

Name of School: Davenport North High 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**

90-100	A
80 -89	B
70 -79	C
60 -69	D
0 -59	F

**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  $\frac{1}{2}$  " to  $\frac{1}{4}$  " 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.  $4\frac{3}{4} - 7/8$  \_\_\_\_\_
- 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.