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

Unit 2: Tack hammer **Suggested unit length:** 8 weeks

Description: This Fitting and Machining project builds on the previous project and introduces new skills such as basic lathe operations, drilling and tapping and metal finishing techniques. Properties of materials are investigated and students are introduced to standard operating procedures and work method statements. Students will also be given the opportunity to apply principals of design in the modification of this project.
Environmental issues related to the finishing of metal products will also be investigated.

This project will include a folio that will incorporate the following aspects:

- work method statements
- 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
Project drawing
Blackfast chemical blackening if available
Video: *Designing and marketing a new product*, Classroom video
Internet and other computer resources
Metalwork textbooks

Safe operating procedures (SOP) for metal lathe
Careers advisor
Material as per cutting list
CAD/Drawing equipment
Self assessment sheet
Job Guide

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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. • Discuss and use safe operating procedure (SOP) for lathe. • Use WorkCover: *Safety Zone* www.workcover.nsw.gov.au/default.htm
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. • Discuss the range of materials that will be used in the tack hammer. • Introduce the production of steel highlighting the differences between bright and black (mill scale, hot and cold rolled).
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. • Use safe operating procedure (SOP) for lathe. • Use *Metalwork for Schools,* pp. 38–43 to investigate types and techniques of filing. Create a table that highlights types of files and their uses.

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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 – rivets – soft soldering • prepare and finish surfaces by polishing, buffing and/or painting	• Demonstrations. • Production of practical projects. • Students to create a formula to work out the drilling sizes for tapping metric screw threads, i.e. tap diameter – thread pitch = drill size. • Teacher initiated discussion on the finishes available for metal products highlighting the pros and cons of each, i.e. zinc, tin, plastic, paint, electrolysis and chemical blackening.
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. use of letter and number drills for correct hole size, application of finishes. • Brainstorm and investigate one career in the metal industry using Job Guide or similar career resources. Careers advisor could be used as an additional resource.

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Students learn about:	Students learn to:	Teaching strategies and tasks
Design		
• functional and aesthetic aspects of design	• identify the functional and aesthetic aspects of design in metal, including material selection, edge treatments and service requirements	• Production of folio. • Use student self-evaluation assessment sheet to evaluate progress.
• design principles and processes	• apply principles of design in the modification of projects • evaluate work practices and practical projects in terms of quality	• Development of cutting lists etc in folio. • Some students may have time to design and produce alternate hammer heads.
• material lists • project costing	• read and interpret material lists • estimate quantities of materials to be used in practical projects	
Workplace communication skills		
• workplace signage	• respond to OHS signage	
• pictorial and working drawings	• read and interpret simple workshop and pictorial drawings • make freehand sketches of workshop items and/or projects	• Generation of folio.
• industry terminology • text types to support the documentation of practical projects and processes including: – procedure and factual recount • a range of computer software applications to assist in the planning, production and reporting of practical 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	• Compile a list of industry terminology related to the project and create a glossary.

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Students learn about:	Students learn to:	Teaching strategies and tasks
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	• Excursion to recycling yard. Observe the initial processes in metal recycling through to recycled products.
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	• Some students may have time to design and produce alternate hammer heads to improve its form and function. • Demonstrate the benefits of chemical blackening. Students to produce a short report promoting its benefits to potential clients.

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Timing	Practical lessons	Theory lessons	Evidence
Week 1	• Demonstrate measuring, marking out and cutting of 12 mm square bar for hammer head. • Demonstrate de-burring and marking out for filing to shape using witness marks.	• Instruct students on the creation of orthogonal views of project using AutoCAD. • Show *Case study of a new car model: The Toyota Camry*, highlighting the use of CAD in industry from the video: *Design and marketing of a new product*, Classroom Video.	• Project development. • Folio.
Week 2	• Demonstrate filing techniques including correct selection and use of file. • Discuss safety aspects of files. • Demonstrate marking out and centre punching in preparation for drilling.	• Develop cutting list using spreadsheet. • Use *Metalwork for Schools* pp. 38–43 to investigate types and techniques of filing. Create a table that highlights types of files and their uses.	• Project development. • Folio.
Week 3	• Demonstrate correct and safe use of drill press. • Demonstrate drilling techniques including holding and clamping of job (relate to industry application). • Demonstrate internal thread cutting (relate to industry application).	• Discuss formula for calculating drill size for tapping metric screw threads, i.e. tap diameter – thread pitch = drill size. Calculate ideal drill size for commonly used thread sizes. • Work through a *PowerPoint* presentation on thread cutting and complete an accompanying comprehension question and answer quiz.	• Project development. • Folio.
Week 4	• Demonstrate measuring, marking out and cutting of 12 mm round for hammer handle. • Demonstrate correct and safe use of lathe, introducing correct terminology for all parts. • Highlight work place safety signage. • Review (emphasising accuracy) facing off. • Demonstrate parallel and taper turning using the lathe (relate to industry application). • Demonstrate measuring diameters using Vernier callipers and micrometers.	• Complete a work method statement for the lathe work on the handle including risk identification, reduction and elimination. Use WorkCover: *Safety Zone* www.workcover.nsw.gov.au/default.htm • to learn about hazards in the workplace.	• Project development. • Folio.
Week 5	• Demonstrate centre drilling and knurling (relate to industry application). • Review (emphasising accuracy) taper turning. • Demonstrate drilling using the lathe.	• Start a *Tools Used* table showing the name of the tool, a picture of the tool (possibly sourced from the Internet), and a brief description of what the tool was used for.	• Project development. • Folio.

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Timing	Practical lessons	Theory lessons	Evidence
Week 6	• Review internal thread cutting and demonstrate threading of handle using taper and plug taps (relate to industry application).	• Draw a pictorial flow chart outlining the production of steel based on Gray, T.A. and McCormick, T. (1984) *Metal Shop Technics,* William Brooks, pp. 14–17. • Write a summary on hot rolling and cold rolling of steel based on Gray, T.A. and McCormick, T. (1984) *Metal Shop Technics,* William Brooks, p. 23. • Add terms such as annealing to glossary. • Homework: Design four alternative hammer head shapes.	• Project development. • Folio.
Week 7	• Review cutting round to length and chamfering for shank. • Demonstrate external thread cutting of shank. • Demonstrate brazing including correct set up and use of oxy-acetylene or LPG equipment of head to shank.	• Complete a cloze exercise (a passage with key words blanked out) on brazing uses and procedure based on Ableson, B. and Pateman, A. (1974) *Metalworking,* Macarthur Press, pp. 153–154. • Read, discuss and answer questions on oxy-acetylene equipment from Westover, K. (1982) *Metalwork for High Schools 2,* Pitman, pp. 39–42.	• Project development. • Folio.
Week 8	• Demonstrate preparation of steel surfaces for applying finish. • Demonstrate chemical blackening of steel e.g. the *Blackfast* technique. • Students to fill out self-evaluation assessment sheets. • Excursion to recycling yard if time permits.	• Write a short report on the benefits of chemical blackening promoting the technique to potential clients. • Do a pluses, minuses and interesting ideas (PMI) activity for different metal finishing techniques .	• Project development. • Folio.