



Name of School:

Name of Course: **Metals, Materials, and Processes**

Instructor Information

Name:
E-mail address:
School phone number:
Web page address: http:
Best times to be reached:

Course Description

This is an introductory course to the use of metal as a building material. Students will learn to turn pieces of metal into useful items through the use of forge and foundry machine tools, grinding, and cutting equipment. Safety will be given special emphasis. Materials fee required.

District Standards and Power Benchmarks

Power Standards

1. Students will develop an understanding of the nature of metalworking technology.
2. Students will develop an understanding of metalworking design.
3. Students will develop abilities for a technological world in Metals, Materials, and Processes.

Power Benchmarks

1. Apply Industrial Shop Safety
2. Read Drawings / Blueprints
3. Determine Planning, Measurement, and Layout
4. Practice Sheet Metal Processes
5. Practice Machining / Separating Processes
6. Practice Metal Casting and Forming Processes
7. Practice Metal Combining Processes
8. Practice Boring / Drilling Processes
9. Practice CNC (Computer Numerical Control) Machining
10. Discover Metalworking Careers and Career Planning Strategies

Course Information

No prerequisites
Meets for one term
0.5 credits
Elective course for 9-12 grade students

Course Outline/Calendar

Safety
Metalworking Careers
Blueprints/ Drawing
Measurement and layout
Machining and separating process
Metal combining process
Boring and drilling process
CNC

Text/Other Required Materials/Resources

Text book furnished, spiral notebook, and pencil

Instructional Procedures & Support

Lecture, bookwork, lab projects, quizzes, test, and “Math Monday”

Classroom Management Procedures

Be to class on time.
Have notebook & pencil every day.
Stay on task.
Treat others with respect at all times.

Assessment Plan

Grades will be given for: daily performance, written quizzes, tests, projects and notebook.

Grading System

A	93 and above	Firm command of knowledge domain High level of skill development
A⁻	90 - 92	Exceptional preparation for later learning
B⁺	87 - 89	Command of knowledge beyond the basic concepts of knowledge Advanced development of most skills
B	83 - 86	Has prerequisites for later learning
B⁻	80 - 82	
C⁺	77 - 79	Command of the basic concepts of knowledge Demonstrates ability to use basic skills
C	73 - 76	Lacks a few prerequisites for later learning
C⁻	70 - 72	
D⁺	67 - 69	Lacks knowledge of some fundamental ideas Some important skills not attained
D	63 - 66	Deficient in many of the prerequisites for later learning
D⁻	60 - 62	
F	59 and below	Most of the basic concepts and principles not learned Most essential skills have not been demonstrated Lacks most prerequisites needed for later learning

Please fill out , sign and return this page.

Student and Parent/Guardian Information

Student/Parent Name	Email/Elocker	Phone #

Parents and Students need to sign below to indicate that they have read and agreed to the above policies.
Parent _____ **Student** _____

Metals Shop Safety

Lathe

1. Always be sure the work piece and cutting tool are properly secure before starting the machine.
2. Keep your hands away from moving machinery and tools.
3. **Do not** touch the work piece surface while the machine is running.
4. Always stop the machine to adjust tooling.
5. **Do not** brush away metal shavings with your hand. Always use a brush.
6. **Do not** use air to blow off machine.
7. When changing auto feed speed, stop the machine.
8. Make sure the tool post and tooling are away from work piece before starting the machine.

Milling

1. Make sure table is clean and dry before making setup.
2. Always be certain that work-holding devices such as a vise is fastened tightly to the table.
3. Select the right kind of cutter for the job.
4. Disengage the control handles when using auto feeds.
5. Do not wear loose clothing, jewelry, or long hair down; these things could become tangled in work piece.
6. Keep your hands away from revolving cutter at all times.

Band Saw

1. Keep your fingers 2 inches away from the blade at all times.
2. Never leave the band saw while it is running. Wait till it has come to a complete stop.
3. **Do not** stand to the right side of the band saw. If the blade breaks you are in a dangerous position.

Welding

1. Safety glasses are required while welding.
2. Wear all Personal Protection Equipment (PPE: safety glasses, helmet, coat, gloves and proper foot wear) while welding.
3. Always wear shade #10 lens while welding.

Sheet Metal

1. Wear gloves while handling sheet metal.
2. Sharp edges will cut your hands easily.
3. Be aware of all *pinch points* on sheet metal bending and cutting machines.

Grinder

1. **DO NOT** wear gloves while operating the grinder.
2. Be aware of all *pinch points* on the grinder.
3. Watch long hair, baggy clothes, and jewelry because of *rotary motion*.
4. Make sure the tool rest is only ½ ” to ¼ ” away from the grinding wheel.

Drill Press

1. Never leave the chuck wrench/key in the chuck.
2. Clamp small pieces of stock. The cutter/drill could pull the stock from your hand and cause serious injury.
3. Keep your fingers away from the rotating cutters/drills.
4. If the cutter/drill catches the material, turn the machine OFF and step back.

Foundry

1. Safety clothing
2. Asbestos sheeting (floor)
3. Tools set up.
4. Degassing tablet.
5. Fill crucible
6. Start furnace
7. Do a dry run

Metals: Machine Parts

Lathe

Head stock

Tail stock

Auto feed

Forward/Reverse switch

Tooling: Cutter and Parting

Tool rest

X Control

Y Control

Knurl, cut to 5/8" diameter, part @ 1/4" from end

Mill

Auto feed

Forward/Reverse switch

Auto feed lock

Brake

X Control

Y Control

Z Control

Vise

Remove 1/8" deep, 3 passes

CNC

Program

Router

X, Y, Z coordinates

Open Matercam X, open manual program

Welding

Gloves

Helmet

Jacket

Electrode

Ground

Gas 30psi

Weld an arrow

Foundry

Foam model

Drag

Cope

Sprue

Riddle

Spoon

Rammer

Trowel

Verbally describe process

Sheet Metal

Shears

Bender

Cornice Break

Anvil

Snips

Ballpean Hammer

Shear, 1/4" bend, 45 deg. Angle, pound out

Bandsaw

Blade

Blade Guard

ON/Off Switch

Table Top

Cut 5/16" off end

Drill Press

Chuck

Chuck Key

Table Top

Drill 2 holes, x=1", y=1"; x=2 7/8", y=1 7/8

Metals Shop Safety

Lathe

9. Always be sure the work piece and cutting tool are properly _____ before starting the machine.
10. Keep your _____ away from moving machinery and tools.
11. **Do not** touch the work piece surface while the machine is _____.
12. Always _____ the machine to adjust tooling.
13. **Do not** brush away metal shavings with your _____. Always use a brush.
14. **Do not** use _____ to blow off machine.
15. When changing auto _____ speed, stop the machine.
16. Make sure the tool post and tooling are away from _____ before starting the machine.

Milling

7. Make sure table is clean and dry before making _____.
8. Always be certain that work-holding devices such as a _____ is fastened tightly to the table.
9. Select the right kind of _____ for the job.
10. Disengage the control handles when using _____ feeds.
11. Do not wear loose _____, _____, or _____ down; these things could become tangled in work piece.
12. Keep your hands _____ from revolving cutter at all times.

Band Saw

4. Keep your fingers _____ inches away from the blade at all times.
5. Never leave the band saw while it is _____. Wait till it has come to a complete stop.
6. **Do not** stand to the _____ side of the band saw. If the blade breaks you are in a dangerous position.

Welding

4. Safety _____ are required while welding.
5. Wear all _____ (safety glasses, helmet, coat, gloves and proper foot wear) while welding.
6. Always wear shade _____ lens while welding.

Sheet Metal

4. Wear _____ while handling sheet metal.
5. Sharp _____ will cut your hands easily.
6. Be aware of all _____ on sheet metal bending and cutting machines.

Grinder

5. _____ wear gloves while operating the grinder.
6. Be aware of all _____ on the grinder.
7. Watch long _____, baggy clothing, and jewelry because of *rotary motion*.
8. Make sure the tool rest is only _____” to _____” away from the grinding wheel.

Drill Press

5. Never leave the _____ wrench/key in the chuck.
6. Clamp small pieces of stock. The cutter/drill could pull the stock from your _____ and cause serious injury.
7. Keep your fingers away from the _____ cutters/drills.
8. If the cutter/drill catches the material, turn the machine _____ and step back.

Foundry

8. Safety clothing
9. _____
10. _____
11. _____
12. _____
13. _____
14. Do a dry run

Metals, Materials & Processes Parts Exam

Lathe

- 1 _____
- 2 _____
- 3 _____
- 4 _____
- 5 _____
- 6 _____
- 7 _____
- 8 _____

Mill

- 1 _____
- 2 _____
- 3 _____
- 4 _____
- 5 _____
- 6 _____
- 7 _____
- 8 _____

CNC

- 1 _____
- 2 _____
- 3 _____

Welding

- 1 _____
- 2 _____
- 3 _____
- 4 _____

5 _____

6 _____

Foundry

1 _____

2 _____

3 _____

4 _____

5 _____

6 _____

7 _____

8 _____

Sheet Metal

1 _____

2 _____

3 _____

4 _____

5 _____

6 _____

Bandsaw

1 _____

2 _____

3 _____

4 _____

Drill Press

1 _____

2 _____

3 _____

Numbers 1-16 are a line measurement sheet that I don't have electronically

Reduce the fractions to the lowest denominator. 1 pt each.

- 17. $\frac{6}{8}$ _____
- 18. $\frac{12}{16}$ _____
- 19. $\frac{3}{8}$ _____
- 20. $\frac{2}{4}$ _____

Add or subtract the fractions. Remember to show your work. 1pt. each

- 21. $9\frac{1}{2} + 5\frac{3}{4}$ _____
- 22. $9\frac{1}{2} - 1\frac{1}{2}$ _____
- 23. $8\frac{1}{2} - 8\frac{1}{4}$ _____
- 24. $3\frac{3}{8} + 8\frac{1}{8}$ _____
- 25. $2\frac{1}{8} + 3\frac{1}{4}$ _____
- 26. $9\frac{1}{4} - 3\frac{7}{8}$ _____
- 27. $10\frac{1}{8} - 3\frac{3}{4}$ _____
- 28. $4\frac{3}{4} - \frac{7}{8}$ _____
- 29. $7\frac{1}{4} - 3\frac{3}{8}$ _____
- 30. $6\frac{3}{4} - 5\frac{3}{4}$ _____

Using the figure below, fill in the measurements. 1pt. each

- 31. A _____
- 32. B _____
- 33. C _____
- 34. D _____
- 35. E _____

Draw the missing view. Remember to label the measurements and shade the different heights.

Correct view/shape: 5pts.

Correct measurements: 5pts.

Measurements labeled: 3pts.

Depth shaded: 2pts.