

Exploratory Metals
Tim Pinkert
Exploring Metalworking

Course Purpose:

The purpose of Exploratory Metals is to introduce students to the field of metalworking as a God pleasing career or hobby.

Course Outcomes:

The student will:

1. Learn and follow an orderly process to create a project from idea to finished product.
2. Learn and demonstrate mechanical skills.
3. Demonstrate safe work habits on the job.
4. Follow directions
5. Critically evaluate good workmanship
6. Apply problem-solving skills in the production of projects.
7. Employ math skills in working with measurements.
8. Demonstrate the ability to work well with others.

Course Goals:

The goals of this course are to:

1. help students determine if God has given them the skills and interests which will allow them to successfully pursue careers in metalworking and related fields.
2. instill in the students a Christ-centered work ethic: i.e., good attendance, punctuality, cooperation, initiative, attitude, reliability, etc.
3. help students gain an insight into the physical properties of different types of metal.
4. help students gain understanding in metal machining, forming and fabrication.

Course Outline:

Unit One: Shop Safety

- list general shop safety rules
- list machine safety rules
- analyze shop situations according to safety rules
- demonstrate shop safety

Textbook: pages 59-63

Number of days: 4

S.O. 2-4,6,7

D.O. 1.1, 2.2, 2.3, 4.2, 4.4, 6.1

W.S.S. B12.2

Unit Two: Bench Metal

- Name hand tools
- Demonstrate proper and safe use of hand tools
- Demonstrate ruler reading
- Demonstrate use of drill press and hand drill
- Explain the use of abrasive materials and how they are used for the finishing process
- Analyze bench metal as a career.

Textbook: pages 64-66, 77-94

Number of Days: 7-8

S.O. – 2-7

D.O. – 1.1, 3.4, 3.5, 4.2, 4.3, 4.4, 5.1, 5.4, 6.1, 6.2, 6.3

W.S.S. B12.2, 12.3, 12.8

Unit Three: Sheet Metal

- Demonstrate proper safety with sheet metal tools
- Describe the different sheet metal layouts
- Demonstrate a parallel line development using a ruler and pencil
- Demonstrate the use of various sheet metal cutting tools
- Explain which cutting tools work best for various situations
- Demonstrate sheet metal fabrication using the brake, bar folder and forming rolls
- Demonstrate fastening sheet metal by using pop rivets and spot welding in conjunction with tabs and seams
- Analyze career opportunities in the sheet metal industry

Number of Days: 6-7

S.O. – 2-7

D.O. – 1.1, 3.4, 3.5, 4.2, 4.3, 4.4, 5.1, 5.4, 6.1, 6.2, 6.3

W.S.S. B12.2, 12.3, 12.8

Unit Four: Welding

- Demonstrate and identify safe welding procedures
- Compare and contrast welding to soldering, gluing, hardware, and duct tape
- List various welding processes
- Demonstrate a bead, and possible butt weld using the SMAW process
- Demonstrate a spot weld using the spot welder
- Analyze career opportunities in the welding industry

Textbook: pages 155-162

Number of Days: 3-5

S.O. – 2-7

D.O. – 1.1, 2.1, 3.4, 3.5, 4.2, 4.3, 4.4, 5.1, 5.4, 6.1, 6.2, 6.3

W.S.S. A12.7, B12.1, 12.2, 12.3, 12.7, 12.8, C12.6, C12.11

Unit Five: Machine Shop

- Demonstrate and identify safe machine shop procedures
- Identify basic parts of the lathe
- Demonstrate facing, turning, filing, and drilling on the lathe
- Explain how a CNC machine operates using CAD and CAM
- Demonstrate the use of an existing CAM program to machine using the CNC mill
- Analyze career opportunities in the machine shop

Textbook: pages 168-177

Number of Days: 8-10

S.O. – 2-7

D.O. – 1.1, 2.1, 2.2, 3.4, 3.5, 4.2, 4.3, 4.4, 5.1, 5.4, 6.1, 6.2, 6.3

W.S.S. B12.2, 12.3, 12.5, 12.7, 12.8, C12.6

Unit Six: Forging and possible Heat-treating

- Demonstrate and identify safe forging and heat treating procedures
- Explain different forging methods and how they are used in industry
- Demonstrate hand forging to make a flat head screw driver
- Explain the pros and cons to heat treating metal
- Analyze the career opportunities for forging and heat treating

Textbook: pages 136-140

Number of Days: 1

S.O. – 2-7

D.O. – 1.1, 3.4, 3.5, 4.2, 4.3, 4.4, 5.1, 5.4, 6.1, 6.2

W.S.S. B12.2, 12.3, 12.8

Instructional Strategies

- Lecture – 15%
- Demonstration – 25%
- Small group teaching during hands on work – 60%

Grading Procedures (approximate)

- Project grades – 75%
- Tests, quizzes, homework – 25%

APPENDIX:

COURSE: EXPLORATORY METALS
INSTRUCTOR: JAMES HAHM

Unit One: Shop Safety

- 1.1 Apply the problem-solving process to challenging situations
- 2.2 Contribute to a common goal
- 2.3 Resolve differences of opinion in a productive manner
- 4.2 Recognize environmental dangers
- 4.4 Recognize and practice effective work habits
- 6.1 Follow verbal and written direction

Unit Two: Bench Metal

- 1.1 Apply the problem-solving process to challenging situations
- 3.4 Develop their gifts
- 3.5 Use abilities and interests for God-pleasing recreation
- 4.2 Recognize environmental dangers
- 4.3 Recognize and practice effective work habits
- 4.4 Apply mathematical and scientific principles to industrial applications
- 5.1 Produce products with high quality standards
- 5.4 Follow verbal and written direction
- 6.1 Follow verbal and written direction
- 6.2 Communicate clearly and precisely
- 6.3 Read technical literature and/or drawings effectively

Unit Three: Sheet Metal

- 1.1 Apply the problem-solving process to challenging situations
- 3.4 Develop their gifts
- 3.5 Use abilities and interests for God-pleasing recreation
- 4.2 Recognize environmental dangers
- 4.3 Practice Christian stewardship of natural resources
- 5.1 Apply mathematical and scientific principles to industrial applications
- 6.1 Follow verbal and written direction
- 6.2 Communicate clearly and precisely
- 6.3 Read technical literature and/or drawings effectively

Unit Four: Welding

- 1.1 Apply the problem-solving process to challenging situations
- 2.1 Assist others in a common goal
- 3.4 Develop their gifts
- 3.5 Use abilities and interests for God-pleasing recreation
- 4.2 Recognize environmental dangers
- 4.3 Practice Christian stewardship of natural resources
- 4.4 Recognize and practice effective work habits
- 5.1 Apply mathematical and scientific principles to industrial applications
- 5.4 Produce products with high quality standards
- 6.1 Follow verbal and written direction
- 6.2 Communicate clearly and precisely
- 6.3 Read technical literature and/or drawings effectively

Unit Five: Foundry

- 1.1 Apply the problem-solving process to challenging situations
- 2.1 Assist others in a common goal
- 3.4 Develop their gifts
- 3.5 Use abilities and interests for God-pleasing recreation
- 4.2 Recognize environmental dangers
- 4.3 Practice Christian stewardship of natural resources
- 4.4 Recognize and practice effective work habits
- 5.1 Apply mathematical and scientific principles to industrial applications
- 5.4 Produce products with high quality standards
- 6.1 Follow verbal and written direction
- 6.2 Communicate clearly and precisely
- 6.3 Read technical literature and/or drawings effectively

Unit Six: Machine Shop

- 1.1 Apply the problem-solving process to challenging situations
- 2.1 Assist others in a common goal
- 2.2 Contribute to a common goal
- 3.4 Develop their gifts
- 3.5 Use abilities and interests for God-pleasing recreation
- 4.2 Recognize environmental dangers
- 4.3 Practice Christian stewardship of natural resources
- 4.4 Recognize and practice effective work habits
- 5.1 Apply mathematical and scientific principles to industrial applications
- 5.4 Produce products with high quality standards
- 6.1 Follow verbal and written direction
- 6.2 Communicate clearly and precisely
- 6.3 Read technical literature and/or drawings effectively

Unit Seven: Forging and possible Heat-treating

- 1.1 Apply the problem-solving process to challenging situations
- 3.4 Develop their gifts
- 3.5 Use abilities and interests for God-pleasing recreation
- 4.2 Recognize environmental dangers
- 4.3 Practice Christian stewardship of natural resources
- 4.4 Recognize and practice effective work habits
- 5.1 Apply mathematical and scientific principles to industrial applications
- 5.4 Produce products with high quality standards
- 6.1 Follow verbal and written direction
- 6.2 Communicate clearly and precisely

WISCONSIN STATES STANDARDS

Unit One: Shop Safety

- B.12.2 Demonstrate how systems are planned, organized, designed, built, and controlled

Unit Two: Bench Metal

- B.12.2 Demonstrate how systems are planned, organized, designed, built, and controlled
- B.12.3 Explain how enterprises apply technological systems for generating wealth by providing goods and services
- B.12.8 Select and apply appropriate processes to transform information into its most useful format

Unit Three: Sheet Metal

- B.12.2 Demonstrate how systems are planned, organized, designed, built, and controlled
- B.12.3 Explain how enterprises apply technological systems for generating wealth by providing goods and services
- B.12.8 Select and apply appropriate processes to transform information into its most useful format

Unit Four: Welding

- A.12.7 Explain how scientific and technological research can contribute to improved quality of life and a better standard of living
- B.12.1 Identify and explain the ways technological systems have evolved and will continue to evolve to satisfy human needs and desires
- B.12.2 Demonstrate how systems are planned, organized, designed, built, and controlled
- B.12.3 Explain how enterprises apply technological systems for generating wealth by providing goods and services
- B.12.7 Explain how new and higher quality products require new and higher quality materials and processing techniques
- B.12.8 Select and apply appropriate processes to transform information into its most useful format
- C.12.6 Design and/or create solutions that are functional, aesthetically pleasing, demonstrate quality, have value greater than the investment, and meet a societal want or need
- C.12.11 Select and apply appropriate processes to alter the characteristics of material to make it useful in different situations

Unit Five: Foundry

- B.12.1 Identify and explain the ways technological systems have evolved and will continue to evolve to satisfy human needs and desires
- B.12.2 Demonstrate how systems are planned, organized, designed, built, and controlled
- B.12.8 Select and apply appropriate processes to transform information into its most useful format

Unit Six: Machine Shop

- B.12.2 Demonstrate how systems are planned, organized, designed, built, and controlled
- B.12.3 Explain how enterprises apply technological systems for generating wealth by providing goods and services
- B.12.5 Assess the impact new and improved products and services have had on the quality of life; explain how the development of new tools, materials and processes is necessary to maintain and improve high productivity and quality
- B.12.7 Explain how new and higher quality products require new and higher quality materials and processing techniques
- B.12.8 Select and apply appropriate processes to transform information into its most useful format
- C.12.6 Design and/or create solutions that are functional, aesthetically pleasing, demonstrate quality, have value greater than the investment, and meet a societal want or need

Unit Seven: Forging and possible Heat-treating

- B.12.2 Demonstrate how systems are planned, organized, designed, built, and controlled
- B.12.3 Explain how enterprises apply technological systems for generating wealth by providing goods and services
- B.12.8 Select and apply appropriate processes to transform information into its most useful format