INTRODUCTION TO WELDING & CUTTING PROCESSES
Course Syllabus

Course Number: WELD-1619
OCAS Code: None
Course Length: 90 Hours
Career Cluster: Manufacturing
Career Pathway: Welding and Metal Fabrication
Career Major(s): Combination Welder

Pre-requisite(s):

Course Description:
This is an introduction to basic welding safety, math, hand tools, power tools, blueprints, rigging, communication skills and employability skills. Also an introduction to uses of safety equipment, protective clothing, and procedures for cutting metals are included. This course identifies oxyfuel cutting equipment and setup procedures, safety requirements for oxyfuel cutting, how to light, adjust and turn off equipment. Instruction on cutting techniques, straight line piercing, bevels, washing and gouging is also given.

Textbooks/Materials:
Modern Welding, GoodHeart-Willcox (2004)
Math for Welders, Marion and Nino, GoodHeart-Willcox (2001)

Course Objectives:

A. Demonstrate Safety Skills.  
1. Understand and explain the purpose of safety policies.  
2. Explain the proper steps in reporting an accident or emergency.  
3. Describe and discuss established first aid procedures.  
4. Describe and discuss the role of the Occupational Safety and Health Act (OSHA) and the EPA (Environmental Protection Agency).  
5. Demonstrate knowledge of OSHA requirements:  
   a. Lock Out/Tag out procedures  
   b. Personal protective equipment  
   c. Precautionary labeling  
   d. Working in confined spaces  
   e. Hot work permits  
   f. HAZCOM  
   g. MSDS  
   h. Blood borne Pathogens  
6. Demonstrate safe behavior on and around ladders and scaffolds.  
7. Explain the hazards associated with specific welding process, material, equipment and tools.  
8. Demonstrate safety techniques for storing and handling cylinders.  
9. Describe workplace fire hazards and how to properly extinguish fires.  
10. Discuss electrical hazards and how to avoid electric shock.  
11. Demonstrate proper use and inspection of equipment used for ventilation and
how to avoid welding fumes.  

12. Demonstrate safe material handling techniques.  
   a. Lifting  
   b. Transporting  
   c. Storing  

13. Practice tool safety.  

14. Practicing good housekeeping and work area operation.  

15. Perform safety inspection of equipment and accessories.  
   a. Protective clothing and equipment.  
   b. Hand and Power Tools  
   c. Work area  
   d. Communicate hazard warnings  
   e. Welding equipment and accessories  

B. Identify Basic Safety for the Different Metal Cutting Processes.  
   1. Oxyfuel Cutting  
   2. Air Carbon Arc Cutting and Gouging  
   3. Plasma Arc Cutting 

C. Identify the Different Metal Cutting Processes.  
   1. Oxyfuel Cutting  
   2. Air Carbon Arc Cutting and Gouging  
   3. Plasma Arc Cutting 

D. Identify and Explain the Use of Oxyfuel Cutting Equipment.  

E. Demonstrate an Understanding of the Following Manual Oxyfuel Cutting (OFC) Processes:  
   1. Perform safety Inspections of manual OFC equipment and accessories.  
   3. Set up equipment for manual oxyfuel gas cutting operations on carbon steel plate  
      a. Regulator set for appropriate tip/fuel gas/material.  
      b. Tip selection (size and type).  
   4. Operate manual oxyfuel cutting equipment.  
      a. Light and adjust an oxyfuel torch.  
      b. Control gas flow and flame size/type.  
      c. Start up procedure.  
      d. Shut down procedure for oxyfuel equipment.  
      e. Correct torch angle.  
      f. Travel speed.  
   5. Disassemble oxyfuel equipment  
   7. Perform straight cutting operations on carbon steel plate and pipe in flat and horizontal positions.  
      a. Straight Line.  
   8. Perform shape cutting operations on carbon steel plate and pipe in flat and horizontal positions.  
      a. Square.  
   9. Perform bevel cutting operations on carbon steel plate and pipe in flat and horizontal Positions.  
      a. Piercing.
b. Slot.  

c. Bevels.  

d. Washing.  

e. Gouging.  

10. Perform scarfing and gouging operations to remove base metal on carbon steel plate and pipe in flat and horizontal positions.  

F. Operate a motorized, Portable Oxyfuel Gas Cutting Machine.  

G. Demonstrate an Understanding of the Following Mechanized Oxyfuel Cutting (OFC) Processes:  

1. Perform safety inspections of mechanized OFC equipment and accessories.  

2. Makes minor external repairs to mechanized OFC equipment and accessories.  

3. Set up equipment for manual mechanized gas cutting operations on carbon steel plate.  

4. Operate manual oxyfuel cutting equipment.  

5. Perform straight cutting operations on carbon steel plate and pipe in flat and horizontal Positions.  
   a. Straight Line.  

6. Perform shape cutting operations on carbon steel plate and pipe in flat and horizontal Positions.  
   a. Square.  

H. Complete Administrative Requirements for Enrollment.  

1. Discuss district, school, and class policies and procedures.  

2. Discuss NCCRE Certification requirements.  

3. Discuss grading criteria.  

I. Basic Safety  

1. Identify the responsibilities and personal characteristics of a professional craftsperson.  

2. Explain the role that safety plays in the construction crafts.  

3. Describe what job-site safety means.  

4. Explain the appropriate safety precautions around common job-site hazards.  

5. Demonstrate the use and care of appropriate personal protective equipment.  

6. Follow safe procedures for lifting heavy objects.  

7. Describe safe behavior on and around ladders and scaffolds.  

8. Explain the importance of the HazCom (Hazard Communication Standard) requirement and MSDSs (Material Safety Data Sheets).  

9. Describe fire prevention and fire fighting techniques.  

10. Define safe work procedures around electrical hazards.  

11. Demonstrate proper safe operation practices in the work area.  

J. Welding Safety  

1. Identify some common hazards in welding.  

2. Explain and identify proper personal protection used in welding.  

3. Demonstrate how to avoid welding fumes.  

4. Explain some of the causes of accidents.  

5. Identify and explain uses for material safety data sheets.  

6. Demonstrate safety techniques for storing and handling cylinders.  

7. Explain how to avoid electric shock when welding.  

8. Demonstrate proper material handling methods.  
FCAW PIPE

9. Demonstrate proper use and inspection of ventilation equipment.  
10. Demonstrate proper Hot Zone operation.  
11. Demonstrate proper work actions for working in confined spaces.

K. Introduction to Construction Math
1. Add, subtract, multiply, and divide whole numbers, with and without a calculator.  
2. Use a standard ruler and a metric ruler to measure.  
3. Add, subtract, multiply, and divide fractions.  
4. Add, subtract, multiply, and divide decimals, with and without a calculator.  
5. Convert decimals to percents and percents to decimals.  
6. Convert fractions to decimals and decimals to fractions.  
7. Explain what the metric system is and how it is important in the construction trade.  
8. Recognize and use metric units of length, weight, volume, and temperature.  
9. Recognize some of the basic shapes used in the construction industry and apply basic geometry to measure them.  
10. Demonstrate the proper use of and interpretation of measuring devices to determine size, length, angle, and distance.  
11. Use a calculator and demonstrate rounding of basic arithmetic operations.

L. Introduction to Hand Tools
1. Recognize and identify some of the basic hand tools used in the construction trade.  
2. Use these tools safely.  
3. Describe the basic procedures for taking care of these tools.

M. Introduction to Power Tools
1. Identify commonly used power tools of the construction trade.  
2. Use power tools safely.  
3. Explain how to maintain power tools properly.

N. Demonstrate An Understanding Of Basic Communication Skills.
1. Demonstrate the ability to interpret information and instructions presented in both written and verbal form.  
2. Demonstrate the ability to communicate effectively in on-the-job situations using written and verbal skills.

O. Demonstrate An Understanding Of Basic Employability Skills.
1. Explain the construction industry, the role of the companies that make up the industry, and the role of individual professionals in the industry.  
2. Demonstrate critical thinking skills and the ability to solve problems using those skills.  
3. Demonstrate knowledge of computer systems, and explain common uses for computers in the construction industry.  
4. Demonstrate effective relationship skills with teammates and supervisors, the ability to work on a team, and appropriate leadership skills.  
5. Be aware of workplace issues such as sexual harassment, stress, and substance abuse.

P. Demonstrate An Understanding Of Basic Blueprint Reading.
1. Recognize and identify:  
   a. Basic blueprint terms
b. Components

c. Symbols

2. Relate information on blueprints to actual locations on the print.
3. Recognize different classifications of drawings.
4. Interpret and use drawing dimensions.

Q. Demonstrate An Understanding Of Basic Rigging Practices.
1. Identify and describe the use of slings and common rigging hardware.
2. Describe basic inspection techniques and rejection criteria used for slings and hardware.
3. Describe basic hitch configurations and their proper connections.
4. Describe basic load-handling safety practices.

R. Demonstrate An Understanding of Occupational Orientation Procedures.
1. Prepares time of job cards, reports or records.
2. Performs housekeeping duties.
3. Follows verbal instructions to complete work assignments.
4. Follows written instructions to complete work assignments.

S. Identify the Four Types of Welding Processes.
1. GMAW
2. FCAW
3. GTAW
4. SMAW

T. Demonstrate a Basic Understanding of the Four Types of Welding Processes.
1. GMAW
2. FCAW
3. GTAW
4. SMAW

Core-Introductory Craft Skills, National Center for Construction Education and Research (NCCER)
2 Welding Skills, National Center for Construction Education and Research (NCCER)
3 ODCTE Welding Skill Standards, Duty M
4 Sense Level I, Entry Level Welder, Modules 1 and 2, American Welding Society (AWS)

Teaching Methods:
The class will primarily be taught by the lecture and demonstration method and supported by various media materials to address various learning styles. There will be question and answer sessions over material covered in lecture and media presentations. Supervised lab time is provided for students to complete required projects.

Grading Procedures:
1. Students are graded on theory and shop practice and performance.
2. Each course must be passed with seventy (70%) percent or better.
3. Grading scale: A=90-100%, B=80-89%, C=70-79%, D=60-69%, F=50-59%.
### Description of Classroom, Laboratories, and Equipment:

Tulsa Technology Center campuses are owned and operated by Tulsa Technology Center School District No. 18. All programs provide students the opportunity to work with professionally certified instructors in modern, well-equipped facilities.

### Available Certifications/College Credit

The student may be eligible to take state, national or industry exam after completion of the program. College credit may be issued from Oklahoma State University-Okmulgee or Tulsa Community College. See program counselor for additional information.

### College Credit Eligibility:

The student must maintain a grade point average of 2.0 or better.