Course Title: Advanced Metals
Instructor: Tim Pinkert
Text Book: none

Course Purpose:

The purpose of Advanced Metals is to increase the knowledge and ability of a student who will choose welding, machining, HVAC, engineering, or some related field for a God pleasing career.

Course Outcomes:

The student will:

1. Learn and follow an orderly process to create a project from idea to finished product.
2. Create an orderly process to take a project from an idea to finished project.
3. Learn and demonstrate mechanical skills.
4. Demonstrate safe work habits on the job.
5. Follow directions.
6. Critically evaluate good workmanship
7. Apply problem-solving skills in the production of projects.
8. Employ math skills in working with measurements.
9. Demonstrate the ability to work well with others.
10. Use a micrometer to accurately measure to .001 of an inch
11. Use a caliper to accurately measure to .001 of an inch.
12. Be able to square a piece of metal on the mill.
13. Install an end mill into the mill.
14. Use an edge finder and indicator to create high quality work on the mill.
15. Safely light and extinguish the oxy-acetylene torch.
16. Face, center drill, drill, turn, bore, thread, and knurl on the lathe.
17. Surface, pocket, contour, drill on the CNC mill.
18. Write CNC code for a simple program.
19. Weld a quality weld using the SMAW, GTAW, GMAW and oxy-acetylene process

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 proper shop safety

Number of days: 2-4
S.O. 2-4, 6, 7
D.O. 1.1, 2.2, 2.3, 4.2, 4.4, 6.1, 6.2
W.S.S. B 12.2

Unit Two: Hand Tools (New and Review)

- Name hand tools
- Demonstrate proper use of hand tools, sand clothe, drill press, hand drill
- Demonstrate ruler, micrometer and caliper reading
- Tap and thread properly
- Rivet correctly

Number of days: 5-10
S.O. 2-4, 6, 7
D.O. 1.1, 2.1, 2.3, 4.2, 4.4, 6.1
W.S.S. B12.1, 12.2, 12.3, 12.8

Unit Three: Welding

- Demonstrate and identify safe welding habits
- Demonstrate proper lighting and ignition of oxy-acetylene torch
- Demonstrate a bead and butt weld (base metal and filler rod with a gap) on the oxy-acetylene torch
- Demonstrate a bead, butt weld, and T weld using the stick welder
- Demonstrate a root and weave pass on the stick welder
- Demonstrate a bead, and butt weld using the GTAW process.
- Analyze career opportunities in the welding industry

Number of days: 20-30
S.O. 2-7
D.O. 1.1, 2.1, 2.2, 3.4, 3.5, 4.2, 4.3, 4.4, 5.1, 5.3, 5.4, 6.1, 6.2, 6.3
W.S.S. A12.1, 12.3, 12.7, B12.1, 12.2, 12.8

Unit Four: Machine Shop

- Demonstrate and identify safe machine shop procedures
- Identify the major parts of the lathe
- Demonstrate facing, turning, filling, drilling, speeds and feeds, precision measurement, boring, threading and knurling on the lathe
- Explain how a CNC machine operates using CAD and CAM
- Explain various “G” and “M” codes
- From a tutorial create and execute a CAD and CAM program.
- Create a CNC program from nothing.
- Demonstrate mill operation through facing, squaring, slotting and drilling.
- Demonstrate accurate milling using the edge finder, indicator, and digital read out.
- Analyze career opportunities in the machine shop

Number of days: 100-120
S.O. 2-7
D.O. 1.1, 2.1, 2.2, 3.1, 3.2, 3.4, 3.5, 4.2, 4.3, 4.4, 5.1, 5.2, 5.3, 5.4, 6.1, 6...2, 6.3
W.S.S. W.S.S. A12.1, 12.3, 12.7, B12.1, 12.2, 12.3, 12.7, 12.8, C12.6

Unit Five: Sheet Metal (The student may substitute more machining or welding for sheet metal work)

- Demonstrate proper safety with sheet metal tools
- Describe the different sheet metal layouts
- Demonstrate parallel and radial line development using a ruler and scratch awl
- 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, lock seams and hardware
- Demonstrate soldering sheet metal
- Analyze career opportunities in the sheet metal industry

Number of days: 60
S.O. 2-7
D.O. 1.1, 2.1, 3.4, 3.5, 4.2, 4.3, 4.4, 5.1, 5.3, 5.4, 6.1, 6.2, 6.3
W.S.S. B12.1, 12.2, 12.3, 12.8

Instructional Strategies

Lecture – 10%
Demonstration – 20%
Small group or individual teaching during hands on work – 70%

Grading Procedures (approximate)

Project and Daily Work - 70%
Test, quizzes, homework – 15%
Final – 15%

APPENDIX:

COURSE: ADVANCED METALS
INSTRUCTOR: Tim Pinkert

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
6.2 Communicate clearly and precisely

Unit Two: Hand Tools (New and Review)

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 Three: Welding

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
5.3 Produce products by using current technology
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 Four: 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
5.2 Explore technologies
5.3 Produce products by using current technology
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: Sheet Metal

1.1 Apply the problem-solving process to challenging situations
2.1 Assist others in a common goal
3.4 Develop their gifts
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5.1 Apply mathematical and scientific principles to industrial applications
5.3 Produce products by using current technology
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

WISCONSIN STATE STANDARDS

Unit One: Shop Safety

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

Unit Two: Hand Tools (New and Review)

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.12.8 Select and apply appropriate processes to transform information into its most useful format

Unit Three: Welding

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.12.8 Select and apply appropriate processes to transform information into its most useful format

Unit Four: Machine Shop

A.12.1 Contrast the increasing complexities of technology with its ease of use
A.12.3 Explain why decisions regarding the use of technology are dependent on the situation, application, or perception of the group using it
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

Unit Five: Sheet Metal

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
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