Industrial Technology
Years 7–10

Syllabus

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1 Introduction

1.1 The K–10 Curriculum

This syllabus has been developed within the parameters set by the Board of Studies NSW in its *K–10 Curriculum Framework.* This framework ensures that K–10 syllabuses and curriculum requirements are designed to provide educational opportunities that:

- engage and challenge all students to maximise their individual talents and capabilities for lifelong learning
- enable all students to develop positive self-concepts and their capacity to establish and maintain safe, healthy and rewarding lives
- prepare all students for effective and responsible participation in their society, taking account of moral, ethical and spiritual considerations
- encourage and enable all students to enjoy learning, and to be self-motivated, reflective, competent learners who will be able to take part in further study, work or training
- promote a fair and just society that values diversity
- promote continuity and coherence of learning, and facilitate the transition between primary and secondary schooling.

The framework also provides a set of broad learning outcomes that summarise the knowledge, understanding, skills, values and attitudes essential for all students to succeed in and beyond their schooling. These broad learning outcomes indicate that students will:

- understand, develop and communicate ideas and information
- access, analyse, evaluate and use information from a variety of sources
- work collaboratively with others to achieve individual and collective goals
- possess the knowledge and skills necessary to maintain a safe and healthy lifestyle
- understand and appreciate the physical, biological and technological world and make responsible and informed decisions in relation to their world
- understand and appreciate social, cultural, geographical and historical contexts, and participate as active and informed citizens
- express themselves through creative activity and engage with the artistic, cultural and intellectual work of others
- understand and apply a variety of analytical and creative techniques to solve problems
- understand, interpret and apply concepts related to numerical and spatial patterns, structures and relationships
- be productive, creative and confident in the use of technology and understand the impact of technology on society
- understand the work environment and be equipped with the knowledge, understanding and skills to evaluate potential career options and pathways
- develop a system of personal values based on their understanding of moral, ethical and spiritual matters.

The ways in which learning in the *Industrial Technology Years 7–10 Syllabus* contributes to the curriculum and to the student's achievement of the broad learning outcomes are outlined in the syllabus rationale.

In accordance with the *K–10 Curriculum Framework*, the *Industrial Technology Years 7–10 Syllabus* takes into account the diverse needs of all students. It identifies essential knowledge, understanding, skills, values and attitudes. It enunciates clear standards of what students are

expected to know and be able to do in Years 7–10. It provides structures and processes by which teachers can provide continuity of study for all students, particularly to ensure successful transition through Years 5 to 8 and from Year 10 to Year 11.

The syllabus also assists students to maximise their achievement in Industrial Technology through the acquisition of additional knowledge, understanding, skills, values and attitudes. It contains advice to assist teachers to program learning for those students who have gone beyond achieving the outcomes through their study of the essential content.

1.2 Students with Special Education Needs

In the K–6 curriculum, students with special education needs are provided for in the following ways:

- through the inclusion of outcomes and content in syllabuses which provide for the full range of students
- through the development of additional advice and programming support for teachers to assist students to access the outcomes of the syllabus
- through the development of specific support documents for students with special education needs
- through teachers and parents planning together to ensure that syllabus outcomes and content reflect the learning needs and priorities of individual students.

Students with special education needs build on their achievements in K–6 as they progress through their secondary study and undertake courses to meet the requirements for the School Certificate.

It is necessary to continue focusing on the needs, interests and abilities of each student when planning a program for secondary schooling. The program will comprise the most appropriate combination of courses, outcomes and content available.

Life Skills

For most students with special education needs, the outcomes and content in sections 6 and 7 of this syllabus will be appropriate but for a small percentage of these students, particularly those with an intellectual disability, it may be determined that these outcomes and content are not appropriate. For these students the Life Skills outcomes and content in section 8 and the Life Skills assessment advice below can provide the basis for developing a relevant and meaningful program.

Access to Life Skills outcomes and content in Years 7–10

A decision to allow a student to access the Industrial Technology Years 7–10 Life Skills outcomes and content should include parents/carers and be based on careful consideration of the student's competencies and learning needs.

The decision should establish that the outcomes and content in sections 6 and 7 of the *Industrial Technology Years 7–10 Syllabus* are not appropriate to meet the needs of the student. Consideration should be given to whether modifications to programs and to teaching, including adjustments to learning activities and assessment, would enable the student to access the syllabus outcomes and content.

As part of the decision to allow a student to access the Industrial Technology Years 7–10 Life Skills outcomes and content, it is important to identify relevant settings, strategies and resource requirements that will assist the student in the learning process. Clear time frames and strategies for monitoring progress, relevant to the age of the student, need to be identified and collaborative plans should be made for future needs.

It is not necessary to seek permission of the Office of the Board of Studies for students to undertake the Industrial Technology Years 7–10 Life Skills outcomes and content, nor is it necessary to submit planning documentation.

Life Skills assessment

Each student undertaking a Industrial Technology Years 7–10 Life Skills course will have specified outcomes and content to be studied. The syllabus content listed for each outcome forms the basis of learning opportunities for students.

Assessment should provide opportunities for students to demonstrate achievement in relation to the outcomes and to generalise their knowledge, understanding and skills across a range of situations or environments including the school and the wider community.

Students may demonstrate achievement in relation to Industrial Technology Years 7–10 Life Skills outcomes independently or with support. The type of support will vary according to the particular needs of the student and the requirements of the activity. Examples of support may include:

- the provision of extra time
- physical and/or verbal assistance from others
- the provision of technological aids.

2 Rationale

The study of Industrial Technology Years 7–10 provides students with opportunities to engage in a diverse range of creative and practical experiences using a variety of technologies widely available in industrial and domestic settings. This may include study in the areas of Automotive, Building and Construction, Ceramics, Electronics, Engineering, Farm Maintenance, Leather, Metal, Multimedia/Photography, Polymers or Timber.

Industrial Technology Years 7–10 develops in students knowledge and understanding of materials and processes. Related knowledge and skills are developed through a specialised approach to the tools, materials and techniques employed in the planning, development, construction and evaluation of quality practical projects and processes. Critical thinking skills are developed through engagement with creative practical problem-solving activities.

The *Industrial Technology Years 7–10 Syllabus* allows students to study technology in specific focus areas, relevant to individual needs and interests, and to determine the depth and breadth of study within focus areas through a range of specialised modules. The syllabus has been designed to be inclusive of the needs, interests and aspirations of all students. Students develop responsibility for learning through a range of student-centred learning experiences.

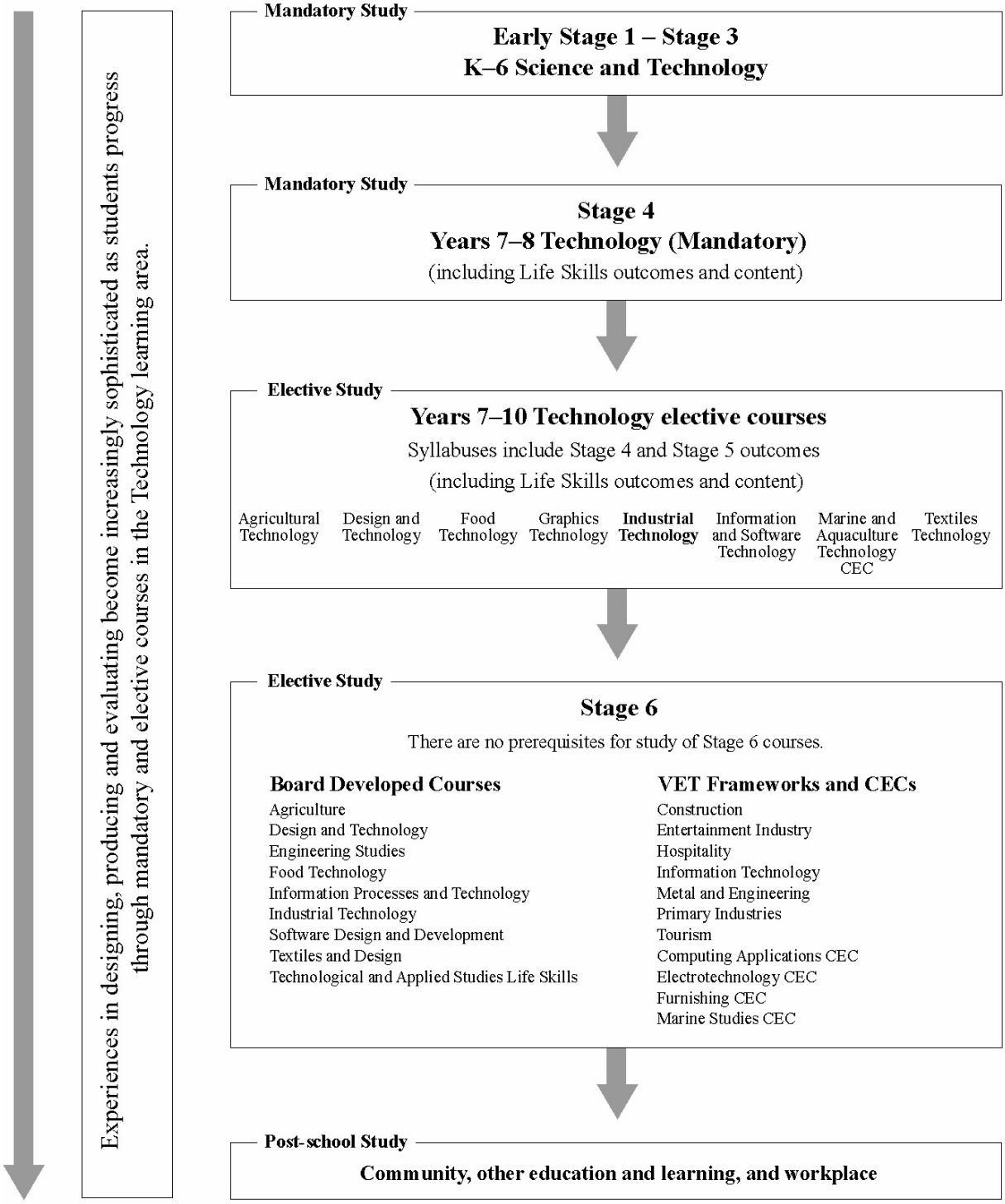
Through the study of Industrial Technology Years 7–10 students develop knowledge relating to current and emerging technologies in industrial and domestic settings. Students study the interrelationship of technologies, equipment and materials used in a variety of settings and develop skills through hands-on interaction with these in the design, planning and production of practical projects.

Industrial Technology Years 7–10 leads students to an awareness of the relationship between technology, industry, society and the environment, and develops their ability to make value judgements about issues, decisions and consequences arising from this interaction. Students develop an awareness of the importance of environmental sustainability in relation to the use of materials and technologies and their effects on people and society.

The study of Industrial Technology Years 7–10 develops in students an understanding of related work environments and Occupational Health and Safety (OHS) matters, while developing a range of skills that will equip them for future leisure and lifestyle activities, potential vocational pathways or future learning in the technology field.

The skills, knowledge and attitudes developed through the study of Industrial Technology Years 7–10 will enable students to make positive contributions to Australian industry and society, to express valued opinions and to make considered judgements as contributing members of society.

3 The Place of the Industrial Technology Years 7–10 Syllabus in the Technology K–12 Curriculum



4 Aim

The aim of the *Industrial Technology Years 7–10 Syllabus* is to develop in students knowledge, understanding, skills and values related to a range of technologies through the safe interaction with materials, tools and processes in the planning, development and construction of quality practical projects. The syllabus aims to develop in students an understanding of the interrelationships between technology, the individual, society and the environment, and to develop their ability to think creatively to devise solutions to practical problems.

5 Objectives

Knowledge, understanding, skills, values and attitudes

Students will develop:

1 knowledge of and competence in applying Occupational Health & Safety (OHS) risk management procedures and practices
2 knowledge, skills and an appreciation of quality in the design and production of practical projects
3 knowledge and understanding of the relationship between the properties of materials and their applications
4 skills in communicating ideas, processes and technical information with a range of audiences
5 an appreciation of the relationship between technology, leisure and lifestyle activities and further learning
6 the ability to critically evaluate manufactured products in order to become a discriminating consumer
7 knowledge and understanding of the role of traditional, current, new and emerging technologies in industry and their impact on society and the environment.

6 Outcomes

Objectives Students will develop:	**Stage 4 Outcomes** A student:	**Stage 5 Outcomes** A student:
1 knowledge of and competence in applying Occupational Health & Safety (OHS) risk management procedures and practices	4.1.1 identifies and applies fundamental OHS principles when working with materials, tools and machines	5.1.1 identifies, assesses and manages the risks and OHS issues associated with the use of a range of materials, hand tools, machine tools and processes 5.1.2 applies OHS practices to hand tools, machine tools, equipment and processes
2 knowledge, skills and an appreciation of quality in the design and production of practical projects	4.2.1 applies a design process in the modification of projects 4.2.2 identifies and uses a range of hand and machine tools in different technological environments 4.2.3 makes quality projects to completion within set limitations	5.2.1 applies design principles in the modification, development and production of projects 5.2.2 identifies, selects and competently uses a range of hand and machine tools, equipment and processes to produce quality practical projects
3 knowledge and understanding of the relationship between the properties of materials and their applications	4.3.1 uses a range of relevant materials for specific purposes 4.3.2 recognises the use of appropriate materials for specific applications	5.3.1 justifies the use of a range of relevant and associated materials 5.3.2 selects and uses appropriate materials for specific applications
4 skills in communicating ideas, processes and technical information with a range of audiences	4.4.1 selects and uses elementary communication techniques when designing, making and evaluating projects and ideas 4.4.2 works cooperatively in the learning environment	5.4.1 selects, applies and interprets a range of suitable communication techniques in the development, planning, production and presentation of ideas and projects 5.4.2 works cooperatively with others in the achievement of common goals

Objectives Students will develop:	**Stage 4 Outcomes** A student:	**Stage 5 Outcomes** A student:
5 an appreciation of the relationship between technology, leisure and lifestyle activities and further learning	4.5.1 applies learnt skills, processes and materials to a variety of contexts and projects	5.5.1 applies and transfers acquired knowledge and skills to subsequent learning experiences in a variety of contexts and projects
6 the ability to critically evaluate manufactured products in order to become a discriminating consumer	4.6.1 evaluates products in terms of functional use and aesthetics	5.6.1 evaluates products in terms of functional, economic, aesthetic and environmental qualities and quality of construction
7 knowledge and understanding of the role of traditional, current, new and emerging technologies in industry and their impact on society and the environment	4.7.1 identifies a range of technologies 4.7.2 recognises the impact of technology on society and the environment 4.7.3 describes cultural and global issues in relation to the use of technology	5.7.1 describes, analyses and uses a range of current, new and emerging technologies and their various applications 5.7.2 describes, analyses and evaluates the impact of technology on society, the environment and cultural issues locally and globally

Stage 4 outcomes have been provided to assist in the assessment and reporting of student achievement in those schools that choose to begin elective study before Year 9. Teachers are advised to select from the syllabus content to target the specific needs of students who commence study in Stage 4.

Life Skills

For some students with special education needs, particularly those students with an intellectual disability, it may be determined that the above outcomes are not appropriate. For these students, Life Skills outcomes and content can provide the basis for the development of a relevant and meaningful program – see section 8.

7 Content

7.1 Organisation of Content

Industrial Technology Years 7–10 is an elective course that builds on the knowledge, skills and experiences developed in the *Technology (Mandatory) Years 7–8 Syllabus*.

The major emphasis of the *Industrial Technology Years 7–10 Syllabus* is on students being actively involved in the planning, development and construction of quality practical projects. Students should be provided with a range of theoretical and practical experiences to develop knowledge and skills in a selected focus area.

A project report is required for each practical project completed and will form part of the overall assessment of each module.

Focus areas and modules

This syllabus covers a number of focus areas in the field of technology: Automotive, Building and Construction, Ceramics, Electronics, Engineering, Farm Maintenance, Leather, Metal, Multimedia/Photography, Polymers, and Timber.

Each focus area is divided into two compulsory core modules (50 hours each) that lead to a range of optional specialised modules to be studied for not less than 50 hours each. The core modules of each focus area include the design, production and evaluation of practical projects that develop basic understanding and skills. These are further enhanced through the specialised modules.

Individual modules (core and specialised) provide specific content related to the focus areas which will be developed in the key areas of:

- Occupational Health and Safety (OHS)
- Materials, Tools and Techniques
- Design
- Links to Industry
- Workplace Communication
- Societal and Environmental Impact.

Modules are structured in a sequential manner, with the knowledge and skills developed in one module applied and enhanced through subsequent modules within the focus area. Schools may deliver consecutive modules concurrently to maximise the use of resources.

For each module, additional content is provided that will enable students to explore focus areas to a greater depth and breadth. Additional content is designed to deepen and broaden students' knowledge and skills in both practical and theoretical contexts.

Syllabus content is to be delivered in accordance with all policies and guidelines relating to the safe handling, use, storage and disposal of tools, equipment, materials and chemicals.

Focus areas and modules

Focus Area	Core Module 50 hours	Core Module 50 hours	Specialised Module 50 hours	Specialised Module 50 hours
Automotive	Automotive 1	Automotive 2	Automotive 3	Automotive 4
Building and Construction	Building and Construction 1	Building and Construction 2	Construction and Renovation 3	Construction and Renovation 4
			Outdoor Structures and Landscaping 3	Outdoor Structures and Landscaping 4
Ceramics	Ceramics 1	Ceramics 2	Ceramics 3	Ceramics 4
Electronics	Circuits and Components 1	Circuits and Components 2	Circuits and Components 3	Circuits and Components 4
			Computer Repair and Construction 3	Computer Repair and Construction 4
Engineering	Engineering 1 Structures	Engineering 2 Mechanisms	Engineering 3 Control Systems	Engineering 4 Alternative Energy
Farm Maintenance	Farm Maintenance 1	Farm Maintenance 2	Farm Maintenance 3	Farm Maintenance 4
Leather	Leatherwork 1	Leatherwork 2	Leatherwork 3	Leatherwork 4
Metal	General Metal 1	General Metal 2	Metal Machining 3	Metal Machining 4
			Fabrication 3	Fabrication 4
	Art Metal 1	Art Metal 2	Art Metal 3	Art Metal 4
			Jewellery 3	Jewellery 4
Multimedia / Photography	Multimedia 1	Multimedia 2	Multimedia 3	Multimedia 4
	Photography 1	Photography 2	Photography 3	Photography 4
Polymers	Polymers 1	Polymers 2	Polymers 3	Polymers 4
Timber	General Wood 1	General Wood 2	Cabinetwork 3	Cabinetwork 4
			Wood Machining 3	Wood Machining 4

Students may study up to 2 courses based on the Industrial Technology syllabus. Each course may comprise:
1 focus area studied for 100 hours (core modules only) **or**
1 focus area studied for 200 hours (core modules plus 2 specialised modules).

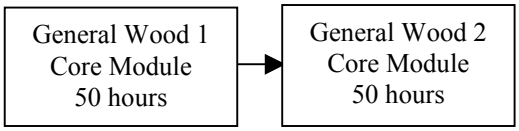
Course combinations in Industrial Technology Years 7–10 may include:
- 1 x 100-hour course
- 1 x 200-hour course
- 2 x 100-hour courses
- 2 x 200-hour courses
- 1 x 100-hour course and 1 x 200-hour course.

Each course must be based on the study of one focus area only. Where a student undertakes two courses in Industrial Technology, they must be from different focus areas.

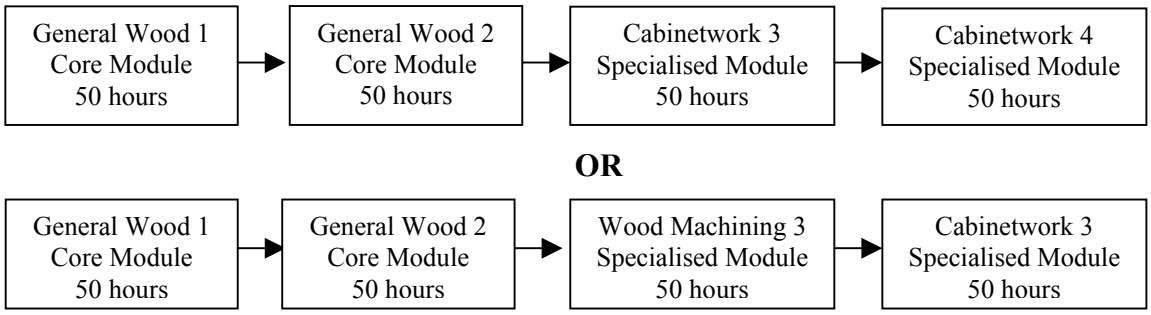
For example:
Focus Area – Timber

A student may choose to study

100-hour course:



200-hour course:



Life Skills
Life Skills outcomes and content are in section 8.

Cross-curriculum Content
Cross-curriculum content assists students to achieve the broad learning outcomes defined in the Board of Studies *K–10 Curriculum Framework*. It is incorporated in the content of the *Industrial Technology Years 7–10 Syllabus* in the following ways:

Information and Communication Technologies (ICT)

Students in all focus areas will integrate a variety of ICT applications through the development, modification and production of practical projects. These include:

- creation of spreadsheets for material costing
- use of the internet in research activities
- word processing and graphics in the production of reports in relation to practical and research projects
- knowledge and application of ICT directly related to the focus area
- optional use of computer-aided design and drafting (CAD) in the production of working drawings.

Work, Employment and Enterprise

In all aspects of the course, students will use and apply appropriate industry terminology and work practices. Students develop an awareness of the range of vocational opportunities available through a materials-based focal study. Problem-solving, workplace communication, cooperative work practices and Occupational Health and Safety are embedded in all focus areas.

Civics and Citizenship

Students develop a sound knowledge of materials and manufacturing processes which enables them to become discriminating consumers and users of materials and processes. This encourages participation as active and informed citizens. Students also reflect on the environmental impacts of industries, leading to ethical considerations in technical practice.

Difference and Diversity

All students are encouraged to develop skills in a variety of areas in which they are interested. By participating in cooperative work practices they learn to appreciate the various roles and contributions of people in society. Students learn the importance of respecting and valuing differences in others.

Environment

All focus areas foster an awareness of the impact of industry on the environment and the importance of the use of alternative and sustainable resources. This enables students to make informed decisions in relation to the selection and use of materials and processes.

Gender

The *Industrial Technology Years 7–10 Syllabus* provides opportunities for students to engage with technological study through a range of focus areas. The technological activities are gender-inclusive and accessible to all students.

Key Competencies

The course structure and pedagogy provide extensive opportunities to develop the key competencies. Experiences in the development of a variety of practical projects ensure that all the key competencies are addressed. During the course, students learn to:

- source, select and sequence information about issues in a selected focus area, developing competence in ***collecting***, ***analysing and organising information***
- debate, describe, discuss and explain ideas and issues in written, graphic and oral form, developing competence in ***communicating ideas and information***
- plan, prepare and present project work to meet a range of needs within set time frames, developing competence in ***planning and organising activities***

- cooperate with individuals and groups, developing competence in ***working with others and teams***
- design, implement and evaluate solutions to practical situations in a specific focus area, developing competence in ***solving problems***
- plan, develop and modify projects including costing, quantities, measurement and time, developing competence in ***using mathematical ideas and techniques***
- prepare practical projects using appropriate materials and equipment, developing competence in ***using technology***.

Literacy

During the planning, construction and evaluation of practical projects students communicate ideas in oral, written and graphical forms. The use of industrial terminology and technical language is fostered and developed in all focus areas.

Numeracy

Numeracy skills are integral to the development of all practical projects through measurement, costing of materials and the interpretation and production of a variety of drawings.

Across the Years 7–10 curriculum there are other areas of cross-curriculum content that all students will experience through the mandatory curriculum. The additional areas of cross-curriculum content are Aboriginal and Indigenous, and Multicultural.

7.2 Content for Years 7–10

INDUSTRIAL TECHNOLOGY – AUTOMOTIVE

The Automotive focus area provides opportunities for students to develop knowledge, understanding and skills in relation to automotive and associated industries.

Core modules develop knowledge and skills in the use of materials, tools and techniques related to automotive maintenance and repair which are enhanced and further developed through the study of specialist modules in automotive technologies.

Practical projects should reflect the nature of the Automotive focus area and provide opportunities for students to develop specific knowledge, understanding and skills related to automotive-related technologies. These may include:

- maintenance and repair of small engines
- automotive restorations
- building a small powered vehicle
- work undertaken on isolated automotive components.

Projects should promote the sequential development of skills and reflect an increasing degree of student autonomy as they progress through the course.

A note to teachers about practical experiences

To satisfy the requirements of the syllabus students must undertake a range of practical experiences that occupy the majority of course time. Practical experiences should be used to develop knowledge and understanding of and skills in designing, producing and evaluating. Student capability, confidence and expertise at their current stage of development are important considerations in determining the teaching and learning sequences in the course.

In developing and delivering teaching programs teachers should be aware of and adopt the relevant guidelines and directives of their education authorities and/or schools. Teaching programs should recognise and reflect relevant State and Commonwealth legislation, regulations and standards including Occupational Health and Safety, Chemical Safety in Schools and Animal Welfare guidelines. Teachers need to be aware of activities that may require notification, certification, permission, permits and licences.

INDUSTRIAL TECHNOLOGY – AUTOMOTIVE

Automotive – Core Module 1	
Students learn about:	**Students learn to:**
OHS and Risk Management • the safe use and handling of hand, power and machine tools • the use of personal protective equipment in the workshop • elementary first aid procedures	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • safely use tools, materials and equipment • use personal protective equipment when working with materials, tools and machines
Power Sources • internal combustion engines including: – 2-stroke – 4-stroke • alternative sources of power	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • identify the major components of and differentiate between the operation of 2-stroke and 4-stroke motors • identify a range of power sources other than internal combustion engine, eg solar, wind, steam
Engine and Related Systems • method of operation of a 2-stroke motor • 4-stroke single-cylinder engine	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • disassemble, clean, inspect, identify and re-assemble a 2-stroke motor • identify and describe the major components in a 4-stroke single-cylinder engine
Automotive Electrical Systems • 12-volt electrical circuits • battery • alternator	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • interpret 12-volt series and parallel electrical circuits • identify major components of a 12-volt battery and demonstrate care and maintenance • identify the major components of an alternator and describe its purpose in an automotive electrical system
Chassis and Related Components • braking systems • chassis construction methods	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • describe braking systems used in vehicles • identify major components of a selected braking system (drum brakes, leading shoe, trailing shoe, friction materials, disc brakes, fixed caliper and floating caliper) • perform basic maintenance and adjustment to a braking system • identify the major components of a fabricated chassis and differentiate between the processes and materials used in the construction of tube, triangulated, and ladder chassis
Links to Industry • traditional, current and emerging technologies that relate to the automotive industry	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • relate elementary industrial maintenance and/or repair techniques to work in the classroom • list career paths in automotive industries
Design • design principles and processes related to engine components • material lists	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • identify the functional aspects of automotive design • evaluate work practices and design in terms of quality • read and interpret technical data

INDUSTRIAL TECHNOLOGY – AUTOMOTIVE

Automotive – Core Module 1	
Students learn about:	**Students learn to:**
Workplace Communication Skills • reading and interpretation • freehand drawing and sketching • working drawings • industry terminology • text types to support the documentation of practical projects and processes including: – procedure – factual recount • a range of computer software applications to assist in the planning, production and reporting of practical projects	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)* • respond to OHS signage • make freehand sketches of workshop items and/or projects • read and interpret simple workshop and pictorial drawings • define specialist terms and produce a glossary • prepare reports to describe processes undertaken in the development and production of practical projects and maintenance and/or repair procedures • prepare reports using appropriate software and hardware, eg word processing
Societal and Environmental Impact • issues relating to the sustainability of resources in the automotive industry • the importance of sustainability to the automotive industry	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)* • identify and distinguish between renewable and non-renewable resources in the automotive industry
Additional Content • braking systems • chassis construction	• identify the major components of and differentiate between the properties and operation of ABS, carbon fibre and high-performance braking systems • identify the major components of a semi-monocoque chassis and differentiate between the processes and materials used in the construction of steel and aluminium semi-monocoque chassis

INDUSTRIAL TECHNOLOGY – AUTOMOTIVE

Automotive – Core Module 2	
Students learn about:	**Students learn to:**
OHS and Risk Management • identified hazards in the work environment • principles of risk management • clean and hygienic work practices	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • safely use hand and power tools, materials finishes and equipment • select and use personal protective equipment
Power Sources • diesel and rotary internal combustion engines	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • identify the major components of and differentiate between the operation of diesel and rotary engines • understand the basic maintenance requirements for these engines
Engine and Related Systems • the fuel system including: – combustion – petrol – fuel pump – carburettor (single and multiple) – air filter	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • identify the major components of the fuel system and describe the function for each component • perform basic maintenance and adjustment on these fuel system components • describe the relative merits of various liquid fuel types (petrol, diesel, LPG) • identify the major components of fuel injection – single point, multi-point, direct and indirect
Automotive Electrical Systems • components in an ignition system including: – spark plugs – ignition coil – distributor – contact breaker points – timing	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • identify and describe the function of major components in an ignition system • test and adjust the components while conducting a basic engine tune-up
Chassis and Related Components • the major components of and performance characteristics of wheels and tyres • suspension: – leaf springs and solid axles – shock absorbers • exhaust systems	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • perform basic maintenance including tyre pressure and rotation • describe the performance characteristics of leaf springs and solid axles • compare the relative merits of various shock absorbers – fluid, gas, air • describe functions of exhaust system components including catalytic converter, muffler and pipe
Links to Industry • traditional, current and emerging technologies that relate to the automotive industry	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • identify alternative historical industrial technologies appropriate to the task and the material being used • relate appropriate industrial maintenance and/or repair skills to work in the classroom • describe different careers within the automotive industry and analyse the relationships between them

INDUSTRIAL TECHNOLOGY – AUTOMOTIVE

Automotive – Core Module 2	
Students learn about:	**Students learn to:**
Design • design principles and processes	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • apply principles of design in the modification of automotive products to enhance function and/or aesthetics • identify the factors influencing the design of automotive products: – material selection – shaping processes – joining methods – finishing • identify planned assembly/construction sequences • evaluate work practices and relate these to quality of components and/or automobiles
Workplace Communication Skills • reading and interpretation • freehand drawing and sketching • working drawings • workplace signage • report writing (including the preparation of documentation to support the development and production of practical projects)	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)* • read and interpret workshop and pictorial drawings • interpret and produce orthogonal drawings related to the development and production of practical projects • write reports to document the development of practical projects, identifying materials, processes and equipment used
Societal and Environmental Impact • the effects of the automotive industry on society and the physical environment • the use of renewable resources in the automotive industry and the impact on the living environment	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)* • identify sustainable automotive resources
Additional Content • alternative fuels • the operation of a power source other than internal combustion	• identify the major components of and differentiate between the performance of alternative fuel systems • identify the major components of and complete a study of a selected power source

INDUSTRIAL TECHNOLOGY – AUTOMOTIVE

Automotive – Specialised Module 3	
Students learn about:	**Students learn to:**
OHS and Risk Management • the intent of the OHS Act and the role of WorkCover in the workplace • potential hazards in the work environment • safe handling of chemicals	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • select and use personal protective equipment • identify specific OHS issues associated with the production of practical projects
Power Sources • different engine configurations available including: – inline – V – horizontally opposed	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • identify and differentiate between the configurations of the engine designs • identify the major components of and differentiate between the operation of overhead valve and overhead cam systems
Engine and Related Systems • internal combustion cooling systems including: – air – water • internal combustion lubrication systems including: – properties of oil – pumps and filters – bearings	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • identify the major components of and differentiate between air-cooled and water-cooled engines • understand the maintenance requirements for internal combustion engine cooling systems • identify properties of oil and associated applications • identify methods of lubrication in both 2- and 4-stroke internal combustion engines • perform basic service of an internal multi-cylinder engine • understand the importance and function of bearings (bush, shell, ball and roller)
Automotive Electrical Systems • electronic ignition • electrical components	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • identify the major components, and operation of electronic ignition • identify the major components, and functions of instruments and gauges
Chassis and Related Components • manual transmission including: – manual gearbox – clutch • automatic transmission including: – automatic gearbox – torque converter	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • identify the major components and functions of manual gearbox, synchromesh, gear sets, shafts • identify the major components and functions of the clutch (hydraulic and cable), clutch plate, pressure plate, thrust bearing • identify the major components of and differentiate between the operation of an automatic gearbox, torque converter, tiptronic style

INDUSTRIAL TECHNOLOGY – AUTOMOTIVE

Automotive – Specialised Module 3	
Students learn about:	**Students learn to:**
Links to Industry • traditional, current, new and emerging technologies that relate to the automotive industry	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • compare and contrast industrial processes with those undertaken in the classroom • identify relevant technologies and contrast with those used in the past • compare and contrast careers and professions in the automotive industry
Design • design principles and processes • project sequencing and time management • automotive bodies	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • modify materials and details to enhance a project's design • plan and follow a sequence of operations to complete projects within specified time frames • evaluate practical projects and processes • understand the principles of body design for aerodynamics, strength and lightness • describe the importance and operation of crash protection/safety devices fitted to automobiles – primary and secondary safety (crumple zones) • identify the importance of new lightweight and/or long-lasting materials in automotive design
Workplace Communication Skills • signage • freehand drawing and sketching • reading and interpretation of working drawings • report writing (including the preparation of documentation to support the development and production of practical projects)	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)* • respond to OHS signage • produce freehand sketches to visualise, generate and record ideas • read, interpret and produce working drawings including pictorials, orthogonals and materials lists, to assist in the production of projects • prepare and present reports using a range of software and hardware, displaying skills in more than one application
Societal and Environmental Impact • the impact of the automotive industry on society and the physical environment	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)* • explain how fossils fuels are sourced, refined and used in the operation of an engine and the impact that this has on society and the environment • explain the importance of alternative fuels to the automotive industry and how these impact on the environment and society
Additional Content • transmission systems	• identify the major components of and differentiate between the operation of constantly variable transmission, clutchless manual, sequential gearbox, viscous couplings and four-wheel drive

INDUSTRIAL TECHNOLOGY – AUTOMOTIVE

Automotive – Specialised Module 4	
Students learn about:	**Students learn to:**
OHS and Risk Management • risk management principles included in the OHS Act and Regulation • risk identification and hazard reduction strategies	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • conduct a risk assessment • identify and respond to OHS issues to help ensure a safe working environment
Power Sources • the operation of at least two power sources other than internal combustion: – solar – electric – steam – hybrid – jet	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • identify the major components of and complete a detailed study of selected power sources
Engine and Related Systems • the internal workings of a multi-cylinder 4-stroke engine including: – piston, connecting rod and crankshaft assembly – rockers and valves – camshaft	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • identify and describe the functions of the major components in a multi-cylinder 4-stroke engine • disassemble, identify, clean, inspect and re-assemble a multi-cylinder internal combustion engine
Automotive Electrical Systems • engine management systems	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • identify the major components and functions of different engine management systems
Chassis and Related Components • the steering system • front suspension components including: – wishbone – strut – torsion bar • rear suspension components including: – swing axles – wishbone – trailing arm • automotive body corrosion	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • identify the major components of and differentiate between the operation of steering systems (worm and roller, cam and peg, rack and pinion) and power-assisted steering (hydraulic, electric, variable) • identify the major components of and understand the performance characteristics of independent front suspension • identify the major components of and differentiate between the operation of independent rear suspensions • describe the significance of corrosion and corrosion protection
Links to Industry • traditional, current and emerging technologies that relate to the automotive industry	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • research current techniques, materials and equipment used by industry to develop and produce similar projects • compare and contrast industrial/commercial practices with classroom experiences

INDUSTRIAL TECHNOLOGY – AUTOMOTIVE

Automotive – Specialised Module 4	
Students learn about:	**Students learn to:**
Design • design principles and processes relating to the automotive industry including: – aerodynamics – safety – Australian Design Rules (ADRs) – emerging materials • automotive interiors	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • modify materials and details to enhance a project's design • work through a design process to develop and produce practical projects • plan and follow a sequence of operations to complete projects within specified time frames • explain and justify selection and use of materials, processes and equipment in practical projects • evaluate practical projects and processes • identify the importance of lightweight materials (aluminium alloys, plastics) in interior design
Workplace Communication Skills • reading and interpretation • freehand drawing and sketching • working drawings • signage • a range of computer software applications to assist in the planning, production and reporting of practical projects	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)* • respond to OHS signage • produce drawings to visualise, generate, understand and record ideas • read and interpret workshop manual drawings and technical data including materials lists, pictorials, orthogonals and dimensions • write and present reports to detail the design, construction and evaluation of practical projects
Societal and Environmental Impact • the impact of the automotive industry on society and the physical environment	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)* • identify, analyse and compare the power output of different types of engines, both in the past and now, and explain the impact this has had on the environment and society • analyse the use of different fuels to operate engines in the past and at present, and how these fuels impact on the environment and society • analyse and explain the environmental and societal impact of resources used in the development and production of practical projects
Additional Content • suspension systems	• identify the major components of, and differentiate between, the operation of other suspension systems such as hydro/pneumatic, air and gas

INDUSTRIAL TECHNOLOGY – BUILDING AND CONSTRUCTION

The Building and Construction focus area provides opportunities for students to develop knowledge, understanding and skills in relation to the building and associated industries.

Core modules develop knowledge and skills in the use of materials, tools and techniques related to building and construction. These are enhanced and further developed through the study of specialist modules in:

- Construction and Renovation
- Outdoor Structures and Landscapes.

Practical projects should reflect the nature of the Building and Construction focus area and provide opportunities for students to develop specific knowledge, understanding and skills related to building and construction-related technologies. They may include:

- construction of small structures
- scale models
- elementary repairs and renovations
- development of garden and recreational areas
- work undertaken on isolated building models and mock-ups.

Projects should promote the sequential development of skills and reflect an increasing degree of student autonomy as they progress through the course.

A note to teachers about practical experiences

To satisfy the requirements of the syllabus students must undertake a range of practical experiences that occupy the majority of course time. Practical experiences should be used to develop knowledge and understanding of and skills in designing, producing and evaluating. Student capability, confidence and expertise at their current stage of development are important considerations in determining the teaching and learning sequences in the course.

In developing and delivering teaching programs teachers should be aware of and adopt the relevant guidelines and directives of their education authorities and/or schools. Teaching programs should recognise and reflect relevant State and Commonwealth legislation, regulations and standards including Occupational Health and Safety, Chemical Safety in Schools and Animal Welfare guidelines. Teachers need to be aware of activities that may require notification, certification, permission, permits and licences.

INDUSTRIAL TECHNOLOGY – BUILDING AND CONSTRUCTION

Building and Construction – Core Module 1	
Students learn about:	**Students learn to:**
OHS and Risk Management • the safe use and handling of hand, power and machine tools • the use of personal protective equipment in the workshop • elementary first aid procedures	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • safely use tools, materials and equipment • use personal protective equipment when working with materials, tools and machines
Materials • the properties and applications of materials used in residential building and construction • council building codes and specifications	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • identify a range of materials used for: – footings – framing – flooring – roofing – cladding – internal lining • identify materials specified by council for building in the local area
Equipment, Tools and Machines • a range of hand tools used for: – marking out and cutting – chiselling and planing – drilling • portable power tools and machines used for: – drilling – sanding – cutting	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • adjust and use hand tools in the production of practical projects • use portable power tools and machines in the production of practical projects
Techniques • correct measuring standards and methods • a range of processes and techniques for preparing, joining and finishing	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • measure, mark out and prepare materials from a workshop drawing • use a variety of joining methods including: – simple framing joints – screwing, nailing and gluing • prepare surfaces and apply finishes to timber
Links to Industry • industrial/commercial processes and construction techniques • a range of career paths in building and construction	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • relate construction techniques used in the building industry to work in the classroom • list career paths in the building construction industry
Design • functional and aesthetic aspects of design • material lists • project costing	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • apply principles of design in the modification of projects • evaluate work practices and practical projects in terms of quality • read and interpret material lists • estimate quantities of materials to be used in practical projects

INDUSTRIAL TECHNOLOGY – BUILDING AND CONSTRUCTION

Building and Construction – Core Module 1	
Students learn about:	**Students learn to:**
Workplace Communication Skills • workplace signage • pictorial and working drawings • freehand drawing and sketching • industry terminology • text types to support the documentation of practical projects and processes including: – procedure – factual recount • a range of computer software applications to assist in the planning, production and reporting of practical projects	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)* • respond to OHS signage • read and interpret simple workshop and pictorial drawings • make freehand sketches of elementary building construction items and/or projects • define specialist terms and produce a glossary • prepare reports to describe processes undertaken in the development and production of practical projects • prepare reports using appropriate software and hardware, eg word processing
Societal and Environmental Impact • issues relating to the sustainability of resources in the building and construction industry	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)* • identify between renewable and non-renewable resources in building and construction • recognise the need to conserve materials and recycle as appropriate
Additional Content • a range of techniques and skills to enhance the appearance and/or function of practical projects • the structure, properties and applications of hardwoods and softwoods in building and construction	• add appropriate detailing to a building construction project to enhance its appearance and/or function. • compare the differences in properties and applications of hardwoods and softwoods • identify the different applications of hardwoods and softwoods and how, where and why they are used in the building industry

INDUSTRIAL TECHNOLOGY – BUILDING AND CONSTRUCTION

Building and Construction – Core Module 2	
Students learn about:	**Students learn to:**
OHS and Risk Management • identified hazards in the work environment • principles of risk management • clean and hygienic work practices	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • safely use hand and power tools, materials, finishes and equipment • select and use personal protective equipment
Materials • the properties and applications of materials associated with building and construction • a range of fixtures and fittings used in building and construction including: – windows – doors – skirtings and architraves – fascias	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • consider the working characteristics of a number of materials commonly used in the building construction industry • identify window and door types • compare the merits of fixtures and fittings manufactured from a range of materials, eg timber, metal and composites
Equipment, Tools and Machines • a range of equipment, hand tools, power tools and machines used in building and construction • the care and use of a range of hand and power tools	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • select, adjust and use hand tools related to the building industry • use power tools and machines in the development and production of practical projects • care for hand and power tools and understand the importance of proper care and maintenance
Techniques • wall frame construction • interior wall lining • formwork for concreting • elementary bricklaying	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • set out and construct a simple frame to be fitted with a window incorporating top plate, bottom plate, studs, noggings, header and brace • fix lining materials to a wall frame • set out and construct formwork for concrete, eg for pavers, stepping stones, garden border • erect elementary brickwork
Links to Industry • industrial/commercial techniques and processes • alternative historical industrial technologies related to materials used and processes undertaken • building codes • the interrelationship between careers and industries in building and construction	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • relate commercial building construction techniques to work in the classroom • describe different careers in the building construction industry and analyse the relationships between them

INDUSTRIAL TECHNOLOGY – BUILDING AND CONSTRUCTION

Building and Construction – Core Module 2	
Students learn about:	**Students learn to:**
Design	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)*
• design principles and processes	• apply principles of design in the modification of projects to enhance function and/or aesthetics • evaluate work practices and relate these to quality of practical projects
• factors that impact on the design of building frames including: – material choices – joining techniques – structural sizes of members – interior and exterior linings – window and door shape and position	• identify and consider design factors in the modification of projects • use suitable materials and sections in the development and production of practical projects
• material lists and project costing	• follow material lists to prepare materials • calculate quantities and costs of materials for projects • use spreadsheets to assist in the calculation of project costs
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• architectural drawings and plans	• read, interpret and sketch simple floor plans and elevations • identify elementary architectural symbols
• industry terminology	• identify and recall specialist terms and use them in context
• report writing (including the preparation of documentation to support the development and production of practical projects)	• write reports to document the development of a building construction project identifying the materials, processes and equipment used
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• the effects building and construction have on society and the physical environment	• recognise the use of renewable resources in the building industry and the impact of these on the environment • investigate and identify alternate materials in building and construction
Additional Content	
• a range of techniques and skills to enhance the appearance and/or function of practical projects	• add features such as doors, architraves, skirtings and hardware • undertake elementary plaster work, eg fixing of cornices
• local government codes and ordinances	• explain the importance of, and implications of building codes and local environment plans (LEPs), their enforcement and variation
• elementary CAD applications	• develop a simple floor plan using an appropriate drawing package

INDUSTRIAL TECHNOLOGY – BUILDING AND CONSTRUCTION

Construction and Renovation – Specialised Module 3	
Students learn about:	**Students learn to:**
OHS and Risk Management • the intent of the OHS Act and the role of WorkCover in the workplace • potential hazards in the work environment • safe handling of chemicals	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • select and use personal protective equipment • identify specific OHS issues associated with the production of practical projects
Materials • the properties and applications of materials associated with the building industry including: – solid timbers – manufactured boards – bricks and mortar	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • select and use materials suitable for completing a construction or renovation project • compare the composition and construction of manufactured boards and their applications to building and construction
Equipment, Tools and Machines • a range of equipment, tools and machines in building and construction used for: – cutting and joining – drilling – site marking out and preparation – levelling – elementary demolition and stripping out	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • adjust and use hand and power tools in the development and production of projects
Techniques • site preparation • foundations and footings • flooring for internal or external use • tiles and tiling • building maintenance and repair	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • set out and prepare sites for building projects • construct a simple footing with piers, bearers and joists • lay flooring • prepare and fix tiles to either walls or floors • undertake minor maintenance and repair to buildings
Links to Industry • industrial/commercial techniques in building and construction including the application of computer-aided manufacture (CAM)	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • compare and contrast industrial/commercial processes with those undertaken in the classroom • describe the effects of computer and mass production technologies on the building industry, eg prefabrication • describe the effects of new and emerging technologies on careers and professions in building and construction
Design • design principles and processes • project sequencing and time management • research techniques	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • apply principles of design in the modification and design of construction or renovation projects • identify and apply the factors influencing good architectural and project design • follow a planned sequence of operations • use internet facilities to research practical projects

INDUSTRIAL TECHNOLOGY – BUILDING AND CONSTRUCTION

Construction and Renovation – Specialised Module 3	
Students learn about:	**Students learn to:**
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• working drawings	• produce freehand sketches to visualise, generate and record ideas • read, interpret and produce simple floor plans, elevations and cross-sections, including material lists, to assist in the production of construction or renovation projects
• industry terminology	• recall specialist terms and use them in context when reporting on the development and production of practical projects
• report writing (including the preparation of documentation to support the development and production of practical projects)	• prepare reports documenting the development of projects – identifying the materials, processes and equipment used • prepare and present reports using appropriate software and hardware displaying skills in more than one application
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• the effects building and construction have on society and the physical environment	• analyse the use of plantation timbers and old growth forest timber as they relate to their use in construction or renovation • identify and analyse the uses for recycled materials in building and construction and their impact on landfill and society
Additional Content	
• a range of techniques and skills to enhance the appearance and/or function of practical projects	• select different materials for a part of or for the whole construction or renovation project
• timber finishes for building and construction	• identify and use a range of finishes for exterior and interior applications
• elementary CAD applications	• use a CAD program to produce simple 2D workshop drawings

INDUSTRIAL TECHNOLOGY – BUILDING AND CONSTRUCTION

Construction and Renovation – Specialised Module 4	
Students learn about:	**Students learn to:**
OHS and Risk Management • risk management principles included in the OHS Act and Regulation • risk identification and hazard reduction strategies	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • conduct a risk assessment • identify and respond to OHS issues to help ensure a safe working environment
Materials • the properties and applications of materials associated with the building industry • timber defects	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • select and use materials most suitable for completing a construction or renovation project • check for defects in solid timber and timber products • describe the effect of defects on structural properties of timber and apply techniques to overcome such defects where possible
Equipment, Tools and Machines • a range of equipment, tools and machines in building and construction	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • identify, select and use a range of hand and power tools for cutting and shaping exercises associated with construction or renovation • understand, use and maintain specified power tools
Techniques • a range of processes and techniques related to building and construction including simple roof construction	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • mark, set out and produce projects which incorporate: – framework suitable for a shed, room or small extension to be fitted with a window, door and cladding – flooring – simple roof construction
Links to Industry • industrial and commercial techniques used in the building and construction industry	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • research current techniques, materials and equipment used by industry to produce similar projects • compare and contrast commercial practices with classroom experiences
Design • the application of design principles and processes to individual projects • resource selection • project management	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • work through a design process to develop and produce practical projects • explain and justify selection and use of materials, processes and equipment in practical projects • research and calculate all costs for the development of projects • plan and follow a sequence of operations to complete projects within specified time frames

INDUSTRIAL TECHNOLOGY – BUILDING AND CONSTRUCTION

Construction and Renovation – Specialised Module 4	
Students learn about:	**Students learn to:**
Workplace Communication Skills • working drawings • report writing (including the preparation of documentation to support the development and production of practical projects) • a range of computer software applications to assist in the planning, production and reporting of practical projects	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)* • produce drawings to visualise, generate, understand and record ideas • read, interpret and produce working drawings to assist in the construction of projects • write and present reports to detail the design, construction and evaluation of projects • justify design decisions and choice of materials, processes and equipment • present reports using appropriate software and hardware, displaying skills in several applications which could include scanning and digital photography
Societal and Environmental Impact • the effects of building and construction industries on society and the environment	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)* • analyse and explain the environmental and societal impact of resources used in the development and production of projects
Additional Content • elementary plumbing and maintenance • defects in timber due to insect and/or fungal attack	• undertake simple plumbing processes • analyse the effect of insect attack and fungal decay on timber and undertake strategies to minimise risks

INDUSTRIAL TECHNOLOGY – BUILDING AND CONSTRUCTION

Outdoor Structures and Landscaping – Specialised Module 3	
Students learn about:	**Students learn to:**
OHS and Risk Management • the intent of the OHS Act and the role of WorkCover in the workplace • potential hazards in the work environment • safe handling of chemicals	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • select and use personal protective equipment • identify specific OHS issues associated with the production of practical projects
Materials • the properties and applications of a range of materials used in landscaping including: – solid timber – lattice – bricks, blocks and pavers – sand, soil and gravels – concrete – fittings, eg post saddles – recycled materials, eg crusher dust	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • compare the advantages and disadvantages of different materials, eg timber: treated vs untreated • select and use a range of materials and resources in the development and production of practical projects
Equipment, Tools and Machines • a range of equipment, tools and machines used in landscaping and construction including tools for: – building: cutting, shaping, joining – excavation and site preparation – levelling	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use hand and power tools in the construction of projects
Techniques • a range of processes and techniques related to the construction of projects such as: – simple framed structures – concrete slabs – decks – retaining walls – paved areas – simple garden furniture, garden edging or garden structures	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • prepare sites for landscaping • use jigs to assist in the production of outdoor structures or landscaping • mark out, set out and complete projects
Links to Industry • industrial and commercial techniques and processes relating to landscape design and construction including the application of computing technologies in these industries	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • compare and contrast commercial practice with classroom experiences • identify new and emerging technologies and contrast with those used in the past • describe the impact of new and emerging technologies on careers and professions in landscaping

INDUSTRIAL TECHNOLOGY – BUILDING AND CONSTRUCTION

Outdoor Structures and Landscaping – Specialised Module 3	
Students learn about:	**Students learn to:**
Design	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)*
• design principles and processes including: – functional and aesthetic aspects of landscape design	• apply principles of design in the modification and development of projects • identify the factors influencing good landscape and project design
• material selection	• produce material lists relating to projects
• project sequencing and time management	• follow a planned sequence of operations • calculate the total cost of projects
• research techniques	• use internet facilities to research practical projects
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• working and layout drawings	• produce freehand sketches to visualise, generate and record ideas • read, interpret and produce simple landscape plans, building plans and elevations, including material lists, to assist in the production of projects
• industry terminology	• recall specialist terms and use them in context when reporting on the development and production of practical projects
• report writing (including the preparation of documentation to support the development and production of practical projects)	• prepare and present reports documenting the development of projects, identifying the materials, processes and equipment used • prepare reports using appropriate software and hardware displaying skills in more than one application
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• the impact of landscape design on society and the environment	• analyse issues relating to landscape design including: – water run-off – impact on native flora and fauna – local government codes and regulations – the production and use of treated timbers
• applications for recycled materials in landscaping	• identify and analyse the uses for recycled materials in landscaping and their impact on landfill and society
Additional Content	
• a range of techniques and skills to enhance the appearance and/or function of practical projects	• select and use additional techniques to enhance an outdoor structure and landscaping project. These may include additional features such as hardware, railings, planting etc
• elementary CAD applications	• use CAD programs to produce simple 2D workshop drawings

INDUSTRIAL TECHNOLOGY – BUILDING AND CONSTRUCTION

Outdoor Structures and Landscaping – Specialised Module 4	
Students learn about:	**Students learn to:**
OHS and Risk Management • risk management principles included in the OHS Act and Regulation • risk identification and hazard reduction strategies	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • conduct a risk assessment • identify and respond to OHS issues to help ensure a safe working environment
Materials • the properties and applications of materials associated with landscaping including: – irrigation systems – drainage systems – moisture linings – decorative blocks (keystones) – tiles	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • identify, select and use a range of materials most suitable for completing an outdoor structure or landscaping project • sight and check for defects in timber, timber products and allied materials
Equipment, Tools and Machines • a range of equipment, tools and machines used in landscaping and construction	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • identify, select and use hand and power tools in the production of practical projects • use specialist tools for specific purposes
Techniques • a range of processes and techniques related to the development and production of outdoor structures and/or landscapes	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • identify, select and use suitable processes and techniques for the construction of specific projects which may include: – gazebos or pergolas – concrete slabs and decks – drainage and irrigation systems – paving including patterns – ponds and water features
Links to Industry • industrial/commercial techniques used in landscape design	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • research current materials and techniques employed in landscaping • compare and contrast commercial practices with classroom experiences
Design • the application of design principles and processes to individual projects • project management • resource selection	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • modify materials and details to enhance a project's design • work through a design process to develop and produce practical projects • plan and follow a sequence of operations to complete projects within a specified time frame • explain and justify the selection and use of materials, processes and equipment in practical projects • research and calculate all costs for the development of projects

INDUSTRIAL TECHNOLOGY – BUILDING AND CONSTRUCTION

Outdoor Structures and Landscaping – Specialised Module 4	
Students learn about:	**Students learn to:**
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• working drawings	• produce drawings/sketches to visualise, generate, understand and record ideas • read, interpret and produce working drawings to assist in the construction of practical projects
• report writing (including the preparation of documentation to support the development and production of practical projects)	• write and present reports to detail the design, construction and evaluation of projects • justify design decisions and selection of materials, processes and equipment
• a range of computer software applications to assist in the planning, production and reporting of practical projects	• prepare reports using appropriate software and hardware displaying skills in several applications which could include scanning and digital photography
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• the effects building and construction have on society and the physical environment	• analyse and explain the environmental and societal impact of resources used in the development and production of projects
Additional Content	
• techniques for the construction of walls and fences	• construct fences and/or solid block or brick walls • undertake simple rendering projects
• elementary CAD applications	• use CAD programs to produce landscape layouts, workshop drawings and pictorials including dimensioning
• plant selection and propagation	• research plant types most suited to individual locations and incorporate these plants into a landscape design

INDUSTRIAL TECHNOLOGY – CERAMICS

The Ceramics focus area provides opportunities for students to develop knowledge, understanding and skills in relation to ceramics and associated industries.

Core modules develop knowledge and skills in the use of materials, tools and techniques related to ceramics which are enhanced and further developed through the study of specialist modules in ceramics-based technologies.

Practical projects should reflect the nature of the Ceramics focus area and provide opportunities for students to develop specific knowledge, understanding and skills related to ceramics-related technologies. These may include:

- a variety of pottery-based projects
- sculptures
- ceramic appliances
- decorative feature items.

Projects should promote the sequential development of skills and reflect an increasing degree of student autonomy as they progress through the course.

A note to teachers about practical experiences

To satisfy the requirements of the syllabus students must undertake a range of practical experiences that occupy the majority of course time. Practical experiences should be used to develop knowledge and understanding of and skills in designing, producing and evaluating. Student capability, confidence and expertise at their current stage of development are important considerations in determining the teaching and learning sequences in the course.

In developing and delivering teaching programs teachers should be aware of and adopt the relevant guidelines and directives of their education authorities and/or schools. Teaching programs should recognise and reflect relevant State and Commonwealth legislation, regulations and standards including Occupational Health and Safety, Chemical Safety in Schools and Animal Welfare guidelines. Teachers need to be aware of activities that may require notification, certification, permission, permits and licences.

INDUSTRIAL TECHNOLOGY – CERAMICS

Ceramics – Core Module 1	
Students learn about:	**Students learn to:**
OHS and Risk Management • the safe use and handling of hand, power and machine tools • the use of personal protective equipment in the workshop • elementary first aid procedures	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • safely use tools, materials and equipment • use personal protective equipment when working with materials, tools and machines
Materials • the properties and applications of clays including: – particle size and shrinkage rates – strength and stress – deficiencies of the clay body – workable range of moisture content • the properties and applications of glazes and associated decoration mediums in enhancing ceramics work including: – oxides – underglazes – glaze stains	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • consider clay working characteristics and properties when using clays in the production of practical projects • identify different clay types for hand-building and for wheelwork • describe the different forms of glaze application and use a range of glazes suitable for the chosen firing temperature
Equipment, Tools and Machines • a range of tools and equipment used for: – cutting and shaping – forming – firing	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use tools in the production of practical projects • describe the differences between bisque and gloss kiln firing • make open forms on the pottery wheel • finish wheel-thrown forms by turning
Techniques • measurement and sizing • a range of techniques to prevent projects from drying out while working on them prior to preparation for firing • forming processes including: – coil – pinch – slab – fabrication – press moulds – modelling – pottery wheel • surface decoration techniques including: – glazing – burnishing – stamping (impressing) – slip decoration	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • weigh materials accurately • measure and mark out clay and templates for projects • join clay parts of the same moisture content • join clay to minimise shrinkage of parts and stress • describe and use a range of forming processes in the production of practical projects • describe and use a range of surface decoration techniques

INDUSTRIAL TECHNOLOGY – CERAMICS

Ceramics – Core Module 1	
Students learn about:	**Students learn to:**
Links to Industry • industrial and studio processes and production techniques • a range of career paths in the ceramics industry	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • relate elementary industrial and studio production to work in the classroom • list further study options and career paths in ceramics
Design • functional and aesthetic aspects of design • design principles and processes • material lists and project costing	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • identify the functional and aesthetic aspects of design in ceramics including strength, size/thickness of components and materials used • apply principles of design in the modification of projects • evaluate work practices and practical projects in terms of quality • read and interpret material lists • estimate quantities of materials to be used in practical projects
Workplace Communication Skills • workplace signage • freehand drawing and sketching • industry terminology • text types to support the documentation of practical projects and processes including: – procedure – factual recount • a range of computer software applications to assist in the planning, production and reporting of practical projects	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)* • respond to OHS signage • make freehand sketches of workshop items and/or projects • define specialist terms and produce a glossary • prepare reports to describe the processes undertaken in the development and production of practical projects • prepare reports using appropriate software and hardware, eg word processing
Societal and Environmental Impact • issues of pollution and sustainability as they relate to ceramics industries	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)* • identify the impact of clay quarries on the environment • appreciate the importance of minimising and eliminating material wastes entering water systems
Additional Content • a range of techniques and skills to enhance the appearance and/or function of practical projects • structure and properties of glasses	 • add features such as lids and handles to practical projects • apply a range of surface finishes such as inlaying, fluting and pressing to practical projects • compare the properties of clay body ceramics to glasses

INDUSTRIAL TECHNOLOGY – CERAMICS

Ceramics – Core Module 2	
Students learn about:	**Students learn to:**
OHS and Risk Management • identified hazards in the work environment • principles of risk management • clean and hygienic work practices	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • safely use hand and power tools, materials, finishes and equipment • select and use personal protective equipment
Materials • the properties and applications of clays • the properties and applications of glazes and associated decoration mediums in enhancing ceramics work	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • consider the working characteristics of a number of commonly used clays when selecting and using clay for specific projects • select and prepare clays suitable for hand-building and wheelwork • select and use suitable glazes, decoration mediums and application techniques for projects
Equipment, Tools and Machines • the care and use of a range of tools and equipment • machines and equipment used for: – throwing, rolling and extruding clays – firing – reclaiming clays	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • select and use suitable hand tools for projects • care for hand tools, machines and equipment • use machines and equipment for throwing, rolling and extruding clay • identify differences between earthenware and stoneware kiln firing • use plug mills to reclaim clays
Techniques • forming processes including: – coil – pinch – slab – press mould – modelling – pottery wheel – combinations of these • surface decoration techniques	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use a variety of forming processes to produce practical projects • make cylindrical and closed forms and finish these forms when throwing or by turning • select and use surface decorations appropriate to individual projects
Links to Industry • traditional, current, new and emerging technologies that relate to the ceramics industry • the relationships between careers and industries in ceramics	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • compare elementary industrial technologies and studio production techniques with classroom experiences • relate mass-production techniques to work in the classroom • describe different study paths and career paths within the ceramics industry and analyse the relationships between them

INDUSTRIAL TECHNOLOGY – CERAMICS

Ceramics – Core Module 2	
Students learn about:	**Students learn to:**
Design	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)*
• design principles and processes	• apply principles of design in the modification of projects to enhance function and/or aesthetics • evaluate work practices and relate these to the quality of practical projects
• factors that impact on the design of ceramic products including: – clay selection – form – techniques – finishing	• identify and consider design factors in the modification of projects
• material lists	• follow materials lists to weigh and calculate quantities of materials to be used in projects
• project costing	• use spreadsheets to assist in the calculation of project costs
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• freehand pictorial drawing	• interpret and produce freehand drawings to communicate design ideas
• industry terminology	• identify and recall specialist terms and use them in context
• report writing (including the preparation of documentation to support the development and production of practical projects)	• write reports to document the development of practical projects, identifying the materials, processes and equipment used
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• the impact of the ceramics industry on society and the environment	• identify and explain the impact on society and the environment of kiln firing in industrial and studio potteries • explain the need and methods for reclaiming clays • list and describe uses for recycled ceramic products
Additional Content	
• a range of techniques and skills to enhance the appearance and/or function of practical projects • the development of materials to replace traditional uses of ceramics	• select and use detailing techniques in addition to, or further to, any of the detailing methods chosen in Ceramics 1 • analyse a variety of traditional uses for ceramics and the replacement of ceramics by newer materials • explain reasons for changes to newer materials in terms of mechanical properties, economic considerations and manufacturing techniques

INDUSTRIAL TECHNOLOGY – CERAMICS

Ceramics – Specialised Module 3	
Students learn about:	**Students learn to:**
OHS and Risk Management • the intent of the OHS Act and the role of WorkCover in the workplace • potential hazards in the work environment • safe handling of chemicals	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • select and use personal protective equipment • identify specific OHS issues associated with the production of practical projects
Materials • the properties and applications of clays including: – clays suitable for throwing – grogged clays suitable for hand building and sculptural forms – raku clays – paper clays • glazes and associated decoration mediums including: – earthenware, stoneware and raku glazes – sulfate and salt as used in pit firings – oxides – underglazes and glaze stains	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • describe and compare the properties of a range of clays • select and use clays most suitable for completing projects • select and use appropriate glazes and associated decorating mediums to complete a project
Equipment, Tools and Machines • a range of tools, machines and equipment in the Ceramics focus area including: – hand tools – pottery wheels – electric, gas, wood-fired and alternative methods of firing ceramic work	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • maintain and use hand tools which may include making simple hand tools • understand the construction and operating principles of the pottery wheel • fire ceramic work using a variety of methods
Techniques • a range of processes and techniques related to the Ceramics focus area • techniques for shaping and pulling handles • other decorative forms of attachments	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • make projects using the wide range of techniques that have been explored • shape or pull simple handles for projects • select and apply different forms of surface decoration • throw and finish forms to which attachments are added
Links to Industry • industrial and commercial manufacturing techniques in ceramics including the application of new and emerging technologies • applications of ceramics in a wider range of industries, eg automotive, electronics, biomedical and engineering	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • compare and contrast industrial processes with those undertaken in the classroom • identify current and past production processes as used in the ceramics industry • describe a range of applications for ceramics

INDUSTRIAL TECHNOLOGY – CERAMICS

Ceramics – Specialised Module 3	
Students learn about:	**Students learn to:**
Design	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)*
• design principles and processes	• apply principles of design in the modification and design of ceramics projects • identify and apply the factors influencing good design to the design and/or modification of projects • account for design limitations in the development of projects
• project sequencing and time management	• follow a planned sequence of operations
• research techniques	• use internet facilities to research practical projects • read, interpret and evaluate reference material
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• freehand drawing and sketching • signage • industry terminology	• read, interpret and produce drawings to assist in the production of projects • recall specialist terms and use them in context when reporting on the development and production of projects
• report writing (including the preparation of documentation to support the development and production of practical projects)	• prepare and present reports to document the development of projects, identifying the materials, processes and equipment used • prepare reports using a range of software and hardware displaying skills in more than one application
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• the effects of the ceramics industries on society and the environment	• analyse the recent trends away from mass production of domestic ware back to hand-produced wares and the associated impact on society • analyse the use of new renewable materials (such as paper clays) on the environment
Additional Content	
• ceramic forming methods including: – slip casting – extrusion – press moulding	• identify and investigate ceramic forming processes for specific purposes
• nature and structure of composite ceramic materials	• explain the advantages, disadvantages and applications of ceramic composites

INDUSTRIAL TECHNOLOGY – CERAMICS

Ceramics – Specialised Module 4	
Students learn about:	**Students learn to:**
OHS and Risk Management • risk management principles included in the OHS Act and Regulation • risk identification and hazard reduction strategies	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • conduct a risk assessment • identify and respond to OHS issues to help ensure a safe working environment
Materials • the properties and applications of materials used in the production of ceramics projects • glazes and associated decoration mediums including preparation of simple glazes	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • select and use clays, recognising their special characteristics which make them suitable for the projects being undertaken • resource a clay from the local environment and prepare it for use • select and use suitable glazes and associated decoration mediums for projects • make simple glazes and identify the functions of the different ingredients
Equipment, Tools and Machines • a range of tools, machines and equipment in the Ceramics focus area • the differences between conventional gas and electric kilns and fuel-fired downdraft kilns	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • identify, select and use a range of hand tools, machines and equipment that are used for both hand-building and wheelwork • fire ceramics projects using alternative kilns such as: – sawdust kiln – pit-fired kiln
Techniques • a range of processes and techniques including: – throwing multi-piece forms which could include lids and spouts • techniques to overcome the problems associated with large-scale work such as: – weight – stress – drying – joining	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • identify, select and use appropriate techniques for individual projects
Links to Industry • industrial manufacturing techniques in ceramics	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • research current techniques and materials used in industry to develop and mass-produce a similar project • compare and contrast industrial practices with classroom experiences

INDUSTRIAL TECHNOLOGY – CERAMICS

Ceramics – Specialised Module 4	
Students learn about:	**Students learn to:**
Design • the application of design principles and processes to individual projects • project management • resource selection	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • work through a design process to develop and produce practical projects • evaluate practical projects and processes • plan and follow a sequence of operations to complete projects within specified time frames • explain and justify the selection and use of materials, processes and equipment in practical projects
Workplace Communication Skills • freehand drawing and sketching • report writing (including the preparation of documentation to support the development and production of practical projects)	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)* • produce drawings to visualise, generate, understand and record ideas • read, interpret and produce drawings to assist in the production of projects. This may include exploded views and dimensioned drawings • write and present reports to detail the design and production of projects • justify design decisions and selection of materials, processes and equipment • use appropriate software and hardware displaying skills in several applications which could include scanning and digital photography
Societal and Environmental Impact • the effects of ceramics industries on society and the environment	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)* • analyse and explain the environmental and societal impact of resources used in the development and production of projects
Additional Content • elementary CAD applications • advanced applications of ceramics including biomedical, aerospace, aeronautical	• use a suitable CAD program to produce working drawings • identify and describe the use of ceramics in a broad range of applications

INDUSTRIAL TECHNOLOGY – ELECTRONICS

The Electronics focus area provides opportunities for students to develop knowledge, understanding and skills in relation to the electronics and associated industries.

Core modules develop knowledge and skills in the use of materials, tools and techniques related to electronics which are enhanced and further developed through the study of specialist modules in:

- Circuits and Components
- Computer Repair and Construction.

Practical projects should reflect the nature of the Electronics focus area and provide opportunities for students to develop specific knowledge, understanding and skills related to electronics-related technologies. These may include:

- electronic circuits and kits
- electronic controlled devices
- robotic projects
- computer systems
- work undertaken on isolated computer components.

Projects should promote the sequential development of skills and reflect an increasing degree of student autonomy as they progress through the course.

A note to teachers about practical experiences

To satisfy the requirements of the syllabus students must undertake a range of practical experiences that occupy the majority of course time. Practical experiences should be used to develop knowledge and understanding of and skills in designing, producing and evaluating. Student capability, confidence and expertise at their current stage of development are important considerations in determining the teaching and learning sequences in the course.

In developing and delivering teaching programs teachers should be aware of and adopt the relevant guidelines and directives of their education authorities and/or schools. Teaching programs should recognise and reflect relevant State and Commonwealth legislation, regulations and standards including Occupational Health and Safety, Chemical Safety in Schools and Animal Welfare guidelines. Teachers need to be aware of activities that may require notification, certification, permission, permits and licences.

INDUSTRIAL TECHNOLOGY – ELECTRONICS

Circuits and Components – Core Module 1	
Students learn about:	**Students learn to:**
OHS and Risk Management • the safe use and handling of hand, power and machine tools • the use of personal protective equipment in the workshop • elementary first aid procedures	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • safely use tools, materials and equipment • use personal protective equipment when working with materials, tools and machines
Materials and Components • components used in elementary electronics including: – resistors – capacitors – transistors • a variety of component mounting methods including: – breadboard – veroboard – surface mount – single- and double-sided printed circuit board (PCB) • the characteristics and working properties of a range of materials used for project housings	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • identify, understand and use basic electrical components • use units of measurement for electronic components • use a variety of component mounting methods including: – direct wiring – bread/veroboard • design and produce circuit board housings
Equipment, Tools and Machines • a range of hand tools and equipment used for: – marking out, cutting and shaping – soldering and desoldering – circuit construction – testing and measuring components • portable power tools and machines used for drilling and cutting	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use a range of hand tools in the construction of electronic circuits and circuit housings • use soldering irons • use continuity testers/multimeters in the production and testing of practical projects • use a range of machines and power tools
Techniques • a range of techniques and processes related to: – component identification – prototype design – circuit construction – soldering and desoldering – fault finding – methods of package manufacture • power generation and power supplies	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • read and measure values for circuit components • interpret colour codes for components • convert orders of magnitude in electronic units of measurement • apply soldering, sawing, drilling, bending, gluing methods • produce electronic circuits using veroboard or breadboard • conduct elementary fault-finding: visual and continuity tester • identify and describe a range of sources of power • use power supplies

INDUSTRIAL TECHNOLOGY – ELECTRONICS

Circuits and Components – Core Module 1	
Students learn about:	**Students learn to:**
Links to Industry • industrial processes and production techniques • a range of career paths in the electronics industry	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • relate elementary industrial production techniques to work in the classroom • list different career paths in electronics industries
Design • design principles and processes • methods of prototyping designs before manufacture • component lists	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • carry out simple modifications to existing circuit designs • design housings for electronic circuits • develop and use simple veroboard/breadboard designs • read and interpret component lists
Workplace Communication Skills • workplace signage • circuit diagrams and symbols • freehand sketching • text types to support the documentation of practical projects and processes including: – procedure – factual recount • a range of computer software applications to assist in the planning, production and reporting of practical projects	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)* • respond to OHS signage • read and interpret circuit schematic diagrams, workshop and pictorial drawings • produce freehand sketches of workshop items and/or projects • prepare reports to describe processes undertaken in the development and production of practical projects • prepare reports using appropriate software and hardware, eg word processing
Societal and Environmental Impact • issues relating to the sustainability of resources in the electronics industry	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)* • describe a range of power generation techniques and their relative impacts on the environment • compare battery types and the environmental consequences of each
Additional Content • a range of techniques and skills to enhance the appearance and/or function of practical projects	• add features to enhance a project's function or aesthetics. These may include: – adding buttons, LEDs, modifying battery or power source arrangement – adding lids, perspex light tubes for LEDs – spray painting – project packaging

INDUSTRIAL TECHNOLOGY – ELECTRONICS

Circuits and Components – Core Module 2	
Students learn about:	**Students learn to:**
OHS and Risk Management • identified hazards in the work environment • principles of risk management • clean and hygienic work practices	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • safely use hand and power tools, materials, finishes and equipment • select and use personal protective equipment
Materials and Components • wire types • a variety of semi-conductors and components including: – special purpose resistors, eg LDRs – transistors – diodes • the production of printed circuit boards • a range of materials suited to the construction of circuit housing	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • identify and use different types of wires • use a range of components in the production of practical projects • use simple PCB construction methods • use solvents and etchant solutions • use perspex, sheet metals, or timber and timber products to produce circuit housings
Equipment, Tools and Machines • desoldering equipment including: – solder suckers – desoldering braids • testing equipment including multimeters • printed circuit board manufacture	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • desolder components from a circuit • use multimeters to test circuits and components • use etchant tanks and related equipment to produce PCBs
Techniques • testing and fault-finding strategies • elementary calculations in electronics • basic AM transmission	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • diagnose and rectify faults in circuits • calculate voltage, current and resistance using Ohm's law • calculate total resistance for resistors in series and in parallel • apply coil winding • explain modulation and rectification in AM reception
Links to Industry • industrial techniques and processes • the relationships between careers in electronics industries	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • identify alternative industrial technologies appropriate to the task and components being used • relate industrial processes and components to work in the classroom • describe different careers in electronics and analyse the relationships between them

INDUSTRIAL TECHNOLOGY – ELECTRONICS

Circuits and Components – Core Module 2	
Students learn about:	**Students learn to:**
Design	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)*
• design principles and processes	• apply principles of design in the modification of electronic projects
• factors that influence design of electronic circuits including component function, value and layout	• describe the operation of simple circuits
• component lists	• prepare a component list from a circuit diagram • calculate costs of materials and components for practical projects
• printed circuit board design	• develop PCB pattern design
• project sequencing	• follow a planned construction sequence
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• schematic, pictorial drawings	• read, interpret and produce circuit schematic diagrams, workshop and pictorial drawings • produce freehand sketches of workshop items and/or projects
• technical and safety data relating to components and chemicals	• read component codes for resistors, capacitors, and transistors, LEDs and specialised components • respond to OHS signage
• report writing (including the preparation of documentation to support the development and production of practical projects)	• write reports to document the development of practical projects describing the functioning of the circuit, components used and production processes
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• the effects of the electronics industry on society and the environment	• outline the use of renewable resources in electronics and the impact on the environment including disposal of chemical etchants
Additional Content	
• a range of techniques and skills to enhance the appearance and/or function of practical projects	• add features to projects in addition to, or further to, any of the detailing methods chosen in Circuits and Components 1
• elementary CAD applications	• use CAD or draw software to prepare schematic circuit diagrams

INDUSTRIAL TECHNOLOGY – ELECTRONICS

Circuits and Components – Specialised Module 3	
Students learn about:	**Students learn to:**
OHS and Risk Management • the intent of the OHS Act and the role of WorkCover in the workplace • potential hazards in the work environment • safe handling of chemicals	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • select and use personal protective equipment • identify specific OHS issues associated with the production of practical projects
Materials and Components • transmission methods: – coaxial cable – electronic and LAN cable – fibre-optic cable – hook-up and lead wire – paired and non-paired – ribbon cable • integrated circuits: – operational amps – 555 timers – 4000 series • the safe use and handling of chemicals used in printed circuit board manufacture • allied hardware and external components, eg mouldings, mountings, sockets for pots, LEDs and switches • AC/DC motors and generators • sensing devices including LDRs, ultrasonic sensors, infra-red sensors, temperature and pressure • control technologies including: – switching devices such as 741 Op – amplifier ICs – transistors and relays	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • use different wire types and other transmission methods in the development and production of practical projects • compare the advantages and disadvantages of different transmission methods • understand and use dual in-line (DIL) series of ICs • use solvents, etchants and photo-etching chemicals • select and use a range of components and hardware in the development and production of practical projects • identify AC/DC motors and generators • use sensing devices in the production of practical projects • use control technologies in circuit design and production
Equipment, Tools and Machines • a range of tools and equipment including cathode-ray oscilloscope, sound generators and signal generators	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use, operate and care of a variety of tools and test equipment
Techniques • fault diagnosis and rectification • the use of measurement equipment including multimeters • PCB design and construction • FM transmission • magnetism and inductance	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • fault-find projects using multimeter • use a multimeter to measure current and voltage in series and parallel circuits • use software to develop PCB pattern design • produce PCBs using etchants and photo-etching • describe basic FM transmission • explain the principles of electromagnetism and induced currents • explain inductance process and transformation of power

INDUSTRIAL TECHNOLOGY – ELECTRONICS

Circuits and Components – Specialised Module 3	
Students learn about:	**Students learn to:**
Links to Industry • industrial manufacturing techniques in electronics including the application of computer-aided manufacture (CAM)	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • compare and contrast industrial practices with those undertaken in the classroom • identify new and emerging technologies and contrast with those used in the past • describe the impact of robotics/mechatronics on industry
Design • design principles and processes • project management • research techniques	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • apply principles of design in the design and/or modification of electronic projects • produce freehand sketches to generate, visualise and record ideas • calculate the total cost of projects • follow a planned sequence of operations • use internet facilities to research practical projects
Workplace Communication Skills • circuit schematic diagrams and technical data sheets • industry terminology • report writing (including the preparation of documentation to support the development and production of practical projects)	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)* • read and interpret circuit schematic diagrams and technical data sheets for specific components • produce schematic diagrams • recall specialist terms • prepare and present reports to document the development of projects using a range of software and hardware, displaying skills in more than one application • prepare and use component lists
Societal and Environmental Impact • the effects of electronics industries on society and the environment	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)* • analyse the impact of power transmission on society and the environment • describe health issues arising from electromagnetic fields associated with electronic devices
Additional Content • a range of skills and methods used in industry to enhance the appearance of the finished project	• select and use detailing techniques in addition to, or further to, any of the detailing methods chosen in previous modules

INDUSTRIAL TECHNOLOGY – ELECTRONICS

Circuits and Components – Specialised Module 4	
Students learn about:	**Students learn to:**
OHS and Risk Management • risk management principles included in the OHS Act and Regulation • risk identification and hazard reduction strategies	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • conduct a risk assessment • identify and respond to OHS issues to help ensure a safe working environment
Materials and Components • the use of transmission mediums: wire types, other transmission media and junction types • a range of DIL integrated circuits such as: – operational amplifiers – 555 timing circuits – 4000 series – 7400 series • the use of fibre optics	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • use DIL series integrated circuits in the development and production of practical projects • explain the operation of amplifiers • recognise fibre optic components • describe the use of optical infra-red components
Equipment, Tools and Machines • a range of test and measuring equipment such as: – multimeters – cathode ray oscilloscope – signal generators – sound generators – logic probes • inductance coils • transformers	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use testing and measuring equipment to diagnose and rectify faults in circuits • use etchant tanks, chemicals and photo etching equipment • select and use a range of hand and machine tools and test equipment in the production of practical projects • use inductor coils • describe types of transformers
Techniques • measuring, testing and fault-finding methods using the multimeter, CRO and logic probe • a variety of wireless transmission and control technologies including LDRs, ultrasonic sensors, infra-red sensors, temperature and pressure sensors	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • measure a variety of circuit outputs • measure current in series and parallel circuits, frequency and digital outputs • identify basic infra-red transmissions • use a variety of sensing and control devices
Links to Industry • industrial manufacturing techniques in electronics industries	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • compare and contrast current techniques used in industry with those used in the classroom • understand the surface mount process of circuit construction

INDUSTRIAL TECHNOLOGY – ELECTRONICS

Circuits and Components – Specialised Module 4	
Students learn about:	**Students learn to:**
Design	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)*
• the application of design principles and processes to individual projects	• work through a design process to develop and produce practical projects • evaluate practical projects and processes
• resource and component selection	• explain and justify choice of materials, components, processes and equipment
• project time management and sequencing	• plan and follow a sequence of operations to complete projects within a specified time frame
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• workshop drawings	• read, interpret and produce circuit schematic diagrams to assist in the production of practical projects • draw to visualise, generate and record ideas
• technical data sheets	• read and interpret technical data sheets
• report writing (including the preparation of documentation to support the production and sequencing of a project)	• write and present reports to detail the design, production and evaluation of projects • justify design decisions and the selection of materials, components and processes
• a range of computer software applications to assist in the planning, production and reporting of practical projects	• use appropriate software and hardware displaying skills in several applications which could include scanning or digital photography
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• the effects of the electronics industry on society and the environment	• analyse and explain the environmental and societal impact of the resources used in the development and production of projects
Additional Content	
• alternative energy supplies and sources	• analyse the developments in alternative energy • predict and suggest alternative energy for certain situations in society
• elementary CAD applications	• use a suitable CAD program to produce schematic and working drawings of circuits and projects

INDUSTRIAL TECHNOLOGY – ELECTRONICS

Computer Repair and Construction – Specialised Module 3	
Students learn about:	**Students learn to:**
OHS and Risk Management • the intent of the OHS Act and the role of WorkCover in the workplace • potential hazards in the work environment • safe handling of chemicals	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • select and use personal protective equipment • identify specific OHS issues associated with the production of practical projects
Materials and Components • a range of computer devices and components including: – software and hardware types – central processing units (CPU) – add-on cards – peripherals	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • identify components in a computer and computer system • compare software types (operating system and application) and hardware
Equipment, Tools and Machines • a range of tools and equipment used for testing and assembly/disassembly of computers including: – hand tools – multimeters	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use a variety of hand tools in the completion of practical exercises and projects
Techniques • a range of techniques for the upgrade and/or replacement of: – motherboard – memory: - RAM and ROM - chips - CPU • diagnosis of problems and incompatibilities: – slot types and functions – hardware and peripherals: - floppy and HDDs - CDs - printers	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • identify and explain of the function of circuit board hardware • use fault diagnosis techniques to isolate problems • devise action plans to rectify faults • install a range of peripherals including drivers • evaluate the suitability of alternative replacement components
Links to Industry • traditional, current, new and emerging technologies that relate to the computer industry • a range of equipment and tools used in industrial/commercial settings for the maintenance and upgrade of computers and computer systems	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • describe advances in computer technology and the ensuing improvements in computers and computer systems • compare and contrast industrial/commercial practices with those undertaken in the classroom

INDUSTRIAL TECHNOLOGY – ELECTRONICS

Computer Repair and Construction – Specialised Module 3	
Students learn about:	**Students learn to:**
Design • principles of design related to the computer industry • factors influencing the design of computers and computer systems including: – ergonomics, function, system – requirements/compatibility and cost • project management	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • apply principles of design in the modification of computer systems • identify and apply the factors influencing the design of computers to practical projects • follow a planned sequence of operations • prepare and use materials and component lists
Workplace Communication Skills • schematic diagrams and technical data sheets • industrial terminology, standards and drawings • freehand drawing • report writing (including the preparation of documentation to support the development and production of practical projects)	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)* • read, interpret and produce schematic diagrams and technical data sheets for specific systems and components • recall specialist terms and use them in appropriate contexts • respond to OHS signage • sketch to visualise, generate and record ideas • prepare reports documenting the development of projects identifying the materials, processes and equipment used
Societal and Environmental Impact • the impact of computers and computing on the workplace and the nature of work • social, legal and environmental issues relating to how the computing industry affects society • the environment and recycling	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)* • contrast the difference in working environment between pre-computerisation and the present • discuss social behaviours and health problems associated with high computer use in a working environment • be aware of legal issues relevant to the recycling of used computer products
Additional Content • a range of techniques and skills to enhance the appearance and operation of projects which may include: – ergonomics – wireless technologies – projecting, designing the life cycle of a product	• add appropriate details to enhance a project's function or aesthetics in regards to the packaging, components and/or circuit design. These may include: – sketching new ergonomic designs for components – researching and describing new ideas related to the wireless computer technology – planning a recycling flow chart for a computer, from manufacture to discarded product

INDUSTRIAL TECHNOLOGY – ELECTRONICS

Computer Repair and Construction – Specialised Module 4	
Students learn about:	**Students learn to:**
OHS and Risk Management • risk management principles included in the OHS Act and Regulation • risk identification and hazard reduction strategies	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • conduct a risk assessment • identify and respond to OHS issues to help ensure a safe working environment
Materials and Components • hardware components • pin arrangements • hard drives • cabling types	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • identify hardware components and their compatibility in order to design and construct a system or subsystem
Equipment, Tools and Machines • a range of tools and equipment used for the testing, repair and construction of computers and computer systems	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use a range of tools and equipment in the development, testing and production of practical projects and exercises
Techniques • selection of appropriate hardware and software for a designated system	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • design a system to satisfy client needs by selecting: – appropriate hardware – operating software – application software
Links to Industry • industrial/commercial practices in computer repair and construction • mass production and industrial assembly and manufacturing methods	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • compare and contrast current techniques used by industry to develop and mass-produce with those used in the classroom
Design • the application of design principles and processes to individual projects • project management	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • select and use components to enhance a project's design • evaluate design solutions • plan and follow a sequence of operations to enable the successful completion of projects • calculate costs for the development and production of practical projects • explain and justify the selection of components and processes used in the development of projects

INDUSTRIAL TECHNOLOGY – ELECTRONICS

Computer Repair and Construction – Specialised Module 4	
Students learn about:	**Students learn to:**
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• workshop drawings	• read, interpret and produce circuit schematic diagrams to assist in the production of practical projects • draw to visualise, generate and record ideas
• technical data sheets	• read and interpret technical data sheets
• report writing (including the preparation of documentation to support the production and sequencing of a project)	• write and present reports to detail the design, production and evaluation of projects • justify design decisions and the selection of materials, components and processes
• a range of computer software applications to assist in the planning, production and reporting of practical projects	• use appropriate software and hardware displaying skills in several applications which could include scanning or digital photography
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• the effects of the electronics industry on society and the environment	• analyse and explain the environmental and societal impact of resources used in the development and production of projects
Additional Content	
• design of a recycling environment	• analyse government policies to encourage recycling in the computer industry on a large scale
• network design	• design a network layout for an office, small working environment or remote workstation. This could include a written report, sketches or floor plans with specifications on components, products and pricing

INDUSTRIAL TECHNOLOGY – ENGINEERING

The Engineering focus area provides opportunities for students to develop knowledge, understanding and skills in relation to engineering and its associated industries.

Core modules develop knowledge and skills in the use of materials, tools and techniques related to structures and mechanisms. These are enhanced and further developed through the study of specialist modules in:

- Control Systems
- Alternative Energy.

Practical projects should reflect the nature of the Engineering focus area and provide opportunities for students to develop specific knowledge, understanding and skills related to engineering. These may include:

- small structures
- small vehicles
- a range of devices and appliances
- robotics projects
- electronic and mechanical control systems.

Projects should promote the sequential development of skills and reflect an increasing degree of student autonomy as they progress through the course.

A note to teachers about practical experiences

To satisfy the requirements of the syllabus students must undertake a range of practical experiences that occupy the majority of course time. Practical experiences should be used to develop knowledge and understanding of and skills in designing, producing and evaluating. Student capability, confidence and expertise at their current stage of development are important considerations in determining the teaching and learning sequences in the course.

In developing and delivering teaching programs teachers should be aware of and adopt the relevant guidelines and directives of their education authorities and/or schools. Teaching programs should recognise and reflect relevant State and Commonwealth legislation, regulations and standards including Occupational Health and Safety, Chemical Safety in Schools and Animal Welfare guidelines. Teachers need to be aware of activities that may require notification, certification, permission, permits and licences.

INDUSTRIAL TECHNOLOGY – ENGINEERING

Engineered Structures – Core Module 1	
Students learn about:	**Students learn to:**
OHS and Risk Management • the safe use and handling of hand, power and machine tools • the use of personal protective equipment in the workshop • elementary first aid procedures	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • safely use tools, materials and equipment • use personal protective equipment when working with materials, tools and machines
Materials • the properties, structure and applications of materials including: – hardness – ductility – tensile and compressive strength • the elastic and plastic behaviour of materials • the basic structure and advantages of composite materials used in engineered structures • the corrosion and/or degradation of materials used in structures	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • use materials in the design and production of structures based on an understanding of their properties • conduct experiments and tests to understand the properties of materials • use techniques to minimise corrosion and/or degradation of materials used in practical projects
Equipment, Tools and Machines • a range of equipment, tools and machines used in experiments, prototypes and products	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use a range of equipment to carry out experiments and construct projects in relation to engineered structures
Engineering Principles and Processes • the nature and purpose of structures: – bridges, buildings, dams, chairs • elements that make up structures: – beams, columns, braces • fundamental quantities, derived quantities and their units: – force, mass, acceleration • forces that act on structures: – wind loads, live loads, weight etc • the effects of forces on structures: – reactions, induced stress, deflection and motion	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • design and construct simple structures for specific purposes • experiment with load applications on structures: – destructive and non-destructive testing • determine the effects of forces on engineered structures
Links to Industry • a range of engineering fields and traditional, current and emerging technologies that relate to engineering	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • list some branches of engineering involved in designing structures • list career paths in engineering

INDUSTRIAL TECHNOLOGY – ENGINEERING

Engineered Structures – Core Module 1	
Students learn about:	**Students learn to:**
Design • design principles and processes • Australian Standards for engineering design • alternative design solutions appropriate to engineered structures • past, present and future challenges in engineering structures, eg Empire State Building, Sydney Opera House	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • identify the functional and aesthetic aspects of the design of some structures • use elementary design principles and processes in the design and production of structures
Workplace Communication Skills • freehand drawing and sketching • reading and interpreting graphics • pictorial and orthogonal drawings • text types to support the documentation of practical projects and processes including: – procedure – factual recount • a range of computer software applications • industry terminology	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)* • sketch ideas for simple structures • read and interpret simple engineering drawings • prepare reports to document experiments and processes undertaken in the development and production of practical projects • prepare reports using word-processing software • identify specialist terms and produce a glossary
Societal and Environmental Impact • the impact of engineering on society and the physical environment	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)* • analyse a structure in terms of its effect on the community, eg dam, bridge • discuss some legal and ethical issues that apply to engineered structures
Additional Content • use formulas to solve problems relating to simple engineered structures	• calculate forces and reactions on structures • calculate loads in members of structures • calculate induced stress in an axially loaded member • apply factors of safety to determine maximum allowable loads

INDUSTRIAL TECHNOLOGY – ENGINEERING

Engineered Mechanisms – Core Module 2	
Students learn about:	**Students learn to:**
OHS and Risk Management • identified hazards in the work environment • principles of risk management • clean and hygienic work practices	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • safely use hand and power tools, materials, finishes and equipment • select and use personal protective equipment
Materials • the properties, structure and applications of materials related to engineered mechanisms: – toughness – malleability – corrosion resistance – torsional and shear strength • the classification of engineering materials • typical materials used in mechanisms • the modification of materials to improve their mechanical and chemical properties: – heat treatment – cladding – reinforcement	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • use materials in the design and production of mechanisms based on an understanding of their properties • experiment to understand properties such as: – toughness – strength, torsion and shear – corrosion resistance – malleability • classify materials into groups, eg: – metals – ferrous, non-ferrous, alloys – polymers – thermosetting, thermoplastic – ceramics – building ceramics, engineering ceramics
Equipment, Tools and Machines • a range of equipment, tools and machines used in experiments, prototypes and products	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use a range of equipment, hand and power tools to carry out experiments and construct projects/models in relation to engineered mechanisms
Engineering Principles and Processes • the nature and purpose of mechanisms • components that make up mechanisms • the function and operation of mechanisms such as levers, pulleys, gears and cams • friction and its significance to the operation of mechanisms • mechanical advantage, velocity ratio and efficiency in mechanisms • methods of driving mechanisms	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • dismantle and assemble mechanisms to understand how they work • design and construct mechanisms for specific purposes • carry out experiments to demonstrate engineering principles
Links to Industry • a range of engineering fields and traditional, current and emerging technologies that relate to engineering	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • describe different careers in engineering

INDUSTRIAL TECHNOLOGY – ENGINEERING

Engineered Mechanisms – Core Module 2	
Students learn about:	**Students learn to:**
Design • design principles and processes • Australian Standards relevant to engineering design • the factors influencing the design of mechanisms including: – material choices – energy sources – structures • past, present and future challenges in the application of engineering mechanisms	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • modify designs and follow a planned construction sequence in the development and production for projects relating to engineered mechanisms • observe standards in the development of engineered mechanisms
Workplace Communication Skills • reading and interpreting graphics • freehand drawing and sketching • pictorial and orthogonal drawings • report writing (including the preparation of documentation to support experimental work and the production of practical projects) • a range of computer software applications • industry terminology	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)* • understand and apply engineering data and terminology • sketch ideas for components or products • read, interpret and produce simple engineering drawings: – isometric – orthogonal • prepare reports outlining the development of experiments or projects identifying the materials, processes and equipment used • prepare and present reports using software and hardware including word processing and spreadsheets
Societal and Environmental Impact • the impact of the focus area on society and the physical environment	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)* • analyse an engineered mechanism in terms of its effect on society and/or the environment, eg lifting bridge, gearbox
Additional Content • the relationship between components in complex mechanisms • moments • mechanical advantage, velocity ratio and efficiency for simple mechanisms	 • develop projects using combinations of different mechanisms • apply the principles of and calculate moments in simple engineered mechanisms • calculate mechanical advantage, velocity ratio and efficiency for simple mechanisms

INDUSTRIAL TECHNOLOGY – ENGINEERING

Control Systems – Specialised Module 3	
Students learn about:	**Students learn to:**
OHS and Risk Management • the intent of the OHS Act and the role of WorkCover in the workplace • potential hazards in the work environment • safe handling of chemicals	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • select and use personal protective equipment • identify specific OHS issues associated with the production of practical projects
Materials • the properties, structure and applications of materials • testing materials for properties • the basic structure of metals, alloys, polymers, ceramics • electromagnetic induction and induction motors	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • use materials in the design and production of control systems based on an understanding of their properties • test materials for properties and/or examine and analyse results of property tests
Equipment, Tools and Machines • a range of equipment, tools and machines used in experiments, prototypes and products	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use a range of equipment, hand and power tools, and machines to carry out experiments and construct projects/working models/prototypes in control systems
Engineering Principles and Processes • the nature and purpose of control systems • types of control systems: mechanical, electronic, hydraulic, pneumatic • the principles of simple control systems using sensors, actuators and controllers • the applications of control systems, eg production processes, robots, washing machines, servo brakes • the function of feedback in a control system	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • design and construct, or simulate, control systems for specific purposes • conduct experiments with a range of control devices and systems
Links to Industry • traditional, current and emerging technologies that relate to control technologies	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • describe the impact of control technologies on the working environment
Design • design principles and processes • past, present and future challenges in control systems • Australian Standards for engineering design	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • apply principles of design in the development and production of projects related to control systems

INDUSTRIAL TECHNOLOGY – ENGINEERING

Control Systems – Specialised Module 3	
Students learn about:	**Students learn to:**
Workplace Communication Skills • reading and interpreting graphics • freehand drawing and sketching • pictorial and orthogonal drawings • report writing (including the preparation of documentation to support experimental work and the production of practical projects) • a range of computer software applications • industry terminology	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)* • read, interpret and produce working drawings including pictorial and orthogonal with material lists • sketch and draw engineering solutions using SI units and Australian Standards • prepare and present reports documenting the development of experiments or projects – identifying the materials, processes and equipment used • present reports using appropriate software and hardware including word processing and spreadsheets • recall specialist terms and use them in the appropriate context • apply engineering data and terminology
Societal and Environmental Impact • the impact of the focus area on society and the physical environment • legal and ethical responsibilities of engineers toward the environment and community	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)* • analyse a control system in terms of its effect on the community and the environment, eg Sydney Coordinated Adaptive Traffic Control System (SCATS)
Additional Content • elementary CAD applications • animations and simulations	• use a CAD program to produce simple engineering drawings • use a suitable software program to simulate more complex control systems

INDUSTRIAL TECHNOLOGY – ENGINEERING

Alternative Energy – Specialised Module 4	
Students learn about:	**Students learn to:**
OHS and Risk Management • risk management principles included in the OHS Act and Regulation • risk identification and hazard reduction strategies	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • conduct a risk assessment • identify and respond to OHS issues to help ensure a safe working environment
Materials • the properties, structures and applications of materials • the relationships between structure, properties and the application of materials within engineering • the structures, properties and applications of composite materials	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • use materials in the design and construction of projects based on an understanding and analysis of their properties • design a testing jig or apparatus to analyse properties of materials
Equipment, Tools and Machines • a range of equipment, tools and machines used in experiments, prototypes and products	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use a range of equipment, tools and machines to carry out experiments and construct projects related to alternative energy
Engineering Principles and Processes • the nature and purpose of alternative energy systems • various types of alternative energy systems such as wind, solar, wave, human, geothermal • advantages and disadvantages of alternative energy systems • electrical units and values of voltage, power, current and energy in relation to alternative energy systems	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • plan and construct or simulate a working model, prototype or full-scale alternative energy system • examine the components of an alternative energy system • use an alternative energy system to power a device • compare the advantages and disadvantages of alternative energy systems
Links to Industry • traditional, current and emerging technologies that relate to engineering • the role of engineers in creating safe communities and environments • the use of alternative energies for industrial/commercial applications	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • describe the impact of new and emerging engineering fields on careers and professions
Design • design principles and processes • past and present achievements in engineering involving alternative energy	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • follow a design process in the development and production of projects related to alternative energy • justify design decisions and choices of materials, processes and equipment • apply relevant Australian Standards to engineering designs

INDUSTRIAL TECHNOLOGY – ENGINEERING

Alternative Energy – Specialised Module 4	
Students learn about:	**Students learn to:**
Workplace Communication Skills • reading and interpreting graphics • freehand drawing and sketching • pictorial and orthogonal drawings • report writing (including the preparation of documentation to support experimental work and the production of practical projects) • a range of computer software applications • industry terminology	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)* • produce engineering drawings and charts including material lists, flow charts, Gantt charts • apply Australian drawing standards to engineering drawings • prepare reports detailing the design and construction of experiments or projects, processes and equipment • prepare and present reports using a variety of software and hardware • recall specialist terms and use them in the appropriate context
Societal and Environmental Impact • the impact of alternative energy on society and the physical environmental	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)* • analyse the use of an alternative energy source in terms of its effect on society and the environment, eg solar power, wind farms • identify and distinguish between renewable and non-renewable energy resources used by engineers
Additional Content • CAD and 3D modelling • calculations relating to energy sources	 • use a suitable CAD or 3D modelling program to represent alternative energy systems • calculate simple quantities related to alternative energy systems

INDUSTRIAL TECHNOLOGY – FARM MAINTENANCE

The Farm Maintenance focus area provides opportunities for students to develop knowledge, understanding and skills in relation to farm maintenance and its associated industries.

Core modules develop knowledge and skills in the use of materials, tools and techniques related to farm maintenance. These are enhanced and further developed through the study of specialist modules in technologies applicable to farm maintenance.

Practical projects should reflect the nature of the Farm Maintenance focus area and provide opportunities for students to develop specific knowledge, understanding and skills related to farm maintenance-related technologies. These may include:

- small structures for farm applications
- maintenance and repair of farm appliances and equipment
- tools and implements to assist on the farm
- fences and gates
- structures for containing/restraining livestock.

Projects should promote the sequential development of skills and reflect an increasing degree of student autonomy as they progress through the course.

A note to teachers about practical experiences

To satisfy the requirements of the syllabus students must undertake a range of practical experiences that occupy the majority of course time. Practical experiences should be used to develop knowledge and understanding of and skills in designing, producing and evaluating. Student capability, confidence and expertise at their current stage of development are important considerations in determining the teaching and learning sequences in the course.

In developing and delivering teaching programs teachers should be aware of and adopt the relevant guidelines and directives of their education authorities and/or schools. Teaching programs should recognise and reflect relevant State and Commonwealth legislation, regulations and standards including Occupational Health and Safety, Chemical Safety in Schools and Animal Welfare guidelines. Teachers need to be aware of activities that may require notification, certification, permission, permits and licences.

INDUSTRIAL TECHNOLOGY – FARM MAINTENANCE

Farm Maintenance – Core Module 1	
Students learn about:	**Students learn to:**
OHS and Risk Management • the safe use and handling of hand, power and machine tools • the use of personal protective equipment in the workshop • elementary first aid procedures	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • safely use tools, materials and equipment • use personal protective equipment when working with materials, tools and machines
Materials • the properties and applications of materials associated with the areas of: – metalshop practice – farm motor mechanics – farm building construction – farm maintenance	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • use a range of materials commonly applied in the farm context. These may include: – ferrous or non-ferrous metals – timber or timber products – petroleum or petroleum products – sealant and gasket materials to assemble components
Equipment, Tools and Machines • a range of equipment, tools and machines associated with: – metalshop practice – farm motor mechanics – farm building construction – farm maintenance • the applications of a range of hand and machine tools	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • adjust and use hand tools and machines for: – holding – cutting – shaping – drilling – joining – finishing
Techniques • a range of processes and techniques for preparing, marking out, cutting, fabricating, joining and finishing materials used in the areas of: – metalshop practice – farm motor mechanics – farm building construction – farm maintenance	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • apply correct measuring standards and methods • mark out projects from a workshop drawing • use a range of processes in the production of practical projects • use a variety of simple joining methods in the fabrication/construction of practical projects • prepare surfaces and apply appropriate finishes
Links to Industry • industrial processes and production techniques • a range of career paths in farm maintenance	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • relate current practice in the farming industry to work in the classroom • explore career paths in farm maintenance

INDUSTRIAL TECHNOLOGY – FARM MAINTENANCE

Farm Maintenance – Core Module 1	
Students learn about:	**Students learn to:**
Design • functional and aesthetic aspects of design • design principles and processes • material lists • project costing	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • identify the functional and aesthetic aspects of design in farm maintenance projects • apply principles of design in the modification of projects • evaluate work practices and practical projects in terms of quality • read and interpret material lists • estimate quantities of materials to be used in practical projects
Workplace Communication Skills • workplace signage • pictorial and working drawings • industry terminology • text types to support the documentation of practical projects and processes including: – procedure – factual recount • a range of computer software applications to assist in the planning, production and reporting of practical projects	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)* • respond to OHS signage • read and interpret simple workshop and pictorial drawings • make freehand sketches of workshop items and/or projects • define specialist terms and produce a glossary • prepare reports to describe processes undertaken in the development and production of practical projects • prepare reports using appropriate software and hardware, eg word processing, drawing packages
Societal and Environmental Impact • issues relating to the sustainability of resources in farming industries	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)* • identify and distinguish between renewable and non-renewable resources in the farming industry • appreciate the importance of sustainability in the farming industry
Additional Content • joining materials • the use and applications of composite materials	 • join similar materials by mechanical or chemical systems • identify and describe the use of composite materials

INDUSTRIAL TECHNOLOGY – FARM MAINTENANCE

Farm Maintenance – Core Module 2	
Students learn about:	**Students learn to:**
OHS and Risk Management • identified hazards in the work environment • principles of risk management • clean and hygienic work practices	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • safely use hand and power tools, materials, finishes and equipment • select and use personal protective equipment
Materials • the properties and applications of materials associated with the areas of: – metalshop practice – farm motor mechanics – farm building construction – farm maintenance • the working characteristics, properties and applications of a range of commonly used materials in the farm context	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • consider the properties and applications of a number of commonly used materials when selecting materials for farm maintenance projects • select and prepare materials for specific projects: – metals (ferrous or non-ferrous) – timber or timber products – petroleum or petroleum products – sealant and gasket materials to assemble components
Equipment, Tools and Machines • the range of equipment, tools and machines incorporating aspects of: – metalshop practice – farm motor mechanics – farm building construction – farm maintenance • care and maintenance of a range of hand and machine tools	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • select, adjust, use and maintain a range of hand tools in cutting and shaping a variety of materials and fabricating farm maintenance projects • use machine and power tools for: – surface preparation, eg sanding or grinding – drilling – turning
Techniques • a range of processes and techniques for preparing, marking out, cutting, fabricating, joining and finishing a range of materials • mechanical and chemical joining methods • a range of finishes suitable to a variety of applications • metal machining using a lathe	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use a range of processes to complete farm maintenance practical projects • join materials using a variety of methods • use a range of finishes suitable for farm maintenance projects • set up a lathe and perform basic turning operations
Links to Industry • industrial techniques and processes • the relationships between careers and industries in the farming area	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • identify alternative historical technologies related to farm maintenance and relate appropriate farm workshop techniques to work in the classroom • describe different careers within the farming industry and analyse the relationships between them

INDUSTRIAL TECHNOLOGY – FARM MAINTENANCE

Farm Maintenance – Core Module 2	
Students learn about:	**Students learn to:**
Design • design principles and processes • factors that impact on the design of a range of farming products including: – material selection – shaping and forming processes – joining methods – finishing – hardware • project sequencing • material lists and project costing	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • apply principles of design in the modification of a range of farming products to enhance function and/or aesthetics • identify the factors influencing design in a range of farming products including: – engineered components – farm structures • identify and consider design factors in the modification of projects • evaluate work practices and relate these to quality of practical projects • follow a planned construction sequence • follow material lists to prepare materials • use spreadsheets to assist in calculating the cost of parts and materials
Workplace Communication Skills • working drawings • industry terminology • report writing (including the preparation of documentation to support the development and production of practical projects)	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)* • read, interpret and use workshop technical drawings and workshop manuals to inform the production of practical projects • produce orthogonal drawings related to the development and production of practical projects • identify and recall specialist terms and use them in context • write reports to document the development of maintenance programs, identifying the materials, processes and equipment used • use a computing application to produce a maintenance schedule
Societal and Environmental Impact • the impact of the farm maintenance activities on society and the physical environment	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)* • describe the environmental need for the safe disposal of waste products • discuss the issues of pollution and recycling in relation to farm maintenance activities • explain the impact of a range of farm maintenance activities and processes on the environment
Additional Content • heat treatment of steels • structure/property relationships in materials	 • modify properties of steels by heat treatment • identify the difference between various materials in terms of structure and properties

INDUSTRIAL TECHNOLOGY – FARM MAINTENANCE

Farm Maintenance – Specialised Module 3	
Students learn about:	**Students learn to:**
OHS and Risk Management • the intent of the OHS Act and the role of WorkCover in the workplace • potential hazards in the work environment • safe handling of chemicals	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • select and use personal protective equipment • identify specific OHS issues associated with the production of practical projects
Materials • the properties and applications of materials associated with farm maintenance • student learning experiences must incorporate elements of: – metalshop practice – farm motor mechanics – farm building construction – farm maintenance	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • select and use a range of materials to complete projects. These may include: – solid timber products – composite materials – ceramics – polymers – metals
Equipment, Tools and Machines • the range of equipment, tools and machines in farm maintenance • student learning experiences must incorporate elements of: – metalshop practice – farm motor mechanics – farm building construction – farm maintenance	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • adjust and maintain hand tools and machines for the cutting and shaping of: – timber and associated products – metals and associated products – composite materials
Techniques • measurement and sizing • a range of processes and techniques related to farm maintenance	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • measure and mark out projects from a workshop drawing with accuracy and precision • use a range of techniques to check projects for square and level • use a range of joining methods appropriate to a selected project • select appropriate surface preparation methods and apply a suitable finish to a project
Links to Industry • industrial/commercial practices relating to the maintenance and repair of farming equipment and structures	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • identify alternative historical industrial technologies used in farm maintenance • identify new and emerging technologies and contrast them with those used in the past • relate appropriate rural practice skills to work in the classroom • describe different careers related to farm maintenance and analyse the relationships between them

INDUSTRIAL TECHNOLOGY – FARM MAINTENANCE

Farm Maintenance – Specialised Module 3	
Students learn about:	**Students learn to:**
Design • design principles and processes • factors influencing design of farm equipment and structures including: – material selection – shaping processes – joining methods – finishing • project management	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • apply principles of design in the modification of products to enhance function and/or aesthetics • evaluate work practices and relate these to quality of practical projects • identify and apply the factors influencing design in the development and production of practical projects • follow a planned construction sequence • develop material lists and calculate total costs of projects
Workplace Communication Skills • working drawings • industry terminology • report writing (including the preparation of documentation to support the development and the production of practical projects) • a range of computer software applications to assist in the planning, production and reporting of practical projects	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)* • read, interpret and produce workshop drawings and material lists to assist in the development and production of practical projects • identify and recall specialist terms and use them in context • prepare and present reports to document the development of practical projects, identifying the materials, processes and equipment used • use computer applications to assist in: – the calculation of project costs – communication with suppliers – the preparation and presentation of reports
Societal and Environmental Impact • the impact of farming industries on society and the physical environment	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)* • outline the use of renewable resources and the impact on the living environment • identify sustainable natural resources • use recycled materials as a viable alternative to new materials
Additional Content • the modification of properties of materials • advanced construction techniques	• select and use modified materials according to their service requirements • identify, select and make complex joints to produce and assemble timber structures

INDUSTRIAL TECHNOLOGY – FARM MAINTENANCE

Farm Maintenance – Specialised Module 4	
Students learn about:	**Students learn to:**
OHS and Risk Management • risk management principles included in the OHS Act and Regulation • risk identification and hazard reduction strategies	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • conduct a risk assessment • identify and respond to OHS issues to help ensure a safe working environment
Materials • the properties and applications of materials associated with farm maintenance • timber defects	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • select appropriate materials, products and allied materials most suitable for completing projects • consider properties in the selection and use of materials for individual projects • sight and check for defects in solid timber and apply techniques to overcome such defects
Equipment, Tools and Machines • the range of equipment, tools and machines in farm maintenance • student learning experiences must incorporate elements from the following areas of study: – metalshop practice – farm motor mechanics – farm building construction – farm maintenance	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • select and use a range of hand, power and machine tools to be used for cutting, shaping and joining a variety of materials.
Techniques • a range of processes and techniques related to the focus areas	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • identify, select and use suitable processes and techniques for individual projects • use jigs to assist in the production, construction and assembly of projects
Links to Industry • industrial/commercial practices in farm maintenance	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • research current techniques, materials and equipment used in industrial and commercial applications to undertake similar tasks and projects • compare and contrast industrial/commercial practice with classroom experiences
Design • the application of design principles and processes to individual projects • project management • resource selection	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • work through a design process to develop and produce practical projects • evaluate practical projects and processes • plan and follow a sequence of operations to complete projects within specified time frames • research and calculate all costs for the development of projects • explain and justify selection and use of materials, processes and equipment in practical projects

INDUSTRIAL TECHNOLOGY – FARM MAINTENANCE

Farm Maintenance – Specialised Module 4	
Students learn about:	**Students learn to:**
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• working drawings • signage	• produce drawings to visualise, understand and record ideas • read, interpret and produce working drawings to assist in the production of practical projects • produce and use material lists
• industry terminology	• identify, recall specialist terms and use them in the appropriate contexts
• report writing (including the preparation of documentation to support the development and production of practical projects)	• write and present reports to detail the design, construction and evaluation of projects
• a range of computer software applications to assist in the planning, production and reporting of practical projects	• prepare and present reports using appropriate software and hardware displaying skills in several applications which could include scanning and digital photography
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• the impact of farm technologies on society and the physical environment	• use renewable/recycled resourses where possible • analyse and explain the environmental and societal impact of resources and processes used in the development and production of projects
Additional Content	
• environmental considerations in farm maintenance	• be aware of the legal and ethical responsibilities towards the community and environment including the protection and maintenance of waterways
• elementary CAD applications	• use a suitable CAD package to produce working drawings for practical projects

INDUSTRIAL TECHNOLOGY – LEATHER

The Leather focus area provides opportunities for students to develop knowledge, understanding and skills in relation to the leather and associated industries.

Core modules develop knowledge and skills in the use of materials, tools and techniques related to leather which are enhanced and further developed through the study of specialist modules in leather-based technologies.

Practical projects should reflect the nature of the Leather focus area and provide opportunities for students to develop specific knowledge, understanding and skills related to leather-related technologies. These may include:

- belts
- handbags and wallets
- saddles and harnesses
- leather jewellery and accessories.

Projects should promote the sequential development of skills and reflect an increasing degree of student autonomy as they progress through the course.

A note to teachers about practical experiences

To satisfy the requirements of the syllabus students must undertake a range of practical experiences that occupy the majority of course time. Practical experiences should be used to develop knowledge and understanding of and skills in designing, producing and evaluating. Student capability, confidence and expertise at their current stage of development are important considerations in determining the teaching and learning sequences in the course.

In developing and delivering teaching programs teachers should be aware of and adopt the relevant guidelines and directives of their education authorities and/or schools. Teaching programs should recognise and reflect relevant State and Commonwealth legislation, regulations and standards including Occupational Health and Safety, Chemical Safety in Schools and Animal Welfare guidelines. Teachers need to be aware of activities that may require notification, certification, permission, permits and licences.

INDUSTRIAL TECHNOLOGY – LEATHER

Leatherwork – Core Module 1	
Students learn about:	**Students learn to:**
OHS and Risk Management • the safe use and handling of hand, power and machine tools • the use of personal protective equipment in the workshop • elementary first aid procedures	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • safely use tools, materials and equipment • use personal protective equipment when working with materials, tools and machines
Materials • the properties, types and applications of leather and associated materials including: – grain – thickness – part of the hide – defects	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • consider leather's basic characteristics and use leather in the production of practical projects • identify types, applications and origins of leather
Equipment, Tools and Machines • a range of equipment, tools and machines used for: – marking out – cutting – simple edging – stamping – punching holes, slots, wads – simple carving – skiving	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use hand tools in the production of practical projects • use simple hardware items
Techniques • measurement and sizing • preparation of leather • a range of joining methods including: – rivets – adhesives – simple stitching – simple thonging	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • apply correct measuring standards and methods • use basic shaping, cutting and simple decorating methods • apply appropriate edge treatment, prepare leather and apply simple finishes, eg antique, satin seal • attach hardware to leather projects
Links to Industry • industrial processes and production techniques • a range of career paths in the leather industry	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • relate elementary industrial production skills to work in the classroom • list career paths in leatherwork industries

INDUSTRIAL TECHNOLOGY – LEATHER

Leatherwork – Core Module 1	
Students learn about:	**Students learn to:**
Design • functional and aesthetic aspects of design	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • identify the functional and aesthetic aspects of designing in leather including hide thickness, type of leather
• design principles and processes	• apply principles of design in the modification of projects • evaluate work practices and projects in terms of quality
• material lists and quantities	• measure and mark out simple leatherwork projects from a workshop drawing
• project costing	• estimate quantities of materials to be used in practical projects
Workplace Communication Skills • workplace signage	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)* • respond to OHS signage
• pictorial and workshop drawings	• read and interpret workshop and pictorial drawings and project plans
• freehand drawing and sketching	• make freehand sketches of workshop items and/or projects
• industry terminology	• define specialist terms and produce a glossary
• text types to support the documentation of practical projects and processes including: – procedure – factual recount	• prepare reports to describe processes undertaken in the development and production of practical projects
• a range of computer software applications to assist in the planning, production and reporting of practical projects	• prepare reports using appropriate software and hardware, eg word processing
Societal and Environmental Impact • issues relating to sustainability of resources and pollution as they relate to the leather industry	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)* • identify impacts of leatherworking processes on society and the environment • identify different leathers and how their use impacts on the environment and society
Additional Content • a range of techniques and skills to enhance the appearance and/or function of practical projects	• add features such as letters and numbers, repeating stamped patterns, punched patterns, stitching, carved details • apply finishing techniques such as using a boner, edge slick, dyes

INDUSTRIAL TECHNOLOGY – LEATHER

Leatherwork – Core Module 2	
Students learn about:	**Students learn to:**
OHS and Risk Management • identified hazards in the work environment • principles of risk management • clean and hygienic work practices	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • safely use hand and power tools, materials, finishes and equipment • select and use personal protective equipment
Materials • the properties and working characteristics of leather • leather production and treatment processes	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • consider the working characteristics of a number of commonly used leathers when selecting and using leather for specific projects • describe how leather is tanned and manufactured
Equipment, Tools and Machines • the care and use of hand and power tools • a range of equipment, tools and machines used for: – braiding – stamping – carving – silhouette and relief – punching – simple modelling – fitting of hardware	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • adjust and use hand tools in the production of practical projects • care for hand tools and understand the importance of proper care and maintenance
Techniques • measurement and sizing • a range of processes and techniques for shaping, cutting and joining leather including: – complex carving – bending – buttonhole stitch – sewing by hand – inserting gussets – cementing • edge treatments and finishing	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • measure and mark out projects from a workshop drawing with accuracy and precision • use a variety of shaping, cutting and joining methods • braid a simple three-strand plait • apply edge treatments, prepare surfaces and apply suitable finishes, eg stains and dyes
Links to Industry • industrial techniques and processes • the relationships between careers and industries in the leather area	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • identify alternative historical industrial technologies appropriate to the task and the material being used • relate appropriate industrial production skills to work in the classroom • describe different careers within the leatherwork industry and analyse the relationships between them

INDUSTRIAL TECHNOLOGY – LEATHER

Leatherwork – Core Module 2	
Students learn about:	**Students learn to:**
Design	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)*
• design principles and processes	• apply principles of design in the modification of projects to enhance function and/or aesthetics • evaluate work practices and relate these to quality of practical projects
• factors that impact on the design of leather products including: – material selection – shaping processes – joining methods – decorating – finishing	• identify and consider design factors in the modification of projects • follow a planned construction sequence
• material lists and project costing	• use a material list to determine total quantities of materials for a given project • calculate quantities and costs of materials to be used in the completion of projects • use spreadsheets to assist in the calculation of project costs
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• freehand drawing and sketching	• interpret and produce workshop drawings related to the development and production of practical projects
• industry terminology	• identify and recall specialist terms and use them in context
• report writing (including the preparation of documentation to support the development and production of practical projects)	• write reports documenting the development of projects identifying the materials, processes and equipment used • present a report using appropriate software and hardware including word processing and spreadsheets
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• the impact of the leather industry on society and the environment	• explain different methods of manufacture and tanning and how these methods and their waste products affect the environment and society
Additional Content	
• a range of techniques and skills to enhance the appearance and/or function of practical projects	• select detailing techniques in addition to, or further to, any of the detailing methods chosen in core module 1. These could include: – adding features such as more complex decoration, stitching, thonging etc – additional finishing techniques such as colouring and dying, oxalic acid
• the environmental impact of large-scale leather industries	• discuss the issues of pollution and recycling in relation to large-scale leather-based industries and analyse how these compare to the craft industry

INDUSTRIAL TECHNOLOGY – LEATHER

Leatherwork – Specialised Module 3	
Students learn about:	**Students learn to:**
OHS and Risk Management • the intent of the OHS Act and the role of WorkCover in the workplace • potential hazards in the work environment • safe handling of chemicals	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • select and use personal protective equipment • identify specific OHS issues associated with the production of practical projects
Materials • the properties and applications of materials and components associated with leatherwork	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • select and use a range of suitable leathers, other materials and components, for leather projects based on their properties • explore the history of leather and its uses
Equipment, Tools and Machines • the care and use of a range of equipment, tools and machines used in leatherwork for: – carving and cutting – modelling and bending – braiding and joining – lining and thonging – finishing – sewing machines, air brushing equipment, oilstones	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • adjust, use and maintain hand and machine tools in cutting, shaping and decorating of leather to produce practical projects
Techniques • a range of processes and techniques related to leatherwork	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • apply more advanced shaping, forming and decorating methods to the construction of leather projects • use jigs to assist in the production and construction of a project • select appropriate edge and surface preparation methods and apply a suitable finish or surface treatment to achieve a quality result
Links to Industry • industrial manufacturing techniques in leather-based industries including the application of computer-aided manufacture (CAM)	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • compare and contrast industrial processes with those used in the classroom • identify new and emerging technologies and contrast them with those used in the past • describe the impact of new and emerging technologies on careers and professions in the leatherwork industry

INDUSTRIAL TECHNOLOGY – LEATHER

Leatherwork – Specialised Module 3	
Students learn about:	**Students learn to:**
Design • design principles and processes • project sequencing and management • research techniques	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • apply principles of design in the design and/or modification of leatherwork projects • identify and apply the factors influencing good design to the design and/or modification of leather projects • follow a planned sequence of operations • use a range of methods to gain information to guide the development of leatherwork projects
Workplace Communication Skills • working drawings • industry terminology • report writing (including the preparation of documentation to support the development and production of practical projects)	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)* • read, interpret and produce simple working drawings including pictorials, orthogonals and material lists, to assist in the production of leatherwork projects • recall specialist terms, and use them in the appropriate context • prepare and present a report to document the development of projects, identifying the materials, processes and equipment used • prepare reports using a range of software and hardware, displaying skills in more than one application • prepare and use material lists
Societal and Environmental Impact • traditional and modern methods of manufacturing and tanning leather • the environmental impacts of the manufacture and tanning of leather • pollution control measures used in the manufacture and tanning of leather	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)* • explain the social and environmental impacts of the manufacture and tanning of leather using traditional and modern methods
Additional Content • a range of techniques and skills to enhance the appearance, quality or function of leatherwork projects • the development and use of synthetic materials for traditional leather applications	• use appropriate detailing to enhance a project's appearance and/or function; select detailing techniques in addition to, or further to, any of the detailing methods chosen in previous modules • identify a range of synthetic materials that are used to manufacture products traditionally manufactured from leather • compare the merits of synthetic materials over leather for specific applications

INDUSTRIAL TECHNOLOGY – LEATHER

Leatherwork – Specialised Module 4	
Students learn about:	**Students learn to:**
OHS and Risk Management • risk management principles included in the OHS Act and Regulation • risk identification and hazard reduction strategies	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • conduct a risk assessment • identify and respond to OHS issues to help ensure a safe working environment
Materials • the properties and applications of materials and components associated with leatherwork	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • select a range of appropriate materials and components most suitable for completing leatherwork projects • identify and use related materials to enhance a leatherwork project's appearance • compare the different properties and applications of various leathers and apply them to leatherwork projects
Equipment, Tools and Machines • the range of equipment, tools and machines in leatherwork	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • identify, select and use a range of suitable leatherworking tools for the production and completion of practical leatherwork projects • use, adjust and maintain specialist leatherwork tools as required
Techniques • a range of advanced processes and techniques which could include: – moulding – machining garments – inverted carving	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use suitable processes and techniques and apply them to advanced projects • construct and use jigs to assist in the production and construction of a project • select and apply appropriate edge and surface preparation methods and apply a suitable surface treatment or finish to achieve a quality project
Links to Industry • industrial manufacturing techniques in the leather industry	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • research current techniques, materials and equipment used in the leatherwork industry to develop and mass-produce a similar project • compare and contrast industrial practices with classroom experiences
Design • the application of design principles and processes to individual projects • project management • resource selection	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • work through a design process to develop and produce practical projects • evaluate practical projects and processes • plan and follow a sequence of operations to complete projects within specified time frames • research and calculate all costs for the development of a project • explain and justify the selection and use of materials, processes and equipment in practical projects

INDUSTRIAL TECHNOLOGY – LEATHER

Leatherwork – Specialised Module 4	
Students learn about:	**Students learn to:**
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• workshop drawings	• produce drawings to generate, visualise, understand and record ideas • read, interpret and produce working drawings to assist in the production of practical projects
• industry terminology	• recall specialist terms and use them in the appropriate contexts
• report writing (including the preparation of documentation to support the development and production of practical projects)	• write and present a report to detail the design and construction of projects • justify design decisions and selection of materials, processes and equipment
• a range of computer software applications to assist in the production and reporting of practical projects	• use appropriate software and hardware, displaying skills in several applications which could include scanning and digital photography
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• the impact of leatherwork on society and the physical environment	• analyse and explain the environmental and societal effects of resources used in the development and production of leather projects
Additional Content	
• techniques: detailing	• use appropriate detailing to enhance a project's appearance and/or function; select detailing techniques in addition to any of the detailing methods chosen in previous modules • explore further aspects of the tanning and manufacture of leather and discuss the positive and negative effects that this industry has on the environment and society
• further implications of large-scale leather industries in relation to recycling and pollution	• discuss the issues of pollution and recycling in relation to large-scale leather-based industries and analyse how these compare to the craft industry

INDUSTRIAL TECHNOLOGY – METAL

The Metal focus area provides opportunities for students to develop knowledge, understanding and skills in relation to the metal and associated industries.

Core modules develop knowledge and skills in the use of materials, tools and techniques related to metal **or** art metal which are enhanced and further developed through the study of specialist modules in:

- Metal Machining
- Fabrication

or

- Art Metal
- Jewellery.

Practical projects should reflect the nature of the Metal focus area and provide opportunities for students to develop specific knowledge, understanding and skills related to metal-related technologies. These may include:

- sheet metal products
- metal machining projects
- fabricated projects
- artistic metal projects
- jewellery and accessories.

Projects should promote the sequential development of skills and reflect an increasing degree of student autonomy as they progress through the course.

A note to teachers about practical experiences

To satisfy the requirements of the syllabus students must undertake a range of practical experiences that occupy the majority of course time. Practical experiences should be used to develop knowledge and understanding of and skills in designing, producing and evaluating. Student capability, confidence and expertise at their current stage of development are important considerations in determining the teaching and learning sequences in the course.

In developing and delivering teaching programs teachers should be aware of and adopt the relevant guidelines and directives of their education authorities and/or schools. Teaching programs should recognise and reflect relevant State and Commonwealth legislation, regulations and standards including Occupational Health and Safety, Chemical Safety in Schools and Animal Welfare guidelines. Teachers need to be aware of activities that may require notification, certification, permission, permits and licences.

INDUSTRIAL TECHNOLOGY – METAL

General Metal – Core Module 1	
Students learn about:	**Students learn to:**
OHS and Risk Management • the safe use and handling of hand, power and machine tools • the use of personal protective equipment in the workshop • elementary first aid procedures	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • safely use tools, materials and equipment • use personal protective equipment when working with materials, tools and machines
Materials • the properties and applications of a range of metals including: – solid stock – sheet metals – tube – ferrous and non-ferrous metals	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • use a range of metals in the production of practical projects • list the basic properties and common applications of metals
Equipment, Tools and Machines • a range of hand tools used for: – marking out – cutting – shaping – drilling – holding – joining • portable power tools and machines used for: – drilling – polishing – cutting	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • adjust and use hand tools in the production of practical projects • use portable power tools and machines in the production of practical projects
Techniques • measurement and sizing • a range of processes and techniques for preparing, cutting, joining and finishing metals	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • measure and mark out materials from a project drawing • shape metals by cutting, filing and bending • use a variety of joining methods including: – fasteners – rivets – soft soldering • prepare and finish surfaces by polishing, buffing and/or painting
Links to Industry • industrial processes and production techniques • a range of career paths in the metal industries	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • relate elementary industrial production techniques to work in the classroom • list career paths in the metal industries

INDUSTRIAL TECHNOLOGY – METAL

General Metal – Core Module 1	
Students learn about:	**Students learn to:**
Design	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)*
• functional and aesthetic aspects of design	• identify the functional and aesthetic aspects of design in metal, including material selection, edge treatments and service requirements
• design principles and processes	• apply principles of design in the modification of projects • evaluate work practices and practical projects in terms of quality
• material lists • project costing	• read and interpret material lists • estimate quantities of materials to be used in practical projects
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• workplace signage • pictorial and working drawings	• respond to OHS signage • read and interpret simple workshop and pictorial drawings • make freehand sketches of workshop items and/or projects
• industry terminology • text types to support the documentation of practical projects and processes including: – procedure – factual recount	• define specialist terms and produce a glossary • prepare reports to describe processes undertaken in the development and production of practical projects
• a range of computer software applications to assist in the planning, production and reporting of practical projects	• prepare reports using appropriate software and hardware, eg word processing
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• issues relating to the sustainability of resources in metal industries	• identify and distinguish between renewable and non-renewable resources in metal industries • appreciate the importance of recycling to metal industries
Additional Content	
• techniques and skills to enhance the appearance and/or function of practical projects	• add features to projects to enhance appearance and/or function • use surface finishes such as plastic coating, enamelling or a variety of painting techniques
• the production of iron and steel	• describe materials and processes used in the production of steel

INDUSTRIAL TECHNOLOGY – METAL

General Metal – Core Module 2	
Students learn about:	**Students learn to:**
OHS and Risk Management • identified hazards in the work environment • principles of risk management • clean and hygienic work practices	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • safely use hand and power tools, materials, finishes and equipment • select and use personal protective equipment
Materials • the properties and applications of metals, eg ferrous, non-ferrous, coated sheet metals, tube, RHS etc • heat treatment of metals	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • consider the properties of a number of commonly used metals and sections when selecting and using metals for specific applications • modify the properties of metals through heat-treatment processes
Equipment, Tools and Machines • a range of machines, portable power tools and equipment used for: – turning – cutting – drilling – heating and joining metals • screw threads and thread-cutting techniques	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use machine and portable power tools and equipment in the production of practical projects • produce internal and external screw threads
Techniques • measurement and sizing • screw thread terminology and sizes • power tools, machines and equipment used for cutting, turning, drilling, heating and joining • techniques and equipment used for the cutting, bending, forming and joining of sheet metals	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • measure and mark out projects from a workshop drawing with accuracy and precision • calculate tapping hole sizes • use machine tools to cut materials to length • perform lathe machining operations including facing, drilling, parallel turning and taper turning • shape, form and join sheetmetals
Links to Industry • industrial techniques and processes • the relationships between careers and industries in the metals area	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • identify alternative historical industrial technologies appropriate to the tasks and materials being used • relate industrial production techniques to work in the classroom • describe different careers within the metal industries and analyse the relationships between them

INDUSTRIAL TECHNOLOGY – METAL

General Metal – Core Module 2	
Students learn about:	**Students learn to:**
Design	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)*
• design principles and processes	• apply principles of design in the modification of projects to enhance function and/or aesthetics • evaluate work practices and relate these to the quality of practical projects
• factors that impact on the design of metal products including: – material selection – shaping and forming processes – joining methods – finishing – hardware	• identify and consider design factors in the modification of projects • follow a planned construction sequence
• material lists	• follow material lists to prepare materials
• project costing	• calculate quantities and costs of materials to be used in the completion of projects • use spreadsheets to assist in the calculation of project costs
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• working drawings	• interpret and produce engineering and pictorial drawings related to the development and production of practical projects • produce developments of sheet metal projects
• industry terminology	• identify and recall specialist terms and use them in context
• report writing (including the preparation of documentation to support the development and production of practical projects)	• write reports to document the development of practical projects, identifying materials, processes and equipment used
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• the effects of metal industries on society and the environment • issues of pollution and recycling in relation to metal-based industries	• explain the impact of a range of metalworking activities and processes on the environment
Additional Content	
• a range of techniques and skills to enhance the appearance and/or function of practical projects	• select and use detailing techniques in addition to, or further to, any of the detailing methods chosen in General Metal 1
• elementary computer numerically controlled (CNC) machining	• explain the use of CNC equipment and perform simple operations

INDUSTRIAL TECHNOLOGY – METAL

Metal Fabrication – Specialised Module 3	
Students learn about:	**Students learn to:**
OHS and Risk Management • the intent of the OHS Act and the role of WorkCover in the workplace • potential hazards in the work environment • safe handling of chemicals	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • select and use personal protective equipment • identify specific OHS issues associated with the production of practical projects
Materials • the properties and applications of materials associated with metal fabrication • metal finishes including**:** – painting – plating – galvanising – powder coating – anodising	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • describe the properties of a range of metals • select and use a range of materials and components in the development and production of fabrication projects • use finishes and protective coatings suitable for metal fabrication projects
Equipment, Tools and Machines • a range of equipment, tools and machines used in metal fabrication including: – metal lathe – drills – grinders – oxyacetylene equipment – MIG welding equipment – cutting/bending/rolling/forming equipment	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use tools, machines and equipment in the production of practical projects
Techniques • a range of processes and techniques used for the shaping, bending and forming of metals • a range of metal joining techniques and processes including: – mechanical fasteners – welding (MIG/oxyacetylene) – adhesives	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • select and use a variety of techniques to shape and form metals in the production of practical projects • select and use a variety of joining methods
Links to Industry • industrial manufacturing techniques in metal fabrication including the application of computer-aided manufacture (CAM) • new and emerging technologies in metal fabrication	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • compare and contrast industrial processes with those undertaken in the classroom • describe the impact of new and emerging technologies on careers and professions in metal fabrication • compare new and emerging technologies to traditional technologies

INDUSTRIAL TECHNOLOGY – METAL

Metal Fabrication – Specialised Module 3	
Students learn about:	**Students learn to:**
Design	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)*
• design principles and processes	• apply principles of design in the modification and design of metal projects • identify and apply the factors influencing good design to the design and/or modification of projects • produce freehand sketches to visualise, generate and record ideas
• the efficient use of materials when planning projects	• calculate the total cost of projects • using standard available sizes, calculate economical quantities of materials for projects
• project sequencing and time management • research techniques	• follow a planned sequence of operations • use internet facilities when designing and making practical projects
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• working drawings	• read, interpret and produce assembly and detail drawings to assist in the production of projects • develop and use material lists
• industry terminology	• recall specialist terms and use them in context when reporting on the development and production of projects
• report writing (including the preparation of documentation to support the development and production of practical projects)	• prepare and present reports to document the development of projects, identifying the materials, processes and equipment used • prepare reports using a range of software and hardware displaying skills in more than one application
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• the effects of metal industries on society and the environment • the consequences of raw material extraction on the environment	• identify pollution control measures used in fabrication activities in metal industries
Additional Content	
• a range of techniques and skills to enhance the appearance and/or function of practical projects	• select and use techniques in addition to or further to any of the methods nominated in previous modules
• elementary CAD applications	• use CAD programs to produce 2D workshop drawings for projects
• applications of metals and corrosion control techniques	• identify and investigate a range of materials and finishes used in the production of manufactured domestic products (refrigerators, washing machines, stoves etc)

INDUSTRIAL TECHNOLOGY – METAL

Metal Fabrication – Specialised Module 4	
Students learn about:	**Students learn to:**
OHS and Risk Management • risk management principles included in the OHS Act and Regulation • risk identification and hazard reduction strategies	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on pages 12)* • conduct a risk assessment • identify and respond to OHS issues to help ensure a safe working environment
Materials • the properties and applications of materials associated with the Metal focus area • metal alloys	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • select metals for individual projects based on an analysis of properties and service requirements • identify common metal alloys and explain the reasons for alloying
Equipment, Tools and Machines • the range of equipment, tools and machines used in metal fabrication • the use of jigs in the manufacture of fabrication projects	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • identify, select and use a range of hand, power and machine tools and equipment in the production of practical projects • use jigs to assist in the construction and assembly of projects
Techniques • a range of processes, methods and techniques related to metal fabrication	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • identify, select and use suitable processes and techniques for individual projects
Links to Industry • industrial manufacturing techniques in the metal fabrication industry • current techniques, materials and equipment used by the metal industry to develop and produce similar projects	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • compare and contrast industrial practices with classroom experiences
Design • the application of design principles and processes to individual projects • project management • resource selection	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • use a design process to develop and produce practical projects • evaluate practical projects and processes • plan and follow a sequence of operations to complete projects within specified time frames • research and calculate all costs for the development of individual projects • explain and justify selection and use of materials, processes and equipment in practical projects

INDUSTRIAL TECHNOLOGY – METAL

Metal Fabrication – Specialised Module 4	
Students learn about:	**Students learn to:**
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• workshop drawings	• produce drawings to visualise, generate, understand and record ideas • read, interpret and produce working drawings to assist in the production of practical projects
• industry terminology	• recall specialist terms and use them in the appropriate contexts
• report writing (including the preparation of documentation to support the development and production of practical projects)	• write and present reports to detail the design, construction and evaluation of projects • justify design decisions and selection of materials, processes and equipment
• a range of computer software applications to assist in the planning, production and reporting of practical projects	• use appropriate software and hardware displaying skills in several applications which could include scanning and digital photography
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• the effects of metal industries on society and the environment	• analyse and explain the environmental and societal impacts of resources used in the development and production of projects
Additional Content	
• metal forming processes including: – rolling – forging – drawing – casting – sintering	• explain the manufacture of a range of specific steel sections
• elementary CAD applications	• use CAD packages to produce workshop drawings with dimensions

INDUSTRIAL TECHNOLOGY – METAL

Metal Machining – Specialised Module 3	
Students learn about:	**Students learn to:**
OHS and Risk Management • the intent of the OHS Act and the role of WorkCover in the workplace • potential hazards in the work environment • safe handling of chemicals	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • select and use personal protective equipment • identify specific OHS issues associated with the production of practical projects
Materials • the properties and applications of materials associated with fitting and machining • the effects of increased carbon content on the properties of steels	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • describe the properties of a range of metals • compare the machining properties of different metals • select and use metals most suitable for machining projects
Equipment, Tools and Machines • a range of equipment, tools and machines utilised in fitting and machining including: – hand tools – portable power tools – metal lathe – milling machines – shaper – drilling machines – grinding machines	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use tools, equipment and machines in the production of practical projects
Techniques • a range of processes, methods and techniques related to fitting and machining • turning operations including: – boring and reaming – knurling • fits and tolerances • metal joining techniques including: – mechanical fasteners – welding (MIG and oxyacetylene) – threads – adhesives	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • select and use a range of techniques for: – marking out and measuring – cutting, shaping and forming – holding work clamps, jigs, vices etc • machine metals with accuracy and precision • read and use micrometers and vernier calipers • use a range of fastening devices and methods to join metals
Links to Industry • industrial manufacturing techniques in metal machining including the application of computer-aided manufacture (CAM) • new and emerging technologies in metal machining	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • compare and contrast industrial processes with those undertaken in the classroom • describe the impact of new and emerging technologies on careers and professions in metal machining

INDUSTRIAL TECHNOLOGY – METAL

Metal Machining – Specialised Module 3	
Students learn about:	**Students learn to:**
Design	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)*
• design principles and processes	• apply principles of design in the modification and design of metal projects • identify and apply the factors influencing good design to the design and/or modification of projects • produce freehand sketches to visualise, generate and record ideas • calculate the total cost of projects
• project sequencing and time management	• follow a planned sequence of operations
• research techniques	• use internet facilities to research practical projects
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• working drawings	• read, interpret and produce engineering drawings to assist in the production of projects • develop and use material lists
• industry terminology	• use specialist terms in context when reporting on the development and production of practical projects
• report writing (including the preparation of documentation to support the development and production of practical projects)	• prepare reports to document the development of projects, identifying the materials, processes and equipment used • prepare reports using a range of software and hardware, displaying skills in more than one application
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• the effects of metal industries on society and the environment • the benefits and associated costs of recycling in metal industries	• identify and describe a range of pollution control measures used in metal industries
Additional Content	
• computer-aided manufacture (CAM)	• use CNC machinery to produce components for projects
• elementary CAD applications	• use CAD programs to produce 2D workshop drawings
• applications of metals	• identify and investigate metals for specific metal machining applications

INDUSTRIAL TECHNOLOGY – METAL

Metal Machining – Specialised Module 4	
Students learn about:	**Students learn to:**
OHS and Risk Management • risk management principles included in the OHS Act and Regulation • risk identification and hazard reduction strategies	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • conduct a risk assessment • identify and respond to OHS issues to help ensure a safe working environment
Materials • the properties and applications of materials associated with fitting and machining • the machining, mechanical and chemical properties of different metals • metal alloys	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • select appropriate metals for the production of projects • identify common metal alloys and explain the reasons for alloying
Equipment, Tools and Machines • the range of equipment, tools and machines used in fitting and machining	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • identify, select and use a range of metalworking tools and machines in the production of practical projects
Techniques • a range of processes and techniques including: – advanced turning operations – milling operations – repetition work	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • identify, select and use machining processes for specific projects
Links to Industry • industrial manufacturing techniques in fitting and machining	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • research current techniques, materials and equipment used by industry to develop and produce similar projects • compare and contrast industrial practices with classroom experiences
Design • the application of design principles and processes to individual projects • project management • resource selection	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • use a design process to develop and produce practical projects • evaluate practical projects and processes • plan and follow sequence of operations to complete projects within specified time frames • research and calculate all costs for the development of individual projects • explain and justify the selection and use of materials, processes and equipment in practical projects

INDUSTRIAL TECHNOLOGY – METAL

Metal Machining – Specialised Module 4	
Students learn about:	**Students learn to:**
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• workshop drawings	• produce drawings to visualise, generate, understand and record ideas • read, interpret and produce working drawings to assist in the production of practical projects
• industry terminology	• recall specialist terms and use them in appropriate contexts
• report writing (including the preparation of documentation to support the development and production of practical projects)	• write and present reports to detail the design production and evaluation of projects • justify design decisions and selection of materials, processes and equipment
• a range of computer software applications to assist in the planning, production and reporting of practical projects	• use appropriate software and hardware displaying skills in several applications which could include scanning and digital photography
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• the effects of metal industries on society and the environment	• analyse and explain the environmental and societal impacts of resources used in the development and production of projects
Additional Content	
• advanced metal machining processes which could include: – metal spinning – screw cutting – form turning – gang milling – indexing – slot cutting – CAD-CAM or other automated or computerised processes	• explain and/or use advanced machining operations
• elementary CAD and CAM	• identify, explain and/or use CAD/CAM manufacturing processes to produce components

INDUSTRIAL TECHNOLOGY – METAL

Art Metal – Core Module 1	
Students learn about:	**Students learn to:**
OHS and Risk Management • the safe use and handling of hand, power and machine tools • the use of personal protective equipment in the workshop • elementary first aid procedures	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • safely use tools, materials and equipment • use personal protective equipment when working with materials, tools and machines
Materials • the properties and applications of a range of materials suitable for various aspects of art metalwork including: – bar/wire – tube – sheet metal – ferrous and non-ferrous metals	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • use a range of metals in the production of practical projects • list the basic properties of metals used in art metal projects • list some common applications of metals in domestic and industrial settings
Equipment, Tools and Machines • a range of hand tools used for: – marking out and holding – cutting and sawing – filing and drilling – bending and twisting • a range of machine tools for: – drilling and polishing • heating equipment for annealing and simple joining	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • adjust and use hand tools for producing art metal projects • use machine tools for drilling and polishing • use heating equipment for annealing and simple joining
Techniques • measurement and sizing • edge treatment of metals • a range of simple forming methods such as bending, hollowing and twisting • beaten hollow ware, enamelling, jewellery, metal embossing, wrought iron work	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • apply correct measuring standards and methods • measure, mark out and prepare materials from a project drawing • remove sharp edges, filings and burrs by applying appropriate edge treatment • use a range of shaping, cutting methods and forming methods in the production of art metal projects • prepare surfaces to either polish or accept a suitable finish or surface treatment
Links to Industry • industrial processes and production techniques • a range of career paths in the metal industry	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • relate elementary industrial production skills to work in the classroom • list career paths in art metal work industries

INDUSTRIAL TECHNOLOGY – METAL

Art Metal – Core Module 1	
Students learn about:	**Students learn to:**
Design	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)*
• functional and aesthetic aspects of design	• identify the functional and aesthetic aspects of design in art metal, including material selection, form and service requirements
• design principles and processes	• apply principles of design in the modification of projects • evaluate work practices and practical projects in terms of quality
• material lists • project costing	• read and interpret material lists • estimate quantities of materials to be used in practical projects
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• workplace signage • pictorial and working drawings	• respond to OHS signage • read and interpret simple workshop and pictorial drawings • make freehand sketches of workshop items and/or projects
• industry terminology • text types to support the documentation of practical projects and processes including: – procedure – factual recount	• define specialist terms and produce a glossary • prepare reports to describe processes undertaken in the development and production of practical projects
• a range of computer software applications to assist in the planning, production and reporting of practical projects.	• prepare reports using appropriate software and hardware, eg word processing
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• issues relating to the sustainability of resources in metals industries • the importance of recycling to art metal industries	• identify and distinguish between renewable and non-renewable resources in art metal industries
Additional Content	
• a range of techniques and skills to enhance the appearance and/or function of practical projects	• add features to projects to enhance their appearance and/or function. These may include: – adding features such as scrolls, twists, piercings, simple stone settings and basic findings – additional surface finishes such as planishing, hammering, oxidising, mirror finishing
• the mining and refinement of metals and ores	• describe the mining of ores and refinement of metals

INDUSTRIAL TECHNOLOGY – METAL

Art Metal – Core Module 2	
Students learn about:	**Students learn to:**
OHS and Risk Management • identified hazards in the work environment • principles of risk management • clean and hygienic work practices	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • safely use hand and power tools, materials, finishes and equipment • select and use personal protective equipment
Materials • the properties and applications of a range of metals used in art metal including: – ferrous and non-ferrous metals – pure metals and alloys • heat treatment of metals • corrosion and its effect on the appearance of a metal	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • consider the properties of a number of suitable metals when selecting and using metals for specific art metalwork applications • modify the properties of metals through heat-treatment processes • either apply the effect of corrosion to enhance an art metal project's appearance or treat it for removal
Equipment, Tools and Machines • the care and maintenance of hand and machine tools • a range of tools, equipment and machines used for cutting, shaping, heating and joining metals	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use a range of tools, machines and equipment in the production of practical projects • use heating equipment for multiple soldering
Techniques • measurement and sizing • a range of cutting, shaping and forming methods including: – piercing – sandwiching (layering) – enamelling – metal embossing – lapidary – metal embossing • surface finishes and edge treatments	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • measure and mark out projects from drawings with accuracy and precision • use a variety of methods and techniques in the production of practical projects • prepare for and apply appropriate surface finishes and edge treatments
Links to Industry • industrial techniques and processes • the relationships between careers and industries in the metals area	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • identify alternative historical industrial technologies appropriate to the tasks and materials being used • relate industrial production techniques to work in the classroom • describe different careers within art metal industries and analyse the relationships between them

INDUSTRIAL TECHNOLOGY – METAL

Art Metal – Core Module 2	
Students learn about:	**Students learn to:**
Design	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)*
• design principles and processes	• apply principles of design in the modification of projects to enhance function and/or aesthetics • evaluate work practices and relate these to the quality of practical projects
• factors that impact on the design of metal products including: – material selection – shaping and forming processes – joining methods – finishing – hardware – material lists – project costing	• identify and consider design factors in the modification of projects • follow a planned construction sequence • follow material lists to prepare materials • calculate quantities and costs of materials to be used in the completion of projects • use spreadsheets to assist in the calculation of project costs
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• working drawings	• read, interpret and produce workshop and pictorial drawings • make freehand sketches of workshop items and/or projects
• industry terminology	• identify and recall specialist terms and use them in context
• report writing (including the preparation of documentation to support the development and production of practical projects)	• write reports to document the development of practical projects, identifying materials, processes and equipment used
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• the impact of art metal industries on society and the environment • issues of pollution and recycling in relation to art metal-based industries	• explain the impact of a range of art metalworking activities on society and the physical environment
Additional Content	
• a range of techniques and skills to enhance the appearance and/or function of practical projects	• use selected detailing to enhance a project's aesthetics and/or function. This may include: – adding features such as scrolls, twists, more complex settings and findings, tapers – additional surface finishes such as planishing, chasing, repoussé, enamelling, sgraffito, doming, brush or satin finishing, plastic/powder coating, colouring

INDUSTRIAL TECHNOLOGY – METAL

Art Metal – Specialised Module 3	
Students learn about:	**Students learn to:**
OHS and Risk Management • the intent of the OHS Act and the role of WorkCover in the workplace • potential hazards in the work environment • safe handling of chemicals	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • select and use personal protective equipment • identify specific OHS issues associated with the production of practical projects
Materials • the properties and applications of a range of metals and alloys suitable for art metal projects • a range of metal finishes including: – painting – plating – galvanising – powder coating – anodising	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • describe the properties of a range of metals • select and use a range of materials and components in the development and production of art metal projects • use finishes and protective coatings suitable for art metal projects
Equipment, Tools and Machines • a range of equipment, tools and machines in art metal for: – turning – spinning – soldering – welding (oxyacetylene and MIG) – forging – cutting, bending and forming	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use and maintain hand tools for cutting and shaping metal • adjust and use machine tools for: – lathe work • use heating equipment for: – multiple soldering and joining – forging and welding
Techniques • shaping, forming and surface treatment methods which could include dapping, spinning, punching, upsetting, champlevé, engraving, stone setting • the use of jigs to assist in the production and construction of a project • a range of welding (MIG and oxyacetylene) and soldering techniques • edge and surface preparation methods • suitable finishes or surface treatments	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • select and use a range of techniques to shape, form and join metals for art metal projects • use jigs to assist in the production of projects • select and use a range of joining methods • select and use appropriate edge treatments and surface finishes
Links to Industry • industrial manufacturing techniques in art metal including the application of computer-aided manufacture (CAM) • new and emerging technologies in art metal and comparing them with traditional technologies	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • compare and contrast industrial processes with those undertaken in the classroom • describe the impact of new and emerging technologies on careers and professions in art metal

INDUSTRIAL TECHNOLOGY – METAL

Art Metal – Specialised Module 3	
Students learn about:	**Students learn to:**
Design	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)*
• design principles and process	• apply principles of design in the modification and design of metal projects • identify and apply the factors influencing good design to the design and/or modification of projects • produce freehand sketches to visualise, generate and record ideas • calculate the total cost of projects • using standard available sizes, calculate economical quantities of materials for projects
• project sequencing and time management	• follow a planned sequence of operations
• research techniques	• use a range of research methods in the development of practical projects
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• working drawings	• read, interpret and produce simple working drawings (pictorial and orthogonal) to assist in the production of projects • develop and use material lists
• industry terminology	• recall specialist terms and use them in context when reporting on the development and production of projects
• report writing (including the preparation of documentation to support the development and production of practical projects)	• prepare reports to document the development of projects, identifying the materials, processes and equipment used • prepare reports using a range of software and hardware, displaying skills in more than one application
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• the impact of art metal industries on society and the environment • the consequences of raw materials extraction on the environment	• identify pollution control measures used in art metal activities in industry
Additional Content	
• a range of techniques and skills to enhance the appearance and/or function of practical projects	• select and use techniques in addition to, or further to, any of the methods nominated in previous modules
• elementary CAD applications	• use CAD programs to produce 2D workshop drawings
• applications of metals	• describe the properties and uses of metals for specific art metal purposes

INDUSTRIAL TECHNOLOGY – METAL

Art Metal – Specialised Module 4	
Students learn about:	**Students learn to:**
OHS and Risk Management • risk management principles included in the OHS Act and Regulation • risk identification and hazard reduction strategies	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • conduct a risk assessment • identify and respond to OHS issues to help ensure a safe working environment
Materials • the properties and applications of materials and components related to the Metal focus area • materials related or allied to those used in the construction of art metal projects	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • identify and select metals for individual projects based on an analysis of properties and service requirements • identify, select and use related materials to further enhance an art metal work project's appearance
Equipment, Tools and Machines • a range of tools, equipment and machines used in art metalwork • the use of jigs in the production of art metal projects	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • identify, select and use a range of hand, power and machine tools and equipment in the production of practical projects • select and use appropriate heating equipment as required • use jigs to assist in the production and assembly of projects
Techniques • a range of processes and techniques related to art metalwork	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • identify, select and use suitable processes and techniques for individual projects
Links to Industry • industrial manufacturing techniques in art metal industries	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • research current techniques, materials and equipment used by industry to develop and produce similar projects • compare and contrast industrial practices with classroom experiences
Design • the application of design principles and processes to individual projects • project management • resource selection	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • work through a design process to develop and produce practical projects • evaluate practical projects and processes • plan and follow a sequence of operations to complete a project within a specified time frame • research and calculate all costs for the development of individual projects • explain and justify selection and use of materials, processes and equipment in practical projects

INDUSTRIAL TECHNOLOGY – METAL

Art Metal – Specialised Module 4	
Students learn about:	**Students learn to:**
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• workshop drawings	• produce drawings to visualise, generate, understand and record ideas • read, interpret and produce working drawings to assist in the production of practical projects
• industry terminology	• recall specialist terms and use them in the appropriate contexts
• report writing (including the preparation of documentation to support the development and production of practical projects)	• write and present reports to detail the design and construction of projects • justify design decisions and selection of materials, processes and equipment
• a range of computer software applications to assist in the planning, production and reporting of practical projects	• use appropriate software and hardware, displaying skills in several applications which could include scanning and digital photography
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• the effects of art metal industries on society and the environment	• analyse and explain the environmental and societal impacts of resources used in the development and production of projects
Additional Content	
• metal forming processes including: – rolling – forging – drawing – casting – sintering	• explain a range of metal forming processes and their application to art metal
• elementary CAD applications	• use CAD packages to produce workshop drawings with dimensions

INDUSTRIAL TECHNOLOGY – METAL

Jewellery – Specialised Module 3	
Students learn about:	**Students learn to:**
OHS and Risk Management • the intent of the OHS Act and the role of WorkCover in the workplace • potential hazards in the work environment • safe handling of chemicals	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • select and use personal protective equipment • identify specific OHS issues associated with the production of practical projects
Materials • the properties and applications of a range of metals and alloys and sections suitable for jewellery projects • the identification and selection of stones and other fittings	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • describe the properties of a range of metals • select and use a range of suitable materials for jewellery projects • incorporate fixtures and fittings into practical projects
Equipment, Tools and Machines • hand and machine tools used for: – cutting, shaping and forming – drilling and polishing – lathework • heating equipment used for: – annealing – multiple soldering – forging	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use and maintain hand tools for cutting, shaping and forming metals and setting stones • adjust and use machine tools • use heating equipment for a variety of purposes
Techniques • advanced shaping, forming and surface treatment methods which could include dapping, doming, engraving, stone setting – claw, bezel • jigs to assist in the production and construction of a project • edge, surface preparation and surface finishing methods	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • select and use a range of techniques to shape, form and join metals for jewellery projects • use jigs to assist in producing jewellery projects • select and use appropriate edge treatments and surface finishes
Links to Industry • industrial manufacturing techniques in jewellery production including the application of computer-aided manufacture (CAM)	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • compare and contrast industrial processes with those undertaken in the classroom • identify new and emerging technologies in jewellery production and compare them to traditional technologies • describe the impact of new and emerging technologies on careers and professions in jewellery design and production

INDUSTRIAL TECHNOLOGY – METAL

Jewellery – Specialised Module 3	
Students learn about:	**Students learn to:**
Design	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)*
• design principles and processes	• apply principles of design in the modification and design of jewellery projects • identify and apply the factors influencing good design to the design and/or modification of projects • produce freehand sketches to visualise, generate and record ideas • calculate the total cost of projects • calculate economical quantities of materials for projects using standard available sizes
• project sequencing and time management	• follow a planned sequence of operations
• research techniques	• use a range of research methods to inform the development of practical projects
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• working drawings	• read, interpret and produce simple working drawings (pictorial and orthogonal) to assist in the production of projects • develop and use material lists
• industry terminology	• recall specialist terms and use them in context when reporting on the development and production of projects
• report writing (including the preparation of documentation to support the development and production of practical projects)	• prepare and present reports to detail the development of projects, identifying the materials, processes and equipment used • prepare reports using a range of software and hardware, displaying skills in more than one application
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• the effects of jewellery industries on society and the environment • the consequences of raw materials extraction on the environment	• identify pollution control measures used in jewellery activities in industry
Additional Content	
• a range of techniques and skills to enhance the appearance and/or function of practical projects	• select and use techniques such as: – advanced scrolling – twists, piercings, plating, sandwich work, inlays, making shot – additional surface finishes such as punching, chemical colouring, engraving – making simple findings
• jewellery display and packaging	• make simple packages for projects

INDUSTRIAL TECHNOLOGY – METAL

Jewellery – Specialised Module 4	
Students learn about:	**Students learn to:**
OHS and Risk Management • risk management principles included in the OHS Act and Regulation • risk identification and hazard reduction strategies	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • conduct a risk assessment • identify and respond to OHS issues to help ensure a safe working environment
Materials • the properties and applications of materials and components related to jewellery-making • materials related or allied to those used in the construction of jewellery projects • metal alloys	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • select materials for individual projects based on an analysis of properties and aesthetic appeal • identify, select and use related materials to further enhance the appearance of jewellery projects • identify common metal alloys and explain the reasons for alloying
Equipment, Tools and Machines • a range of tools, equipment and machines used in jewellery-making • the use of jigs in the manufacture of jewellery products	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • identify, select and use a range of hand, power and machine tools and equipment in the production of practical projects • select and use heating equipment for heating and joining metals • use jigs to assist in the construction and assembly of jewellery pieces
Techniques • a range of processes and techniques related to jewellery making • jig design and manufacture	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • identify, select and use suitable processes and techniques for individual projects • make and use jigs to assist in the construction of a project • select and apply appropriate edge treatments, surface preparation methods and apply a suitable surface treatment or finish
Links to Industry • industrial manufacturing techniques in jewellery industries	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • research current techniques, materials and equipment used by the jewellery industry to develop and mass-produce a similar project • compare and contrast industrial practices with classroom experiences
Design • the application of design principles and processes to individual projects • project management • resource selection	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • work through a design process to develop and produce practical projects • evaluate practical projects and processes • plan and follow a sequence of operations to complete projects within specified time frames • research and calculate all costs for the development of individual projects • explain and justify selection and use of materials, processes and equipment in practical projects

INDUSTRIAL TECHNOLOGY – METAL

Jewellery – Specialised Module 4	
Students learn about:	**Students learn to:**
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• workshop drawings	• produce drawings to visualise, generate, understand and record ideas • read, interpret and produce working drawings to assist in the production of practical projects
• industry terminology	• recall specialist terms and use them in context
• report writing (including the preparation of documentation to support the development and production of practical projects)	• write and present reports to detail the design and construction of projects • justify design decisions and selection of materials, processes and equipment
• a range of computer software applications to assist in the planning, production and reporting of practical projects	• use appropriate software and hardware, displaying skills in several applications which could include scanning and digital photography
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• the impact of jewellery industries on society and the environment	• analyse and explain the environmental and societal impact of resources used in the development and production of projects
Additional Content	
• metal forming processes including: – rolling – forging – drawing – casting	• describe a range of metal-forming processes and their application to jewellery manufacture
• a range of materials other than metals used in the design and manufacture of jewellery products	• investigate and discuss the emergence of 'new' materials and the reasons for their increased use

INDUSTRIAL TECHNOLOGY – MULTIMEDIA/PHOTOGRAPHY

The Multimedia/Photography focus area provides opportunities for students to develop knowledge, understanding and skills in relation to multimedia, photographic and associated industries.

Core modules develop knowledge and skills in the use of materials, tools and techniques related to multimedia or photography which are enhanced and further developed through the study of specialist modules in photographic or multimedia-based technologies.

Practical projects should reflect the nature of the Multimedia/Photography focus area and provide opportunities for students to develop specific knowledge, understanding and skills related to multimedia and/or photography-related technologies. These may include:

- individual photographic images
- photographic presentations
- brochures incorporating photographic images
- photo journals
- computer animations
- webpages.

Projects should promote the sequential development of skills and reflect an increasing degree of student autonomy as they progress through the course.

A note to teachers about practical experiences

To satisfy the requirements of the syllabus students must undertake a range of practical experiences that occupy the majority of course time. Practical experiences should be used to develop knowledge and understanding of and skills in designing, producing and evaluating. Student capability, confidence and expertise at their current stage of development are important considerations in determining the teaching and learning sequences in the course.

In developing and delivering teaching programs teachers should be aware of and adopt the relevant guidelines and directives of their education authorities and/or schools. Teaching programs should recognise and reflect relevant State and Commonwealth legislation, regulations and standards including Occupational Health and Safety, Chemical Safety in Schools and Animal Welfare guidelines. Teachers need to be aware of activities that may require notification, certification, permission, permits and licences.

INDUSTRIAL TECHNOLOGY – MULTIMEDIA/PHOTOGRAPHY

Multimedia – Core Module 1	
Students learn about:	**Students learn to:**
OHS and Risk Management • the safe use of computers including: – ergonomically designed furniture – vision care – repetitive strain injury (RSI) • the use of ergonomically designed furniture and equipment	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • safely use computing equipment and associated materials • develop correct computer use
Materials • the properties and characteristics of – still image file formats – vector and bitmapped images – file sizes relevant to different storage mediums – effects applied to still images – layers and transparency	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • identify and use a range of still image file formats • identify and apply varied file input, manipulation and output techniques
Equipment, Tools and Machines • a range of equipment, tools and machines in the multimedia industry which may include: – analogue and/or digital cameras – scanners – flat bed and/or film – removable storage devices – printers	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use computer systems, software packages and file formats to complete exercises • use a variety of hardware items in the development and production of multimedia projects
Techniques • producing, editing and storing still images • image-capturing techniques including analogue and digital formats • file transfer and recovery techniques • artificial lighting techniques	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use a range of techniques to produce multimedia presentations • use a range of media to present projects • incorporate text and graphics into multimedia projects • import different file types • backup data using a range of techniques and media • apply lighting effects during the production or capturing of images
Links to Industry • industrial processes and production techniques • a range of career paths in the multimedia industry	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • relate elementary industrial production techniques to work in the classroom • list career paths in multimedia industries

INDUSTRIAL TECHNOLOGY – MULTIMEDIA/PHOTOGRAPHY

Multimedia – Core Module 1	
Students learn about:	**Students learn to:**
Design • desktop publishing principles for print and electronic distribution such as: – typography/font styles – white space and colour choices – Gutenberg Diagram (Primary Optical Area/Terminal Anchor) • design principles and processes used in multimedia presentations • storyboarding used in the multimedia industry for planning a range of presentations	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • implement desktop publishing principles • create projects that are visually appealing and relevant to the target audience • produce linear storyboards when planning simple presentations
Workplace Communication Skills • workplace signage • freehand sketching and storyboards • technical data interpretation • industry terminology • text types to support the documentation of practical projects and processes including: – procedure – factual recount	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)* • respond to OHS signage • produce freehand sketches of images to visualise, generate and record ideas prior to production of multimedia presentations • produce storyboards and design/screen layout sketches to generate and record ideas • read and interpret charts, tables, hardware/software settings, reference manuals, hardware/software terminology, icons and symbols • recall terms relevant to the production of still images • prepare reports to describe processes undertaken in the development and production of practical projects
Societal and Environmental Impact • the impact of multimedia on society and the environment • end user requirements and limitations in both skills and access to hardware and software	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)* • describe the environmental and societal implications of the change from traditional paper-based presentation media to digital media
Additional Content • advanced image manipulation	• convert vector images to bitmapped images and vice versa • convert images from one file format to another using a variety of processes and software applications

INDUSTRIAL TECHNOLOGY – MULTIMEDIA/PHOTOGRAPHY

Multimedia – Core Module 2	
Students learn about:	**Students learn to:**
OHS and Risk Management • identified hazards in the work environment • principles of risk management • clean and hygienic work practices	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • use computers, associated materials and accessories safely and responsibly
Materials • digital image quality including colour/bit depth and compression • sound files and their application within the multimedia industry • a variety of motion types and formats used in the multimedia industry including: – cell and path-based animation – video capture and creation – digital file formats	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • select appropriate image settings to achieve a desired result • select and use appropriate sound file types • select and use motion software
Equipment, Tools and Machines • a range of input, processing, output and storage devices used in the multimedia industry • the effect of memory, processing speed and storage requirements in multimedia creation and playback	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use a variety of hardware items including: – analogue and/or digital (still and/or video) cameras – scanners – flat bed and/or film – removable storage devices – printers
Techniques • a variety of video and animation processes and software used in the multimedia industry • sound creation processes used in the music and multimedia industries	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • capture and/or create motion using a range of methods • incorporate sound into multimedia projects
Links to Industry • industrial techniques and processes	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • identify alternative historical industrial technologies and relate them to current and emerging practices • relate industrial production techniques to work in the classroom

INDUSTRIAL TECHNOLOGY – MULTIMEDIA/PHOTOGRAPHY

Multimedia – Core Module 2	
Students learn about:	**Students learn to:**
Design • design principles and processes used in multimedia presentations • multimedia variables and image settings such as: – size and scale – resolution – aspect ratio – screen layout – frame rate – colour/bit depth • project costing	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • select a suitable storyboard layout when planning a multimedia presentation • select and/or adjust multimedia variables in the development and production of multimedia presentations • calculate software/hardware requirements, completion time and output media requirements associated with practical projects
Workplace Communication Skills • report writing (including the preparation of documentation to support the development and production of multimedia projects) • industry terminology	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)* • prepare reports using a range of software and hardware, displaying skills in more than one application • identify, define and recall specialist terms and use them in appropriate contexts
Societal and Environmental Impact • the effects of multimedia on society and the environment • legal and ethical obligations relating to multimedia generation and production including: – copyright – media classification relevant to age • recycling of materials and components used in the multimedia industry	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)* • outline both the societal and environmental differences in the use of traditional and digital media • consider legal and ethical issues in the development of multimedia presentations • select and incorporate content for multimedia presentations that is appropriate to the target audience • identify recyclable and non-recyclable materials and components used in the multimedia industry
Additional Content • webpage design and html • effects used in video and animation, eg morphing, transitions, textures	• apply design skills and principles to the production of a webpage • create multimedia presentations incorporating a range of effects

INDUSTRIAL TECHNOLOGY – MULTIMEDIA/PHOTOGRAPHY

Multimedia – Specialised Module 3	
Students learn about:	**Students learn to:**
OHS and Risk Management • the intent of the OHS Act and the role of WorkCover in the workplace • potential hazards in the work environment • safe handling of chemicals	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • select and use personal protective equipment • identify specific OHS issues associated with the production of practical projects
Materials • motion properties such as: – frame rate – size and scale – data rate – compression codecs • sound file attributes, eg: – sample size and sample rate – audio signal processing systems, eg Dolby© – compression codecs to reduce file size	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • identify and select motion creation settings • select audio file types and attributes to be incorporated into multimedia presentations
Equipment, Tools and Machines • a range of input, processing, output and storage devices used in the multimedia industry including: – analogue and/or digital cameras/video cameras – video capture cards – scanners – flat bed and/or film – removable storage devices – printers	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use a variety of hardware items in the development and production of multimedia presentations • demonstrate knowledge and understanding of a range of hardware items • select memory, processing speed and storage requirements for multimedia presentations
Techniques • methods of motion and audio creation used in the multimedia industry	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • create and integrate motion into multimedia presentations • manipulate and/or create audio files to be incorporated into multimedia presentations
Links to Industry • traditional, current and emerging technologies that relate to the multimedia industry	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • compare and contrast industrial processes with those undertaken in the classroom • describe the impact of new and emerging technologies on careers and professions in multimedia industries

INDUSTRIAL TECHNOLOGY – MULTIMEDIA/PHOTOGRAPHY

Multimedia – Specialised Module 3	
Students learn about:	**Students learn to:**
Design	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)*
• design principles and processes used in multimedia presentations	• apply principles of design in the planning and production of multimedia presentations • produce storyboards and design/screen layout sketches to generate, understand and record ideas • identify and apply the factors influencing good design to the design and/or modification of presentations
• project sequencing and time management	• follow a planned sequence of operations
• research techniques	• use digital information sources to research practical projects
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• industry terminology	• recall specialist terms and use them in context when reporting on the development and production of projects
• report writing (including the preparation of documentation to support the development and production of practical projects)	• prepare and present reports to document the development of projects, identifying software, processes and equipment used • prepare and present reports using appropriate software and hardware, displaying skills in several applications
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• the effects of multimedia on society and the environment	• analyse how society is using digital multimedia and its effects on socialisation • understand and respect the needs for cultural differences and sensitivities to the use of images, sound and video in presentations
Additional Content	
• the role of multimedia in advertising products and services	• create suitable character or product animations for use in multimedia presentations • use CAD software for the creation of photo-realistic graphics and animations • use a variety of software applications to produce animations and sound for a web-based project • create self-extracting/self-executing media
• video types and production in the multimedia industry	• use and manipulate video formats, filters and delivery such as blue screens, composite video, S-video, etc

INDUSTRIAL TECHNOLOGY – MULTIMEDIA/PHOTOGRAPHY

Multimedia – Specialised Module 4	
Students learn about:	**Students learn to:**
OHS and Risk Management • risk management principles included in the OHS Act and Regulation • risk identification and hazard reduction strategies	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • conduct a risk assessment • identify and respond to OHS issues to help ensure a safe working environment
Materials • the properties of multimedia elements in relation to file size, storage and delivery of multimedia presentations	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • analyse and compare a range of file types, properties and settings during the production of multimedia presentations
Equipment, Tools and Machines • a range of input, processing, output and storage devices used in multimedia including: – analogue and/or digital cameras/video cameras – scanners – flat bed and/or film – removable storage devices – printers	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • identify, select and use a variety of hardware items to complete multimedia projects • analyse and compare memory, processing speed and storage requirements for multimedia presentations
Techniques • a variety of video and animation processes and software used in the multimedia industry • project development processes used in the multimedia industry	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • select and use a range of image capture devices, output devices, processing and manipulation in the production of projects • incorporate text, graphics, animation, sound and video into multimedia projects • plan and implement a series of steps to complete a multimedia presentation within a given time frame
Links to Industry • industrial processes and techniques related to the multimedia industry	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • analyse and compare the current techniques, materials and equipment used in industry to develop and produce projects similar to those undertaken in the classroom • compare and contrast industrial practices with classroom experiences
Design • the application of design principles and processes to individual projects • project management • resource selection	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • work through a design process to develop and produce practical projects • justify the selection and use of processes, software and/or hardware and display mediums used in the production of multimedia projects • plan and follow a sequence of operations to complete projects within specified time frames • research and calculate all costs for the development of projects

INDUSTRIAL TECHNOLOGY – MULTIMEDIA/PHOTOGRAPHY

Multimedia – Specialised Module 4	
Students learn about:	**Students learn to:**
Workplace Communication Skills • report writing (including the preparation of documentation to support the development and production of multimedia images) • industry terminology • workplace drawings	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)* • prepare and present reports using appropriate software and hardware displaying skills in several applications • identify, define and recall specialist terms and use them in the appropriate contexts • use a range of graphical techniques to communicate ideas in the development and production of projects
Societal and Environmental Impact • the effects of multimedia on society and the environment	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)* • analyse and explain the environmental and societal impacts of individual projects • outline legal and ethical considerations in relation to individual projects
Additional Content • the role of multimedia in the cinematic industry	• produce character models and animations using a variety of software • create multimedia presentations using a range of software types including publishing, sound editing, image editing, CAD, webpage design and authoring • create virtual reality animations or presentations

INDUSTRIAL TECHNOLOGY – MULTIMEDIA/PHOTOGRAPHY

Photography – Core Module 1	
Students learn about:	**Students learn to:**
OHS and Risk Management • the safe use and handling of hand, power and machine tools • the use of personal protective equipment in the workshop • elementary first aid procedures • correct and safe use of computing-related equipment	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • safely use tools, materials and equipment • use personal protective equipment when working with materials, tools and machines • develop correct computer use, vision care and an awareness of RSI
Materials • the properties and applications of materials associated with photography	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • use photographic papers, film and digital methods of capturing images • consider the working characteristics such as: – paper sizes – chemical and mixing techniques – film size and speed
Equipment, Tools and Machines • the range of equipment, tools and machines in the Photography focus area	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use basic cameras, digital hardware and darkroom equipment. These may include: – pinhole cameras – disposable cameras – compact cameras – single lens reflex cameras – developing tank for black and white film – enlarger and electronic timer – introduction to flash concepts – digital cameras
Techniques • a range of processes and techniques related to photography	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use a variety of photographic processes including: – development of photograms – basic use of cameras – basic use of enlarger – basic use of scanner and computer • understand the effects of parallax error • experiment with cropping images • estimate distances for flash photography, eg maximum and minimum flash distances
Links to Industry • industrial processes and production techniques • a range of career paths in photography	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • relate elementary photographic production techniques to classroom work and compare to a small industry photo lab • list career paths in photographic industries • describe how the photographic industry operates

INDUSTRIAL TECHNOLOGY – MULTIMEDIA/PHOTOGRAPHY

Photography – Core Module 1	
Students learn about:	**Students learn to:**
Design	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)*
• the functional and aesthetic aspects of photographic design including: – sharpness – exposure – contrast	• identify and analyse the functional and aesthetic aspects of design in photographs
• design principles and processes	• apply principles of design in the modification of images • evaluate work practices and practical exercises in terms of quality
• material costing and calculations	• calculate quantities and ratios • estimate quantities of materials to be used in practical work
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• workplace signage and product labelling	• respond to OHS signage • read and interpret Material Safety Data Sheets for applicable chemicals
• reading and interpretation of charts, tables	• read and interpret simple charts and tables
• freehand drawings	• make a simple sketch of photography/darkroom items and identify major components
• industry terminology	• define specialist terms and produce a glossary
• text types to support the documentation of practical projects and processes including: – procedure – factual recount	• prepare reports to describe processes undertaken in the development and production of images
• a range of computer software applications to assist in the planning, production and reporting of practical projects	• prepare reports using word processing and other appropriate software and hardware
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• the effects of photographic processes on society and the environment	• identify and determine the hazards of chemical usage in wet photography • understand the need for effective ventilation in workplace areas • dispose of chemical waste safely
Additional Content	
• a range of techniques and skills to enhance the appearance and/or function of practical projects	• experiment with and use a range of photographic techniques to enhance the presentation of images
• photographic display	• prepare and present photographs for display

INDUSTRIAL TECHNOLOGY – MULTIMEDIA/PHOTOGRAPHY

Photography – Core Module 2	
Students learn about:	**Students learn to:**
OHS and Risk Management • identified hazards in the work environment • principles of risk management • clean and hygienic work practices	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • safely use photographic equipment and chemicals • select and use personal protective equipment
Materials • the properties and applications of materials associated with photography including: – film types – grain, speed – chemical types and mixing – C-41 processing of black and white film	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • consider the working characteristics of a range of materials in the production of photographic projects
Equipment, Tools and Machines • the care and use of equipment, tools and machines in photography including: – cameras – darkroom – computer equipment – single lens reflex cameras – tripods, cable releases, lens hoods, UV filters – enlargers and electronic timers – digital hardware	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • adjust and use cameras, photographic accessories, software and darkroom equipment in producing photographic images
Techniques • a range of photographic processes and techniques including the use of: – supplementary lenses – wide angle, telephoto and zoom – light metering systems such as exposure meter and through-the-lens metering – flash direct and manual operation – SLR camera – digital camera	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use a variety of photographic methods in the production of photographic images and projects • capture digital images • use software programs to manipulate images
Links to Industry • industrial processes and techniques • the relationships between careers in the photographic industry	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • identify alternative historical photographic technologies appropriate to the task and the materials being used • relate appropriate industrial production skills to work in the classroom • describe different careers within the photographic industry and analyse the relationships between them

INDUSTRIAL TECHNOLOGY – MULTIMEDIA/PHOTOGRAPHY

Photography – Core Module 2	
Students learn about:	**Students learn to:**
Design • design principles and processes • factors that impact on the design of photographic images and presentation including: – lighting – depth of field – rule of thirds – points of interest • project costing	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • apply principles of design in the processing of photographic images to enhance the presentation of display • identify the factors influencing the presentation of photographs • observe the effects of horizons, viewpoints and lighting • interpret the effect of aperture setting on depth-of-field scale • calculate quantities and ratios • compare and calculate the costs of different photographic processes, eg conventional and digital cameras, to produce a photographic image
Workplace Communication Skills • reading and interpretation of charts, tables • industry terminology • report writing (including the preparation of documentation to support the development and production of practical exercises) • a range of computer software applications to assist in the planning, production and reporting of practical projects	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)* • read and interpret photographic charts, tables and signage • identify and recall specialist terms and use them in context • write reports to document the development of practical exercises, identifying the materials, processes and equipment used • use spreadsheets to assist in calculating and comparing costs of projects and photographic equipment
Societal and Environmental Impact • the effects of the photographic industry on society and the environment	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)* • store, use and dispose of photographic chemicals in a safe and responsible way • understand the need for efficient use of resources and the benefits of this to the environment
Additional Content • a range of techniques to enhance photographic images • digital storage and manipulation of images captured by traditional photographic means	 • enhance image quality by use of filters, toners and detailed sharpness • use scanners and image manipulation software to store and/or manipulate images

INDUSTRIAL TECHNOLOGY – MULTIMEDIA/PHOTOGRAPHY

Photography – Specialised Module 3	
Students learn about:	**Students learn to:**
OHS and Risk Management • the intent of the OHS Act and the role of WorkCover in the workplace • potential hazards in the work environment • safe handling of chemicals	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • select and use personal protective equipment • identify specific OHS issues associated with the production of practical projects
Materials • the properties and applications of materials associated with photography including: – paper surfaces, eg gloss, satin, pearl, fibre – paper weight and sizes – film types, both for darkroom and commercial processing – chemicals	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • select and use appropriate photographic products for completing specific exercises • identify the basic properties and composition of photographic products such as paper and chemicals
Equipment, Tools and Machines • the use and maintenance of a range of equipment, tools and machines in photography including: – SLR, TLR, digital cameras – supplementary lenses – wide, zoom/telephoto, close-up and filters – artificial lighting – photo lamps, reflectors, flash units – scanners – flat bed and film – tripods, monopods	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • maintain cameras and accessories used in photography • use a variety of cameras and accessories in the production of photographic images and presentations
Techniques • a range of processes and techniques for the manipulation of photographic images including: – burning in, dodging out – fogging in – vignetting – solarisation (Sabbatier effect) – screening – toning – montage	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use a range of techniques to produce special effects by manipulating photographic images • select appropriate printing techniques on a variety of media • identify and apply various advanced manipulation techniques
Links to Industry • industrial/commercial techniques and processes in photography including the application of digital technologies in the photographic industry	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • compare and contrast industrial processes with those undertaken in the classroom • identify new and emerging technologies and contrast them with those used in the past • describe the impact of new and emerging technologies on careers and professions in the photography industry

INDUSTRIAL TECHNOLOGY – MULTIMEDIA/PHOTOGRAPHY

Photography – Specialised Module 3	
Students learn about:	**Students learn to:**
Design	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)*
• design principles and processes	• apply principles of design in the modification and design of photographic images and presentations • identify and apply the factors influencing good design and/or modification of images
• project management	• follow a planned sequence of operations • calculate quantities of materials and chemicals to be used in practical exercises
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• workplace signage	• read and interpret charts, tables, digital software, camera settings and OHS signage • interpret and understand written codes, eg title, caption, words that appear in the image
• freehand sketching	• produce freehand sketches of images to visualise, generate and record ideas prior to production of images • produce photographic images to generate and record ideas
• industry terminology	• recall specialist terms and use them in context when reporting on the development and production of images
• report writing (including the preparation of documentation to support the development and production of photographic images) • a range of computer software applications to assist in the planning, production and reporting of practical projects	• prepare and present reports to document the development of the project, identifying the materials, processes and equipment used • prepare reports using a range of software and hardware displaying skills in more than one application • use suitable advanced digital imaging software and a variety of allied hardware for image production
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• the effects of the photographic industry on society and the environment	• analyse methods used in reducing and stopping chemical waste • describe the environmental and societal implications of the change from wet photography to digital imaging
• legal and ethical considerations in photography	• describe legal obligations, eg copyright laws, modelling rights and local regulations relating to the production and use of photographic images
Additional Content	
• image manipulation and enhancement	• use filters to enhance images • produce panorama images • use multigrade filters and special-effects filters
• elementary video production	• capture and produce moving images

INDUSTRIAL TECHNOLOGY – MULTIMEDIA/PHOTOGRAPHY

Photography – Specialised Module 4	
Students learn about:	**Students learn to:**
OHS and Risk Management • risk management principles included in the OHS Act and Regulation • risk identification and hazard reduction strategies	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • conduct a risk assessment • identify and respond to OHS issues to help ensure a safe working environment
Materials • the properties and applications of materials associated with photography	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • select and use appropriate photographic products and allied materials for completing individual projects
Equipment, Tools and Machines • the range of equipment, tools and machines in photography	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use a variety of lighting techniques in the production of images, ie flash, studio, available lighting and low lighting situations • use a flash meter to calculate exposure settings in a lighting set-up
Techniques • a range of processes and techniques related to the production of photographic images and presentations including processes for: – image capture – printing – mounting and displaying – fault rectification – recording and storing images – lighting	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • select and use a range of image capture devices, output devices and processing program manipulation in the production of a major image • produce a major image of technical difficulty • use a range of printing techniques to assist in the production of mounted photographs for display • select and demonstrate different methods of mounting photo images for display purposes – dry mounting – spray adhesive – mounting boards • sight and check for faults in processing, determine the reasons for faults, and use trouble-shooting techniques to overcome such defects • use different formats for recording, storing and processing images • identify and use a range of lighting techniques
Links to Industry • industrial/commercial techniques in the photographic industry	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • research current techniques, materials and equipment used in industrial/commercial practice to produce photographic images and presentations • compare and contrast industrial/commercial practice with classroom experiences
Design • the application of design principles and processes to individual projects • project management • resource selection	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • work through a design process to develop and produce a photographic image • evaluate practical projects and processes • plan and follow a sequence of operations to complete an exercise within a specified time frame • explain and justify the selection and use of materials,

INDUSTRIAL TECHNOLOGY – MULTIMEDIA/PHOTOGRAPHY

Photography – Specialised Module 4	
Students learn about:	**Students learn to:**
	• processes and equipment used in the production of image products • research and calculate all costs for the development of photographic exercises
Workplace Communication Skills • reading and interpretation of charts, tables, digital software, camera settings and OHS signage • techniques for the communication of ideas and concepts • industry terminology • report writing (including the preparation of documentation to support the development and production of photographic images) • a range of computer software applications to assist in the planning, production and reporting of practical projects	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)* • respond to OHS signage • produce drawings to visualise, understand and record ideas • produce photographic images to generate, understand and record ideas • read, interpret and produce visual images to assist in the production of practical assignments including describing and discussing symbolic codes, eg in portraits, such considerations as gesture, pose, facial expression • plan, produce and develop a sequence of visual images in the production of a practical project • recall specialist terms and use them in appropriate contexts • write reports to detail the development and display of photographic images • justify image design decisions and selection of materials and techniques • prepare and present reports using appropriate software and hardware, displaying skills in several applications which could include scanning, imaging, and PowerPoint presentations
Societal and Environmental Impact • the effects of the photographic industry on society and the physical environment	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)* • analyse how society is using digital imaging and its effects on socialisation • analyse and explain the environmental and societal impacts of resources used in the development and production of projects • understand the need to respect cultural differences and sensitivities to photographs
Additional Content • special techniques in photographic production • multiple media presentations	• apply special-purpose photography • macro imaging using close-up lenses and extension tubes • develop presentations of images incorporating a range of media

INDUSTRIAL TECHNOLOGY – POLYMERS

The Polymers focus area provides opportunities for students to develop knowledge, understanding and skills in relation to polymer and associated industries.

Core modules develop knowledge and skills in the use of materials, tools and techniques related to polymers which are enhanced and further developed through the study of specialist modules in polymer-related technologies.

Practical projects should reflect the nature of the Polymers focus area and provide opportunities for students to develop specific knowledge, understanding and skills related to polymer-related technologies. These may include:

- utensils
- decorative polymer products
- small boats
- surfboards
- furniture items.

Projects should promote the sequential development of skills and reflect an increasing degree of student autonomy as they progress through the course.

A note to teachers about practical experiences

To satisfy the requirements of the syllabus students must undertake a range of practical experiences that occupy the majority of course time. Practical experiences should be used to develop knowledge and understanding of and skills in designing, producing and evaluating. Student capability, confidence and expertise at their current stage of development are important considerations in determining the teaching and learning sequences in the course.

In developing and delivering teaching programs teachers should be aware of and adopt the relevant guidelines and directives of their education authorities and/or schools. Teaching programs should recognise and reflect relevant State and Commonwealth legislation, regulations and standards including Occupational Health and Safety, Chemical Safety in Schools and Animal Welfare guidelines. Teachers need to be aware of activities that may require notification, certification, permission, permits and licences.

INDUSTRIAL TECHNOLOGY – POLYMERS

Polymers – Core Module 1	
Students learn about:	**Students learn to:**
OHS and Risk Management • the safe use and handling of hand, power and machine tools • the use of personal protective equipment in the workshop • elementary first aid procedures	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • safely use tools, materials and equipment • use personal protective equipment when working with materials, tools and machines
Materials • the properties and applications of a range of polymers	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • use a range of polymers in the production of practical projects • list the basic properties of a range of polymers (both thermoplastics and thermosets) • list some common applications of polymers in domestic and industrial settings
Equipment, Tools and Machines • a range of hand tools used for: – marking out and measuring – cutting, shaping and joining – finishing • portable power tools and machines used for: – drilling – cutting – polishing	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use hand tools in the production of practical projects • use portable power tools and machines in the production of practical projects
Techniques • measurement and sizing • a range of processes and techniques for preparing, cutting, joining and finishing polymers	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • apply correct measuring standards and methods • mark out materials from a project drawing • shape polymers by cutting, filing, drilling and bending (heat and jigs) • join polymers by adhesives or fasteners • finish polymer projects with abrasives, polishing, flame polishing or buffing
Links to Industry • industrial processes and production techniques • a range of careers in polymer/plastics industries	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • relate elementary industrial production techniques to work in the classroom • list career paths in the polymer/plastics industry
Design • functional and aesthetic aspects of design • design principles and processes • material lists • project costing	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • identify the functional and aesthetic aspects of design in polymers, including material selection, edge treatments and service requirements • apply principles of design in the modification of projects • evaluate work practices and practical projects in terms of quality • read and interpret material lists • estimate quantities of materials to be used in practical projects

INDUSTRIAL TECHNOLOGY – POLYMERS

Polymers – Core Module 1	
Students learn about:	**Students learn to:**
Workplace Communication Skills • workplace signage • pictorial and working drawings • industry terminology • text types to support the documentation of practical projects and processes including: – procedure – factual recount • a range of computer software applications to assist in the planning, production and reporting of practical projects	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)* • respond to OHS signage • read and interpret simple workshop and pictorial drawings • make freehand sketches of workshop items and/or projects • define specialist terms and produce a glossary • prepare reports to describe processes undertaken in the development and production of practical projects • prepare reports using appropriate software and hardware, eg word processing
Societal and Environmental Impact • issues relating to the sustainability of resources in polymer industries	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)* • identify and distinguish between renewable and non-renewable resources in polymer industries • appreciate the importance of recycling to polymer industries
Additional Content • a range of techniques and skills to enhance the appearance and/or function of practical projects • the production of polymers and associated materials	 • investigate a range of alternate polymer-forming processes • list the raw materials used in the production of a range of polymers • outline the environmental impacts of the extraction of raw materials for a range of polymers

INDUSTRIAL TECHNOLOGY – POLYMERS

Polymers – Core Module 2	
Students learn about:	**Students learn to:**
OHS and Risk Management • identified hazards in the work environment • principles of risk management • clean and hygienic work practices	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • safely use hand and power tools, materials, finishes and equipment • select and use personal protective equipment
Materials • the properties and applications of materials and components associated with polymer products such as: – acrylics, glass-reinforced plastics, carbon-reinforced plastics etc – release agents and waxes, hardeners, gelcoats, flowcoats, pigments, resins, types of glass reinforcing etc	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • identify a range of appropriate polymers and their applications • select appropriate polymer materials for practical projects • safely use a range of materials in the construction of polymer projects
Equipment, Tools and Machines • the care and use of a range of hand, machine and portable power tools used for: – cutting, shaping and drilling – sanding – finishing • the care and use of a range of tools used for: – preparing and using moulds – laying up and laminating – trimming and joining	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use a range of tools in the production of polymer projects • maintain, adjust and properly care for a range of hand, machine and portable power tools used in the production of practical polymer projects • use and maintain simple moulds
Techniques • a range of processes, methods and techniques used for: – measuring, sizing and estimating – mixing materials – preparing, laying up and releasing single-part moulds – the manufacture of a range of polymer projects made from thermoplastic and thermosetting materials – trimming and finishing moulded products	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use hand tools and weight and volume measuring devices safely and accurately • use a range of tools and processes to cut, shape, produce and finish a variety of polymer projects • use templates and jigs for thermoplastic projects • prepare and use moulds for glass-reinforced plastic projects • apply suitable finishes and edge treatments to moulded and other polymer projects
Links to Industry • industrial techniques and processes • the relationships between careers and industries in the metals area	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • identify alternative historical industrial technologies appropriate to the tasks and materials being used • relate industrial production techniques to work in the classroom • describe different careers within polymer-based industries and analyse the relationships between them

INDUSTRIAL TECHNOLOGY – POLYMERS

Polymers – Core Module 2	
Students learn about:	**Students learn to:**
Design • design principles and processes • factors that affect the design of polymer products including: – material selection – shaping and forming processes – joining methods – finishing – hardware • material lists • project costing	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • apply principles of design in the modification of projects to enhance function and/or aesthetics • evaluate work practices and relate these to the quality of practical projects • identify and consider design factors in the modification of projects • follow a planned construction sequence • follow material lists to prepare materials • calculate quantities and costs of materials to be used in the completion of projects • use spreadsheets to assist in the calculation of project costs
Workplace Communication Skills • working drawings • industry terminology • report writing (including the preparation of documentation to support the development and production of practical projects)	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)* • interpret and produce pictorial, orthogonal and development drawings related to the design, planning and production of practical polymer projects • identify and recall specialist terms and use them in context • write reports to document the development of practical projects, identifying materials, processes and equipment used
Societal and Environmental Impact • the effects of polymer/plastics industries on society and the environment	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)* • explain the effects of a range of polymer production and product manufacturing processes on the environment • discuss the issues of pollution and recycling in relation to polymer-based industries
Additional Content • a range of techniques and skills to enhance the appearance and/or function of practical projects • applications for polymer products	• select and use detailing techniques in addition to, or further to, any of the detailing methods chosen in Polymers 1 • identify a range of industrially produced polymer products (eg boats, play equipment, domestic products etc) and list some factors which affect their design

INDUSTRIAL TECHNOLOGY – POLYMERS

Polymers – Specialised Module 3	
Students learn about:	**Students learn to:**
OHS and Risk Management • the intent of the OHS Act and the role of WorkCover in the workplace • potential hazards in the work environment • safe handling of chemicals	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • select and use personal protective equipment • identify specific OHS issues associated with the production of practical projects
Materials • the properties, applications and production of a range of polymers, components and other materials appropriate to polymer project work	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • describe the properties and applications of a range of polymer materials • select and use a range of suitable materials and components in the development and production of polymer projects
Equipment, Tools and Machines • the care and maintenance of a range of equipment, tools and machines used in the production of polymer projects • the use of jigs, templates and moulds in the production of polymer projects • a range of machine and portable power tools used for machining and finishing polymer projects	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use and maintain a range of tools in the production of polymer projects • prepare and use a range of jigs, templates and moulds in the production of polymer projects • use a range of machine and power tools in the production of polymer projects
Techniques • a range of processes, methods and techniques related to the production of polymers projects such as: – cutting, shaping, forming and finishing polymers using a range of hand and machine tools – joining polymers using adhesives, fastening devices and other methods – casting in resin – multi-part GRP moulding – a range of appropriate finishing processes suitable for use on polymer projects	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • select, correctly and safely use/apply a range of techniques in the development and manufacture of polymer projects • select and use a range of joining methods • select and use a range of appropriate surface finishes and edge treatments
Links to Industry • industrial manufacturing techniques in polymers including the application of computer-aided manufacture (CAM)	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • compare and contrast industrial processes with those undertaken in the classroom • identify new and emerging technologies in polymer product manufacture and compare them to traditional technologies • describe the impact of new and emerging technologies on careers and professions in polymer product manufacture

INDUSTRIAL TECHNOLOGY – POLYMERS

Polymers – Specialised Module 3	
Students learn about:	**Students learn to:**
Design	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)*
• design principles and processes	• apply principles of design in the modification and design of polymer projects • identify and apply the factors influencing good design to the design and/or modification of polymer projects • produce freehand sketches to visualise, generate and record ideas • calculate the total cost of projects • use materials economically
• project sequencing and time management	• follow a planned sequence of operations
• research techniques	• use a range of research methods to inform the development and production of practical projects
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• working drawings	• read, interpret and produce assembly and detail sketches/drawings (including sections) to assist in the production of projects • develop and use material lists
• industry terminology	• recall specialist terms and use them in context when reporting on the development and production of projects
• report writing (including the preparation of documentation to support the development and production of practical projects)	• prepare reports to document the development of projects, identifying the materials, processes and equipment used • prepare reports using a range of software and hardware, displaying skills in more than one application
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• the effects of polymer/plastics industries on society and the environment	• identify pollution control measures used in fabrication activities in the polymer/plastics industry • outline the consequences of raw materials extraction on the environment
Additional Content	
• elementary CAM	• apply CNC technology to machining aspects of polymer projects
• thermal welding of plastics	• weld suitable polymeric materials used in fabricating a polymer project
• polymer forming techniques	• identify and/or apply alternate forming techniques such as vacuum forming, blow moulding, extrusion, compression moulding

INDUSTRIAL TECHNOLOGY – POLYMERS

Polymers – Specialised Module 4	
Students learn about:	**Students learn to:**
OHS and Risk Management • risk management principles included in the OHS Act and Regulation • risk identification and hazard reduction strategies	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • conduct a risk assessment • identify and respond to OHS issues to help ensure a safe working environment
Materials • the properties and applications of materials associated with the Polymers focus area • adhesives and alternate materials and components appropriate to polymer projects	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • select appropriate polymers, adhesives, components and allied materials for completing polymer projects • develop solutions to problems using an appropriate range of materials and components
Equipment, Tools and Machines • a range of equipment, tools and machines used in the manufacture of polymer projects and components • the use of jigs, templates and other aids in the manufacture of polymer projects	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • identify, select and use a range of hand, power and machine tools and equipment in the production of polymer projects • make and use jigs, templates and other aids to assist in the production of quality polymer projects
Techniques • a range of processes, methods and techniques related to the manufacture of polymer projects using thermoplastic and/or thermosetting polymer materials • the design and construction of plugs and moulds • machining and joining polymers	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • identify, select and use suitable processes and techniques for specific projects
Links to Industry • industrial manufacturing techniques in the polymer products industry	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • research current techniques, materials and equipment used by industry to develop and mass-produce a similar project • compare and contrast industrial practices with classroom experiences
Design • the application of design principles and processes to individual projects • project evaluation • project management • resource selection	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • work through a design process to develop and produce practical projects • evaluate practical projects and processes used in their construction • plan and follow a sequence of operations to complete projects within specified time frames • research suitable materials and processes and calculate the cost for the development and production of individual projects • justify the selection and use of materials, processes and equipment in practical projects

INDUSTRIAL TECHNOLOGY – POLYMERS

Polymers – Specialised Module 4	
Students learn about:	**Students learn to:**
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• workshop drawings	• produce drawings to visualise, generate, understand and record ideas • read, interpret and produce working drawings to assist in the production of practical projects
• industry terminology	• recall specialist terms and use them in context
• report writing (including the preparation of documentation to support the development and production of practical projects)	• write and present reports to detail the design, construction and evaluation of projects • justify design decisions and selection of materials, processes and equipment
• a range of computer software applications to assist in the planning, production and reporting of practical projects	• use appropriate software and hardware, displaying skills in several applications which could include scanning, digital photography
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• the effects of polymer industries on society and the environment	• analyse and explain the environmental and societal impacts of resources used in the development and production of projects
Additional Content	
• machining techniques related to the use and manufacture of polymer products	• apply a range of advanced machining techniques which could include: – lathework – milling – shaping – CNC turning and milling operations
• elementary CAD applications	• use CAD, CAM or other automated or computerised processes to produce selected components of polymer projects

INDUSTRIAL TECHNOLOGY – TIMBER

The Timber focus area provides opportunities for students to develop knowledge, understanding and skills in relation to the timber and associated industries.

Core modules develop knowledge and skills in the use of materials, tools and techniques related to timber which are enhanced and further developed through the study of specialist modules in:

- Cabinetwork
- Wood Machining.

Practical projects undertaken should reflect the nature of the Timber focus area and provide opportunities for students to develop specific knowledge, understanding and skills related to timber-related technologies. These may include:

- furniture items
- decorative timber products
- storage and transportation products
- small stepladders or similar
- storage and display units.

Projects should promote the sequential development of skills and reflect an increasing degree of student autonomy as they progress through the course.

A note to teachers about practical experiences

To satisfy the requirements of the syllabus students must undertake a range of practical experiences that occupy the majority of course time. Practical experiences should be used to develop knowledge and understanding of and skills in designing, producing and evaluating. Student capability, confidence and expertise at their current stage of development are important considerations in determining the teaching and learning sequences in the course.

In developing and delivering teaching programs teachers should be aware of and adopt the relevant guidelines and directives of their education authorities and/or schools. Teaching programs should recognise and reflect relevant State and Commonwealth legislation, regulations and standards including Occupational Health and Safety, Chemical Safety in Schools and Animal Welfare guidelines. Teachers need to be aware of activities that may require notification, certification, permission, permits and licences.

INDUSTRIAL TECHNOLOGY – TIMBER

General Wood – Core Module 1	
Students learn about:	**Students learn to:**
OHS and Risk Management • the safe use and handling of hand, power and machine tools • the use of personal protective equipment in the workshop • elementary first aid procedures	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • safely use tools, materials and equipment • use personal protective equipment when working with materials, tools and machines
Materials • the elements of the structure of trees and how a tree grows • the properties and working characteristics of solid timber including: – strength – grain direction – colour – defects	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • consider basic timber working characteristics and use solid timbers in the production of practical projects
Equipment, Tools and Machines • a range of hand tools used for: – marking-out and cutting – shaping and drilling – chiselling and planing – holding and sawing • portable power tools and machines used for: – drilling – sanding – cutting	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • adjust and use hand tools in the production of practical projects • use machines and portable power tools in the production of practical projects
Techniques • measurement and sizing • a range of processes and techniques for preparing, joining and finishing timber	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • apply correct measuring standards and methods • measure and mark out timber projects from a workshop drawing • accurately cut and prepare materials to size • use a variety of joining methods including: – simple joints – screwing, nailing and gluing • describe reasons for timber finishing • prepare surfaces and apply clear finishes to timber
Links to Industry • industrial processes and production techniques • a range of career paths in the timber industry	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • relate elementary industrial production techniques to work in the classroom • list career paths in timber industries

INDUSTRIAL TECHNOLOGY – TIMBER

General Wood – Core Module 1	
Students learn about:	**Students learn to:**
Design	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)*
• functional and aesthetic aspects of design	• identify the functional and aesthetic aspects of design in timber, including grain direction, grain length and the type of timber
• design principles and processes	• apply principles of design in the modification of projects • evaluate work practices and practical projects in terms of quality
• material lists • project costing	• read and interpret material lists • estimate quantities of materials to be used in practical projects
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• workplace signage • pictorial and working drawings	• respond to OHS signage • read and interpret simple workshop and pictorial drawings • make freehand sketches of workshop items and/or projects
• industry terminology • text types to support the documentation of practical projects and processes including: – procedure – factual recount	• define specialist terms and produce a glossary • prepare reports to describe processes undertaken in the development and production of practical projects
• a range of computer software applications to assist in the planning, production and reporting of practical projects	• prepare reports using appropriate software and hardware, eg word processing
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• issues relating to the sustainability of resources in the timber industry	• identify and distinguish between renewable and non-renewable resources in the timber industry • appreciate the importance of sustainability to the timber industry
Additional Content	
• a range of techniques and skills to enhance the appearance and/or function of practical projects • the structure and properties of hardwoods and softwoods	• incorporate features such as lids, doors or hinges • apply surface finishes such as découpage, marquetry, veneer or a variety of painting techniques • identify the differences between hardwoods and softwoods • identify the different applications of hardwoods and softwoods and the reasons for their suitability

INDUSTRIAL TECHNOLOGY – TIMBER

General Wood – Core Module 2	
Students learn about:	**Students learn to:**
OHS and Risk Management • identified hazards in the work environment • principles of risk management • clean and hygienic work practices	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • safely use hand and power tools, materials finishes and equipment • select and use personal protective equipment
Materials • the properties and working characteristics of timber: – hardwoods – softwoods • the suitability of timbers for specific purposes • timber conversion and seasoning	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • consider the working characteristics of a number of commonly used timbers when selecting and using timber for specific projects • select and prepare timber for the lathe • describe timber seasoning and conversion processes
Equipment, Tools and Machines • the care and use of a range of hand and power tools • a range of power and machine tools used for: – sanding – drilling – turning	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • adjust and use hand tools in cutting and shaping timber • care for hand and machine tools and understand the importance of proper care and maintenance • use machine and power tools in the production of practical projects
Techniques • measurement and sizing • joining methods and techniques • wood turning • timber finishes and finishing	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • measure and mark out projects from a workshop drawing with accuracy and precision • use a variety of joining methods including: – joints: corner, framing and/or widening – selecting correctly sized screws, nails and other hardware items – selecting and using appropriate adhesives • set up and use basic lathe techniques for simple turning processes • identify a range of timber finishes and their applications, including clear finishes, stains and paints
Links to Industry • industrial techniques and processes • the relationships between careers and industries in the timber area	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • identify alternative historical industrial technologies appropriate to the task and the material being used • relate appropriate industrial production techniques to work in the classroom • describe different careers within the timber industry and analyse the relationships between them

INDUSTRIAL TECHNOLOGY – TIMBER

General Wood – Core Module 2	
Students learn about:	**Students learn to:**
Design • design principles and processes • factors that affect the design of timber products including: – material selection – shaping processes – joining methods – finishing – hardware • material lists • project costing	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • apply principles of design in the modification of projects to enhance function and/or aesthetics • evaluate work practices and relate these to quality of practical projects • follow a planned construction sequence • follow material lists to prepare materials • calculate quantities and costs of materials to be used in the completion of projects • use spreadsheets to assist in the calculation of project costs
Workplace Communication Skills • orthogonal drawing • industry terminology • report writing (including the preparation of documentation to support the development and production of practical projects)	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)* • interpret and produce orthogonal drawings related to the development and production of practical projects • identify and recall specialist terms and use them in context • write reports to document the development of practical projects, identifying the materials, processes and equipment used
Societal and Environmental Impact • the effects of the timber industry on society and the environment	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)* • describe the use of renewable resources and the impact on the environment
Additional Content • a range of techniques and skills to enhance the appearance and/or function of practical projects • conversion and seasoning of timber	• select detailing techniques in addition to, or further to, any of the detailing methods chosen in General Wood 1 • identify differences in appearance and properties of radially and tangentially cut boards • explain the need to stack cut timber correctly for seasoning and storage • compare the advantages and disadvantages of air and kiln seasoning

INDUSTRIAL TECHNOLOGY – TIMBER

Cabinetwork – Specialised Module 3	
Students learn about:	**Students learn to:**
OHS and Risk Management • the intent of the OHS Act and the role of WorkCover in the workplace • potential hazards in the work environment • safe handling of chemicals	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • select and use personal protective equipment • identify specific OHS issues associated with the production of practical projects
Materials • the properties and applications of solid timbers, manufactured boards and veneers • hardware and allied materials used in cabinetwork such as: – hinges – handles – drawer runners	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • select and use timbers and/or timber products most suitable for completing projects • identify and compare the properties, composition, construction and applications of manufactured boards • identify and use a range of hardware devices in the completion of projects
Equipment, Tools and Machines • the care and maintenance of edge tools • a variety of power and machine tools including: – sanders – band saw – router – biscuit jointer – drills	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use and maintain hand tools in cutting and shaping of timber • use power and machine tools in the construction of projects
Techniques • a range of processes and techniques used in cabinet-making • a range of framing, corner and widening joints including: – dowel and biscuit joints • surface preparation and timber finishing	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use a range of techniques to check projects for square • select and use a range of joining methods • select appropriate surface preparation methods and apply finishes to achieve a quality result
Links to Industry • industrial manufacturing techniques in cabinetwork including the application of computer-aided manufacture (CAM)	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • compare and contrast industrial processes with those undertaken in the classroom • identify new and emerging technologies and contrast with those used in the past • describe the impact of new and emerging technologies on careers and professions in the timber industry

INDUSTRIAL TECHNOLOGY – TIMBER

Cabinetwork – Specialised Module 3	
Students learn about:	**Students learn to:**
Design	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)*
• design principles and processes	• apply principles of design in the modification and design of timber projects • identify and apply the factors influencing good design to the design and/or modification of projects • produce freehand sketches to visualise, generate and record ideas
• project sequencing and time management	• calculate the total cost of projects • follow a planned sequence of operations
• research techniques	• use internet facilities to research practical projects
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• working drawings	• read, interpret and produce working drawings including pictorial and orthogonal, to assist in the production of projects
• industry terminology	• recall specialist terms and use them in context when reporting on the development and production of projects
• report writing (including the preparation of documentation to support the development and production of practical projects)	• prepare and present reports to document the development of the project, identifying the materials, processes and equipment used • prepare and use materials lists • prepare reports using a range of software and hardware displaying skills in more than one application
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• the effects of the timber industry on society and the environment	• describe the environmental implications of the production and use of manufactured boards
Additional Content	
• a range of techniques and skills to enhance the appearance and/or function of practical projects	• select and use additional detailing techniques in addition to any of the detailing methods nominated in previous modules
• methods of producing veneers	• identify methods of cutting veneers and the associated physical characteristics
• elementary CAD applications	• use a CAD program to produce 2D workshop drawings

INDUSTRIAL TECHNOLOGY – TIMBER

Cabinetwork – Specialised Module 4	
Students learn about:	**Students learn to:**
OHS and Risk Management • risk management principles included in the OHS Act and Regulation • risk identification and hazard reduction strategies	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • conduct a risk assessment • identify and respond to OHS issues to help ensure a safe working environment
Materials • the properties and applications of materials associated with the Timber focus area • timber defects • hardware and cabinet fittings	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • select appropriate timbers or timber products and allied materials for completing projects • check for defects in solid timber and apply techniques to overcome such defects • select and use hardware and cabinet fittings
Equipment, Tools and Machines • the range of equipment, tools and machines in the timber focus area • the use of jigs in the manufacture of cabinetwork projects	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • identify, select and use a range of hand, power and machine tools to be used for cutting, shaping and joining timber • use jigs to assist in the construction and assembly of projects
Techniques • a range of processes and construction techniques including: – knockdown fittings – flat pack construction	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • identify, select and use suitable processes and techniques for specific projects
Links to Industry • industrial manufacturing techniques in the cabinet-making industry	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • research current techniques, materials and equipment used by industry to develop and produce similar projects • compare and contrast industrial practices with classroom experiences
Design • the application of design principles and processes to individual projects • project management • resource selection	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • use a design process to develop and produce practical projects • evaluate practical projects and processes • plan and follow a sequence of operations to complete projects within specified time frames • research and calculate all costs for the development of a project • explain and justify selection and use of materials, processes and equipment in practical projects

INDUSTRIAL TECHNOLOGY – TIMBER

Cabinetwork – Specialised Module 4	
Students learn about:	**Students learn to:**
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• workshop drawings	• produce drawings to visualise, generate, understand and record ideas • read, interpret and produce working drawings to assist in the production of practical projects
• industry terminology	• recall specialist terms and use them in the appropriate contexts
• report writing (including the preparation of documentation to support the development and production of practical projects)	• write and present a report to detail the design, construction and evaluation of projects • justify design decisions and selection of materials, processes and equipment
• a range of computer software applications to assist in the planning, production and reporting of practical projects	• use appropriate software and hardware, displaying skills in several applications which could include scanning and digital photography
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• the effects of the timber industry on society and the environment	• analyse and explain the environmental and societal impact of resources used in the development and production of projects
Additional Content	
• defects in timber due to insect and/or fungal attack	• analyse effects of insect attack on properties and appearance of the timber • relate inappropriate seasoning methods to timber defects and insect attack
• elementary CAD applications	• use a suitable CAD program to produce workshop drawings including dimensions

INDUSTRIAL TECHNOLOGY – TIMBER

Wood Machining – Specialised Module 3	
Students learn about:	**Students learn to:**
OHS and Risk Management • the intent of the OHS Act and the role of WorkCover in the workplace • potential hazards in the work environment • safe handling of chemicals	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • select and use personal protective equipment • identify specific OHS issues associated with the production of practical projects
Materials • the properties and applications of materials associated with the Timber focus area • timber defects and their effects on the machining properties of timber	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • select and use timbers most suitable for completing a wood machining project • compare the machining properties of different solid timbers and timber products • sight and check for defects in solid timber prior to machining
Equipment, Tools and Machines • the care and maintenance of tools used for cutting and scraping • the use of jigs and templates in the manufacture of wood machining projects • a variety of machine and power tools used for: – cutting – shaping – drilling – turning – finishing	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • maintain tools used for cutting and scraping • prepare and use jigs and templates in the production of machining projects • use a variety of machine and power tools in the production of practical projects
Techniques • a range of processes and techniques including: – between-centres turning – faceplate turning – specialist chucks • surface preparation and timber finishing techniques suited to machining projects	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • use a variety of wood-turning techniques • shape timber using cutting and scraping techniques • select and apply a range of appropriate surface finishes
Links to Industry • industrial manufacturing techniques in the wood machining industry including the application of computer-aided manufacture (CAM)	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • compare and contrast industrial processes with those undertaken in the classroom • identify new and emerging technologies and contrast with those used in the past • describe the impact of new and emerging technologies on careers and professions in the timber industry

INDUSTRIAL TECHNOLOGY – TIMBER

Wood Machining – Specialised Module 3	
Students learn about:	**Students learn to:**
Design	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)*
• design principles and processes	• apply principles of design in the modification and design of practical projects • identify and apply the factors influencing good design to the design and/or modification of projects • produce freehand sketches to visualise, generate and record ideas • calculate the total cost of projects
• project sequencing and time management	• follow a planned sequence of operations
• research techniques	• use internet facilities to research practical projects
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• working drawings	• read, interpret and produce working drawings including pictorial and orthogonal, to assist in the production projects
• industry terminology	• recall specialist terms and use them in context when reporting on the development and production of projects
• report writing (including the preparation of documentation to support the development and production of practical projects	• prepare and present reports to document the development of projects, identifying the materials, processes and equipment used • prepare and use material lists • prepare reports using a range of software and hardware displaying skills in more than one application
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• the effects of the timber industry on society and the environment	• describe the environmental implications of the use of non-plantation timbers in wood machining
Additional Content	
• elementary CAD applications	• use a CAD program to produce simple 2D workshop drawings
• a range of techniques and skills to enhance the appearance and/or function of practical projects	• select and use appropriate detailing techniques in addition to any of the detailing methods nominated in previous modules

INDUSTRIAL TECHNOLOGY – TIMBER

Wood Machining – Specialised Module 4	
Students learn about:	**Students learn to:**
OHS and Risk Management • risk management principles included in the OHS Act and Regulation • risk identification and hazard reduction strategies	*(refer to Outcomes 5.1.1, 5.1.2, 5.4.2 on page 12)* • conduct a risk assessment • identify and respond to OHS issues to help ensure a safe working environment
Materials • the properties and applications of materials associated with the Timber focus area • timber defects and their effects on the machining properties of timber	*(refer to Outcomes 5.3.1, 5.3.2, 5.5.1 on pages 12–13)* • compare the machining properties of different solid timbers and timber products • select appropriate timbers or timber products and allied materials most suitable for completing projects • sight and check for defects in solid timber and apply techniques to overcome such defects
Equipment, Tools and Machines • the range of equipment, tools and machines in wood machining	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • identify, select and use a range of hand, machine and power tools used in cutting, shaping and joining timber
Techniques • a range of processes and techniques including: – advanced turning techniques – repetition work – flat pack construction	*(refer to Outcomes 5.2.2, 5.4.2, 5.5.1 on pages 12–13)* • identify, select and use suitable processes and techniques for specific projects
Links to Industry • industrial manufacturing techniques in the wood machining industry	*(refer to Outcomes 5.5.1, 5.7.2 on page 13)* • research current techniques, materials and equipment used in wood machining to develop and produce similar projects • compare and contrast industrial practices with classroom experiences
Design • design principles and processes • project sequencing and time management • resource selection	*(refer to Outcomes 5.2.1, 5.5.1, 5.6.1 on pages 12–13)* • work through a design process to develop and produce practical projects • evaluate practical projects and processes • plan and follow a sequence of operations to complete a project within a specified time frame • research and calculate all costs for the development of individual projects • explain and justify selection and use of materials, processes and equipment in practical projects

INDUSTRIAL TECHNOLOGY – TIMBER

Wood Machining – Specialised Module 4	
Students learn about:	**Students learn to:**
Workplace Communication Skills	*(refer to Outcomes 5.4.1, 5.5.1 on pages 12–13)*
• workshop drawings	• produce drawings to visualise, generate, understand and record ideas • read, interpret and produce working drawings to assist in the production of practical projects
• industry terminology	• recall specialist terms and use them in the appropriate context
• report writing (including the preparation of documentation to support the development and production of practical projects)	• write and present reports to detail the design, construction and evaluation of projects • justify design decisions and selection of materials, processes and equipment
• a range of computer software applications to assist in the planning, production and reporting of practical projects	• use appropriate software and hardware, displaying skills in several applications which could include scanning and digital photography
Societal and Environmental Impact	*(refer to Outcomes 5.7.1, 5.7.2 on page 13)*
• the effects of the timber industry on society and the environment	• analyse and explain the environmental and societal impact of resources used in the development and production of projects
Additional Content	
• the defects in timber due to insect and/or fungal attack	• analyse effects of insect attack on properties and appearance of timber • explain how seasoning methods can affect the susceptibility of timber to defects and insect attack
• elementary CAD applications	• use a suitable CAD program to produce 3D images of projects and/or workshop drawings including dimensions
• CNC machining of timber	• produce projects and/or components using CNC equipment

Life Skills

For some students with special education needs, particularly those students with an intellectual disability, it may be determined that the above content is not appropriate. For these students, Life Skills outcomes and content can provide the basis for the development of a relevant and meaningful program – see section 8.

8 Life Skills Outcomes and Content

The Board of Studies recognises that a small percentage of students with special education needs may best fulfil the mandatory curriculum requirements for *Industrial Technology Years 7-10* by undertaking Life Skills outcomes and content. (Requirements for access to Life Skills outcomes and content are detailed in section 1.2.)

Life Skills outcomes will be selected on the basis that they meet the particular needs, goals and priorities of each student. Students are not required to complete all outcomes. Outcomes may be demonstrated independently or with support.

In order to provide a relevant and meaningful program of study that reflects the needs, interests and abilities of each student, schools may integrate Industrial Technology Life Skills outcomes and content across a variety of school and community contexts.

8.1 Outcomes

Objectives Students will develop:		**Outcomes** A student:	
1	knowledge and competence in applying Occupational Health and Safety (OHS) risk management procedures and practices	LS 1.1 LS 1.2 LS 1.3	recognises safe and unsafe conditions in the context of undertaking a project demonstrates safe practices in the use of materials, tools and equipment cares for hand tools, power tools and machines
2	knowledge, skills and an appreciation of quality in the design and production of practical projects	LS 2.1 LS 2.2	recognises that a process is used to design and make projects selects appropriate tools to undertake projects
3	knowledge and understanding of the relationship between the properties of materials and their applications	LS 3.1	selects and uses appropriate materials to undertake projects
4	skills in communicating ideas, processes and technical information with a range of audiences	LS 4.1	uses a variety of communication techniques in the context of undertaking projects
5	an appreciation of the relationship between technology, leisure and lifestyle activities and further learning	LS 5.1	uses skills and processes in a variety of contexts and projects
6	the ability to critically evaluate manufactured products in order to become a discriminating consumer	LS 6.1	evaluates the success of projects
7	knowledge and understanding of the role of traditional, current, new and emerging technologies in industry and their impact on society and the environment	LS 7.1	explores the effects of current and emerging technologies

8.2 Content

The content forms the basis for learning opportunities. Content will be selected on the basis that it meets the needs, goals and priorities of each student. Students are not required to complete all of the content to demonstrate achievement of an outcome.

The examples provided are suggestions only.

<table>
<tr><td colspan="2">Outcome LS 1.1: A student recognises safe and unsafe conditions in the context of undertaking a project.</td></tr>
<tr><td>Students learn about:

• factors that influence safety:
– in specialist rooms
– in external areas</td><td>Students learn to:

• recognise factors that influence safety in specialist areas, eg:
– storage: tools, equipment, materials, hazardous substances
– signage: symbols, marked walkways, single work areas
– lighting and ventilation
– availability and location of safety protection equipment: safety goggles
– electrical safety: safety cut-off switches
– safety guards
– first aid equipment: location and contents
– potentially dangerous materials and equipment

• recognise factors that influence safety in external areas, eg:
– sun, rain, electrical storms, weather protection
– protective clothing
– lifting and transferring materials, tools and equipment
– use of energy – gas, electricity, petroleum</td></tr>
</table>

Outcome LS 1.2: A student demonstrates safe practices in the use of materials, tools and equipment.	
Students learn about:	**Students learn to:**
• the application of OHS practices in relation to: – handling and using a variety of materials – handling and using a variety of hand tools and power tools	• recognise properties of materials, equipment and tools that make them dangerous, eg: – flammability – toxicity – sharpness – weight – temperature – moving parts – electrical operation
• handling and using a variety of equipment including machine tools and computer equipment	• follow safety labelling, eg: – signage – colour coding • carry and transfer materials, tools and equipment safely, eg: – passing knives and chisels – transferring hot welded components – carrying objects of varying weights and lengths • use materials, tools and equipment safely in the context of projects, eg: *making a wedge-shaped door stop* – support timber while sawing – use dust mask and eye protection while sanding – work in a well-ventilated area when applying a clear finish *making a nail punch on a metal turning lathe* – secure metal in a vice while cutting – hold workpiece securely in a 3-jaw chuck – tighten all appropriate lathe parts prior to operating lathe – wear eye protection and check for loose clothing – keep hands clear of moving parts *make a clear plastic photo frame* – secure plastic while cutting to size – hold plastic firmly in vice while filing and polishing edges – wear protective clothing when handling hot plastic – use heating apparatus safely

Outcome LS 1.3: A student cares for hand tools, power tools and machines.	
Students learn about:	**Students learn to:**
• caring for hand tools, power tools and machines	• undertake regular checks of hand tools, power tools and machines, eg: – visually inspect electrical cords and plugs – report loose-fitting handles – store hand and power tools appropriately – regularly check for sharpness – clean safely immediately after use

Outcome LS 2.1: A student recognises that a process is used to design and make projects.	
Students learn about:	**Students learn to:**
• a design process that includes: – analysis of a problem – idea creation – synthesis of ideas and information – making – evaluating • communication throughout the design process • management throughout the design process	• recognise the steps in a design process including: – identify a need – explore ideas – choose preferred idea – plan steps for making the project – select tools, equipment and materials – make projects – evaluate projects

Outcome LS 2.2: A student selects appropriate tools to undertake projects.	
Students learn about:	**Students learn to:**
• the nature and purpose of a range of tools: – hand tools including hammer, screwdriver, tenon saw, chisel, file – power tools including electric drill, orbital sander, power saw, angle grinder – machines including lathe, bandsaw, disc sander – computer equipment including drawing software and scanners	• select tools and equipment in relation to a project, eg: – use cordless drills/saws in preference to 240-volt powered tools to build outdoor school seating (Building and Construction) – use a portable router to machine trenches, as opposed to using a saw, chisel and mallet in the construction of a CD rack (Timber) – use ring spanners rather than adjustable spanner for greater efficiency when working on car engines (Automotive) – use CAD software in designing an outdoor shelter in preference to hand executed drawings, for greater speed and accuracy (Engineering)

Outcome LS 3.1: A student selects and uses appropriate materials to undertake projects.	
Students learn about:	**Students learn to:**
• properties of materials such as: – colour – strength – absorbency – transparency/opacity – rigidity – thermal – electrical – corrosion resistance – acoustics	• consider factors such as cost, environmental issues and aesthetic features in selecting the most appropriate material, eg corrosion resistance, acoustics, durability and aesthetics when selecting materials appropriate for making wind chimes; compare relative costs and benefits of leather or vinyl and brass as opposed to aluminium when making a belt with a buckle
• the key features of a project which influence the choice of materials including: – location (indoor/outdoor) – function – frequency of use	• compare materials to determine those most appropriate to the task, eg examine a variety of timber, taking account of size, strength, and finish to determine the most appropriate for construction of outdoor furniture

Outcome LS 4.1: A student uses a variety of communication techniques in the context of undertaking projects.	
Students learn about:	**Students learn to:**
• using a variety of communication techniques which may include: – magazine/pamphlet pictures – photographs – digital camera – video camera – freehand sketches – scale models – oral presentations – discussions – circuit diagrams – computer-aided drawings	• use techniques to communicate ideas, eg: – collect pictures or download designs of wrought iron items to inspire freehand design sketches for a candelabra – make a cardboard scale model for a simple mechanical toy prior to construction – present a completed practical project to a class or school assembly

Outcome LS 5.1: A student uses skills and processes in a variety of contexts and projects.	
Students learn about:	**Students learn to:**
• using skills to make a project in a variety of technologies: – Building and Construction – Electronics – Engineering – Leather – Metal – Polymers – Automotive – Timber	• participate in making a project in a variety of technologies, eg: *build a child's sandpit with weather protection* – site selection, levelling, retaining walls, roof construction (Building and Construction) *dismantle and reassemble 2- and 4-stroke lawnmowers* (Automotive) *construct a clock using thermoplastic* – sawing, sanding, drilling, shaping, polishing, attaching mechanism (Polymers)
• applying the design process	• follow the steps to complete a project, eg design and make a kitchen stepladder: *explore ideas* – materials, dimensions, number of treads, tread surface, need for handrail, finish plan – make a freehand or workshop drawing – resources – cost, materials, equipment *select and organise materials, tools, equipment and machines* – choose and list materials, tools and machinery such as router, sash cramps, plantation timbers, aluminium – check availability of tools and machinery – organise purchase of materials (Outcome LS 2.2) *make a project* – assist and cooperate with others to undertake tasks – prepare materials (cut treads, sides and top to length, cut trenches in sides) – assemble (glue, screw, finish) *evaluate project* – consider stability, portability and quality

Outcome LS 6.1: A student evaluates the success of projects.	
Students learn about:	**Students learn to:**
• evaluating a project in terms of: – function – aesthetics – available resources – environmental impact – marketability	• evaluate a project throughout the design process, eg: – can the project be completed within available resources such as time, cost, skills, equipment? – have the correct materials, tools and equipment been chosen? – do I need help? – am I working safely? • evaluate a completed project, eg: – does the finished product require modification? – what changes, if any, need to be made? – will it be used? – does the project look well made? – does the project meet the identified need? • evaluate a project in terms of marketability, eg: – presentation – packaging – price/cost – safety – effect on individuals, society, environment

Outcome LS 7.1: A student explores the effects of current and emerging technologies.	
Students learn about:	**Students learn to:**
• the effects of emerging technologies in industry on society and the environment	• explore the effects of technology in industry on society including: – *employment* eg computer-aided manufacture, working at home as opposed to workplace – *transport* eg energy-efficient vehicles, hovercraft, levitating trains, rocket powered international flight • explore the effects of technology in industry on the environment including: – *housing* eg aerated concrete panels, solar roofing, composting toilets – *renewable energy sources* eg wind, solar, tidal

9 Continuum of Learning in Industrial Technology K–10

9.1 Stage Statements

Stage statements illustrate the continuum of learning in the *Industrial Technology Years 7–10 Syllabus* and are summaries of the knowledge, understanding, skills, values and attitudes that have been developed by students as a consequence of achieving the outcomes for the relevant stage of learning.

Early Stage 1 – Science and Technology

Students who have achieved Early Stage 1 show a growing awareness of, and interest in, the natural and made environments. They demonstrate confidence in proposing ideas for designs they develop through play and modelling. They demonstrate curiosity about artefacts, events, phenomena, places and living things around them.

Early Stage 1 students use play to explore ideas, manipulate materials and trial solutions. They develop and begin to refine their understanding of environments, materials, equipment and other resources through trial and error. They ask questions, suggest ideas, propose their own explanations and are able to report verbally and graphically on their actions and observations.

Students in this stage use their senses to observe features of their immediate environment and to explore the properties of a range of common materials. They identify and group living and non-living things according to some common characteristics.

Students explore and identify the needs of people and other living things. They recognise the use of some forms of energy and their ideas about it are beginning to develop as they experience energy in different contexts.

Students generate their own ideas, using make-believe, and express these verbally, pictorially and through modelling. They are unlikely to perceive the steps in a designing and making process as they often work in situations where these aspects occur at the same time. They identify what they like or dislike about their designs or explorations.

Students in Early Stage 1 recognise that information can come from a variety of sources, including other people and from different media, for example, books and videos. They demonstrate an awareness of a range of uses for computer-based technology as well as showing an emerging confidence in their ability to explore and use computer-based technologies, with assistance, to create text, images and play games.

Students show growing awareness of the appropriate use and maintenance of a range of classroom equipment. They give reasons for safe working practices and organisational procedures related to the use of equipment, resources and materials. Students develop ideas through the use and manipulation of concrete materials as a means of progressing towards abstract thought.

Stage 1 – Science and Technology

Students who have achieved Stage 1 are developing an awareness of the wider world and are applying their scientific and technological understanding to new and different situations. They are starting to develop the social skills required to investigate, design and make products and services.

Students are starting to appreciate the interdependence of living things and their environments. They recognise that people create products, services and environments to meet their own needs. They build on their existing understanding of some of the forms of energy.

Students are able to interpret information and make predictions based on their own observations. They are better able to accept that the result of a test may be different from what was originally expected.

Students are able to recognise the purpose of an investigation and seek further information as a result of their own curiosity. They begin to see that an investigation is a series of orderly steps. They use their senses to identify similarities and differences. Students show curiosity about natural and made environments and seek explanations that allow them to interpret their observations.

Using plans, drawings and models, Stage 1 students begin to generate and select ideas to best meet design task objectives, and give simple explanations of why they have chosen a certain idea. Students in this stage can draw plans for a design and can explain some of the features and materials to be used. They can write labels and simple explanations when creating images.

Students recognise and discuss with others some of the strengths and limitations of what they have done and identify some changes that could be made to improve plans or models, for example in appearance. They make comparisons about what they like and dislike about familiar products, systems or environments.

Students effectively manipulate materials that are available in the classroom environment, and show a growing awareness of the different properties of such materials and how they affect the way in which the materials are used. They recognise that some materials occur naturally, while others are made.

Students have a developing awareness of a range of media and information products. They are able to use computer technology to start and open files or applications, save and shut down. They are able to use computer-based technologies where appropriate for a given task.

They are able to identify the different forms of technology in their immediate environments and explain how they help us. They safely use, maintain and store equipment such as scissors, magnifying glasses, computers and disks.

Stage 2 – Science and Technology

Students who have achieved Stage 2 are able to initiate their own investigations as a result of something that has aroused their curiosity. They ask perceptive questions and respond to design tasks in innovative ways. They identify ways of improving their own scientific and technological activities by considering issues such as how well something works, its appearance and how it might affect the environment.

Students develop the capacity to ask questions to clarify understanding. They predict outcomes by proposing explanations and testing to see if their predicted outcomes eventuate. As students develop skills in predicting, testing, recording results and drawing conclusions, they begin to form understanding about 'fair testing' that takes into account the need for consistent conditions combined with one variable, in order to ensure accurate results.

Students who have achieved Stage 2 are able to explore ideas for investigations and their design proposals in order to identify where decisions still need to be made, and to suggest possible courses of action. Students may suggest modifications to improve their initial proposals, including the selection of different solutions to arrive at a suitable outcome.

Students are able to explore the properties, capabilities and working characteristics of both natural and manufactured materials and components. They recognise that materials are varied and have different properties that affect their use. They can select, maintain and safely use classroom tools and equipment, hardware and software, and justify their selection for particular tasks.

Students give consideration to issues such as function and aesthetics when designing and evaluating products, services and environments. They can identify some limitations when carrying out a design task. Students develop plans that show some consideration of the types and quantities of materials required and an awareness of the need for accuracy in a plan for production purposes.

Students recognise the function of some hardware and software and are able to select and use these to meet the requirements of a task. They can discuss the possibilities and limitations of using a range of technology including computer-based technology.

Students are developing a capacity to understand relationships in the natural world. They can identify and describe some aspects of the structure and function of living things and some of the ways living things interact. They can also identify and describe some of the interactions of the Earth with other parts of the solar system. Students in this stage devise systems that inform or utilise their understanding of some forms of energy.

Students also demonstrate a greater understanding of and control over a design process. They recognise the importance of evaluation throughout a design cycle.

Stage 3 – Science and Technology

Students who have achieved Stage 3 are able to undertake investigations independently in order to satisfy their own curiosity. They demonstrate a willingness to initiate their own investigations; this might include designing appropriate fair tests to evaluate a range of possible explanations for the results of their investigations.

Students select and use appropriate language, structures and media and demonstrate skills in critically examining and communicating scientific and technological ideas and issues. Students can relate their scientific and technological understanding to new tasks or different situations.

Students research and investigate to identify phenomena and processes that have influenced Earth over time. They build on their existing understanding of forms of energy.

Students are aware of the skills and processes involved in designing and making, investigating and using technology. They manage the design process including aspects of time management, design constraints and needs of the target audience. At this stage, they can make decisions involving some conflicting interests or issues, for example ethical, aesthetic, environmental and cultural.

Students use two- and three-dimensional drawings and models to develop and modify their design ideas and to communicate details to others. They recognise and use some conventions and symbols related to developing plans and diagrams, such as measurements and some use of scale. They can observe the form and detail of objects carefully in order to produce accurate drawings from different views and they reflect on their drawings, sketches or computer models.

Students are aware of a range of issues related to scientific and technological achievements. They are capable of acquiring information from a variety of sources and are able to experiment with new techniques and skills as technologies change. Students identify emerging trends by using data, diagrams and a range of tools and equipment to assist with observations.

Students recognise that computer-based technologies have a wide range of applications in society and can identify and describe some of the effects of such technologies on individuals and communities. Students who have achieved Stage 3 can confidently and competently use a range of computer-based hardware and applications. Students at this stage can identify alternative uses and can be creative in adapting available software to the requirements of a task.

Students reflect on the methods used and positive and negative results of technological and scientific activity both throughout their own projects and in personal, local and global contexts.

Stage 4 – Technology (Mandatory)

Students at Stage 4 are able to independently initiate design projects and investigations that reflect an understanding of needs and opportunities. They demonstrate the ability to research and extract information from a variety of sources and a willingness to use experiments and tests to enhance the development of a design project. They describe factors that influence design.

Students select and use a broad range of media and method, and appropriate language and structures, to accurately communicate design ideas to a diverse audience. This may include recounting the process of designing, producing and evaluating used when developing design projects. Students are aware of the skills and processes involved in designing and are able to generate and communicate design ideas and solutions. They develop knowledge and understanding of a range of design processes, roles of designers and associated work opportunities. They can identify what makes good design and are able to creatively develop quality design projects.

Students responsibly, safely, confidently and accurately apply a range of contemporary and appropriate tools, materials and techniques and understand the implications and applications of these in the wider community. Students demonstrate competence when using a range of ICTs and have the ability to select and use them appropriately in developing design projects.

Students recognise the importance of safety, quality and management in the design and production of design projects. They learn to manage their own time by sequencing processes of designing, producing and evaluating to plan ahead. They work collaboratively and learn to work safely with others in technological environments.

Throughout the design process students reflect on and evaluate their design projects. They consider the impact of innovation and emerging technology on society and the environment and identify and explain ethical, social, sustainability and environmental considerations related to design projects.

Stage 4 – Industrial Technology

Students undertaking the study of Industrial Technology at Stage 4 enhance and enrich the experiences gained through Technology (Mandatory) Years 7–8. In particular they will focus more directly on the development of specific practical skills associated with the material being studied and the associated Occupational Health and Safety issues arising through the use of these materials and related equipment.

Stage 5 – Industrial Technology

The knowledge, skills and attitudes developed in the *Technology (Mandatory) Years 7–8 Syllabus* are further enhanced through the study of Industrial Technology Years 7–10 through applied practical experiences in one or more focus area.

Students at Stage 5 are able to recognise and make an assessment of the risks and OHS issues that are associated with hand and machine tools and processes that they will be using in the development of their projects. They can identify and assess risks and apply appropriate OHS practices to all of the hand and machine tools and materials that they use and follow correct procedures in completing processes.

Students are able to competently apply a design process to modify, develop and produce original design solutions for a range of practical projects. They are able to identify, select and apply the appropriate hand and machine tools and processes to produce quality practical projects.

Students understand the relationship between the physical and mechanical properties of a range of relevant and associated materials and their functional applications. They are able to select the most appropriate material/s for the successful completion of their practical projects. At Stage 5 students are able to communicate technical ideas and information with others using a range of methods including graphical, written and verbal. They can select the most appropriate way in which to communicate information.

Through experiences in a range of practical activities, students have developed an appreciation of the value of working cooperatively with others in the achievement of common goals and gain personal satisfaction and enjoyment. These skills form the basis that enables students to continue their learning experiences in many lifestyle and leisure activities.

Students are able to identify and critically evaluate products that have been well designed and well made, and which fulfil their intended function. They are able to apply design criteria to the planning and development of their own projects.

Students are aware of the nature and impact of current, new and emerging technologies on society and the environment. They are able to describe the effect of these technologies on industry and the local and global environment and to envisage future directions and possible applications of technology.

10 Assessment

10.1 Standards

The Board of Studies *K–10 Curriculum Framework* is a standards-referenced framework that describes, through syllabuses and other documents, the expected learning outcomes for students.

Standards in the framework consist of two interrelated elements:
- outcomes and content in syllabuses showing what is to be learnt
- descriptions of levels of achievement of that learning.

Exemplar tasks and student work samples help to elaborate standards.

Syllabus outcomes in Industrial Technology contribute to a developmental sequence in which students are challenged to acquire new knowledge, understanding and skills.

The standards are typically written for two years of schooling and set high, but realistic, expectations of the quality of learning to be achieved by the end of Years 2, 4, 6, 8, 10 and 12.

Using standards to improve learning
Teachers will be able to use standards in Industrial Technology as a reference point for planning teaching and learning programs, and for assessing and reporting student progress. Standards in Industrial Technology will help teachers and students to set targets, monitor achievement and, as a result, make changes to programs and strategies to support and improve each student's progress.

10.2 Assessment for Learning

Assessment for learning in Industrial Technology is designed to enhance teaching and improve learning. It is assessment that gives students opportunities to produce the work that leads to development of their knowledge, understanding and skills. *Assessment for learning* involves teachers in deciding how and when to assess student achievement, as they plan the work students will do, using a range of appropriate assessment strategies including self-assessment and peer assessment.

Teachers of Industrial Technology will provide students with opportunities in the context of everyday classroom activities, as well as planned assessment events, to demonstrate their learning.

In summary, *assessment for learning*:
- is an essential and integrated part of teaching and learning
- reflects a belief that all students can improve
- involves setting learning goals with students
- helps students know and recognise the standards they are aiming for
- involves students in self-assessment and peer assessment
- provides feedback that helps students understand the next steps in learning and plan how to achieve them
- involves teachers, students and parents in reflecting on assessment data.

Quality Assessment Practices

The following *Assessment for Learning Principles* provide the criteria for judging the quality of assessment materials and practices.

Assessment for learning:

- **emphasises the interactions between learning and manageable assessment strategies that promote learning**
  In practice, this means:
  - teachers reflect on the purposes of assessment and on their assessment strategies
  - assessment activities allow for demonstration of learning outcomes
  - assessment is embedded in learning activities and informs the planning of future learning activities
  - teachers use assessment to identify what a student can already do.

- **clearly expresses for the student and teacher the goals of the learning activity**
  In practice, this means:
  - students understand the learning goals and the criteria that will be applied to judge the quality of their achievement
  - students receive feedback that helps them make further progress.

- **reflects a view of learning in which assessment helps students learn better, rather than just achieve a better mark**
  In practice, this means:
  - teachers use tasks that assess, and therefore encourage, deeper learning
  - feedback is given in a way that motivates the learner and helps students to understand that mistakes are a part of learning and can lead to improvement
  - assessment is an integral component of the teaching-learning process rather than being a separate activity.

- **provides ways for students to use feedback from assessment**
  In practice, this means:
  - feedback is directed to the achievement of standards and away from comparisons with peers
  - feedback is clear and constructive about strengths and weaknesses
  - feedback is individualised and linked to opportunities for improvement.

- **helps students take responsibility for their own learning**
  In practice, this means:
  - assessment includes strategies for self-assessment and peer assessment emphasising the next steps needed for further learning.

- **is inclusive of all learners**
  In practice, this means:
  - assessment against standards provides opportunities for all learners to achieve their best
  - assessment activities are free of bias.

10.3 Reporting

Reporting is the process of providing feedback to students, parents and other teachers about students' progress.

Teachers can use evidence gathered from assessment to extend the process of *assessment for learning* into their *assessment of learning*. In a standards-referenced framework this involves teachers in making professional judgements about student achievement at key points in the learning cycle. These may be at the end of a year or stage, when schools may wish to report differentially on the levels of knowledge, understanding and skills demonstrated by students.

Descriptions of levels of achievement for Stage 4 and Stage 5 in Industrial Technology have been developed to provide schools with a useful tool to report consistent information about student achievement to students and parents, and to the next teacher to help to plan the next steps in the learning process. These describe observable and measurable features of student achievement at the end of a stage, within the indicative hours of study. Descriptions of levels of achievement provide a common language for reporting.

At Stage 5 there are six levels of achievement. Level 6 describes a very high level of achievement in relation to course objectives and outcomes. Level 2 describes satisfactory achievement, while the level 1 description will help identify students who are progressing towards the outcomes for the stage.

At the end of Year 10, teachers of Industrial Technology Years 7–10 will make an on-balance judgement, based on the available assessment evidence, to match each student's achievement to a level description. This level will be reported on the student's School Certificate Record of Achievement.

At Stage 4 there are four levels of achievement. Level 4 describes a very high level of achievement; levels 2 and 3 describe satisfactory and high achievement that should provide a solid foundation for the next stage of learning. The level 1 description will help identify students who are progressing towards the outcomes for the stage.

For students undertaking Life Skills outcomes and content in Years 7–10, the content listed for each identified Life Skills outcome forms the basis of the learning opportunities for these students. It also provides examples of activities on which teachers can base judgements to report student progress in relation to individual learning goals.

10.4 Choosing Assessment Strategies

Planning for assessment is integral to programming for teaching and learning. In a standards-referenced framework, teachers assess student performance on tasks in relation to syllabus outcomes and make on-balance judgements about student achievement. Assessment relies on the professional judgement of the teacher and is based on reliable data acquired in a fair and challenging environment, from multiple performances in a variety of contexts. Assessment is fundamental for furthering student learning.

In planning programs, teachers, individually and collaboratively, review the syllabus and standards materials. They use these materials to describe for themselves what students should know and be able to do at a particular stage, and they consider the kinds of evidence their students could produce to show they have learnt what they needed to learn.

Students are provided with a description of the learning expected to be accomplished, opportunities to discuss the criteria on which judgements will be based, time to learn, and where possible, examples of what that learning looks like.

Assessment is used to determine the students' initial knowledge, understanding and skills, to monitor student progress and to collect information to report student achievement. The assessment cycle is continuous; students receive and give themselves feedback on what they have learnt, and what needs to be done to continue their learning. Students gain information about their learning through feedback from teachers and from self-assessment and peer assessment. The challenge and complexity of assessment tasks increase to enable students to develop evaluative independence as they assess their own knowledge, understanding and skills, and determine ways to improve their learning.

Teachers of Industrial Technology should employ a range of assessment strategies to ensure that information is being gathered regarding the knowledge and understanding that are being acquired, and the skills that are being developed. Strategies should be appropriate to the outcomes being addressed, be manageable in number and be supportive of the learning process. Teachers could work collaboratively in planning appropriate assessment strategies. Working collaboratively leads teachers to develop a shared understanding of the syllabus standards and also supports teachers in making consistent and comparable judgements of student achievement in relation to these standards.

In planning for assessment in Industrial Technology it is important for teachers to consider:
- the requirements of the syllabus
- the accessibility of the proposed activity in terms of language requirements
- the appropriateness of the challenge presented to individual students
- resource availability
- how the task will be administered
- the way in which feedback will be provided.

In planning for assessment, teachers of Industrial Technology need to consider how results will be recorded, with a view to ensuring that there is sufficient and appropriate information collected for making an on-balance holistic judgement of the standard achieved by the student at the end of the stage. The evidence collected should enable teachers of Industrial Technology to make consistent judgements to meet the various reporting requirements that the system, school and community may have.

Industrial Technology particularly lends itself to the following assessment techniques, keeping in mind that a range of strategies should be used to assess the outcomes of the course.

Practical experiences
As practical project work is the major focus of the course, it follows that much of the assessment for this course will take place in the context of practical projects. As students progress through the course they move from undertaking teacher-guided work to a more independent mode. Assessment of projects should reflect the change in nature and demands of the course at different stages. When students are working on practical work in class, the teacher has the opportunity to observe and note aspects of student learning.

When undertaking practical experiences, students could be assessed on their ability to:
- select appropriate techniques, equipment or materials for a project
- justify their use of a particular technique or material
- use appropriate tools and methods
- perform processes safely, competently and efficiently
- set goals, prioritise tasks and manage time effectively
- use equipment safely and efficiently for an appropriate purpose
- apply OHS practices.

Research projects
Research projects can be used to develop in students analytical, organisational and problem solving skills and may include case studies and internet research projects.

When students undertake research projects, they could be assessed on their ability to:
- conduct appropriate research using a variety of methods
- select and interpret relevant information
- address the chosen issues with clarity
- present information in a logical manner
- acknowledge references appropriately.

Written reports
These may include surveys, project reports, field trip reports, interviews and essays.

When students produce a written report, they could be assessed on their ability to:
- show appropriate depth of analysis
- use appropriate text types for reporting on projects
- use appropriate detail
- use terminology consistent with the focus area of study.

Written and practical tests
Written and/or practical tests can be used to determine if students have the necessary skills, can use correct techniques and can recall, interpret, comprehend and apply knowledge at a level that is appropriate for them to move on to the next step in the learning process. Tests can provide information prior to commencing a unit of work, or along the way, about students' understanding of concepts and allow the teacher to plan further learning activities. It is important that feedback is provided on test performance in order to enhance student learning.

Presentations
Presentations allow students to develop skills in communicating their ideas in oral, graphic and written forms using a variety of subject specific concepts and content. They provide opportunities for students to develop and demonstrate their skills and reflect upon the performances of others. Assessment strategies may include prepared and impromptu oral presentations, graphical presentation of project ideas and concepts and various forms of display techniques. When presentations are used for assessment purposes, students could be assessed on their ability to:

- select and apply appropriate information and communication techniques
- present information in a creative and logical manner.

Journals
Journals provide opportunities for students to write personal reflections. They allow students to develop knowledge, skills and abilities to make informed, responsible choices. They also develop in students, self-awareness and critical thinking skills.

When using journals as an assessment technique, students could be assessed on their ability to:

- show appropriate depth of analysis
- effectively describe the development and production of projects.

Peer assessment
Industrial Technology encourages the active involvement of students in the learning process. Opportunities exist for individual and collaborative work. Activities involving peer assessment might include evaluating the contribution of individuals to a group task, and reflecting on a peer project or presentation.

Self-assessment
In Industrial Technology students are encouraged to acquire basic skills to become self-directed learners. Opportunities exist for students to reflect upon their progress towards the achievement of the syllabus outcomes through the progressive and ongoing evaluation of practical projects and processes. This reflection provides the basis for improving their learning. Developing self-assessment skills is an ongoing process, becoming increasingly more sophisticated and self-initiated as a student progresses.

By self-assessing students can:

- identify their own personal development over time
- identify key indicators and evidence of their own learning.