Stage 5 Industrial Technology	Focus area: Metal	Core module: General Metal 1

Unit 1: Tool carry all **Suggested unit length:** 10 weeks

Description: This introductory sheet metal project will allow students to gain an appreciation of the metal workshop facilities and associated OHS regulations. Students will be introduced to a range of hand and power tools, equipment, materials and techniques relevant to the light metal industries. Students, through the development of this project, will be introduced to the fundamentals of design and workplace communication.

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.

Outcomes

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

First aid guest speaker

Form and function sheet

Internet and other computer resources

Metalwork textbooks

Safe operating procedures (SOP) for drill and MagnaBend

Material as per cutting list

CAD/ Drawing equipment

Project drawing

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Students learn about:	Students learn to:	Teaching strategies and tasks
OHS and risk management • the safe use and handling of hand, power and machine tools • the use of personal protective equipment in the workshop • elementary first aid procedures	• safely use tools, materials and equipment • use personal protective equipment when working with materials, tools and machines	• Demonstrations. • Introduce and use safe operating procedure (SOP) for *MagnaBend*. • Brainstorm hazards in the workshop and identify PPE available. • First Aid guest speaker. • Discussion on reporting accidents.
Materials • the properties and applications of a range of metals including: – solid stock – sheet metals – tube – ferrous and non-ferrous metals	• use a range of metals in the production of practical projects • list the basic properties and common applications of metals	• Production of practical projects. • Westover, K. (1982) *Metalwork for High Schools 2*, Pitman, pp. 96–98 (or similar text). Review table *Metals in common use* and compile list in folio. • Discuss a range of materials that will be used over the duration of the course, e.g. flat, round, RHS, angle, sheet, plate, and coatings applied.
Equipment, tools and machines • a range of hand tools used for: – marking out – cutting and shaping – drilling – holding – joining • portable power tools and machines used for: – drilling – polishing – cutting	• adjust and use hand tools in the production of practical projects • use portable power tools and machines in the production of practical projects	• Demonstrations. • Production of practical projects.

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Students learn about:	Students learn to:	Teaching strategies and tasks
Techniques • measurement and sizing • a range of processes and techniques for preparing, cutting, joining and finishing metals	• measure and mark out materials from a project drawing • shape metals by cutting, filing and bending • use a variety of joining methods including: – fasteners and rivets – soft soldering • prepare and finish surfaces by polishing, buffing and/or painting	• Demonstrations. • Production of practical projects. • Theory reference: Westover, K. (1982) *Metalwork for Schools*, Pitman, pp. 79–90, *Joining sheet metals*. Use to create glossary of terms. • Discuss the need for folded edges and seams in sheet metal work.
Links to industry • industrial processes and production techniques • a range of career paths in the metal industries	• relate elementary industrial production techniques to work in the classroom • list career paths in the metal industries	• Discuss during demonstrations how processes would be undertaken in industry, i.e. hydraulic guillotines. • If time permits conduct excursion to local engineering workshop.
Design • functional and aesthetic aspects of design • design principles and processes • material lists • project costing	• identify the functional and aesthetic aspects of design in metal, including material selection, edge treatments and service requirements • apply principles of design in the modification of projects • evaluate work practices and practical projects in terms of quality • read and interpret material lists • estimate quantities of materials to be used in practical projects	• Production of folio. • Use form and function sheet to revise functional and aesthetic aspects of projects. • Revise and build on the design process learnt in Stage 4 Technology (Mandatory). • Use student self-evaluation assessment sheet to evaluate progress. • Development of cutting lists etc in folio.

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Students learn about:	Students learn to:	Teaching strategies and tasks
Workplace communication skills • workplace signage • pictorial and working drawings • industry terminology • text types to support the documentation of practical projects and processes including: – procedure – factual recount • a range of computer software applications to assist in the planning, production and reporting of practical projects	• respond to OHS signage • read and interpret simple workshop and pictorial drawings • make freehand sketches of workshop items and/or projects • define specialist terms and produce a glossary • prepare reports to describe processes undertaken in the development and production of practical projects • prepare reports using appropriate software and hardware, e.g. word processing	• Discuss common workplace signage. • In teams of four students develop a safety poster to be displayed in the workshop. • Generation of folio. • Compile a list of industry terminology related to the project and create a glossary.
Societal and environmental impact • issues relating to the sustainability of resources in metal industries	• identify and distinguish between renewable and non-renewable resources in metal industries • appreciate the importance of recycling to metal industries	• Use the *different uses strategy* to highlight the need to recycle or re-use, e.g. list ten creative or different uses for sheet metal off-cuts.
Additional content • techniques and skills to enhance the appearance and/or function of practical projects • the production of iron and steel	• add features to projects to enhance appearance and/or function • use surface finishes such as plastic coating, enamelling or a variety of painting techniques • describe materials and processes used in the production of steel	• Students may be given the opportunity to add functional aspects such as dividers to the tool carry all.

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Timing	Practical lessons	Theory lessons	Evidence
Week 1	• Demonstration on how to measure and mark-out sheet for body. • Demonstration on using tin snips. • Remove waste from notching.	• Introduce students to the workshop and discuss the need for safety guidelines. • Handout workshop drawing and set up folio requirements. • Revise and build on the design process learnt in Stage 4 Technology (Mandatory).	• Project development.
Week 2	• Demonstrate the use of the *MagnaBend* and tinman's mallet to produce folded edges and seams. Discuss how this process would be undertaken in industry. • Students to complete task on project.	• Discuss the need for folded edges and seams in sheet metal work. • Introduce and use safe operating procedure (SOP) for *MagnaBend.* • Brainstorm hazards in the workshop and identify PPE available. • Create freehand sketches of completed project.	• Project development. • Folio.
Week 3	• Demonstrate and instruct students how to fold remainder of body. • Demonstrate the method used to construct ends.	• First aid guest speaker to discuss basic first aid and accident reporting. • Develop cutting list using spreadsheet program.	• Project development. • Folio.
Week 4	• Construct ends.	• Introduce students to work method statements (WMS) and highlight key elements. • Produce basic work method statement for project.	• Project development. • Suitable WMS.

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Timing	Practical lessons	Theory lessons	Evidence
Week 5	• Continue ends. • Demonstrate riveting and soft soldering methods to join ends to body.	• Theory reference: Westover, K. (1982) *Metalwork for Schools 2,* pp. 79–90, Pitman: *Joining sheet metals.* • Students to begin compilation of glossary of terms for metal industry.	• Project development. • Glossary of terms in folio.
Week 6	• Students join ends to body.	• Discuss common workplace signage. • In teams of four students develop a safety poster to be displayed in the workshop.	• Project development. • Completed poster.
Week 7	• Demonstrate and instruct students on the construction of the handle.	• Westover, K. (1982) *Metalwork for High Schools 2*, Pitman pp. 96–98. Review table *Metals in common use* and compile list in folio. • Discuss a range of materials that will be used over the duration of the course, e.g. flat, round, RHS, angle, sheet, plate, and coatings applied.	• Project development. • Table in folio.
Week 8	• Construct and fit handle.	• Use the *different uses strategy* to highlight the need to recycle or re-use, e.g. list ten creative or different uses for sheet metal off-cuts.	• Project development. • List of alternate uses.
Week 9	• Design and add dividers if time permits.	• Use form and function sheet to revise functional and aesthetic aspects.	• Project development.
Week 10	• Complete project and accompanying folio. • If time permits conduct excursion to local engineering workshop.	• Complete folio and present. • Use student self-evaluation assessment sheet to evaluate progress.	• Project development