Government of Western Australia
School Curriculum and Standards Authority

MATERIALS DESIGN AND TECHNOLOGY

GENERAL COURSE

Year 11 syllabus

IMPORTANT INFORMATION

This syllabus is effective from 1 January 2015.

Users of this syllabus are responsible for checking its currency.

Syllabuses are formally reviewed by the School Curriculum and Standards Authority on a cyclical basis, typically every five years.

Content

Rationale

Materials are the basic ingredients of technology. Materials are used to make machines and these machines use materials to make products. Materials also supply the energy to enable technology to function. Throughout history, the evolution of technology has been largely determined by the availability of materials. The strong historical links between materials, design and technology remain significant in society today. As long as the desire to create new opportunities and to continue to improve our quality of life remains, the development of materials will continue.

The Materials Design and Technology General course is a practical course. The course allows teachers the choice to explore and use three materials learning contexts: metal, textiles and wood with the design and manufacture of products as the major focus. There is also the flexibility to incorporate additional materials from outside the designated contexts. This will enhance and complement the knowledge and skills developed within the course as many modern-day products are manufactured using a range of different material types. Students examine social and cultural values and the short-term and long-term impacts of the use and misuse of materials and associated technologies. Through this inquiry, experimentation and research, students develop their creativity and understanding of the society in which they live.

Working with materials, students develop a range of manipulation, processing, manufacturing and organisational skills. When designing with materials, they develop cognitive skills, such as solving problems, generating ideas, creative design strategies and communicating what they do. This makes them more technologically literate and, as consumers, enables them to make more informed decisions about the use and misuse of technology.

The course outcomes are relevant to a number of learning areas, including but not limited to, Technology and Enterprise, Society and Environment, The Arts, Science and Mathematics. This course also connects to the world of work, further vocational education and training and university pathways. Students may achieve vocational education and training (VET) competencies as they complete their design projects, while at the same time, developing cognitive skills fundamental to designing in a practical context. This process enhances employability and may lead to further training and employment opportunities in areas that include textiles and clothing, manufacturing, design, built environment, science and engineering.

The Materials Design and Technology General course aims to prepare all students for a future in a technological and material world by providing the foundation for lifelong learning about how products are designed and how materials are developed and used.

Course outcomes

The Materials Design and Technology General course is designed to facilitate achievement of the following outcomes.

Outcome 1 – Technology process

Students apply a technology process to create or modify products, processes or systems in order to meet human needs and realise opportunities.

In achieving this outcome, students:

- investigate issues, values, needs and opportunities
- devise and generate ideas and prepare production proposals
- produce solutions and manage production processes
- evaluate intentions, plans and actions.

Outcome 2 – Understanding the use of materials

Students understand how the nature of materials influences design, development and use.

In achieving this outcome, students:

- understand the structure of materials
- understand the relationship between the structure and properties of materials
- understand how to select appropriate materials based on their structure and properties, and understand how these characteristics influence design, development and usage.

Outcome 3 – Using technology skills

Students create material products safely and efficiently to specified standards.

In achieving this outcome, students:

- plan and manage resources to create products within constraints
- select and apply appropriate techniques and procedures when creating and modifying technologies
- manipulate equipment and resources safely to meet defined standards.

Outcome 4 – Understanding materials, society and the environment

Students understand interrelationships between people, the environment and the use of materials.

In achieving this outcome, students:

- understand how values and beliefs influence materials selection, design and technology
- understand the impact and consequences on society and the environment when selecting and using materials, designs and technologies
- understand strategies for safe and sustainable practices when developing and using materials, designs and technologies.

Organisation

This course is organised into a Year 11 syllabus and a Year 12 syllabus. The cognitive complexity of the syllabus content increases from Year 11 to Year 12.

Structure of the syllabus

The Year 11 syllabus is divided into two units, each of one semester duration, which are typically delivered as a pair. The notional time for each unit is 55 class contact hours.

Unit 1

Students interact with a variety of items that have been specifically designed to meet certain needs. Students are introduced to the fundamentals of design. They learn to communicate various aspects of the technology process by constructing what they design.

Throughout the process, students learn about the origins, classifications, properties and suitability for purpose of the materials they are using, and are introduced to a range of production equipment and techniques. They develop materials manipulation skills and production management strategies, and are given the opportunity to realise their design ideas through the production of their design project.

Unit 2

Students interact with products designed for a specific market. They use a range of techniques to gather information about existing products and apply the fundamentals of design. Students learn to conceptualise and communicate their ideas and various aspects of the design process within the context of constructing what they design.

Throughout the process, students learn about the origins, classifications, properties and suitability for end use of materials they are working with. Students are introduced to a range of technology skills and are encouraged to generate ideas and realise them through the production of their design projects. They work within a defined environment and learn to use a variety of relevant technologies safely and effectively.

Students, in consultation with teachers, select projects of interest and then design and make products suitable for a specific market.

Each unit includes:

- a unit description – a short description of the focus of the unit
- defined contexts – a particular context in which a student can be enrolled. Three different contexts have been defined in this course:
  - Metal
  - Textiles
  - Wood

Students can enrol in more than one context in this course. The course units in each context have different codes.

- unit content – the content to be taught and learned
  - students will study the unit common content and the content of their chosen defined context.

Organisation of content

The course is organised into common content and context specific content. Students must study all of the common content and at least one of the contexts.

The course content areas cover:

Materials

- Nature and properties of materials
- Materials in context

Design

- Design fundamentals and skills
  - investigate
  - devise
  - evaluate

Use of technology

- Skills and techniques
  - ICT
  - drawing
  - materials selection
- Safety
- Production management
  - product manufacture
  - ongoing evaluation.

Common content

The wood, metal and textiles learning contexts in the Materials Design and Technology General course have common content in:

- Design fundamentals and skills
- Skills and techniques
  - information and communication technology (ICT)
  - drawing
- Safety
- Production management.

Students may use any material as a means through which they may approach the course content, or teachers may choose to restrict the choice.

They will explore ways to use the nature and properties of the materials towards the completion of a product.

In design fundamentals and skills, students learn about the elements and principles of design while developing a common understanding of the design process and variations that can apply to design tasks during the design cycle.

As student safety is a high priority in all activities, a common understanding of safe working practices, risk management and an awareness of occupational safety and health (OSH) standards is achieved in each unit through coverage of common content under the safety heading.

In all three contexts, students design a product and plan to safely carry out the management of the making of the product. In Unit 1 and Unit 2, students are encouraged to integrate additional and complimentary material(s) from other contexts as a means through which they approach the course content, to develop a product.

Students are expected to plan and manage production processes, and perform ongoing evaluation, by recording any changes made to the production processes or the project design. For this reason, the skills required to follow a production plan, and the control of ongoing operations and processes to complete production, are common in all three contexts.

Materials

Nature and properties of materials

This aspect of the course focuses on the properties and characteristics of materials that influence the selection, processing and finishing choices which are made throughout the technology process. The effect and interrelationship of a material's structure, its properties and methods of processing and finishing, are addressed in order to help students make appropriate decisions about materials selection and usage. Various types of materials and classification methods are covered. Materials include solid materials, such as metals and alloys (ferrous and non-ferrous), textiles and fibres (natural and manufactured), timbers (natural and manufactured), other materials (polymers, plastics, composites and other non-contextual materials) and emerging materials.

The properties of materials underpin fundamental design decisions. The course examines materials within each context with reference to a range of physical properties that may include thermal, electrical and magnetic properties; a range of chemical properties, such as absorbency, solubility, oxidation, permeability, colourfastness, sun and chemical resistance; a range of mechanical properties, such as durability, abrasion resistance, hardness, toughness, strength and dimensional stability, shrink resistance, resilience and elasticity; and some aesthetic properties, such as lustre, colour, drape and texture. The course investigates material properties by accessing available materials data and specifications.

Materials in context

Materials have social and environmental impacts when used in social, cultural and environmental contexts. Analysis of their own designs, and that of others, develops a sense of the interrelationships between materials, markets, society, communities and the environment. This involves investigating the impact that production, processing and use of various materials has on societies and the environment. Materials are examined in relation to their personal, social and environmental sustainability. Opportunity, cost, waste management and recycling are considered essential in assessing the environmental impact of projects. Green design principles and the whole life cycle of products are explored. These principles result in less pollution and waste and more efficient use of energy and materials. The potential environmental impact of the product is assessed. This includes efficiently using materials during production, accounting for the disposal of the product after production and minimising nuisances, such as noise, fumes, dust and accumulated waste materials.

Design

Design fundamentals and skills

A foundation of design knowledge is critical when developing projects. Concepts related to aesthetics, human factors and consumer markets are covered. Aesthetics include elements of line, shape, form, texture, colour and tone, and principles of contrast, proportion and balance. Sources of inspiration can come from different cultural contexts, historical aspects of design, and different design styles. These influences are considered when design concepts are being developed.

The process of designing consists of a number of skills. These include research and investigation, ongoing evaluation, generation of ideas, communicating design, modelling and testing ideas and developing skills of innovation and enterprise.

Inquiry into problems, the identification of opportunities and the analysis of solutions require a range of investigation techniques. Investigating markets, taking into account user needs and requirements and environmental and social issues, are aspects of enterprising approaches. Research into materials also contributes to design decisions.

The course incorporates cognitive and creative skills that are used in generating ideas and developing solutions, such as rapid concept development, brainstorming, and collaborative designing.

Communication is an integral part of the thinking process as well as a means for sharing ideas with others. Information and communication technology is developed through the units by using different forms of computer technology to develop and communicate design ideas and solutions. The course covers graphical, oral, textual and mathematical communication skills. Skills in the graphic representation of design thinking using a range of manual and/or computer-generated techniques are developed to specific standards. Effective communication and documentation of design intentions and development through to the final outcome is important.

Use of technology

Skills and techniques

The course looks at technologies within a studio or workshop environment. This includes the reading and interpretation of plans, patterns, drawings and material specifications and the measurement and calculation of quantities. Different skills and techniques of information and communication technology are developed at the different stages of study. Materials are used to realise designs.

Skills and techniques are required for the manipulation of materials and project manufacture appropriate to their purpose. There is a relationship between the material and the processing techniques used. Techniques and skills may include forming, fabricating, cutting, joining, shaping, machine operations, constructing, embellishing, finishing and some computer numerically controlled processes (CNC). Skills and techniques are progressively extended through the different units.

Safety

Knowledge and information related to working safely is critical in any technology context. It is important to exercise a duty of care and to operate in a safe and responsible manner, including the application of occupational safety and health legislation and codes of practice. There are safety issues related to the handling and manipulation of materials, for example, safety data information, materials handling and

storage practice, and specific tool and machinery operation safety requirements. Risks have to be identified, assessed and managed.

Production management

Various skills are required to successfully manage the production process. Performance must be evaluated throughout. Environmental factors, including management and reduction of waste and energy efficiencies, must be considered. Project management of time, task and materials management, as well as task modification and record keeping, are employed throughout the production process. Therefore, management skills, principles of quality assurance, ongoing evaluation, and testing are all important factors in ensuring quality outcomes. Communication skills are also important. Working collaboratively with team members, maintaining work schedules and time plans and producing various oral and written communications are all important aspects of the production process.

Representation of the general capabilities

The general capabilities encompass the knowledge, skills, behaviours and dispositions that will assist students to live and work successfully in the twenty-first century. Teachers may find opportunities to incorporate the capabilities into the teaching and learning program for the Materials Design and Technology General course. The general capabilities are not assessed unless they are identified within the specified unit content.

Literacy

Literacy is of fundamental importance in the study of the Materials Design and Technology General course. Students will access design, materials and technological content through a variety of print, oral, visual, spatial and electronic forms, including data books, texts, computer software, images, and written technical materials. They learn to investigate, interpret, and apply design and technology principles from a variety of sources to design solutions for tasks. They analyse and evaluate information for reliability, relevance and accuracy. They learn to monitor their own language use for accuracy in the use of design principles, and technological terms for clarity of ideas, processes and explanations of design activities and development and evaluation of functioning products.

Numeracy

Numeracy is fundamental in calculating materials quantities and evaluating design and technology process costs. Students develop their understanding and skills of numeracy while undertaking tasks to produce, test and evaluate products. Common and context specific theory continues to be studied to forge greater understanding of the scientific, mathematical and technical concepts that explain how designed products function.

Information and communication technology capability

Information and communication technology capability is important in all stages of the design process. Students use digital tools and strategies to locate, access, process and analyse information. They use ICT skills and understandings to investigate and devise design ideas. Students access information from websites and software programs to develop design solutions. Students use computer aided drawing software and computer control software to produce products.

Critical and creative thinking

Critical and creative thinking is integral to the design process. The design thinking methodologies are fundamental to the Materials Design and Technology General course. Students develop understandings and skills in critical and creative thinking during periods of evaluation at various stages of the design process. They devise plausible solutions to problems and then, through interrogation, critically assess the performance of the most efficient solution. Students identify possible weaknesses in their design solutions then analyse, evaluate and modify the developing solution to construct a functioning prototype.

Personal and social capability

Personal and social capability skills are developed and practiced in the Materials Design and Technology General course by students enhancing their communication skills and participating in teamwork. Students have opportunities to work collaboratively during stages of investigation and production of products that have an affect on society. Students develop increasing social awareness through the study of the impact of the use of materials and manufacturing technology, on society and on the environment.

Ethical understanding

Students have opportunities to explore and understand the diverse perspectives and circumstances that shape design processes and technology, and the actions and possible motivations of people in the past compared with those of today. Students have opportunities, both independently and collaboratively, to explore the values, beliefs and principles that have influenced past designs and technological achievements and the ethical decisions required by global design processes of today.

Intercultural understanding

Students have opportunities to explore the different beliefs and values of a range of cultural groups and develop an appreciation of cultural diversity. Students have opportunities to develop an understanding of different contemporary perspectives with regard to design inspiration, product styles, building materials, energy supply and use, and design and technological influences on different groups within society, and how they contribute to individual and group actions in the contemporary world.

Representation of the cross-curriculum priorities

The cross-curriculum priorities address contemporary issues which students face in a globalised world. Teachers may find opportunities to incorporate the priorities into the teaching and learning program for the Materials Design and Technology General course. The cross-curriculum priorities are not assessed unless they are identified within the specified unit content.

Aboriginal and Torres Strait Islander histories and cultures

Students have opportunities to explore Aboriginal and Torres Strait Islander development and use of technology, and the interconnectedness between technologies and identity, People, Culture and Country/Place. Students explore ways in which materials have been used over time and the methods used to manipulate those materials.

Asia and Australia's engagement with Asia

Students have opportunities to explore traditional, contemporary and emerging technological achievements in the countries of the Asian region. Students explore Australia's rich and ongoing engagement with the peoples and countries of Asia to create appropriate products and services to meet personal, community, national, regional and global needs.

Sustainability

Students take action to create more sustainable patterns of living. Students can develop knowledge, understanding and skills necessary to design for effective sustainability.

Students focus on the knowledge, understanding and skills necessary to choose technologies and systems with regard to costs and benefits. They evaluate the extent to which the process and designed solutions embrace sustainability. Students reflect on past and current practices, and assess new and emerging technologies from a sustainability perspective.

Unit 1

Unit description

Students interact with a variety of items that have been specifically designed to meet certain needs. Students are introduced to the fundamentals of design. They learn to communicate various aspects of the technology process by constructing what they design.

Throughout the process, students learn about the origins, classifications, properties and suitability for purpose of the materials they are using, and are introduced to a range of production equipment and techniques. They develop materials manipulation skills and production management strategies, and are given the opportunity to realise their design ideas through the production of their design project.

Defined contexts

Three different contexts have been defined in this course:

- Metal
- Textiles
- Wood.

Students can enrol in more than one context in this course.

Students will study the unit common content and the content of their chosen defined context.

Unit content

This unit includes the knowledge, understandings and skills described below.

Common content

Design

Design fundamentals and skills

- investigate
  - needs, values and beliefs of the client or other end user
  - sources of design inspiration
  - existing ideas and products
  - design fundamentals
    - aesthetics
    - function
    - safety
    - cost
- devise
  - using communication and documentation techniques
    - sketching
    - annotation

  - elements of design
    - line
    - shape
    - form
    - texture
    - colour
    - tone
  - rapid concept development techniques
  - reviewing design ideas against design brief
  - annotated graphics and sketches with appropriate measurements or dimensions applicable to context
  - production planning
    - full materials list
    - full materials costing
    - production plan, including time line

- evaluate
  - design ideas when investigating and devising
  - finished product against the initial design and student generated criteria

Use of technology

Skills and techniques

- ICT, portfolio development and communication skills
  - photography – ongoing record of progress and processes used and final product
  - documenting presentations and evaluations
- context appropriate drawings and relevant technical information to produce the final product to demonstrate
  - sketching rapid concept developments
  - 3D presentation drawings
  - rendering techniques
  - 2D working drawings or using templates
  - inspiration/concept or storyboard development and presentation
  - design and making specification sheets
- workroom/studio terminology appropriate to context
- select appropriate materials and calculate the quantities of materials required to complete the project
- with supervision, operate machinery and tools appropriate to context

Safety

- correct use of personal protective equipment (PPE) where applicable
- occupational safety and health (OSH) practices appropriate to tasks being undertaken in workshops

Production management

- production plan
  - maintain a production plan
  - maintain time management while using tools, equipment and machinery to complete production
    - follow instructions from plans
    - maintain safety requirements
  - record changes to materials lists or costing
  - record regular journal/diary entries
- ongoing evaluation techniques: diary, journal or portfolio notes and use of photography to record ongoing progress/decision changes made to the project

Metal context content

Materials

Nature and properties of materials

- identification of origins of common ferrous and non-ferrous metals
- classification of the properties of common ferrous and non-ferrous metals by weld properties and workability
- identification of common metal sections
  - wire
  - rod
  - flat
  - square
  - hexagonal
  - octagonal bar
  - sheet
  - plate
  - round tube
  - square tube
  - rectangular hollow section
  - angle
- identification of common associated materials used with metal
  - abrasives
  - permanent and non-permanent fixings
  - adhesives
- identification of different metal finishes from the following range of finishes
  - painted
  - galvanised
  - plastic or powder coatings
  - lacquer

Materials in context

- examples of the broad areas of use for tubular metals
- impacts of the disposal of finishes, lubricants and other waste products
- identification of environmental considerations
  - 3 Rs – reduce, re-use, recycle
  - ways to reduce waste
  - ways to re-use and recycle

Use of technology

Skills and techniques

- read and correctly interpret plans/patterns/templates
- use appropriate conventions and workroom terminology
- select and apply appropriate and accurate marking out tools and techniques
- apply skills in using a range of tools for sheet metal fabrication
- apply skills in using a range of tools and machinery, including safe machine operation
- correct use of machine speeds and cutting fluids
- cutting patterns or shapes using gas or electric cutting equipment
- perform cold and hot forming of metal shapes
- use permanent joining and non-permanent fixing of metals
- use fixed or hand held grinding tools
- apply different metal finishes
- demonstrate workshop clean up procedures

Textiles context content

Materials

Nature and properties of materials

- fibre types and classification
  - natural fibres
    - cellulosic – cotton, linen
    - protein – wool, silk
  - manufactured fibres
    - regenerated – rayon
    - synthetic – polyester
- fabric structures
  - woven – warp, weft, selvedge
  - knitted – course, wale
  - non-woven
- processes required to convert fibre to yarn to fabric
- aesthetic and functional properties of textiles used
- select fabrics for particular end-uses considering aesthetic and functional properties

Materials in context

- textiles and their uses
  - apparel
  - furnishings
  - costumes
  - textiles arts
  - non-apparel items
- identification of environmental considerations
  - 3 Rs – reduce, re-use, recycle
  - ways to reduce waste
  - ways to re-use and recycle

Use of technology

Skills and techniques

- use drawing skills
  - sketching
  - fashion drawing using templates
- demonstrate pattern skills
  - use a commercial pattern
  - take basic body measurements
  - design and wearing ease
  - select pattern using body measurements
  - identify pattern parts
  - pattern layout
  - cutting out
  - transfer of pattern markings
  - adapt pattern, lengthen, shorten
- demonstrate sewing machine skills
  - threading
  - straight stitch
  - zig zag
  - changing machine feet
  - changing machine needle
- demonstrate overlocker skills, use overlocker for neatening
- demonstrate construction techniques
  - joining – french seam, flat seam, knit seam
  - shaping – double dart, pleating
  - closures – lapped zipper, invisible zipper, button and buttonhole
  - finishing – rolled hem, hand stitched blind hem
  - pressing
  - embellishment and decorative techniques as appropriate
  - demonstrate workshop/studio clean up procedures

Wood Context Content

Materials

Nature and properties of materials

- origins of common softwoods and hardwoods
- classification of hardwoods, softwoods and manufactured boards using the characteristics of hardness, colour and workability
- difference between rough sawn and DAR timbers
- identification of common timber sizes, lengths, widths and thicknesses, sheet sizes
- identification of the structure and basic parts of a tree
  - cambium layer
  - sapwood
  - heartwood
  - growth rings
  - medullary rays
  - pith
  - bark
- identification of common timber finishes

Materials in context

- broad areas of use for hard and soft woods
- identification of environmental considerations
  - 3 Rs – reduce, re-use, recycle
  - ways to reduce waste
  - ways to re-use and recycle

Use of technology

Skills and techniques

- read and correctly interpret and/or modify plans/patterns/templates
- use appropriate workroom terminology
- select and safely apply technical skills using a range of tools and machinery that could include, but not limited to:
  - radial arm saw or drop saw or compound mitre saw
  - sanding machines
  - portable or fixed routers
  - various grinders
  - carving tools
  - wood lathe
  - biscuit cutter
  - portable saws
  - drill press

- identify and differentiate between PVA, two pack epoxy, contact cement adhesives
- use hand tools and/or machines to fabricate at least one of the following joints:
  - widening joint
  - finger joint
  - cross-halving joint
  - dovetail joint
  - housing joint
  - mortise and tenon
  - bridle joint
  - biscuit joint
- differentiate between water-based, turpentine (oil) based, solvent-based and two pack epoxy finishes, including stains and waxes
- apply multiple coats of a finish by brush, cloth and/or spray gun followed by correct clean up procedures
- demonstrate workshop clean up procedures

Unit 2

Unit description

Students interact with products designed for a specific market. They use a range of techniques to gather information about existing products and apply the fundamentals of design. Students learn to conceptualise and communicate their ideas and various aspects of the design process within the context of constructing what they design.

Throughout the process, students learn about the origins, classifications, properties and suitability for end use of materials they are working with. Students are introduced to a range of technology skills and are encouraged to generate ideas and realise them through the production of their design projects. They work within a defined environment and learn to use a variety of relevant technologies safely and effectively.

Students, in consultation with teachers, select projects of interest and then design and make products suitable for a specific market.

Defined contexts

Three different contexts have been defined in this course:

- Metal
- Textiles
- Wood.

Students can enrol in more than one context in this course.

Students will study the unit common content and the content of their chosen defined context.

Unit content

This unit builds on the content covered in Unit 1.

This unit includes the knowledge, understandings and skills described below.

Common content

Design

Design fundamentals and skills

- investigate
  - needs, values and beliefs of the designer/developer
  - design fundamentals
    - aesthetics – appearance, form
    - function – purpose, use
    - safety – safe design concepts
    - cost – comparison with commercial products
  - similar and alternate existing ideas and products using a variety of sources:
    - sources of design inspiration – aesthetic and functional features
    - performance criteria related to aesthetics and function

- devise
  - communication and documentation techniques
    - sketching
    - annotating
  - ICT or manual presentation skills to create solutions incorporating:
    - elements of design – line, shape, form, texture, colour, tone
    - rapid concept development techniques
  - review of design ideas against design brief and performance criteria
  - design solution, using annotated hand drawings or computer generated drawings with measurements or dimensions applicable to context
  - production planning:
    - full materials list
    - full materials costing
    - production plan, including time line
- evaluate
  - production plan, journal or diary with supporting images
  - finished product against the design brief, initial design and student-generated performance criteria

Use of technology

Skills and techniques

- ICT, portfolio development and communication skills
  - photography – ongoing record of progress and processes used and final product
  - documenting presentations and evaluations
- develop context appropriate drawings and relevant technical information to produce the final product:
  - sketching rapid concept developments
  - 2D working drawings or using templates
  - inspiration/concept or storyboard development and presentation
- use workroom/studio terminology appropriate to context
- select appropriate materials and calculate the correct amount required to order and purchase materials to complete the project
- operate machinery and tools appropriate to context

Safety

- correct use of personal protective equipment (PPE) where applicable
- conduct risk assessment for using specific tools/machinery
- demonstrate occupational safety and health practices appropriate to tasks being undertaken in workshops
- apply risk management strategies in the workshop/studio
- recognise need and purpose of MSD (materials safety data) with regard to storage and handling of hazardous substances and hazardous operations appropriate to situation

Production management

- production plan
  - maintain a production plan
  - maintain time management while using tools, equipment and machinery to complete production
    - adhere to sequential instructions
    - apply safety and risk management
  - record changes to materials lists or costing
  - record regular journal/diary entries
- use ongoing evaluation techniques: diary, journal or portfolio notes and use of photography to record ongoing progress/decision changes made to the project

Metal context content

Materials

Nature and properties of materials

- origins of metal alloys
- production processes for making alloys
- uses of common alloys
- identification of common metal sizes, thicknesses and sections
  - bar
  - tube
  - sheet
- identification of common associated materials used with metal
  - abrasives
  - permanent and non-permanent fixings
  - adhesives
  - finishes

Materials in context

- impact of materials production processes on the workshop and the local environment; metal waste management, fumes, noise

Use of technology

Skills and techniques

- correctly interpret and/or modify plans/patterns/templates
- use appropriate conventions and workshop terminology
- calculate orders and costing for solid materials and/or sheet materials
- apply appropriate and accurate marking out techniques
- apply skills in using a range of tools and machinery
- apply techniques for cutting external and internal threads

- apply correct processes to apply metal finishes from the following range of finishes:
  - painted
  - oiling
  - plastic or powder coatings
  - lacquer
  - electroplating
  - anodising
  - enamelling

Textiles context content

Materials

Nature and properties of materials

- fibre types and classification
  - natural fibres
    - cellulosic – cotton, linen
    - protein – wool, silk
  - manufactured fibres
    - regenerated – rayon, acetate
    - synthetic – polyester, nylon
- identify the following for one synthetic fibre – polyester, nylon or acrylic
  - classification
  - origin
  - fabrics and fabric blends
  - environmental impacts of manufacture
  - care
- fabric structures
  - woven – warp, weft, selvedge
  - knitted – course, wale
  - non-woven – felt, web
- fabric types and classifications
  - woven – plain, satin, twill
  - knit – warp, weft
  - non-woven – felt, interfacings
- fabric manufacturing from fibre to yarn to fabric
  - manufacturing techniques
  - costs
- identification of aesthetic properties of the textiles used
  - colour
  - handle
  - drape

- identification of functional properties of the textiles used
  - comfort
  - laundering

Materials in context

- product life cycle and the impact of disposal of textile products, and waste management on the local environment

Use of technology

Skills and techniques

- demonstrate drawing skills
  - sketching – rapid concept development
  - 2D and 3D fashion drawing using templates
- demonstrate pattern skills
  - use a commercial pattern
  - take basic body measurements
  - design and wearing ease
  - select pattern using body measurements
  - identify pattern parts
  - pattern layout
  - cutting out
  - transfer pattern markings
  - adapt pattern, lengthen, shorten
- demonstrate sewing machine skills
  - threading
  - straight stitch
  - zig zag
  - changing machine feet
  - changing machine needle
- demonstrate overlocker skills, use overlocker for neatening
- demonstrate construction techniques
  - joining – french seam, flat seam, knit seams
  - shaping – double dart, pleating
  - closures – lapped zipper, invisible zipper, button and buttonhole
  - finishing – rolled hem, hand stitch blind hem
  - pressing
  - embellishment and decorative techniques as appropriate

Wood context content

Materials

Nature and properties of materials

- origins of manufactured boards
- production process for manufactured boards
- uses of plywood and different fibreboards
- identification of characteristics of plywood and fibreboards
- the association between hardness, workability and structure
- identification of common associated materials used with wood
  - adhesives
  - permanent and non-permanent fixings
  - abrasives
  - fillers and finishes

Materials in context

- condition of materials recovered through different methods of recycling
- impact of materials production processes on the workshop and the local environment, waste management, dust, fumes, noise

Use of technology

Skills and techniques

- correctly interpret and/or modify plans/patterns/templates
- use appropriate conventions and workshop terminology
- select appropriate materials and calculate the correct amount required for completion of project
- calculate orders and costing for solid timbers and/or sheet materials
- apply appropriate and accurate marking out techniques
- demonstrate correct and safe procedures for setting up and/or operating selected power tools and machinery that could include:
  - radial arm saw or drop saw or compound mitre saw
  - sanding machines
  - portable or fixed routers and table
  - various grinders
  - carving tools
  - wood lathe
  - biscuit cutter
  - bandsaw
  - pneumatic tools
  - portable saws
  - drill press
  - mortise machine

- identification of the main reasons for blades becoming blunt or breaking
- select and use appropriate adhesives
- select and use appropriate finishes
- apply multiple coats of a finish by spray gun, including appropriate clean-up of equipment

School-based assessment

The Western Australian Certificate of Education (WACE) Manual contains essential information on principles, policies and procedures for school-based assessment that needs to be read in conjunction with this syllabus.

Teachers design school-based assessment tasks to meet the needs of students. The table below provides details of the assessment types for the Materials Design and Technology General Year 11 syllabus and the weighting for each assessment type.

Assessment table – Year 11

Type of assessment	Weighting
Design Students apply a design process to develop a product or project. Students are assessed on how they: • investigate products or projects • devise, develop and modify design solutions throughout the technology process • present their findings in written, oral or multimedia form. Types of evidence can include: images, observation checklists, evaluation tools (self or peer), journal, design proposal and project proposal, using a range of communication strategies.	25%
Production Extended and manufacturing project(s) where students control, evaluate and manage processes. Students are assessed on their: • understanding, confidence and competence when using skills in manufacturing processes and when managing production plans • manufactured product in terms of quality and finish. Types of evidence can include: manufactured products, journal, observation checklists and evaluation tools (self or peer) and on-balance judgements.	60%
Response Students apply their knowledge and skills in responding to a series of stimuli or prompts in the following formats: examinations, essays, oral responses, ICT visual responses and product evaluation reports.	15%

Teachers are required to use the assessment table to develop an assessment outline for the pair of units (or for a single unit where only one is being studied).

The assessment outline must:

- include a set of assessment tasks
- include a general description of each task
- indicate the unit content to be assessed
- indicate a weighting for each task and each assessment type
- include the approximate timing of each task (for example, the week the task is conducted, or the issue and submission dates for an extended task).

In the assessment outline for the pair of units, each assessment type must be included at least twice. In the assessment outline where a single unit is being studied, each assessment type must be included at least once.

The set of assessment tasks must provide a representative sampling of the content for Unit 1 and Unit 2.

Assessment tasks not administered under test/controlled conditions require appropriate validation/authentication processes.

Grading

Schools report student achievement in terms of the following grades:

Grade	Interpretation
A	Excellent achievement
B	High achievement
C	Satisfactory achievement
D	Limited achievement
E	Very low achievement

The teacher prepares a ranked list and assigns the student a grade for the pair of units (or for a unit where only one unit is being studied). The grade is based on the student's overall performance as judged by reference to a set of pre-determined standards. These standards are defined by grade descriptions and annotated work samples. The grade descriptions for the Materials Design and Technology General Year 11 syllabus are provided in Appendix 1. They can also be accessed, together with annotated work samples, through the Guide to Grades link on the course page of the Authority website at www.scsa.wa.edu.au

To be assigned a grade, a student must have had the opportunity to complete the education program, including the assessment program (unless the school accepts that there are exceptional and justifiable circumstances).

Refer to the WACE Manual for further information about the use of a ranked list in the process of assigning grades.

Appendix 1 – Grade descriptions Year 11

A	**Design** Independently uses a clearly identifiable design process to generate and devise original ideas and develop solutions for others. Develops documentation which displays clear design progression, using concept sketches that are annotated with appropriate terminology and show the development of several ideas. Includes evidence of investigation into, and explanation of, design fundamentals: aesthetics, function, safety and cost. Presents a portfolio which contains fully-developed, dimensioned working drawings, including the use of 2D and 3D, where applicable in context, and a justification of materials selection against design elements. Provides a clear and detailed sequence of manufacture, and a detailed evaluation of design process and the end product against the requirements of the design criteria.
	Production Independently implements a detailed production plan and uses correct operational procedures to manufacture a product. Provides documentary evidence of ongoing evaluation of processes, and changes and/or modifications implemented resulting from this evaluation. Achieves an excellent standard of finish in the manufacture of the product. Efficiently manages time and the working environment. Independently uses tools and equipment with concern for the safety of self and others.
	Response Clearly and concisely presents referenced research information using appropriate terminology and a variety of suitable formats, including text, diagrams and images. Comprehensively details the impact of task design decisions and materials on society and the environment, including justified conclusions and personal interpretations. Comprehensively details the effects of processing and manufacturing on the properties of materials, including justified conclusions and personal interpretations. Identifies a range of common materials and their properties and gives examples of practical applications in context.

B	**Design** Uses a clearly identifiable design process but requires guidance to generate and devise individual ideas and develop solutions for others. Develops documentation which displays clear design progression. Prepares concept sketches that are annotated with suitable terminology, and which consider and compare several ideas. Provides evidence of investigation into design fundamentals: aesthetics, function, safety and cost. Portfolio contains fully developed, dimensioned working drawings, including the use of 2D and 3D, where applicable in context. Provides an explanation of the suitability of materials selected against the design elements, a sequence of manufacture and an evaluation of project process and the end product against the requirements of the design criteria.
	Production Implements a production plan and uses correct operational procedures to manufacture a product. Provides evidence of ongoing evaluation of processes and, with assistance, implements changes and modifications derived from this evaluation. Achieves a high standard of finish in the manufacture of the product. Requires occasional direction with time management and manufacturing processes. Uses tools and equipment with concern for the safety of self and others.

	Response Uses appropriate terminology in the presentation of research information and data, including text, diagrams and images. Includes references for some sources. Outlines some issues of materials in context and effects on society and the environment. Outlines some effects of processing and manufacturing on the properties of materials. Identifies some common materials, their practical uses and properties.

C	**Design** Applies an identifiable design process with guidance, and with some assistance generates and devises ideas to develop solutions with consideration for others. Shows limited evidence of investigation into design fundamentals: aesthetics, function, safety and cost. Develops documentation which displays some design progression, using concept sketches that are partially annotated with common technical terms, and which show the development of one idea. Presents a portfolio which contains working drawings, including the use of 2D and 3D, where applicable in context, a list of materials chosen, an assisted ongoing evaluation of a simple sequence of manufacture, and an evaluation of the final product.
	Production Implements production plans, but requires guidance in the use of correct operational procedures and equipment to manufacture a product. Provides evidence of ongoing evaluation of processes. Requires guidance and assistance to implement changes and modifications derived from this evaluation. Achieves a satisfactory standard of finish in the manufacture of the product. Requires regular direction with time management and manufacturing techniques. With assistance, uses tools and equipment with concern for the safety of self and others.
	Response Uses technical language and terminology in the presentation of research information with relevant data supported by unclear statements. Includes pictures, tables and photographs with little evidence of referencing. Identifies some common materials and lists a number of uses. Describes some processing and manufacturing of materials, identifies some properties of materials and describes general effects of materials on society and the environment.

D	**Design** Uses a highly-scaffolded question and answer design process, generates and devises ideas, and develops a partial solution. Documentation displays limited design progression for one idea, with limited use of concept sketches. Very little evidence of investigation into design fundamentals: aesthetics, function, safety and cost. Sketches have very few annotations with little use of common technical terms. Includes/develops working drawings which are poorly dimensioned and detailed or incomplete. With assistance, includes a list of materials against the design elements and a simple sequence of manufacture.
	Production Requires guidance to implement a highly-scaffolded set of plans, and regular direction to use equipment and correct operational procedures to manufacture a product. Provides no documentary evidence of ongoing evaluation of processes. Requires guidance and direction to implement given changes and modifications. Achieves a poor standard of finish in the manufactured of the product. Requires supervision with time management and assistance to use tools and equipment. Shows some concern for the safety of self and others.
	Response Uses basic technical language and terminology in the presentation of limited, unreferenced research information. Lists some common materials and uses in context. Describes some processing and manufacturing techniques, but is unclear about how these may affect the properties of the materials, and the effects on society and the environment. Presents some understanding of sustainability through unclear generalisations.

E	Does not meet the requirements of a D grade and/or has completed insufficient assessment tasks to be assigned a higher grade.