



# Engineering Studies General Course Year 12

## Selected Unit 3 syllabus content for the

### Externally set task 2022

This document is an extract from the *Engineering Studies 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 2022 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, 2022 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

In the development of an engineering project, students study core engineering theory and theory in their chosen specialist area. They develop an understanding of the different forms of energy, uses of these different forms and sources of renewable and non-renewable energy. In this unit, students also develop a greater understanding of the engineering design process and learn and apply more complex theory and understanding to a student developed design brief. Given guidelines and a context, students develop and respond to the design brief through a process that requires them to investigate existing products, construction materials and components. Design ideas are developed through annotated sketches and concept drawings. Students select and analyse the most suitable concept for production as a prototype or working model.

Students finalise their chosen design by documenting its specifications in the form of appropriate orthographic drawings and lists of materials and components. They calculate the cost of the prototype or model. They follow a given timeline to undertake tasks required to produce, test and evaluate the product.

## 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.

It is divided into core content and specialist engineering fields. Students must study all of the core content material and at least one of the specialist engineering fields.

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

### Core content

#### Engineering design process

##### Investigating

- develop a design brief
- use research skills to identify existing solutions/products
- describe and analyse existing solutions/products
- research and describe materials and components relevant to the design brief
- consider forms of energy supplies

##### Devising

- annotated pictorial drawings of design ideas
- annotated orthographic drawings of design ideas
- the chosen option to be used as the solution

## Producing

- present specifications for the selected solution
  - dimensioned pictorial and orthographic drawings
  - orthographic drawings and sketches are 3<sup>rd</sup> angle projections and include
    - lines – outlines, hidden detail and centrelines
    - dimensioning – linear, radii, circles, holes through or partial depth with flat base
  - materials selected
  - parts lists
  - costing of prototype or working model
- develop and use a timeline to construct and test the solution
- solution construction by selecting and using appropriate tools and machines, and following safe work practices
- solution testing for correct function and document using checklists and test data

## Evaluating

- final solution in terms of:
  - meeting the requirements of the design brief
  - function and finish of the product
  - variations and changes to the design

## Materials

### Classify types of materials

- metals (pure)
  - aluminium
  - copper
  - zinc
  - iron
- alloys (ferrous)
  - steel
  - stainless steel
- alloys (non-ferrous)
  - brass
  - solder (lead/tin)
- polymers
  - polypropylene
  - polycarbonate
  - acrylic
  - ABS
  - nylon
- composites
  - concrete
  - reinforced concrete

## Fundamental engineering calculations

### Dimensional

- examine dimensioned drawings to determine:
  - overall length, height and width
  - direct and indirect dimensions: linear measurements, radii and diameters

### Perimeter

- square and rectangular plane figures
- right triangular plane figures
  - $\text{hypotenuse}^2 = \text{opposite}^2 + \text{adjacent}^2$
- circles
  - $p = \pi d$

### Surface area

- square and rectangular plane figures
- cubes and rectangular right prisms
- right triangular plane figures
- triangular right prisms
- circles
  - $A = \pi r^2$
- open ended cylinders
  - $A = \pi d h$

### Quantity estimates

- determine lengths and surface area of:
  - geometric shapes and forms
  - individual shapes
  - simple combinations of shapes and forms

## Engineering in society

### Energy

- define and describe relationships between:
  - energy
  - power
  - work
- define and compare forms of energy
  - kinetic
  - potential
  - thermal
  - chemical
  - electrical
  - electro-chemical

- electromagnetic (light)
- sound
- nuclear
- identification of non-renewable sources
  - fossil fuels: coal, gas and oil
  - nuclear
- identification of renewable sources
  - solar: thermal, biomass, photovoltaic and wind
  - solar/gravity: waves
  - gravity: tidal and hydroelectric
  - geothermal
- advantages and disadvantages of non-renewable and renewable sources