

Metals Processing 120

New  Brunswick

**Department of Education
Educational Programs & Services Branch
2008**

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Introduction

Overview

Metal Processing 120 allows students to advance basic skills developed in Metals Processing 110. Also students will practice and develop new introductory skills that are required to pursue post-secondary learning in the Metals trades. Students enrolled in this course are encouraged to work both independently and in teams while achieving specific curriculum outcomes. Students must have successfully completed Metals Processing 110 as a pre-requisite.

Learning Activities

When available, industry/trades representatives should be invited to present to students. Industry representatives provide realistic applications of skills learned. Students plan, draft and complete small projects to demonstrate the importance of skill development and safety procedures.

General Curriculum Outcomes

Upon the completion of Metals Processing, students will have achieved the following outcomes:

- GCO 1** Demonstrate the skill and knowledge required to prevent accidents.
- GCO 2** Demonstrate an understanding of working drawings and proper layout.
- GCO 3** Exhibit basic proficiency in measurement and the application of mathematical skills (metric and imperial).
- GCO 4** Develop offhand grinding skills and practices used in industry.
- GCO 5** Demonstrate safe the use of engine lathes.
- GCO 6** Demonstrate safe the use of milling machines.
- GCO 7** Identify various careers available in the Metal Processing industry

Duration

90 hours

Course Code

WEMEB1200



METALS PROCESSING 120

GCO 1 Demonstrate the skill and knowledge to prevent accidents.

Specific Curriculum Outcomes:

Students will be expected to:

- identify safety procedures and common potential hazards in the lab and workplace
- describe the rationale for first aid kits and an emergency action plan in the working environment
- demonstrate personal responsibility in the prevention of accidents and describe how accidents can be prevented
- demonstrate knowledge of immediate response procedures.
- use and store lab materials and tools in a safe manner.
- demonstrate knowledge of the WHMIS system as it pertains to the machine shop environment.
- demonstrate safe body mechanics (i.e. back safety, lifting, etc.)
- display safe tool operation

Suggestions for Teaching/Learning:

The teacher leads a class discussion about personal injury, causes and prevention strategies (include examples of personal injury).

Teacher identifies the parts of each major tool. Teacher exhibits safe operation of the tool by performing a safety demonstration. Uses and proper maintenance of the tool will be displayed.

The teacher invites a guest speaker from WHSCC or Training and Employment Development to discuss with students why accidents happen, demonstrating preventative steps students/workers should follow to minimize the risk of accidents and possibly injury.

Students tour the school lab to observe safety guards and other measures used in the lab to prevent injury (activity should include appropriate clothing, footwear and eye and ear protection).

Students identify potential accidents associated with selected tools/equipment located in the lab. Match specific first aid applications and procedures used with each of the possible identified potential accidents.

The teacher explains hazardous situations that can arise from working with rotating parts.



METALS PROCESSING 120

GCO 1 Demonstrate the skill and knowledge to prevent accidents.

Suggestions for Learning/Assessment:

Students must understand the Workplace Hazardous Material Information System by passing a designated test or completing a safety course designed to assist in passing the test.

Students draw scale plan of shop, locate, label, and list five safety rules for each tool. This plan should also include location of fire extinguishers, fire blankets first aid kits and eye washes.

Students are required to obtain and keep proof of observing a safety demonstration from the teacher on each major tool in the machine shop.

Through the use of written or PowerPoint presentations, students outline safety precautions followed to prevent injury and list the contents of the first aid kit and how to stop bleeding.

The teacher observes students while they perform simple operations on machines, demonstrating safe practices.

Students analyze workplace situations to determine possible hazards and relate these situations to the school lab.

Students and teacher prepare a list of safety directives and have a test to demonstrate understanding.

Resources:

Recommended Text

Technology Of Machine Tools, Sixth Edition (Hardcover)

Steve F. Krar, Arthur R. Gill, Peter Smid
Copyright 2005

The McGraw-Hill Companies, Inc
ISBN-13:978-0-07-830722-5
ISBN-10:0-07-830722-8

Instructors Manual
ISBN 0-07-297469-9

Student Workbook
ISBN-13: 978-0-07-830724-9
ISBN-10:0-07-830724-4

WHSCC Choices For Life/Health & Safety (K-12) Binder

- Safety procedures for all grades, includes illustrations applying to all subject areas
sections: C6-C18,D,E,F,G and H1-H4

Things You Better Know

- Available from NB Workplace Health and Safety Compensation Commission

Phone (800) 442-9776

URL <http://www.whscc.nb.ca>

Canadian Red Cross

First Responder

ISBN 0-8151-2094-x

Chapter9



METALS PROCESSING 120

GCO 2 Demonstrate an understanding of working drawings and proper layout.

Specific Curriculum Outcomes:

Students will be expected to:

- Understand orthographic and isometric drawings.
- Understand dimensions and other information included on drawings.
- Understand the types of drawings used in the machine shop.
- Make a parts list from a drawing.
- Making lines on metal
- Squares.
- Measuring angles.
- Simple layout steps.
- Layout Safety.

Suggestions for Teaching/Learning:

Demonstrate orthographic and isometric representation of drawings by sketching five different shapes of increased complexity.

Demonstrate and have students complete a blueprint including dimensions, title block, material type, tolerances, finish, and quantity on a drawing.

Discuss and explain assembly, subassembly and exploded views.

Provide students with a completed project and have them make a blueprint and complete a parts list.

Demonstrate proper care and use of appropriate layout tools.

Provide students with a piece of sheet metal and have students properly layout holes, lines and slots from a blueprint.



METALS PROCESSING 120

GCO 2 Demonstrate an understanding of working drawings and proper layout.

Suggestions for Learning/Assessment:

Demonstrate basic Drawing using AutoCAD and a projector.

Show the students various drawings and or blueprints so that they can see why it is important to understand them.

Have the students complete various orthographic view exercises to demonstrate their understanding.

Engross the students in an activity to draw an item of their or the instructor's choice using orthographic projection. (This could be their project.)

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Various Blueprints or AutoCAD drawings.



METALS PROCESSING 120

GCO 3 Exhibit basic proficiency in measurement and the application of mathematical skills (metric and imperial).

Specific Curriculum Outcomes:

Students will be expected to:

- understand the need for two types of measuring systems in Canada and when they are used.
- Become proficient in converting from fractional inch to decimal inch to mm.
- Demonstrate use of the steel rule in both systems
- Demonstrate use of the vernier calliper in both systems
- Demonstrate use of the micrometer in both systems
- Exhibit the uses of the dial indicator in the setup of machine tools
- Manipulate formulas used in the machinist trade

Suggestions for Teaching/Learning:

Teacher invites a machinist to the classroom to discuss the concept of working plans and measurement. When metric is used and when Imperial is required.

Teacher provides students with conversion chart and several different objects to sketch and measure. Each dimension will be expressed in fractional, decimal, and metric units.

Students prepare power point presentation on how to measure using the steel rule, micrometer and vernier calliper.

Teacher researches and presents online activities in measuring to the class.

Students utilize dial indicator to properly set up a four jaw chuck on the engine lathe.

Students create a personalized pocket handbook to record measurements, formulas, and conversion charts.

Students create chart to calculate speeds required for turning and drilling utilizing the proper formulas.

Students should use trigonometry to figure out the depth of a countersink.



METALS PROCESSING 120

GCO 3 Exhibit basic proficiency in measurement and the application of mathematical skills (metric and imperial).

Suggestions for Learning/Assessment:

Student is provided with stepped steel block and tested on measurement skills and accuracy.

Teacher uses measurement rubric on all projects completed in the shop and records student's skill in measuring and tolerance.

Students are tested on the comprehension of manipulating formulas by setting up tools to work at the proper speeds for the material used. Teacher documents progress.

Students prepare project reports on completed items that include title page, sketch, working drawing with dimensions, step by step procedure, and concepts learned.

Resources:

Project rubric worksheet

Measuring

FREE Link: http://www.wisc-online.com/objects/index_tj.asp?objID=MSR3102

Micrometer

FREE Link: http://www.wisc-online.com/objects/index_tj.asp?objID=MSR3903

Trigonometry

Stepped block project

METALS PROCESSING 120

GCO 6 Recognize and demonstrate basic grinding skills and practices used in industry.

Specific Curriculum Outcomes:

Students will be expected to:

Grinding

- Grinder Safety
- Grinding wheels
- Portable hand grinders.
- Bench and pedestal grinders
- Surface grinders

Suggestions for Teaching/Learning:

Demonstrate proper grinder safety operations applicable to the project.

Explain and demonstrate checking wheel for cracks.

Demonstrate changing and choosing a grinding wheel.

Demonstrate truing of wheels and why it is important for tool sharpening.

Explain grinding wheel numbering designation system.

Have students compare and contrast the differences between aluminium oxide and silicon carbide wheels and what they are used for.

Explain common safety concerns regarding offhand grinding. (Sparks, standing to one side of grinder, adjustment of tool-rest.)



METALS PROCESSING 120

GCO 6 Recognize and demonstrate basic grinding skills and practices used in industry.

Suggestions for Learning/Assessment:

Have the students engage in proper use of the associated grinders by performing an activity.

- Use a pedestal grinder to remove burrs or mushroomed heads on chisels or punches.
- Use a pedestal grinder to reshape a flat head screwdriver.
- Use a pedestal grinder to sharpen a chisel or center punch.
- May also use the pedestal grinder to sharpen drill bits or tool steel. (If theory has been covered)
- Demonstrate the surface grinder and its uses.

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Free Link: Virtual Machine Shop

<http://www.jjtrain.com/vms/>

Tool catalogue (Goodson, etc.)



METALS PROCESSING 120

GCO 7 Display proper technique in operating cut off saws and band machines.

Specific Curriculum Outcomes:

Students will be expected to:

- Identify, select, use and care for metal cut off saws.
- Operate band machines.
- Identify, select and understand the proper use of cutting wheels and machine bands.

Suggestions for Teaching/Learning:

Students research health problems associated with poor ventilation.

Students Draw sketch and identify all major parts on cut off saws and band machines.

Students prepare and set up cut off saws understanding materials to be cut and proper cut off machine required

The teacher explains the different types of ventilation systems required to keep students safe while cutting metal

Students construct chart for machine shop handbook identifying blades required for different materials.

Students demonstrate skill by safely cutting metal on the machines.

METALS PROCESSING 120

GCO 7 Display proper technique in operating cut off saws and band machines.

Suggestions for Learning/Assessment:

Teacher assesses student proper use of ventilation and vapour control.

Students complete written assignments demonstrating knowledge of cutting procedures.

Students will be marked on practical work completed in the school lab emphasizing quality, speed, safety and cleanliness.

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METALS PROCESSING 120

GCO 8 Demonstrate safe use of the engine lathe and milling machines.

Specific Curriculum Outcomes:	Suggestions for Teaching/Learning:
<p><i>Students will be expected to:</i></p> <ul style="list-style-type: none">• Lathe safety• Parts of lathe<ul style="list-style-type: none">○ Cutting tools and tool holders○ Cutting speeds and feeds• Lathe operations:<ul style="list-style-type: none">○ Facing stock held in a chuck.○ Knurling○ Turning and turning to a shoulder○ Parting operations○ 3 ways to Cut a taper○ Filing and polishing○ Drilling○ Boring○ Cutting screw threads• Calculate Tailstock offset• Measuring tailstock set over• Milling Machine parts and operation<ul style="list-style-type: none">○ Cutting tools and tool holders○ Cutting speeds and feeds• Milling Machine operations<ul style="list-style-type: none">○ End Milling (flat surfaces, squaring edges)○ Facing○ Counter boring and spot facing○ Reaming and Tapping○ Slots and Keyways○ Open and closed pockets○ Chamfering	<p>Demonstrate the procedure of how lathes are sized.</p> <p>Have student label a drawing showing the main parts of a lathe.</p> <p>Discuss and demonstrate the proper safety procedures for operating a lathe.</p> <p>Discuss cutting tools and tool holders.</p> <p>Using practical projects demonstrate to the students how to operate the lathe properly.</p> <p>Demonstrate various Milling Machine operations and how each will be applied in their practical projects.</p>

METALS PROCESSING 120

GCO 8 Demonstrate safe use of the engine lathe and milling machines.

Suggestions for Learning/Assessment:

Engage the students in practical projects to encourage the learning of basic lathe operation skills.

The Cross peen hammer handle made of steel will allow the students to practice center drilling and mounting stock with a live center, facing, knurling, turning to diameter, turning a taper, turning to a shoulder, radius an end as well as threading.

A two-piece center punch will allow the above operations as well as introduce drilling and turning to an exact size (thousands of an inch) to produce an interference fit.

By making a ball peen hammer from $\frac{3}{4}$ inch drill rod the students may experience turning a hard material and may also use the milling machine to mill the slot for the wooden hammer handle.

Cold chisel project will allow the students to square edges on the milling machine as well as machine the flats on each side using an end mill.

Students may be assessed by having a piece for them to compare theirs to so that they know what is expected as well as by giving the students a rubric with the assignment sheets.

Resources:

Project drawings

- *Cross peen hammer, Simonds High*
- *Cold Chisel Project, FHS.(available shortly)*
- *Ball peen hammer project, FHS. (available shortly)*
- *Center punch, FHS.(available shortly)*

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<http://www.jjjtrain.com/vms/>



METALS PROCESSING 120

GCO 9 Identify various careers available in the Metal Processing industry

Specific Curriculum Outcomes:

Students will be expected to:

- Categorize and examine the different career paths that require machine shop training.
- Identify and practice the skills and knowledge required to enter the machinist trade.
- Plan and demonstrate how they will find a job in this trade.

Suggestions for Teaching/Learning:

Students will research the different career paths and demonstrate to the teacher their results with either a power point presentation or part of a project report.

Teacher invites trades person or representative from community college to talk about the different career paths available to machinist and what is required to pursue this job path.

Students draft resume to apply for a job in the machinist trade.

Students do preliminary budget on what it would cost to become a machinist.

METALS PROCESSING 120

GCO 9 Identify various careers available in the Metal Processing industry

Suggestions for Learning/Assessment:

Students prepare and present a written submission outlining the machinist trade.

Students participate in a class presentation while teacher performs observation assessment.

Resources:

New Brunswick Community College
<http://www.nbcc.nb.ca/>

Northern Alberta Institute of Technology
<http://www.nait.ca/>

