

BA Art Metal 10

District Name: Kamloops/Thompson

District Number: SD #73

Developed by: Nathan C. Robinson

Date Developed: February 2004

School Name: Barriere Secondary School

Principal's Name: Greg Howard

Board/Authority Approval Date: 2004/05/17

Board/Authority Signature:

Course Name: Art Metal

Grade Level of Course: 10

Number of Course Credits: 4

Number of Hours of Instruction: 120 hours

Prerequisite(s): None

Special Training, Facilities or Equipment Required: Fully equipped metal shop including foundry with accessories and safety suits, centrifugal caster, wax burn-out oven, and welding equipment (oxy-acetylene, stick, and wire-feed). Lapidary and stained glass equipment recommended to further enhance the course and opportunities for students. Teacher will need to possess qualifications from a training institute for technology education (BCIT).

Course Synopsis:

This course has been developed to support and encourage students to explore the wide array of metalworking techniques used in Art Metal. Students learn to use various metalworking equipment as they follow the steps in creating Art Metal projects of personal interest. Learning Outcomes for the course are grouped under the curriculum organizers: Health and Safety, Personal and Project Management, Mathematical Applications, Tools and Equipment, Materials, Cutting Processes, and Forming and Joining Processes. The approach supports safe workplace practices, student skill development and encourages meaningful methods of ideation, design, planning, production and evaluation of various Art Metal techniques and projects.

Rationale:

This course has been developed to support and encourage students to explore the wide array of metalworking techniques used in Art Metal. Students learn to use various metalworking equipment as they follow the steps in creating Art Metal projects of personal interest. As a culmination, students reflect on their work, write a summary of their journal that they have kept throughout the course and make a presentation to the instructor and class. The approach supports safe workplace practices, student skill development and encourages meaningful methods of ideation, design, planning, production and evaluation of various Art Metal techniques and projects.

Organizational Structure:

Unit	Title	Time
Unit 1	Safety	15 hours
Unit 2	Design and Planning	15 hours
Unit 3	Production	80 hours
Unit 4	Research Project	10 hours
	Total Hours	120 hours

Unit Descriptions:

Unit 1: Safety

15 hours

Students will become oriented with the shop and its hand and machine tools. They will be given instruction in the names and parts of various machines and tools, write safety tests on these machines and tools, practice using the equipment to perform basic operations to the instructor's satisfaction, and perform basic maintenance on machines and tools at the instructor's discretion. They will be given instruction in safe work habits and practices (including WHMIS). In addition, they will learn about all the safety equipment in the shop, its proper uses, and good "housekeeping" procedures.

Curriculum Organizer - Health and Safety

It is expected that students will:

- Identify WHMIS symbols that apply to workplace materials
- Demonstrate a knowledge of safety features and practices associated with metal related tools and equipment
- Identify hazardous situations in the work environment and take appropriate action
- Demonstrate good "housekeeping techniques"
- Demonstrate safe work habits when using tools, equipment, and technical processes

Curriculum Organizer – Personal and Project Management

It is expected that students will:

- Identify and utilize employability skills

Curriculum Organizer – Mathematical Applications

It is expected that students will:

- Interpret tables and charts

Curriculum Organizer – Tools and Equipment

It is expected that students will:

- Identify, describe and use:
 - layout tools
 - measuring instruments
 - hand tools
 - lathe, milling, drilling, and grinding tools and equipment
 - welding machines, tools and equipment
 - basic forging and casting tools and equipment
 - sheet metal tools and equipment
- Describe proper maintenance procedures for:
 - lathe, milling, drilling, and grinding tools and equipment
 - oxy-acetylene and other welding tools
 - forging and foundry tools
 - hand tools

- sheet metal tools
- Identify needed repairs or replacements for broken or used parts
- Perform basic maintenance procedures as directed
- Properly store tools and equipment

Curriculum Organizer – Cutting Processes

It is expected that students will:

- Perform cutting processes in a safe manner

Curriculum Organizer – Forming and Joining Processes

It is expected that students will:

- Execute forming and Joining processes in a safe manner

Unit 2: Design and Planning

15 hours

Students will receive instruction in measuring, sketching, different projection methods, and ideation. They will present the instructor with a proposal comprised of projects of their own design within the appropriate units, a finished drawing of the proposed project, a production plan, and a cost sheet for materials needed.

Curriculum Organizer – Personal and Project Management

It is expected that students will:

- Interpret drawings and produce simple sketches to communicate design ideas
- Identify, organize, and execute processes required to accomplish a task
- Identify and organize task-related tools and materials
- Identify and utilize employability skills
- Demonstrate a willingness to find unique solutions to problems that arise during the design process
- Identify methods to improve their abilities to work with others during problem-solving activities
- Describe and use the process of product design
- Evaluate the efficiency of a production process
- Develop a plan to clearly communicate ideas for creating products and systems
- Use a variety of drawing projection methods

Curriculum Organizer – Mathematical Applications

It is expected that students will:

- Demonstrate the ability to use the following measuring instruments:
 - tape measures
 - scales
- Demonstrate proficiency in adding, subtracting, multiplying and dividing whole numbers, fractions, and decimals to perform layout and solve problems related to Art Metal fabrication and machining
- Convert between Imperial and SI units
- Interpret tables and charts

Curriculum Organizer – Materials

It is expected that students will:

- Select metal stock whose size, structural shape, and finish are appropriate for specific applications
- Select materials based on a set of design specifications
- Identify ways to minimize waste and reuse products

Unit 3: Production

80 hours

Students will continue to develop their Art Metal production skills, strategies, and ability to follow a design process as they work through the production sub-units. Sub-units will include but are not limited to: Casting (foundry, cuttlebone, lost-wax mold), Sheet Metal, and Welding. Students and student teams will develop project designs, cost sheets, production plans and manufacture their projects. Concepts such as material characteristics and identification, choosing appropriate materials for projects, effective use of materials, tool and machine identification, proper tool and machine use, and finishing processes will be explored. There will be a continual emphasis on safety throughout the unit.

Curriculum Organizer - Health and Safety

It is expected that students will:

- Identify WHMIS symbols that apply to workplace materials
- Demonstrate a knowledge of safety features and practices associated with metal related tools and equipment
- Identify hazardous situations in the work environment and take appropriate action
- Demonstrate good “housekeeping techniques”
- Demonstrate safe work habits when using tools, equipment, and technical processes

Curriculum Organizer – Personal and Project Management

It is expected that students will:

- Interpret drawings and produce simple sketches to communicate design ideas
- Identify, organize, and execute processes required to accomplish a task
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- Convert between Imperial and SI units
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Curriculum Organizer – Tools and Equipment

It is expected that students will:

- Identify, describe and use:
 - layout tools
 - measuring instruments
 - hand tools
 - lathe, milling, drilling, and grinding tools and equipment
 - welding machines, tools and equipment
 - basic forging and casting tools and equipment
 - sheet metal tools and equipment

Curriculum Organizer – Materials

It is expected that students will:

- Identify and describe the basic characteristics of common metals
- Identify common types and gauges of sheet metal
- Use spark and file tests to identify ferrous metals
- Identify and classify the properties of materials used to manufacture products
- Apply finishes and details to manufactured products to enhance their appearance and durability
- Identify ways to minimize waste and reuse products

Curriculum Organizer – Cutting Processes

It is expected that students will:

- Perform cutting processes in a safe manner
- Use common hand tools for cutting metal and other materials
- Use common sheet metal cutting tools
- Set up and perform the following cutting processes on a lathe:
 - facing
 - parallel turning to size
 - drilling
- Set up and perform flat surface cutting and slotting on a milling machine
- Set up and perform grinding processes using:
 - bench/pedestal grinders
 - portable grinders
 - abrasive cut-off saws
- Set up and perform drilling and countersinking processes using a drill press
- Set up and perform power sawing processes
- Set up and use oxy-acetylene equipment to perform short cuts freehand
- Select the appropriate cutting tool for a given cutting task

Curriculum Organizer – Forming and Joining Processes

It is expected that students will:

- Execute forming and Joining processes in a safe manner
- Describe the uses of the following common welding processes:
 - Oxy-acetylene
 - SMAW (stick)
 - GMAW (wire feed)
- Identify and use a variety of common mechanical fastening methods
- Demonstrate the ability to lay out, form, and join sheet metal using a variety of methods
- Describe types and uses of casting
- Produce a simple cast object using an open, closed, or lost wax mold
- Identify uses and applications of forging processes
- Shape a piece of metal using a forging process
- Demonstrate skill in managing time and resources
- Describe combining, forming, separating, and finishing processes as they relate to materials used in product manufacturing

Unit 4: Research Project

10 hours

Students will choose a metal related career and write a paper describing the position, the approximate salary, job benefits, working conditions, union requirements, recommended high school courses for this career, if an apprenticeship/journeyman program is involved, post secondary schooling and training required, and local and distant employers for the chosen career. Students will be given instruction in good writing techniques (note-taking, pre-write, draft, revision, editing, proofing, publishing and bibliography writing). Their paper will be word-processed, include graphics, and information from a variety of sources. Students will also be encouraged to interview a local person in the chosen career and use the information gained in the development of their paper. Students will present their papers and findings to the class in a manner of their choosing which could be in the form of a paper, orally, power point presentation, etc. The instructor would then compile these papers into a resource for the class in career planning.

Curriculum Organizer – Personal and Project Management

It is expected that students will:

- Identify and utilize employability skills
- Describe new careers and occupations in metal-related industries and determine their educational prerequisites
- Use information-gathering and communication methods to solve problems involving technology and to create effective presentations

Instructional Components:

- Direct instruction
- Indirect instruction
- Interactive (Peer) instruction
- Independent instruction
- Modeling
- Practical creativity
- Brainstorming
- Group work
- Analysis of own and classmates' project work

Assessment Components:

Sixty-five per cent (65%) of the grade will be based on safety tests and project evaluations throughout the course. This portion of the grade will reflect the students' most consistent level of achievement throughout the course, although special consideration will be given to the more recent evidence of achievement.

Thirty-five per cent (35%) of the grade will be based on student research, documentation, reflection, and demonstration of proper employability skills (proper industrial work habits ranging from the safe use of equipment to good "housekeeping" techniques).

Formative VS Summative

Type of Assessment	Category	Details	Weighting (%)
Formative (65%)	Practical	Tests	15
	Applications	Projects	50
	Self Rating Rubrics		
Summative (35%)	Performance	Notebooks	10
	Documentation	Assignments	15
	Research	Industrial Work	
	Communication	Habits	10
		Total	100%

Performance Methods	Personal Communication	Other
<ul style="list-style-type: none"> • Project proposal outline • Project logbook submissions • Projects • Presentation of completed works 	<ul style="list-style-type: none"> • Group dialogue • Student/instructor/mentor dialogue • Logbook reflection • Self evaluation • Peer evaluation 	<ul style="list-style-type: none"> • Daily-weekly assessment • Teacher anecdotal records • Teacher log • Checklists • Rubrics • Rating scales

Learning Resources:

- Teacher handouts
- Guest speakers from the community in related fields
- Visit/interview local trades people in related fields
- Articles and information about Art Metal careers on internet
- Books
 - *Basic Metalwork Procedures - Metric ed.*, D. D. Caspersen, 1984.
 - *Making Wire Jewelry*, Helen Clegg and Mary Larom, Asheville, Lark, 1997.
 - *Practical Casting. Revised ed.* Tim McCreight, Brynmorgen, Cape Elizabeth, 1994.
 - *The Encyclopedia of Jewelry-Making Techniques.* Jinks McGrath, Philadelphia, Running, 1995.

Additional Course Information:

This is a new course based on the old locally developed Art Metal course. Schools will need adequate equipment to make the course run smoothly. The course will evolve as shops obtain more equipment. Other possible units that may be incorporated into the course are lapidary and stained glass. Delivery of the course will be altered to reflect each schools equipment and resources.

Bibliography:

Board/Authority Authorized Courses: Requirements and Procedures. Ministry of Education, Province of British Columbia, 2003.

Technology Education 11 and 12 – Metal Fabrication and Machining Integrated Resource Package 2002. Ministry of Education, Province of British Columbia, 2002.

Technology Education 8 to 10 - Integrated Resource Package 1995. Ministry of Education, Province of British Columbia, 1995.

