



# **Materials Design and Technology**

## **General Course Year 12**

### **Selected Unit 3 syllabus content for the**

### **Externally set task 2017**

This document is an extract from the *Materials Design and Technology General Course Year 12 syllabus*, featuring all of the content for Unit 3. The content that has been highlighted in the document is the content on which the Externally set task (EST) for 2017 will be based.

All students enrolled in the course are required to complete an EST. The EST is an assessment task which is set by the Authority and distributed to schools for administering to students. The EST will be administered in schools during Term 2, 2017 under standard test conditions. The EST will take 50 minutes.

The EST will be marked by teachers in each school using a marking key provided by the Authority. The EST is included in the assessment table in the syllabus as a separate assessment type with a weighting of 15% for the pair of units.

# Unit 3

## Unit description

Students develop an understanding of the elements and fundamentals of design and consider human factors involved in the design, production and use of their projects. They develop creative thinking strategies and work on design projects within specified constraints. Students learn about the classification and properties of a variety of materials and make appropriate materials selection for design needs.

Students learn about manufacturing and production skills and techniques. They develop the skills and techniques appropriate to the materials being used and gain practice in planning and managing processes through the production of design project. They learn about risk management and ongoing evaluation processes.

## 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

An understanding of the year 11 content is assumed knowledge for students in year 12. It is recommended that students studying Unit 3 and Unit 4 have completed Unit 1 and Unit 2.

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

### Common content

#### Design

##### Design fundamentals and skills

- investigate
  - designs in practice
  - needs, values and beliefs of the designer/developer
  - sources of design inspiration
  - performance criteria for products
  - application of design fundamentals and factors affecting design
    - aesthetics
    - function
    - cost
    - measurements
    - environmental impact and considerations
    - safety

- **devise**
  - using communication and documentation techniques
    - sketching and drawing
    - rendering
    - annotating
  - understanding the elements and principles of design where applicable in context
    - line
    - shape
    - form
    - texture
    - contrast
    - proportion
    - balance
    - colour
  - rapid concept development techniques to generate design ideas and concepts
  - final design concept using design brief and performance criteria
  - review of best idea using design brief and performance criteria
  - **design solution**
    - develop best concept using annotated hand or computer generated graphics (front, back views and detailed sketches as necessary)
    - **2D illustrations (working/technical drawings)**
    - **3D illustration (presentation drawings)**
    - inspiration/concept/storyboard
  - production plans
    - materials list
    - costing for all materials components
    - time line for stages of production
- evaluate
  - final product against design brief, initial design and performance criteria related to needs, values and beliefs of the end user

## 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 drawing 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
- 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
- apply risk management strategies in the workshop/studio
- assess the condition of tools and machinery

## Production management

- production planning
  - 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

- investigate metals
  - ferrous
    - functional differences between low, medium, high carbon steels, cast iron, cast steel
- metal structure
  - physical characteristics of mild steel
- metal alloy types and classifications
  - ferrous – steel, cast iron
  - non-ferrous – aluminium alloys, copper alloys, nickel alloys
- identification of the different common cross sections and sizes of metals from the following list
  - wire
  - rod
  - flat
  - square
  - hexagonal
  - octagonal bar
  - sheet
  - plate
  - round tube
  - square tube
  - rectangular hollow section
  - angle
- aesthetic properties
  - lustre
  - colour
  - texture

- **physical properties**

- ductility
- malleability
- hardness
- tensile strength
- density
- conductivity
- melting point

### **Materials in context**

- the uses and classification of the major metal types for:
  - furniture products
  - building and construction materials
  - consumer products
- the environmental impact of metals production
  - raw material extraction and processing – steel and aluminium
  - end-of-life of a product – recycling and safe disposal

### **Use of technology**

#### **Skills and techniques**

- select and apply appropriate and accurate marking out tools and techniques for measuring and marking out in sheet metal, bar and tube projects, that include the use of:
  - rule
  - square
  - scriber
  - centre punch
  - inside/outside callipers
  - combination squares
- select and safely apply technical skills using a range of tools and machinery, that could include:
  - hand tools for shaping
  - files and filing
  - hacksaws and blades
  - metal lathe
  - vice and clamps
  - hand tools for cutting
  - electric hand drill
  - drill press/pedestal drill
- apply methods of drilling different metals
  - preparations for drilling
  - drill speeds
  - lubricants for different metals
- select and apply appropriate methods of fixing metals together through permanent and non-permanent joining , that could include:
  - welding
  - types of nuts and bolts
  - riveting
  - screws
- name and operate a powered cutting machine or mechanical cutting device
- name and operate machines for folding and shaping metals
- apply correct methods of gas and electric metal welding
  - metal preparation
  - welding operations
  - set up
  - testing
- apply appropriate finishing techniques using brush or cloth and/or spray gun followed by correct clean up procedure

## 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
- investigation of natural fibres – cotton, wool, silk
  - fabrics and fabric blends
  - care
  - properties
- fabric structures
  - woven – warp, weft, selvedge
  - knitted – course, wale
  - non-woven – felt, web
- aesthetic properties
  - lustre
  - drape
  - handle
- physical properties
  - durability
  - strength
  - abrasion resistance
  - resilience
  - elasticity
  - dimensional stability
  - shrink resistance
- chemical properties
  - absorbency
  - thermal properties
  - flammability
  - sun resistance
  - colourfastness

#### Materials in context

- specific textiles and their uses
  - apparel
  - furnishings
  - costumes
  - textile arts
  - non-apparel items
- environmental impact of the textile industry
  - growing, extraction and processing – cotton and wool
  - end-of-life of a product – recycling and safe disposal

## Use of technology

### Skills and techniques

- ICT skills related to design development and presentation
- demonstrate drawing skills
  - sketching – rapid concept development
  - 3D presentation drawings – using templates
  - 2D working drawings – using templates
  - inspiration/concept and storyboard
- apply pattern skills
  - use a commercial pattern
  - take basic body measurements
  - design and wearing ease
  - select pattern using body measurements
  - pattern parts
  - pattern layout
  - cutting out
  - transfer pattern markings
  - pattern adaptations as required
- identify the parts of:
  - sewing machine
  - overlocker
- demonstrate how to correctly operate and adjust:
  - sewing machine
  - overlocker
- demonstrate machine skills
  - threading
  - straight stitch
  - zig zag
  - changing machine feet
  - changing machine needle
  - use overlocker for neatening
- select and apply appropriate construction and pressing techniques
  - joining
  - shaping
  - closures
  - finishing
- select and apply fabric decoration, embellishment and manipulation techniques as required

## Wood Context Content

### Materials

#### Nature and properties of materials

- wood types and classification
  - natural wood
    - hardwood – jarrah, Australian oak
    - soft wood – radiata pine, Douglas fir
  - man-made board
    - plywood - interior, exterior, marine
    - medium density fibreboards – plain, veneered
    - particle board
- difference between rough sawn and DAR timbers
- identification of common timber sizes, lengths, widths and thicknesses
- physical properties
  - durability
  - strength
  - abrasion resistance
  - flexibility
  - dimensional stability
  - shrink resistance
- classification of adhesives for timber
  - PVA
  - epoxy
  - cyanoacrylate
  - latex/rubber based

#### Materials in context

- the uses and classification of the major timber types for:
  - furniture products
  - building and construction materials
  - consumer products
- the environmental impact of producing timber
  - growth/harvesting
  - milling/conversion
  - end-of-life of a product – recycling and safe disposal

#### Use of technology

#### Skills and techniques

- ICT skills related to design development and presentation
- demonstrate drawing skills
  - drawing, reading and interpreting plans/ patterns/templates
  - isometric and pictorial hand sketches for project development
  - dimensioned orthogonal drawing in 3<sup>rd</sup> angle for working drawing



- select and safely apply technical skills using a range of tools and machinery that could include:
  - bandsaw
  - biscuit joiner
  - drill press
  - domino joiner
  - various grinders or carving tools
  - table saw
  - sanding machines
  - mortise machine
  - portable or fixed routers
  - wood lathe
  - radial arm saw or drop saw or compound mitre saw
- use hand tools and/or machinery to fabricate at least two of the following joints
  - widening joint
  - housing joint
  - finger joint
  - mortise and tenon
  - cross-halving joint
  - bridle joint
  - dovetail joint
  - biscuit joint
- select and use the correct type and grade of abrasive paper
- prepare correctly a surface for finishing
- apply appropriate finishing techniques using brush or cloth and/or spray gun