Stage 5 Industrial Technology	Focus area: Metal	Core module: General Metal 2

Unit 5: Candelabra **Suggested unit length:** 8 weeks	**Outcomes**
Description: Students are encouraged to operate within certain limitations to produce a unique design that satisfies their need. Skills utilised include time management, costing, developing work method statements, selection of materials, tools and techniques as well as preparing a report using suitable workplace communication skills. This project will include a folio that will incorporate the following aspects: • work method statements (WMS) • selection and use of resources • industry related terminology • OHS regulations • societal and environmental implications • design processes. The folio will be developed using appropriate workplace communication skills.	A student: 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 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 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 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 5.5.1 applies and transfers acquired knowledge and skills to subsequent learning experiences in a variety of contexts and projects 5.6.1 evaluates products in terms of functional, economic, aesthetic and environmental qualities and quality of construction 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
Resources Metal workshop Hand and power tools Scrolling jig or machine Sample candelabra designs Internet and other computer resources	 Metalwork textbooks Material as per cutting list CAD/ Drawing equipment Project drawing

Industrial Technology: General Metal 2 — Unit 5: Candelabra

Students learn about:	Students learn to:	Teaching strategies and tasks
OHS and risk management • identified hazards in the work environment • principles of risk management • clean and hygienic work practices	• safely use hand and power tools, materials, finishes and equipment • select and use personal protective equipment	• As a whole group activity conduct a safety audit to identify possible workshop hazards. In pairs investigate one hazard and prepare a report to be presented to the class. • Use textbook Schlyder, D. *Engineering* to highlight key elements of risk management. • Discussion on appropriate PPE for tasks undertaken. • Conduct routine maintenance on workshop.
Materials • the properties and applications of metals, e.g. ferrous, non-ferrous, coated sheet metals, tube, RHS etc • heat treatment of metals	• 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	• Practical project. • Demonstration of annealing copper and discussion on why it is done. • Discuss materials available for use in candelabra designs.
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	• use machine and portable power tools and equipment in the production of practical projects • produce internal and external screw threads	• Demonstrations during practical lessons. • Students manufacture of practical projects.

Industrial Technology: General Metal 2 — Unit 5: Candelabra

Students learn about:	Students learn to:	Teaching strategies and tasks
Techniques		
• measurement and sizing	• measure and mark out projects from a workshop drawing with accuracy and precision	• Demonstrations during practical lessons. • Students manufacture of practical projects.
• screw thread terminology and sizes	• calculate tapping hole sizes	
• power tools, machines and equipment used for cutting, turning, drilling, heating and joining	• use machine tools to cut materials to length • perform lathe machining operations including facing, drilling, parallel turning and taper turning	
• techniques and equipment used for the cutting, bending, forming and joining of sheet metals	• shape, form and join sheetmetals	
Links to industry		
• industrial techniques and processes	• identify alternative historical industrial technologies appropriate to the tasks and materials being used • relate industrial production techniques to work in the classroom	• Discuss during demonstrations how processes would be undertaken in industry, i.e. manufacturing of dishes using presses or the use of outsourcing. • Develop crossword using glossary of terms.
• the relationships between careers and industries in the metals area	• describe different careers within the metal industries and analyse the relationships between them	

Industrial Technology: General Metal 2 — Unit 5: Candelabra

Students learn about:	Students learn to:	Teaching strategies and tasks
Design		
• 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	• Generation of a comprehensive folio outlining the development of the design and production of the project. Including concept sketches, workshop drawings, cutting lists, work method statements, evaluations etc.
• 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	• Use spreadsheet to develop cutting and costing list. Integrate the use of formulas to calculate totals and create graphs to highlight cost distribution.

Industrial Technology: General Metal 2 — Unit 5: Candelabra

Students learn about:	Students learn to:	Teaching strategies and tasks
Workplace communication skills • working drawings • industry terminology • report writing (including the preparation of documentation to support the development and production of practical projects)	• interpret and produce engineering and pictorial drawings related to the development and production of practical projects • produce developments of sheet metal 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	• Use CAD software to develop workshop drawings. • Update list of industry terminology related to the project and add to glossary. • Generation of folio. • Develop freehand sketches of possible design solutions.
Societal and environmental impact • 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 • elementary computer numerically controlled (CNC) machining	• select and use detailing techniques in addition to, or further to, any of the detailing methods chosen in General Metal 1 • explain the use of CNC equipment and perform simple operations.	• Students market their individual work to the school community highlighting entrepreneurial activities.

Industrial Technology: General Metal 2 — Unit 5: Candelabra

Timing	Practical lessons	Theory lessons	Evidence
Week 1		• Introduction to project. • Internet searches for possible design ideas. • Show students sample products. • Discuss materials available for use in candelabra designs. • Students to produce a concept map of tools, techniques and materials that will influence the success of their design. • Begin idea generation and develop best idea in folio.	• Folio.
Week 2		• Create orthographic drawing using CAD or drawing tools of proposed project. • Use spreadsheet to develop cutting and costing list. Integrate the use of formulas to calculate totals and create graphs to highlight cost distribution. • Create work method statement for completion of project.	• Folio.
Week 3	• Students to start production of their project. • Teacher discussion or demonstration of processes as needed.		• Project development. • Folio.
Week 4	• Students to continue production of their project. • Teacher discussion or demonstration of processes as needed.	• As a whole group activity conduct a safety audit to identify possible workshop hazards. In pairs investigate one hazard and prepare a report to be presented to the class.	• Project development. • Folio.

Industrial Technology: General Metal 2 — Unit 5: Candelabra

Timing	Practical lessons	Theory lessons	Evidence
Week 5	• Demonstration of annealing copper and discussion on why it is done. • Discuss during demonstrations how processes would be undertaken in industry, i.e. manufacture of dishes using presses or the use of outsourcing. • Students to continue production of their project. • Teacher discussion or demonstration of processes as needed.	• Use textbook Schlyder, D. *Engineering* to highlight key elements of risk management and get students to summarise these in their folio.	• Project development. • Folio.
Week 6	• Students to continue production of their project. • Teacher discussion or demonstration of processes as needed.	• Present safety audit reports.	• Project development. • Presentation of reports.
Week 7	• Students to complete project and folio. • Students self and peer-evaluate projects.	• Update list of industry terminology related to the project and add to glossary.	• Project development. • Folio. • Evaluation sheets.
Week 8	• Display finished projects to school and wider community. • Maintenance of workshop facilities.	• Students market individual work to the school community highlighting entrepreneurial activities. • Develop crossword using glossary of terms.	• Project development. • Folio.