

YOSEMITE REGIONAL OCCUPATIONAL PROGRAM

SHEET METAL AND INDUSTRIAL FABRICATION

CBEDS Code: 5613/5608

JOB TITLES

DOT NO.

Machine Shop Apprentice

660.280-026

Course description:

This course is designed for students who plan to pursue industrial technology careers and/or training. Students will explore the three primary areas of industrial technology: production, manufacturing, and construction, using hands-on laboratory exercises throughout the course. Students will practice the basic skills necessary to successfully function as an entry-level technician. This course will also focus on preparing students for several technical specialty-training programs offered at Modesto Junior College. A field trip and guest speakers are included in the curriculum

Recommended Prerequisites: None

DURATION: 2 Semesters/ 180 total hours

CREDIT: 5 Units/Semester

MEETS GRADUATION REQUIREMENTS IN: Practical Arts

REQUIRED FOR GRADUATION: No

SCHOOLS OFFERED: Beyer, Davis, Downey, Elliott, Johansen, and Modesto

MEETS UNIVERSITY OF CALIFORNIA ENTRANCE REQUIREMENTS: No

MEETS CALIFORNIA STATE UNIVERSITY REQUIREMENTS: No

ARTICULATED WITH POSTSECONDARY INSTITUTIONS: No

Basic Text(s):

Technology Shaping Our World, Gradwell, Welch, and Martin. Goodheart-Wilcox, 1991.

Supplementary Text(s):

Technology Shaping Our World, Gradwell, Welch, and Martin. Goodheart-Wilcox, 1991.

Equipment/Supplies Needed:

Student Tool Boxes (1 per 3 students)

Adjustable open-end wrench

Ballpein hammer

Center punch (4")

Combination squares

Dividers (6")

Drill gauges (1-60, 1/16-1/2, a-z

Files

Inside spring calipers (6")

Pipe wrench (12")

Scratch awl

Slip joint pliers (6")

Tape measure (3/4" x 16')

Drawing boards (26"x20")

T-squares (26")

30/60/90 triangles

45/45/70 triangles

Drafting compasses

Drafting scales

Framing squares

Steel rulers (12", 24", 36")

Outside micrometers

Vernier calipers

Welding equipment

Wire gauges

Wooden mallets

Basic electrical circuit board

Driver-driven pulley system board

Standard roller chain and sprocket

Hydraulic pump and motor

Compressor

Industrial lubricants (3 common types)

Manuals on hazardous materials

Overhead projector and transparencies

Slide projector and slides

VCR and monitor

Aviation snips

Bench vises

Cold chisel

Compass

Drill bit sets

Ear plugs

Hacksaw

Needle nose pliers

Safety glasses

Screw drivers (standard and phillips)

Steel protractor

Vise grips

Instructional Content
Instruction will include:

Student Outcomes
At the end of instruction, the
Student will be able to:

Hours
CL=Classroom
CC=Comm. Class

1. Sheet Metal & Industrial Fabrication 1. Key definitions and purposes 2. Careers in Industrial Fabrication. 3. Basic skill requirements in Industrial Fabrication occupations 4. Effects of Industrial Fabrication on society and the environment	Goal: Introduce the student to the concepts of Industrial Fabrication. A. Define "technology" and "industry" and their purposes. B. Identify and explain at least 3 types of Industrial Fabrication/Industrial Technology careers. C. Identify & explain at least 5 basic skills needed to succeed in Industrial Fabrication. D. Contrast how a specific type Industrial Fabrication has impacted society and the environment, both negatively and positively.	CTE C1.0-1.3 C2.2 C2.3	Anchor/CR A2.4-2.6 A3.1-3.9 A4.1 A5.1 A8.3 A8.4 A10.1-10.4 CR1 CR2 CR4 CR5 CR10	CL	CC 5
2. Problem solving processes. 1. Differences between man-made and naturally formed objects 2. Steps in the design process to solve problems 3. Design elements in problem-solving 4. Prototypes, and processes to build and evaluate a prototype	Goal: Introduce the student to the problem-solving processes utilized in contemporary technology. A. Distinguish between man-made and naturally formed objects. B. List and demonstrate the steps in the design process to arrive at a solution to a problem. C. List and use the elements of design to develop the problem solution. D. Explain the term "prototype". E. List and demonstrate the sequential steps necessary to build and evaluate a prototype. F. Understand the universal, systematic problem-solving model incorporating input, process, outcome, & feedback components.	C1.1 C1.2 C4.3	A4.0-4.6 A5.0-5.4 A11.1 A11.2 CR1 CR2 CR4 CR5 CR10		6
3. Production Technology Processes 1. Explanation of "production technology." 2. Four major parts of a production system 3. Five main classes of inputs in a production system 4. Explanation of the two production technologies: manufacturing and construction 5. Common output for manufacturing and construction 6. Three types of essential transportation 7. Three types of communication	Goal: Introduce the student to the processes of production technology. A. Define "production technology." B. List and describe the four major parts of a production system. C. List and define five main classes of inputs in a production system. D. Describe the two production technologies: manufacturing and construction. E. Define and list a common output for both manufacturing and construction. F. List and describe how three types of transportation are essential to a production system. G. List and describe how three types of communication support a production system.	C1.1 C2.0-2.4 C5.0-5.6	A4.0 A10.1 A10.2 CR1 CR2 CR4 CR5 CR9 CR11		12

LEGEND:
A = ANCHOR
CR – CAREER READY

Instructional Content
Instruction will include:

Student Outcomes
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6. Industrial Safety	Goal: Introduce student to all aspects of industrial safety.	CTE	Anchor/CR	CL	CC
<ol style="list-style-type: none"> 1. Review hazardous material. 2. Disposing and storing hazardous materials. 3. Industry and the environment. 4. Safe work environment. 5. General shop safety. 6. Personal safety equipment for specific occupations. 7. Safety signs. 8. Protecting co-workers. 9. Role of OSHA. 10. Ramifications of worker's compensation costs. 	<ol style="list-style-type: none"> A. Define the term "hazardous material." B. Identify and practice the proper methods of disposing and storing hazardous materials: toxins, flammables, abrasives, etc. C. Define the relationship between environmental impact and industry. D. Inspect the work area for a safe working environment and practice the proper procedures for reporting any violations, written and/or verbal. E. Pass a general shop safety test and demonstrate general shop safety. F. Choose the proper personal safety equipment for a specific occupational hazard. G. Read and select safety signs for specific industrial hazards H. Practice good habits for protecting co-workers. I. Explain and be familiar with OSHA. J. Explain company cost involved with maintaining safe working conditions and worker's compensation benefits. 	B6.1 B7.1 B5.8	A6.0 A5.0 A7.0 A8.0 CR1 CR2 CR5 CR6 CR7 CR11		11
7. Machine-Tool Processes: Hand Tools. <ol style="list-style-type: none"> 1. Review hand tools used in the industry. 2. Safe usage of hand tools. 3. Appropriate safety equipment used with hand tools. 4. Functions and tasks for various hand tools. 	Goal: Introduce the student to common hand tools used in Industrial Fabrication occupations. <ol style="list-style-type: none"> A. Identify hand tools. B. Demonstrate safe usage of hand tools during exercises. C. Select proper safety equipment for using various hand tools. D. Select the proper hand tool for a specific task. E. Understand the safe & appropriate use of tools & machines. F. Demonstrate the correct operation of tools & machines to form, separate, combine, & condition materials 	C6.0-6.3	A2.0-2.6 A4.1 A4.2 A5.1 A5.3 A10.1 A10.2 CR1 CR2 CR11		10
8. Machine-Tool Processes: Power Tools. <ol style="list-style-type: none"> 1. Review power tools used in the industry. 2. Care of power tools. 3. Safe usage of power tools. 4. Appropriate safety equipment used with power tools. 5. Functions and tasks for various power tools. 	Goal: Introduce the student to common power tools used in Industrial Fabrication occupations. <ol style="list-style-type: none"> A. Identify power tools. B. Demonstrate proper care of power tools during exercises. C. Demonstrate safe usage of power tools during exercises. D. Select proper safety equipment for using various power tools. E. Select the proper power tool for a specific task. F. Understand the safe & appropriate use of tools & machines. G. Demonstrate the correct operation of tools & machines to form, separate, combine, & condition material. 	C6.0-6.3	A6.2-6.5 A6.7 A7.2 A9.1-9.3 A10.1 A10.2 A10.4 A11.1 CR1 CR2 CR11		10

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<p>9. English (Conventional) Measuring System: Linear Measurement 1. Basic units in the conventional linear measuring system. 2. Measuring fractional inches. 3. Multiple measurements. 4. Review types of measuring devices. 5. Using precision tools for multiple measurements. 6. Measuring tools that measure 1/1000th of an inch 7. Math and arithmetic operations involving linear data. 8. Converting conventional linear measurement to metric.</p>	<p>Goal: Prepare the student with a working knowledge of the English (conventional) measuring system: linear measurement A. Identify the basic units of the conventional linear measuring system. B. Identify all divisions of the basic fractional inch to 1/32" using a common fractional inch ruler. C. Make multiple measurements within 1/16". D. Identify the types of measuring devices that measure in the fractional inch system. E. Make multiple measurements within 1/1000" using various precision tools. F. Identify the types of tools that measure to 1/1000 inch. G. Demonstrate general math and arithmetic ability by performing addition, subtraction, multiplication, and division operations involving linear data. H. Convert conventional linear measurement to metric linear measurement.</p>	<p>CTE C1.0-1.4</p>	<p>Anchor/CR A10.1 A11.0 CR1 CR2 CR5 CR11</p>	<p>CL</p>	<p>CC 6</p>
<p>10. Metric Measuring System: Linear Measurement. 1. Review metric measuring devices. 2. Review basic units of metric linear measurement system. 3. Multiple measurements. 4. Using precision measuring tools for multiple measurements. 5. Math and arithmetic operations involving linear data. 6. Converting metric linear measurement to English measurement.</p>	<p>Goal: Prepare the student with a working knowledge of the metric measuring system: linear measurement. A. Identify the common metric measuring devices. B. Identify the basic units of the metric linear measuring system. C. Demonstrate multiple measurements to one millimeter. D. Identify the types of measuring devices that measure to one millimeter. E. Make multiple measurements to 0.02 millimeters. F. Identify the types of precision measuring tools that measure to 0.02 millimeters. G. Demonstrate general math and arithmetic ability by performing addition, subtraction, multiplication and division operations involving linear data. H. Convert metric linear measurement to English linear measurement.</p>	<p>C1.0-1.4</p>	<p>A10.1 A11.0 CR1 CR2 CR5 CR11</p>		<p>6</p>
<p>11. English (Conventional) Measuring System: Area and Volume Measurement. 1. Review basic units of the conventional area and measuring system. 2. Review formulas used in calculating area and volume.</p>	<p>Goal: Prepare the student with a working knowledge of the English (conventional) measuring system: area and volume measurement. A. Identify the basic units of the conventional volume and area measuring system. B. Demonstrate a working knowledge of formulas used in calculating area and volume of various geometric shapes.</p>	<p>C1.0-1.4</p>	<p>A10.1 A11.0 CR1 CR2 CR5 CR11</p>		<p>6</p>

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11. English (Conventional) Measuring System: Area and Volume Measurement. (Cont.) 3. Review measuring devices used to measure and calculate area and volume. 4. Math and arithmetic operations involving volume and area data. 5. Converting conventional area and volume measurement to metric.	C. Demonstrate the ability to measure and calculate the area and volume of various geometric shapes using various measuring devices. D. Demonstrate general math and arithmetic ability by performing addition, subtraction, multiplication and division operations involving volume and area data. E. Convert conventional volume and area measurement to metric measurement.	CTE	Anchor/CR	CL	CC
12. Metric Measuring System: Area and Volume Measurement. 1. Review basic units of the metric area and measuring system. 2. Review formulas used in calculating area and volume. 3. Review measuring devices used to measure and calculate area and volume. 4. Math and arithmetic operations involving volume and area data. 5. Converting metric area and volume measurement to conventional.	Goal: Prepare the student with a working knowledge of the metric measuring system: area and volume measurement. A. Identify the basic units of the metric volume and area measuring system. B. Demonstrate a working knowledge of formulas used in calculating area and volume of various geometric shapes. C. Demonstrate the ability to measure and calculate the area and volume of various geometric shapes using various measuring devices. D. Demonstrate general math and arithmetic ability by performing addition, subtraction, multiplication and division operations involving volume and area data. E. Convert metric volume and area measurement to conventional measurement.	C1.0-1.4	A10.1 A11.0 CR1 CR2 CR5 CR11		6
13. Mechanical Drawing and Layout. 1. Review mechanical drawing, sketching and layout as it pertains to Industrial Fabrication. 2. Review standard mechanical drawing instruments. 3. Review standard layout tools. 4. Review sketching technique. 5. Review role of sketching as a form of communication. 6. Developing orthographic projection. 7. Developing isometric and oblique drawings. 8. Planning & layout processes	Goal: Prepare the student with a working knowledge of mechanical drawing and layout abilities used in Industrial Fabrication applications. A. Explain the purpose for mechanical drawing, sketching and layout with regard to industrial technology. B. Identify and demonstrate the use of standard mechanical drawing instruments. C. Identify and demonstrate the use of standard layout tools. D. Understand the various tools, equipment, media, & materials used in drafting appropriate to the field, & will understand methods & techniques for employing them appropriately. E. Demonstrate the sketching technique. F. Explain why sketching is an essential form of communication in Industrial Fabrication. G. Demonstrate the ability to develop orthographic projection; understand, identify & correctly use the alphabet of lines; develop an object graphically, using appropriate projection techniques. H. Demonstrate the ability to develop isometric and oblique drawings. I. Understand the planning & layout processes (designing, print reading, measuring, & so forth) used in manufacturing. J. Read prints & uses information from the prints to plan, layout, & produce products.	C1.0-1.4 B1.1	A1.0 A2.0-2.6 A4.0-4.6 A5.0-5.4 A6.7 A7.4-7.7 A8.1-8.3 A9.2 A9.3 A9.7 CR1 CR2 CR5 CR9		15

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<p>14. Fundamentals of Electricity and Applications to Industry.</p> <ol style="list-style-type: none"> 1. Ohm's law. 2. Review basic electrical test equipment. 3. Alternating current and direct current. 4. Review and define common elements of electricity. 5. Breakers and fuses. 6. Diagramming parallel loads. 7. Diagramming loads in a series. 8. Basic parallel circuits assembly. 9. Basic circuit series assembly. 	<p>Goal: Introduce the student to the fundamentals of electricity and its common applications in industry.</p> <ol style="list-style-type: none"> A. Demonstrate Ohms law. B. Identify basic electrical test equipment. C. Identify and demonstrate a working knowledge of test equipment. D. Explain what alternating current is. E. Explain what direct current is. F. Define the difference between alternating current and direct current. G. Explain the term "circuit." H. Explain the term "resistance." I. Explain the term "load." J. Explain the term "voltage." K. Explain the term "amperage." L. Explain the term "3-phase." M. Explain the purpose of breakers and fuses. N. Draw a diagram of parallel loads. O. Draw a diagram of loads in series. P. Assemble a basic parallel circuit. Q. Assemble a basic circuit series. 	<p>B3.0-3.6</p>	<p>CR1 CR2 CR4 CR5</p>		<p>11</p>
<p>15. Hydraulic Applications in Industry.</p> <ol style="list-style-type: none"> 1. Review concept of "hydraulics" and its applications to industry. 2. Functions and mechanics of fixed and variable displacement pumps. 3. Fixed displacement pump control. 4. Hydraulic motor functions. 5. Hydrostatic transmission. 	<p>Goal: Introduce the student to the principles of hydraulic applications in industry.</p> <ol style="list-style-type: none"> A. Explain the term "hydraulics." B. Understand the basic principles of hydraulic power. C. Explain the applications of hydraulic power to generate electricity, mechanical movement, & force multiplication. D. List five ways hydraulics are used in industry. E. Explain the basic function of a fixed displacement pump. F. Explain the basic function of a variable displacement pump. G. Explain the difference between a fixed and variable displacement pump. H. Illustrate by diagram how a fixed displacement pump control works. I. Explain the basic function of a hydraulic motor. J. Define the term "hydrostatic transmission." 	<p>B11.4</p>	<p>A2.0-2.6 A5.0-5.4 A11.0 CR1 CR2 CR4 CR5</p>		<p>11</p>

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16. <i>Pneumatic Applications in Industry.</i>	Goal: Introduce the student to the principles of pneumatic applications in industry.	CTE	Anchor/CR	CL	CC
<ol style="list-style-type: none"> 1. Review pneumatics concepts and application to industry. 2. Basic compressor function. 3. Basic motor function. 4. Diagram pneumatic control system. 5. Comparing a pneumatic system to a hydraulic system. 6. Applications of pneumatic and hydraulic power systems. 	<ol style="list-style-type: none"> A. Explain the term "pneumatics." B. Understand the basic principles of pneumatic power. C. Explain the applications of pneumatic power to generate electricity, mechanical movement, & force multiplication. D. List five ways pneumatics are used in industry. E. Explain the basic function of a compressor. F. Explain the basic function of a motor in pneumatic power. G. Illustrate by diagram how a pneumatic control system works. H. Explain the difference between a hydraulic and a pneumatic system. I. Explain why pneumatic power would be better power. J. Identify a situation where hydraulic power would be a preferred choice over pneumatic power. K. List three applications where hydraulic power would be the appropriate choice. L. List three applications where pneumatic power would be the appropriate choice. 		A2.0-2.6 A4.1 A4.5 A5.0-5.4 A9.7 A10.0-10.4 CR1 CR2 CR4 CR5		11
17. Communication Skills in Industrial Technology Occupations. <ol style="list-style-type: none"> 1. Developing a work log (or journal) to record laboratory assignments. 2. How to write a safety plan for specific tools. 3. Developing oral skills to describe safe operations of tools. 4. Review terminology exercises in each instructional unit. 	Goal: Introduce and allow the student to practice communication skills necessary for Industrial Fabrication occupations. <ol style="list-style-type: none"> A. Create a basic work log (journal), recording laboratory assignments. B. Develop a written safety plan for using an electric hand drill. C. Give an oral explanation of safety steps for the operation of a power machine. D. Perform terminology exercises from each instructional unit. E. Function effectively as a team member. 	Infused & integrated through-out the course			
18. Math Applications in Industrial Technology Occupation (infused throughout the course). <ol style="list-style-type: none"> 1. Math and arithmetic applications in laboratory exercises. 2. Using ratios to determine drive speeds. 3. Formulas to determine area and volume. 4. Electrical formula to calculate electrical ratios. 5. Arithmetic operations in the unit on measuring. 6. Arithmetic operations in the unit on mechanical drawing, layout and design. 	Goal: Introduce the student to practice math applications necessary for Industrial Fabrication occupations. <ol style="list-style-type: none"> A. Perform the required math and arithmetic applications for all laboratory exercises. B. Use ratios to determine drive speeds of power transmission. C. Use formulas to determine area and volume of basic geometric shapes. D. Use the electrical formula to calculate electrical ratios. E. Perform basic arithmetic operations during the instructional unit on measuring: standard and precision. F. Perform basic arithmetic operations during the instructional unit on mechanical drawing, layout and design. 	Infused & integrated through-out the course			

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Hours

<p>19. Attitudes, Behaviors, and Personal Characteristics Valued by Employers.</p> <ol style="list-style-type: none"> 1. Traits necessary to be a productive team member. 2. Comparing destructive and constructive criticism. 3. Alcohol and substance abuse in the workplace. 4. Impact of worker's compensation on an employer. 5. The personal characteristics valued by employers. 	<p>Goal: Communicate to the student the types of attitudes, behaviors, and personal characteristics valued by employers.</p> <ol style="list-style-type: none"> A. Demonstrate the traits necessary to perform as an active and productive team member. B. Explain the difference between destructive and constructive criticism. C. Explain why substance and alcohol abuse are inappropriate in the workplace, D. Explain the role and cost of worker's compensation insurance for the employer. E. Demonstrate the following personal characteristics valued by employers: <ol style="list-style-type: none"> a. Responsibility and dependability. b. Strong motivation and a willingness to learn. c. Have a good personal appearance. d. Honesty and pride in their job tasks. 	<p>Infused & integrated through-out the course</p>
<p>20. Mechanical Support Skills for Industrial Occupations.</p> <ol style="list-style-type: none"> 1. Review common mechanical fasteners. 2. Use of abrasives. 3. Importance of preventative maintenance in industry. 	<p>Goal: Teach student the basic mechanical support skills needed for industrial occupations.</p> <ol style="list-style-type: none"> A. Identify common mechanical fasteners. B. Give a general explanation about the use of abrasives. C. Explain why preventative maintenance is important in industry. 	<p>5</p>
<p>21. Shielded Metal Arc Welding (SMAW)</p> <ol style="list-style-type: none"> 1. Hazards associated with SMAW. 2. Safety equipment. 3. Power sources. 4. Electrodes. 5. Welding positions. 6. Alternating & direct currents. 7. Correct applications. 8. Welding joints. 9. Flat position. 	<ol style="list-style-type: none"> D. List the breakdown for the AWS code E6011. E. List the 4 basic welding positions. F. Define the difference between direct current reverse polarity, & direct current straight polarity & alternating current. G. Define a situation where SMAW would be the correct welding procedure. H. Demonstrate the 4 primary welding joints. I. Fill a 4" x 8" coupon with overlapping E8018 beads in the flat position. J. Understand the functions of SMAW machines & consumables, & how the equipment used in those functions is properly assembled & set up for various applications. K. Produce weldments, using appropriate machine setup & electrode types as indicated by material type & size, weld position, joint alignment & type, deposition rate, & bead finish. 	<p>10</p>

Instructional Content

Instruction will include:

Student Outcomes

At the end of instruction, the Student will be able to:

Hours

<p>22. Oxy-Acetylene Welding (OAW).</p> <ol style="list-style-type: none"> 1. Hazards associated with OAW. 2. Safety equipment. 3. Equipment used in OAW. 4. Fusion & adhesive welding applications. 5. Proper adjustment of equipment. 6. Flat position. 	<p>Goal: Instruct student in the applications of oxy-acetylene welding used in industrial fabrication.</p> <ol style="list-style-type: none"> A. Define the 5 most common hazards associated with OAW. B. Identify & properly use the 5 most common types of safety equipment associated used during the OAW process. C. Identify the 5 primary components of an OAW apparatus. D. Define the difference between fusion & adhesion welding. E. Set the apparatus to hold a neutral welding flame. F. Weld butt joint using a 2" x 2" 18 gauge steel coupons. G. Understand the safe & efficient use of oxyfuel processes & equipment to form, separate, & combine metals. H. Use the oxyfuel processes of forging, flame cutting, brazing, soldering, & welding to produce parts & products. 	5
<p>23. Oxy-Acetylene Cutting (OAC)</p> <ol style="list-style-type: none"> 1. Hazards associated with OAC. 2. Safety equipment. 3. Equipment used in OAC. 	<p>Goal: Instruct student in the applications of oxy-acetylene cutting used in industrial fabrication.</p> <ol style="list-style-type: none"> A. Define the 5 most common hazards associated with OAC. B. Identify & properly use the 5 most common types of safety equipment used during the OAC process. 	5
<p>23. Oxy-Acetylene Cutting (OAC)</p> <ol style="list-style-type: none"> 4. Proper adjustment of equipment used in OAC. 5. Correct application of OAC. 	<ol style="list-style-type: none"> C. Identify the 5 primary components of an OAC apparatus. D. Set the apparatus to hold a neutral cutting flame. E. Cut a 4" x 8" coupon from a piece of 1/2" steel plate. 	
<p>24. Plasma Arc Cutting (PAC)</p> <ol style="list-style-type: none"> 1. Hazards associated with PAC. 2. Safety equipment. 3. Equipment used in PAC. 4. Proper adjustment of equipment used in PAC. 5. Correct application of PAC 	<p>Goal: Instruct student in the applications of plasma arc cutting used in industrial fabrication.</p> <ol style="list-style-type: none"> A. Define the 5 most common hazards associated with PAC. B. Identify & properly use the 5 most common types of safety equipment used during the PAC process. C. Identify the 5 primary components of a PAC power source. D. Set the apparatus to hold a neutral cutting flame. E. Cut a 4" x 4" coupon from a piece of 18 gauge steel sheet metal. 	5

Instructional Content

Instruction will include:

Student Outcomes

At the end of instruction, the Student will be able to:

Hours

<p>25. Gas Metal Arc Welding (GMAW)</p> <ol style="list-style-type: none"> 1. Hazards associated with GMAW. 2. Safety equipment. 3. Power sources used in GMAW. 4. Proper use of a welding gun. 5. Using filler wire. 6. Purpose of shield gas. 7. Types of shielding gas. 8. Correct applications of GMAW. 9. Transfer modes. 10. Flat position. 	<p>Goal: Instruct the student in the application of GMAW used in industrial fabrication.</p> <ol style="list-style-type: none"> A. Define the 5 most common hazards associated with GMAW. B. Identify & properly use the 5 most common types of safety equipment used during the GMAW process. C. Adjust the power source for short circuit transfer welding. D. Identify the components of a GMAW gun. E. Define the difference between solid & flux core wire. F. Define the function of a shielding gas. G. Define the difference between a reactive gas & an inert gas. H. Define a situation where GMAW would be the correct welding application. I. Define the difference between spray & short circuit transfer modes. J. Perform lap joints on 4" x 4" 18 gauge steel sheet metal coupons using .025 wire. K. Have a basic understanding of the machines & consumables used in GMAW & similar processes. L. Produce weldments, using the appropriate shielding gas, wire type & size, type of metal transfer, & machine setup as indicated by type & thickness of metal, weld position, penetration, & type of weld bead. 	<p style="text-align: center;">10</p>
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