



2023-2024

Welding Technology 3

COURSE OUTLINE - UC

DESCRIPTION:

Welding Technology 3 is a capstone course in the Welding and Materials Joining pathway which builds on the knowledge and skills acquired in Welding Technology 2. Students will continue to practice structure and precision in various welding and cutting processes while learning advanced techniques in Shielded Metal Arc Welding (SMAW) and Orbital Arc Welding. Emphasis is placed on hands-on projects and quality welds that meet industry standards and certifications. This course prepares students for entry-level jobs and post-secondary education. Activities in this course include work-based learning that connects students to industry and the local community. Students must successfully complete Welding Technology 1 and Welding Technology 2 for pathway completion and/or articulation.

INFORMATION:

PRE-REQUISITE:	Welding Technology 2
LENGTH:	One Year
SECTOR:	Manufacturing and Product Development
PATHWAY:	Welding and Materials Joining
ARTICULATED:	No
UC A-G APPROVAL:	Yes: College-Preparatory Elective (G) – Interdisciplinary Requirement

O*NET SOC CODES:

47-2211.00	Sheet Metal Workers
51-2041.00	Structural Metal Fabricators and Fitters
51-4121.00	Welders, Cutters, Solderers, and Brazers
51-4122.00	Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders

Orientation
<ul style="list-style-type: none"> A. Introduce the course and facilities. B. Discuss the syllabus and major objectives. C. Explain applicable classroom management procedures, the ROP Student Rules of Conduct, and any operational guidelines. D. Review instructor/student expectations. E. Explain enrollment and attendance requirements and procedures. F. Review grading and student evaluation procedures. G. Discuss the community classroom aspect of the program if applicable. H. Discuss the “next steps” related to additional education, training, and employment. I. Review classroom safety, emergency and disaster procedures.
1. Communication Skills
<ul style="list-style-type: none"> A. Demonstrate positive verbal communication skills using appropriate vocabulary, demeanor, and vocal tone in the classroom and/or worksite. B. Read and interpret written information and directions. C. Practice various forms of written communication appropriate to the occupation. D. Practice positive body language skills. E. Practice professional verbal skills for resolving a conflict. F. Demonstrate active listening skills including techniques for checking for understanding, and for obtaining clarification of directions.
2. Interpersonal Skills
<ul style="list-style-type: none"> A. Demonstrate positive teamwork skills by contributing to a group effort. B. Practice the importance of diversity awareness and sensitivity in the workplace. C. Define sexual harassment in the workplace and identify the employee’s role and responsibility. D. Practice participation skills. E. Identify different personality types and strategies for working effectively with each type. F. Practice business and social etiquette skills appropriate to the occupation. G. Discuss the role of business and personal ethics in the decision-making process. H. Evaluate various job-related scenarios and justify decisions based on ethics. I. Demonstrate flexibility and adaptability in working with others. J. Demonstrate the use of time management skills.

3. Employability Skills

- A. Demonstrate appropriate attendance and punctuality practices for the classroom and worksite if applicable.
- B. Prepare a resume, cover letter, and job application forms.
- C. Demonstrate interviewing techniques using appropriate tone and body language.
- D. Demonstrate appropriate dress and grooming standards in seeking employment and for the workplace.
- E. Identify strategies for employment retention.
- F. Analyze the impact of social networking on employability.
- G. Identify the need for continuing education, professional development, and professional growth in chosen field.
- H. Identify appropriate procedures for leaving a job.
- I. Identify sources of job information, including electronic sources.
- J. Review company policies and current trends in employee compatibility screening, drug screening, and background checks.

4. Leadership

- A. Define leadership and identify the responsibilities, competencies, and behaviors of successful leaders.
- B. Work with peers to promote divergent and creative perspectives.
- C. Demonstrate how to organize and structure work, individually and in teams, for effective performance and the attainment of goals.
- D. Explain multiple approaches to conflict resolution and their appropriateness for a variety of situations in the workplace.
- E. Employ ethical behaviors and actions that positively influence others.
- F. Use a variety of means to positively impact the direction and actions of a team or organization.
- G. Analyze the short-term and long-term effects a leader's actions and attitudes can have on productivity, morale, and organizational culture.

5. Personal and Occupational Safety

- A. Demonstrate procedures to be followed in the case of emergencies.
- B. Discuss ways to report a potential safety hazard to a supervisor.
- C. Identify and discuss cyber ethics, cyber safety, and cyber security.
- D. Apply personal safety practices to and from the job.
- E. Describe the procedure for reporting a work-related hazard or injury.
- F. Recognize the effects of substance abuse in the workplace.
- G. Recognize good housekeeping as a safety issue.
- H. Identify safety hazards commonly found in the workplace environment.
- I. Explain the importance of CAL-OSHA.
- J. Define and discuss ergonomics in relation to the working environment.
- K. Identify the electrical hazards of working with electronic equipment.

6. Career Awareness
<ul style="list-style-type: none"> A. Research specific jobs and working conditions in various welding careers. B. Examine personal traits for entrepreneurship. C. Explore the risks and benefits of entrepreneurship. D. Meet welding industry professionals. E. Apply to training and apprenticeship programs. F. Participate in work-based learning programs. G. Review licensure and certifications in the industry. H. Identify continuing education requirements. I. Update portfolio to include skills, talents, awards, experiences and job search documents.
7. Workshop Safety
<ul style="list-style-type: none"> A. Describe safety practices for different types of welding. B. List factors for maintaining a clean and safe work area. C. Properly wear and use personal protective clothing and equipment such as safety glasses, ear protection, face shields and gloves. D. Follow safety procedures while working with equipment in a group setting. E. Locate and demonstrate knowledge of material safety data sheets (MSDS). F. Demonstrate safety procedures for flammable materials, gases, fire, hazardous materials and disaster. G. Use hand brush, slag hammer, grinder, and power cup brush and other power tools safely and appropriately to the job. H. Adhere to rules for avoiding electric shock. I. Apply CAL-OSHA and AWS standards. J. Recognize how to provide proper ventilation in shop. K. Correctly store all equipment.
8. Measurements and Math
<ul style="list-style-type: none"> A. Read and explain the use of measurement tools such as tape measure, compass, and ruler. B. Make accurate measurements, draw lines and objects. C. Review basic math concepts used in welding. D. Accurately add, subtract, multiply, and divide whole numbers, decimals, and fractions. E. Practice math conversions between decimals, percentages, fractions, inches, and the English-Metric system. F. Calculate perimeters, areas, circumferences, and the mid-point of a given distance. G. Identify basic geometric figures.
9. Advanced Welding / Cutting Processes and Certification

- A. Employ various cutting processes and equipment to produce components for a specific product.
- B. Analyze and use welding processes (such as OFW, SMAW, GMAW, FCAW) and equipment to complete a fabrication or repair.
- C. Demonstrate proper preparation, fabrication, and welding techniques that meet performance weldments for American Welding Society (AWS) qualification testing.
- D. Demonstrate proper preparation, fabrication, and welding techniques that meet performance weldments for D9.1 1G Certification.
- E. Demonstrate proper preparation, fabrication, and welding techniques that meet performance weldments for D1.1 Certification (3G and 4G SMAW) limited and unlimited thickness.

10. Advanced Shielded Metal Arc Welding (SMAW)

- A. Review the basic theory of shielded metal arc welding (SMAW) welding.
- B. Identify and understand the five basic welding joints.
- C. Identify and correct basic weld defects.
- D. Demonstrate knowledge of at least four from position welds 1G, 2G, 3G and 4G.
- E. Check for weld failure and prevent defect.
- F. Demonstrate safety and proper technique.

11. Orbital Welding

- A. Describe orbital welding terminology and processes.
- B. Identify, set up, and safely use orbital equipment, including orbital welding heads.
- C. Identify techniques related to orbital welding.
- D. Differentiate between GMAW, SMAW, and orbital welding processes.
- E. Perform welds using the orbital welding process in various applications and positions.

12. Inspection and Quality Control

- A. Identify weld imperfections.
- B. Explain causes of weld imperfections.
- C. Describe reasons for inspections and quality control.
- D. Write and describe procedures to check for distortion, joint misalignment and poor fit-up before and after welding.
- E. Describe how to troubleshoot performance problems of welding systems.

13. Advanced Project Planning & Leadership

- A. Explain the importance and function of project management.
- B. Provide a layout and plan of a given project.
- C. Identify group members and allocate tasks.

- D. Draw and interpret plans.
- E. Select appropriate material, tools and equipment for a given project.
- F. Calculate costs for a given project.
- G. Follow project metal working specifications and welding plan.
- H. Exemplify the responsibilities, competencies, and behaviors of successful leaders.
- I. Work with peers to promote divergent and creative perspectives.
- J. Complete a finished product that meets the American Welding Society.
- K. Assess and evaluate performance.

14. Presentation Skills

- A. Identify the audience requesting the project/presentation.
- B. Create a report using information that is appropriate and relevant to the needs of the audience.
- C. Organize presentation that meets the objectives of the audience.
- D. Communicate in a clear and persuasive manner.
- E. Incorporate audience comments following presentation.

15. Portfolio Design

- A. Develop personal marketing and computer skills by refining your digital portfolio for post-secondary and employment acceptance.
- B. Compile best samples of original works and documents for a variety of purposes, which shows a progression in the acquisition of knowledge and/or skills.
- C. Demonstrate knowledge of competencies through journaling or summary of selected works or documents.
- D. Revise professional resume and cover letter to align with skills and objective statements of the relevant industry.
- E. Dress professionally and practice interviewing techniques using portfolio materials.
- F. Assemble industry and employability documents (resume, cover letter, certifications, recommendation letters, etc.).
- G. Create a "leave behind" book or folder.
- H. Display portfolio materials during a fair, community event, competition, or professional panel review.
- I. Evaluate and utilize feedback to improve portfolio.

Key Assignments

Assignment	Competencies	Career Ready Practices	Anchor Standards	Pathway Standards	CCSS
1. Students will participate in mock interviews that represent current industry practices (e.g., skills demonstrations, resumes, applications, portfolios, personal websites, etc.).	1A, B, D 3B, C, D, I, J 6A-I, 15A-I	2 3 10	2 3		LS 11-12.6 SLS 11-12.2
2. Students will connect academic classroom experiences to the field of Welding by reflecting on their academic experiences and connecting their learning to the field of welding. Students will write a 3-5 page paper incorporating information from their online research, informal assessments, and industry/post-secondary tours. Each paper will be organized into 5 parts: <ul style="list-style-type: none"> • Part 1: Introduction - Identify the academics used in welding • Part 2: Personal reflection of current academic standing • Part 3: Personal academic goals for high school • Part 3: Academic plan to meet personal academic goals for high school • Part 4: Post-secondary training plan • Part 5: Works cited (OPTIONAL KEY ASSIGNMENT)	6A-I	2 3 4	2 3 4	C1.0 C2.0 C6.0	WS 11-12.6 WS 11-12.7
3. In teams, students will create a safety presentation and a poster on safety to be posted in the shop. Students will create a presentation based on the following prompt: How do businesses and government agencies work to create a safe work environment? Students will include examples of safety laws or procedures which they will use to design a poster for the workshop. Students will pass a safety test.	7A-K	2	2	C1.0 C2.0	WS 11-12.6 WS 11-12.7
4. Students will research, design and build a bridge to meet specific criteria. Students will present their project to a committee (classmates) for critique.	1B, D, E 2A, D, E, I, J 5D-F, H 8A-G 13A-K 14A-E	1 2 4 5 7-11	4 5 6 7 9	C1.0 C2.0 C6.0 C8.0	ETS 1, 1.B CC 1, 3, 6 G-CO-5 G-CO-12 RLST 11-12.3

Assignment	Competencies	Career Ready Practices	Anchor Standards	Pathway Standards	CCSS
					RLST 11-12.4 RLST 11-12.7 RSIT 11-12.7 SEP 1, 2, 8
5. Students will work on a project to show mastery of welding skills by successfully welding a test plate to: A.W.S. D.1.1 limited, all position specifications and to A.W.S. D.1.1 unlimited, all position skills Students will work on a project to show mastery of welding skills by successfully welding a test plate to A.W.S. D.9.1. Flat and/or all position specifications. Students will be able to differentiate between a weld which will pass code and not pass code.	1B 5D-F, H 9A-E 10A-F 12A-E	1 3 4	6 10 11	C2.0 C4.0 C8.0	PS 1.A RLST 11-12.4 RLST 11-12.3
6. Proficiently weld pipes together using the orbital/RMD welding process.	1B 5D-F, H 11A-E	1 2 5 10 11	2 4 5 6 10 11	C1.0 C2.0 C4.0 C6.0 C8.0	CC 3 ETS 1 G-CO-5 LS 11-12.6 RLST 11-12.4 RSIT 11-12.7 WS 11-12.6 WS 11-12.7
7. Students will braze/braze weld sheet metal together using the correct brazing rod.	1B 5D-F, H 10A-B	1 4 5	6 10 11	C2.0 C3.0	RLST 11-12.3 RLST 11-12.4
8. Students will work on a project to show mastery of welding skills by successfully welding a test plate to: A.W.S. D.1.1 limited, all position specifications and to A.W.S. D.1.1 unlimited, all position skills. Students will be able to differentiate between a weld which will pass code and not pass code.	1B 5D-F, H 12A-H 14A-H	1 3 4	6 10 11	C2.0 C4.0 C8.0	PS 1.A RLST 11-12.4 RLST 11-12.3

Assignment	Competencies	Career Ready Practices	Anchor Standards	Pathway Standards	CCSS
	18A-E 19A, C 21A-F 23A-C				
Students must find, identify, document and report on welds they find on five different structures outside of the school environment. (OPTIONAL)	1B 5I	2 5 11	2 5	C7.0	ETS 2, ETS 2.B LS 11-12.6 SEP 7,8 WS 11-12.7

Standards Assessed in this Program

Career Ready Practices

1. Apply appropriate technical skills and academic knowledge.
2. Communicate clearly, effectively, and with reason.
3. Develop an education and career plan aligned to personal goals.
4. Apply technology to enhance productivity.
5. Utilize critical thinking to make sense of problems and persevere in solving them.
6. Practice personal health and understand financial well-being.
7. Act as a responsible citizen in the workplace and the community.
8. Model integrity, ethical leadership, and effective management.
9. Work productively in teams while integrating cultural/global competence.
10. Demonstrate creativity and innovation.
11. Employ valid and reliable research strategies.
12. Understand the environmental, social, and economic impacts of decisions.

Anchor Standards

2.0 Communications

- Acquire and use accurately sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats.

3.0 Career Planning and Management

- Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans.

4.0 Technology

- Use existing and emerging technology, to investigate, research, and produce products and services, including new information, as required in the sector workplace environment.

5.0 Problem Solving and Critical Thinking

- Conduct short, as well as more sustained, research to create alternative solutions to answer a question or solve a problem unique to the sector using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques.

6.0 Health and Safety

- Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the sector workplace environment.

7.0 Responsibility and Flexibility

- Initiate, and participate in, a range of collaborations demonstrating behaviors that reflect personal and professional responsibility, flexibility, and respect in the sector workplace environment and community settings.

8.0 Ethics and Legal Responsibilities

- Practice professional, ethical, and legal behavior, responding thoughtfully to diverse perspectives and resolving contradictions when possible, consistent with applicable laws, regulations, and organizational norms.

9.0 Leadership and Teamwork

- Work with peers to promote divergent and creative perspectives, effective leadership, group dynamics, team and individual decision making, benefits of workforce diversity, and conflict resolution.

10.0 Technical Knowledge and Skills

- Apply essential technical knowledge and skills common to all pathways in the sector following procedures when carrying out experiments or performing technical tasks.

Pathway Standards

Manufacturing and Product Development - Welding and Materials Joining Pathway

C1.0 Interpret and demonstrate the planning and layout operations used in the welding processes.

C2.0 Understand and demonstrate how materials can be processed through the use of welding tools and equipment.

C3.0 Differentiate and apply various types of welding assembly processes.

C4.0 Understand finishing processes and the differences between various types of finishing materials used in the manufacture of welded parts and products.

C5.0 Understand and defend the purposes and processes of inspection and quality control in welding manufacturing processes.

C6.0 Explore and understand various welding systems that require standard hand and machine tools.

C7.0 Understand various automated welding systems, welding design for manufacturing, flexible manufacturing systems, and materials resource planning.

C8.0 Understand various joining or combining processes, including welding processes used in manufacturing, maintenance, and repair.

Common Core State Standards

ENGLISH LANGUAGE ARTS

Language Standards

LS 11-12.6: Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the (career and college) readiness level, demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Reading Standards for Information Text

RSIT 11-12.7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.

Reading Standards for Literacy in Science and Technical Subjects

- RLST 11-12.3:** Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
- RLST 11-12.4:** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
- RLST 11-12.7:** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

Speaking and Listening Standards

- SLS 11-12.2:** Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions, and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.
- SLS 11-12.1:** Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners, building on others ideas and expressing their own clearly and persuasively.
- SLS 11-12.1d:** Respond thoughtfully to diverse perspectives, synthesize comments, claims and evidence made on all sides of an issue, resolve contradictions when possible, and determine what additional information or research is required to deepen the investigation or complete the work.

Writing Standards

- WS 11-12.6:** Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback including new arguments and information.
- WS 11-12.7:** Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem, narrow or broaden the inquiry when appropriate, synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

MATHEMATICS

Algebra - Creating Equations

- A-CED-1** Create equations and inequalities in one variable including ones with absolute value and use them to solve problems in and out of context, including equations arising from linear functions.

Geometry - Congruence

- G-CO-05:** Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.
- G-CO-12:** Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.

SCIENCE

Crosscutting Concept

CC 1: Patterns

CC 3: Scale, proportion, and quantity

CC 6: Scale, proportion, and quantity

Engineering, Technology, and the Applications of Science

ETS 1: Engineering Design

ETS 1.A: Defining and Delimiting an Engineering Problem

ETS 1.B: Developing Possible Solutions

ETS 1.C: Optimizing the Design Solution

ETS 2: Links Among Engineering, Technology, Science, and Society

ETS 2.B: Influence of Engineering, Technology and Science on Society and the Natural World

Physical Sciences

PS 1.A: Structure and Properties of Matter

Scientific and Engineering Practices

SEP 1: Asking questions ([or science) and defining problems (for engineering)

SEP 2: Developing and using models

SEP 4: Analyzing and interpreting data

SEP 7: Engaging in argument from evidence

SEP 8: Obtaining, evaluating, and communicating information