



# **Materials Design and Technology (Metal)**

## **General Course**

### **Year 12**

## **Selected Unit 3 syllabus content for the Externally set task 2024**

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 2024 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, 2024 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

## 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
    - 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 – 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
- 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
  - using tools, equipment and machinery to complete production
    - follow instructions from plans
    - maintain safety requirements
  - record changes to materials lists or costing
- ongoing evaluation techniques: 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	▪ hexagonal	▪ round tube
▪ rod	▪ octagonal bar	▪ square tube
▪ flat	▪ sheet	▪ rectangular hollow section
▪ square	▪ plate	▪ angle
- aesthetic properties
  - lustre
  - colour
  - texture
- physical properties
 

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

### 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	▪ centre punch
▪ square	▪ inside/outside callipers
▪ scribe	▪ combination squares
- select and safely apply technical skills using a range of tools and machinery, that may include:
 

▪ hand tools for shaping	▪ vice and clamps
▪ files and filing	▪ hand tools for cutting
▪ hacksaws and blades	▪ electric hand drill
▪ metal lathe	▪ 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
  - riveting
  - types of nuts and bolts
  - 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 metal welding
  - metal preparation
  - set up
  - welding operations
  - testing
- apply appropriate finishing techniques using brush or cloth and/or spray gun followed by correct clean up procedure