

## **Lenoir City High School/TCAT Welding Technology Course Outline/Syllabus**

**Instructor: Tim Youngberg (AWS CWI)**

**Possible Class hours per one school year (540)**

**Tennessee College of Applied Technology (TCAT): 1,296 required hours,**

**Description:** The Welding Technology program here at Lenoir City High School prepares individuals to apply technical knowledge and skills to join or cut metal surfaces. Formal and self-paced instruction includes but not limited to: Shielded Metal Arc Welding (SMAW/Stick); Gas Metal Arc Welding (GMAW/MIG); Flux Cored Arc Welding (FCAW); Gas Tungsten Arc Welding (GTAW/TIG), and various cutting processes. Related technical instruction also includes Safety, quality assurance and control, welding symbol and print reading, and workplace skills.

**Assessment:** Students will be assessed in both written and manipulative testing, as well as shop participation utilizing both the Tennessee College of Applied Technology (TCAT) and the National Center for Construction Education and Research (NCCER) Construction Core, Welding Levels One and Two course of study. Plus, the American Welding Society (AWS) applicable codes.

**Grading:** This course is based on a Pass/Fail Grading system, along with a minimum number of student hours which must be met each semester.

### **Student Learning Outcomes:**

1. Communicate effectively.
2. Integrate technology.
3. Learn effectively - use welding equipment effectively.
4. Demonstrate cooperative/teamwork skills.
5. Apply safety.
6. Think critically and creatively.
7. Demonstrate responsible work ethics.

### **Program Outcomes:**

- A. Practice safety in a welding shop.
- B. Develop code of behavior for working in a welding shop environment.
- C. The student will learn to operate and use both hand and power tools such as, Grinders, Ironworker, Bandsaw, and Drill Press.
- D. Demonstrate ability to set-up and operate welding and cutting equipment.
- E. The student will learn and have a basic understanding of cutting processes used in the welding trade, these processes are Oxy-Fuel Cutting (OFC), Plasma Arc Cutting (PAC) and Carbon Arc Cutting (CAC)
- F. The student will have a basic understanding of SMAW (Stick), GMAW (MIG) FCAW, (Flux Core) GTAW (TIG) Arc Welding Processes and will prove that knowledge in both written and manipulative testing and will have entry level welding skills, in various welding positions.

- G. The student will know how to prepare metal for welding and how to fit-up V-groove with backing joints, open-root, lap, and t-joints properly. This skill will be demonstrated during performance tests.
- H. Students will learn the skills needed for employment, good attendance, good work habits, and good personal relation skills.
- I. Students may be able to depending on their individual ability, take the American Welding Society (AWS) D1.1 Structural Steel Welding Test in various positions and processes they have completed to earn a Welder Qualification/Certification.

**WEL1020/29101-15 Welding Safety:** Through a variety of classroom and/or lab learning and assessment activities, students in this course will explain job/site safety and precautions for job/site hazards, determine the uses of personal protective equipment (PPE), identify the safety equipment and procedures related to safe work practices and environment, identify fire prevention and protection techniques, and explore Hazardous Communications (HazCom) including Safety Data Sheets (SDS).

**WEL2010/00102/29106-15/29201/29202 Print Reading/Construction Math/Welding Detail**

**Drawings/Welding Symbols:** The course is designed to teach a basic understanding of welder's math and the symbols used on blueprints. The symbols used on blueprints give the designer a way to relay information to the fitter and welder. The graphic language on blueprints uses various symbols, lines, and notes to convey information. A blueprint is used by a welder to visualize the parts final form, to position and align various members, and to determine the type of joint preparation. It tells the welder what type of filler metal to use, where the weld metal is to be placed, the extent of welding and the size, contour, and finish method for the welds.

**WEL1030/29102-15/29103-13/29104-15 Oxy-Fuel (OFC), Carbon Arc Cutting (CAC), Plasma Arc Cutting (PAC), Cutting Procedures:** This course will include cutting of ferrous and non-ferrous materials with manual, motor driven, and CNC cutting equipment. Also included are plasma-arc cutting (PAC) and carbon-arc cutting (CAC). Safety, equipment, and the fundamentals of cutting processes will be introduced. Students will be expected to produce acceptable oxy-fuel, PAC, and CAC cuts.

**Prerequisites, WEL1020/29101-15 Welding Safety.**

**WEL1040/29107-15/29108-15/29109-15/29111-15/1211-15 SMAW (Stick):** Through classroom and shop learning and assessment activities, students in the course will describe the shielded metal arc welding (SMAW) process, demonstrate the safe and correct set-up of the SMAW equipment, associate SMAW electrode classifications with base metals and joint criteria, demonstrate proper electrode selection and use based on metal types and thicknesses, build pads of weld beads with selected electrodes in the flat, horizontal, Vertical and Overhead positions, perform basic SMAW welds on selected weld joints, and perform visual inspection of welds. **Prerequisites:** WEL1020/29101-15 Welding Safety; WEL2010/00102/29106-15/29201/29202 Print Reading/Construction Math/Welding Detail Drawings/Welding Symbols, WEL1030/29102-15/29103-13/29104-15 Oxy-Fuel (OFC), Carbon Arc Cutting (CAC), Plasma Arc Cutting (PAC), Cutting Procedures.

**WEL135 SMAW (Stick) 2030/1211-15** The course is a continuation of SMAW: Additional positions and tests will be introduced providing the student additional experience with Shielded Metal Arc Welding.

**WEL1055/29209 GMAW (MIG)** Through classroom and shop learning and assessment activities, students in the course will explain gas metal arc welding (GMAW) process, demonstrate the safe and correct set-up of the GMAW process. Build pads of weld beads with selected electrodes in the flat, horizontal, Vertical and Overhead positions, perform basic GMAW welds on selected weld joints, and perform visual inspection of welds **Prerequisites:** WEL1020/29101-15 Welding Safety, WEL2010/00102/29106-15/29201/29202, Print Reading/Construction Math/Welding Detail Drawings/Welding Symbols, WEL1030/29102-15/29103-13/29104-15 Oxy-Fuel (OFC), Carbon Arc Cutting (CAC), Plasma Arc Cutting (PAC), Cutting Procedures, WEL1040/29107-15/29108-15/29109-15/29111-15/1211-15 SMAW (Stick), WEL135 SMAW (Stick) 2030/1211-15,

**WEL2040/29209 GMAW (MIG) Welding:** The course is a continuation of GMAW. Additional positions and tests will be introduced providing the students additional experience with gas metal arc welding.

**WEL29210 FCAW Welding:** The Flux Cored Arc Welding Unit (FCAW) is designed to teach the student the correct techniques to weld in all positions. Safety is stressed in the shop. Practice and training in the welding shop will develop the basic skill level necessary to produce quality welds in all positions and in different joint configurations. **Prerequisites:** WEL1020/29101-15 Welding Safety, WEL2010/00102/29106-15/29201/29202 Print Reading/Construction Math/Welding Detail Drawings/Welding Symbols, WEL1030/29102-15/29103-13/29104-15 Oxy-Fuel (OFC), Carbon Arc Cutting (CAC), Plasma Arc Cutting (PAC), Cutting Procedures, WEL1040/29107-15/29108-15/29109-15/29111-15/1211-15 SMAW (Stick), WEL135 SMAW (Stick) 2030/1211-15, WEL1055/29209 GMAW (MIG).

**WEL2025/29207/29208 GTAW (TIG)** This is an introduction to GTAW (TIG) welding where students will learn safety and how to set up the welding equipment, types of filler metals, electrode and shielding gases. Also, how to weld plate with both filler metal and Autogenous (No Filler metal or fusion welding) **Prerequisites:** WEL1020/29101-15 Welding Safety, WEL2010/00102/29106-15/29201/29202 Print Reading/Construction Math/Welding Detail Drawings/Welding Symbols, WEL1030/29102-15/29103-13/29104-15 Oxy-Fuel (OFC), Carbon Arc Cutting (CAC), Plasma Arc Cutting (PAC), Cutting Procedures, WEL1040/29107-15/29108-15/29109-15/29111-15/1211-15 SMAW (Stick), WEL135 SMAW (Stick) 2030/1211-15, WEL1055/29209 GMAW (MIG).

**WEL2025/29305-16 GTAW (TIG):** The course is a continuation of GTAW. Additional positions and tests will be introduced providing the students additional experience with gas tungsten arc welding, working with both ferrous and non-ferrous metals as well as pipe.

**For details about Dual Enrollment Welding Technology through TCAT, Harriman, click the link:**

<https://tcatharriman.edu/programs/welding-technology>