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

Unit 4: House number sign **Suggested unit length:** 8 weeks	**Outcomes**
Description: This project utilises the skills and knowledge gained using a variety of materials and techniques and allows the use of design skills to individualise the task. Students will investigate the properties of different materials and ascertain their suitability. 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 *Hazpak* worksheet Material samples Scrolling jig or machine Internet and other computer resources	Metalwork textbooks Assessment handout Material as per cutting list CAD/ Drawing equipment Project drawing

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	• Use *Hazpak* matrix to assess risks for the workshop equipment used for project. www.workcover.nsw.gov.au • Discussion on appropriate PPE for tasks undertaken. • Research hazards involved in blacksmithing/forging. This allows a variation in depth to suit student abilities.
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	• In pairs, brainstorm as many non-ferrous metals as possible. Share with the class and develop a class list. Using the text as a reference, create a table listing properties and uses of at least five (*Metalwork for Schools,* pp. 60–69). • Demonstration on the differences in materials. Various tests on a variety of materials, e.g. bending, shaping, tarnishing of mild steel, aluminium, copper, cast iron, acrylic. • Practical project.
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.

Students learn about:	Students learn to:	Teaching strategies and tasks
Techniques • measurement and sizing • screw thread terminology and sizes • power tools, machines and equipment used for cutting, turning, drilling, heating and joining • techniques and equipment used for the cutting, bending, forming and joining of sheet metals	• measure and mark out projects from a workshop drawing with accuracy and precision • calculate tapping hole sizes • use machine tools to cut materials to length • perform lathe machining operations including facing, drilling, parallel turning and taper turning • shape, form and join sheet metals	• Demonstrations during practical lessons. • Students manufacture of practical projects.
Links to industry • industrial techniques and processes • the relationships between careers and industries in the metals area	• identify alternative historical industrial technologies appropriate to the tasks and materials being used • relate industrial production techniques to work in the classroom • describe different careers within the metal industries and analyse the relationships between them	• Use the Internet, e.g. www.history.org/almanack/life/trades/tradebla.cfm to research techniques for forging metal. Compare and contrast techniques to highlight the differences between current and historical processes.

Students learn about:	Students learn to:	Teaching strategies and tasks
Design • design principles and processes • factors that impact on the design of metal products including: – material selection – shaping and forming processes – joining methods – finishing – hardware • material lists • project costing	• 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 • identify and consider design factors in the modification of projects • follow a planned construction sequence • follow material lists to prepare materials • calculate quantities and costs of materials to be used in the completion of projects • use spreadsheets to assist in the calculation of project costs	• Generation of a comprehensive folio outlining the development of the project, including cutting lists, work method statements, evaluations etc. • Use a spreadsheet to develop cutting and costing list. Integrate the use of formulas to calculate totals. • Generate work method statements for the project.
Workplace communication skills • working drawings • industry terminology • report writing (including the preparation of documentation to support the development and	• 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	• Use CAD software to develop workshop drawings. • Compile a list of industry terminology related to the project and create a glossary. • Generate folio. • Develop freehand sketches of possible design solutions.

Students learn about:	Students learn to:	Teaching strategies and tasks
production of practical projects)	equipment used	
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	• Highlight the impact of traditional blacksmithing and the use of fossil fuels on the environment. • Utilise the *Chemical safety in schools* package to highlight current regulations.
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.	

Industrial Technology: General Metal 2 — Unit 4: House number sign

Timing	Practical lessons	Theory lessons	Evidence
Week 1		• Introduction to project. • Hand out assessment coversheet and discuss requirements. • Class discussion to overview design process. • *Homework:* sketch three possible designs for sign. • Sketch modifications and develop orthographic workshop drawings utilising supplied drawings. • Create *criteria to evaluate success* and develop into a table. • Develop cutting and costing list using a spreadsheet. Integrate formulas to calculate totals.	• Sketches. • Commencement of folio.
Week 2		• Discuss and complete supplied work method statements (WMS). • Highlight risks and appropriate PPE identified in WMS. • Complete workshop drawings and cutting lists.	• Folio. • Appropriate drawing standards.
Week 3	• Demonstrate and then students measure, mark out, cut and file square, flat for frame. • Mark out, centre punch and drill 3.5 mm holes for solid rivets and 2.5 mm holes for hanger wire in frame. • Rivet frame together.		• Practical project.
Week 4	• Demonstrate and then students measure, mark out, cut and file square, flat for scroll. • Demonstrate scrolling using scroll winder or scrolling jig and discuss historical methods. • Mark out, centre punch and drill 3.5 mm holes for solid rivets in scroll. • Rivet scroll to frame.		• Practical project.

Industrial Technology: General Metal 2 — Unit 4: House number sign

Timing	Practical lessons	Theory lessons	Evidence
Week 5	• Fit hanger wire to frame. • Prepare surfaces and paint frame. • Measure, mark out and cut timber for backing plate.	• Use the Internet, e.g. www.history.org/almanack/life/trades/tradebla.cfm to research techniques for forging metal. Compare and contrast techniques to highlight the differences between current and historical processes. • Highlight the impact of traditional blacksmithing and the use of fossil fuels on the environment. • Research hazards involved in blacksmithing/forging.	• Appropriate research documented in folio.
Week 6	• Develop overlay for copper design using MS Word, CAD or similar. • Mark out and cut copper sheeting and finish edges. • Transfer design onto copper sheet. • Demonstrate repoussé techniques. • Demonstrate the use of various punches to raise design image on copper. • Students to complete their design.	• Demonstration on the differences in materials. Various tests on a variety of materials, e.g. bending, shaping, tarnishing of mild steel, aluminium, copper, cast iron, acrylic and timber. • In pairs, brainstorm as many non-ferrous metals as possible. Share with the class and develop a class list. Using the text as a reference, create a table listing properties and uses of at least five, *Metalwork for Schools,* pp. 60–69.	• Properties and uses table.
Week 7	• Clean up edges of copper and polish. • Mount to backing board using brass screws. • Apply appropriate sealant to backing board and copper, e.g. Wattyl *Incralac*. • Fit screw eyes to backing board.	• Use *Hazpak* matrix to identify the level of risk involved in using finishes such as Wattyl *Incralac* and paint. • Utilise *Chemical safety in schools* package to highlight current regulations.	• Completed project.
Week 8	• Fit backing board to frame. • Prepare project for presentation.	• Complete folio. • Brainstorm a list of industry terms used in this project and add to glossary of terms in folio.	• Folio. • Updated glossary of terms.