completion of this course learners will be able to:

- apply and communicate a process to design, make and evaluate engineered products (Engineering Process)
- demonstrate understandings of materials, components and scientific and mathematical concepts used in the engineering context (Engineering Understandings)
- use materials, skills and technologies when undertaking an engineering challenge (Engineering Technology Skills)
- analyse ethical, legal, economic, and/or sustainability issues related to technology, materials selected, processes used, and/or solution design (Engineering & Society)
- communicate in a range of modes and contexts to articulate the design process in an engineering context (Communication and Metacognition)
- establish and communicate protocols to manage the iterative design process to produce a solution (Project Management).

Course Structure





Modules Available

Core 1: Engineering

Core 2: Engineering in Context

Core 3: Learner Project

Course Delivery

To be developed through consultation.

Module content

Module 1 - Engineering

- **Engineering Systems**

This module develops students 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.

- **Professional Practices**

What skills and knowledge will todays engineers need to solve tomorrows problems?

Industry Practices & Professional Standards – problem solving, project planning, implementation and management. Legislation, health and safety issues, quality standards. Techniques for reporting and communicating, recognising Australian Standards for engineering drawing. Personal and interpersonal skills, including teamwork and communication.

Emerging Needs – investigate a problem in an area of growing demand. Recognise how the design process can be applied to future problems. Consider the impact of emerging processes, machinery and materials on engineered solutions, e.g. smart cities, Industry 4.0, IoT, sustainability goals.

Module 2 - Engineering in Context

In this module, students consider and analyse the stages within the life cycle of engineering products. Students develop and demonstrate an understanding of the impacts on society, business and the environment that occur during the life cycle of engineered products.





Students continue to refine their understanding and skills of the engineering design process, undertaking tasks to produce, test and evaluate the product. Core and specialist area theory continues to be studied to forge greater understanding of the scientific, mathematical and technical concepts that explain how engineered products function.

Module 3 - Learner Project

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.



Relationship to possible Future Provision

Focus Area	P	1	2	3	4
 DISCIPLINE-BASED			Computer Science Electronics Food and Nutrition		
 TRANSDISCIPLINARY		Design and Technology Digital Projects	Paddock to Plate		Capstone Course Design and Innovation
 PROFESSIONAL STUDIES		Food and Agricultural Technology	Hospitality and Tourism Agriculture Built Environmental Design Automotive and Mechanical Systems Design and Production Industrial Design Solutions Computer Graphics and Design Engineering Design Advanced Manufacturing Information Systems and Digital Technologies		
 PERSONAL FUTURES	Technologies		Essential Skills - Using Computers and the Internet		

Note: Subject to ongoing accreditation considerations in line with the Accreditation Framework