COLTON REDLANDS YUCAIPA
REGIONAL OCCUPATIONAL PROGRAM
Inspiring Possibilities

2017-2018

Welding Technology

OUTLINE

DESCRIPTION:

This program is for students who will seek employment in the welding industry, and will prepare for (OAW) welding certification at a community college. Welding Technology content will focus on shielded metal arc welding (SMAW) and Oxy-Acetylene Gas Welding and Cutting (OFC-A) processes. Some tungsten inert gas (TIG) metal inert gas (MIG) and plasma arch welding training and experience are included in the class for advanced students. In addition, advanced students will develop a working knowledge of blueprint reading skills and the use of welding symbols. Activities in this course include work-based learning that connects students to industry and the local community. A student must successfully complete at least two years of this program as part of the minimum requirements for articulation.
The first two years of this multi-year program have been UC a-g approved to meet the elective ("g" – Interdisciplinary) requirement.

INFORMATION:

A. Pre-requisite: None
B. Length: (Up to) Four years
C. Sector: Manufacturing and Product Development
D. Pathway: Product Innovation and Design

O*Net SOC Codes	
Code #	**Title**
47-2211.00	Sheet Metal Workers
51-2041.00	Structural Metal Fabricators and Fitters
51-4121.00	Welders, Cutters, Solderers, and Brazers

Orientation

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

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

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. Use personal protective clothing and equipment properly, such as safety glasses, ear protection, leathers, hood, and gloves.
E. Follows safety procedures while working with equipment in a group setting.
F. Maintains clean work area free from flammable materials.
G. Demonstrate safety procedures for injury, fire and disaster.
H. Use hand brush, slag hammer, grinder, and power cup brush safely and appropriately to the job.
I. Apply personal safety practices to and from the job.
J. Describe the procedure for reporting a work-related hazard or injury.
K. Recognize the effects of substance abuse in the workplace.

L. Identify safety hazards commonly found in the workplace environment.
M. Explain the importance of CAL-OSHA.
N. Discuss the electrical hazards of working with electronic equipment.

6. Career Awareness

A. Identify advanced training opportunities.
B. Explore three different careers and employment opportunities that require basic welding skills.
C. Identify the licensure and education requirements for welding careers and related career fields where welding skills are utilized.

7. Oxy-Acetylene Gas Welding Process

A. Distinguish between a well-cut surface and a poorly cut surface, and adjust as needed to perform a good cut.
B. Demonstrate how to safely test and use OFC equipment, such as gas cylinder, regulator, hoses, and welding torch tips.
C. Identify the correct brazing applications in welding ferrous and non-ferrous metals.
D. Identify AWS or other similar industry standards.
E. Select proper cutting tip and working pressures for cutting in specific jobs and materials.
F. Identify the function of each component of the outfit.
G. Identify the correct silver soldering in welding ferrous and non-ferrous metals.

8. Shielded Metal Arc Welding of Plate

A. Produce a flat weld proficiently based on visual testing using 6010 rod.
B. Produce a flat weld proficiently based on visual testing using 7018 rod.
C. Produce a horizontal weld proficiently based on visual testing using 6010 rod.
D. Produce a horizontal weld proficiently based on visual testing using 7018 rod.
E. Produce a vertical weld proficiently based on visual testing using 6010 rod.
F. Produce a vertical weld proficiently based on visual testing using 7018 rod.
G. Produce an overhead weld proficiently based on visual testing using 6010 rod.
H. Produce an overhead weld proficiently based on visual testing using 7018 rod.
I. Run a continuous bead with ability to restart a weld using 6010 rod.
J. Run a continuous bead with ability to restart a weld using 7018 rod.
K. Identify the five common joints and their appropriate application, including butt, lap, corner, edge, tee and vee joints.
L. Identify shapes of metal such as angle, I beam, channel, H beam, plate and gauge.
M. Identify American Welding Society codes on welding rods and the materials with which they are compatible.
N. Identify the power sources, electrode lead and terminals, work piece lead and terminals (polarities), and electrode holder and ground as parts of the arc-welding machine.
O. Recognize the importance of high and low current settings, electrode size and heat, arc length, and electrode angle when making a weld.

P. Produce a flat weld proficiently based on visual testing using 7024 rod.
Q. Produce a horizontal weld proficiently based on visual testing using 7024 (fillet) rod.
R. Run a continuous bead with ability to restart a weld using 7024 rod.
S. Apply industrial math in the use of measuring equipment.

9. Advanced Skills

BLUE PRINT READING/USE

A. Draw elements of a blueprint.
B. Interpret elements of a blueprint.
C. Identify, draw, and interpret common welding symbols used in a blueprint.

GAS METAL ARC WELDING (MIG) ADVANCED SKILLS

D. Produce a flat weld proficiently based on visual testing using micro-wire.
E. Produce a horizontal weld proficiently based on visual testing using micro-wire.
F. Produce a vertical weld proficiently based on visual testing using micro-wire.
G. Produce an overhead weld proficiently based on visual testing using micro-wire.
H. Identify and safely use GMAW equipment.
I. Identify and use appropriate gas with a variety of metals (straight carbon dioxide or combination of argon and carbon dioxide gas mix).
J. Identify and use appropriate polarity with ferrous and non-ferrous metals and filler wire.

PLASMA ARC CUTTING ADVANCED SKILLS

K. Identify the descriptive difference between a well-cut metal surface and a poorly cut metal surface using Plasma Art Cutting procedures.

TIG

L. Identify appropriate accessories for TIG applications, such as gas cylinder, flow meter, power source, and torch (hand-held or foot pedal for remote control).
M. Identify and safely use equipment, such as gas cylinder, regulator, hoses, and welding torch tips.
N. Produce a flat weld proficiently based on visual testing.
O. Produce a horizontal weld proficiently based on visual testing.
P. Produce a vertical weld proficiently based on visual testing.
Q. Produce an overhead weld proficiently based on visual testing.

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	2 3 10	2 3		LS 11-12.6 SLS 11-12.2
2. **Beginner:** Students will create and weld a 90 degree open corner joint.	1B 5D-F, H 8A-D, I-K, N, O, S	1 4 5 10	5 6 10 11	C1.0 C2.0 C5.0 C8.0	CC 6 ETS 1.A G-CO-12 RLST 11-12.4
3. **Beginner:** Students will design and create a cube which is square on all axes (X, Y, Z) maintaining 90 degree angles to a +/- 2 degree angular tolerance with a dimensional tolerance to +/- 1/8 inch on all axes (linear dimension).	1B 5D- F, H 8A-D, I-K, M, N, O, S	1 2 4 5 10	5 6 7 10 11	C2.0 C6.0 C8.0	ETS 1.A 1.B, 1.C RLST 11-12.4 RLST 11-12.3 SEP 1 SLS 11-12.1 WS 11-12.7
4. **Beginner:** Students will lie out and cut a ¼" to 3/8" thick plate using plasma arc cutting process (PAC).	1B 5D- F 9B, K	1 2 5	5 6 10 11	C1.0 C2.0	A-CED-1 G-CO-12 RLST 11-12.4 SEP 4
5. Beginner: Students must find, identify, document and report on welds they find on five different structures outside of the school environment.	1B 5I 8K 8L	2 5 11	2 5	C7.0	ETS 2, ETS 2.B LS 11-12.6 SEP 7,8 WS 11-12.7

Assignment	Competencies	Career Ready Practices	Anchor Standards	Pathway Standards	CCSS
6. **Beginner:** Students will braze a lap joint and t-joint to A.W.S. specifications.	1B 5D-F, H 7B-D, F 8S	1 4 5	6 10 11	C2.0 C3.0	RLST 11-12.3 RLST 11-12.4
7. **Advanced:** Students will lie out and cut a ¼" to 3/8" thick plate using the oxy-fuel cutting process (OFC).	1B 5D-F 7A, B, D-F	1 2 5	5 6 10 11	C1.0 C2.0 C6.0 C8.0	A-CED-1 G-CO-12 RLST11-12.4 SEP 4
8. **Advanced:** Students will build a personal project following blueprint conventions, project design revisions and appropriate welding skills.	1B 5D-F, H 7B, D, E 8A-F, I, J, O, S 9A-F, H, K-P, Q	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
9. **Advanced:** In teams, students will research, design and build a bridge to meet specific criteria.	1B, D, E 2A, D, E, I, J 5D-F, H 9A, C-I	1 2 4 5 7 8 9 10	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 RLST 11-12.4 RLST 11-12.7 RSIT 11-12.7

Assignment	Competencies	Career Ready Practices	Anchor Standards	Pathway Standards	CCSS
		11			SEP 1, 2, 8 SLS 11-12.1 SLS 11-12.1b WS 11-12.6 WS 11-12.7
10. **Advanced:** Students will build one of four platonic solids: tetrahedron, octahedron, dodecahedron, or icosahedron.	1B 5D-F, H 8K, L, O, S, 9D-I	1 4 5 10 11	4 5 6 10	C1.0 C2.0 C6.0 C8.0	ETS 1.B, 2 G-CO-12 RLST 11-12.4 RSIT 11-12.7 RLST 11-12.7 SEP 1, 4
11. **Advanced:** Students will show mastery of welding skills by successfully welding a test plate to A.W.S. D.1.1 limited, all position specifications.	1B 5D-F, H 7A, D, E 8A-K, M, O 9B	1 3 4	6 10 11	C2.0 C4.0 C8.0	PS 1.A RLST 11-12.4 RLST 11-12.3
12. **Advanced:** Students will show mastery of welding skills by successfully welding a test plate to A.W.S. D.1.1 unlimited, all position skills.	1B 5D-F, H 7A, D, E 8A-K, M, O 9B	1 3 4	6 10 11	C2.0 C4.0 C8.0	PS 1.A RLST 11-12.4 RLST 11-12.3

UC Writing Assignments

Assignment	Career Ready Practices	Anchor Standards	CCSS
1. **Beginner and Advanced:** Learning journal - Students will appraise their own learning and achievement as well as examine their thoughts and feelings about what they are learning. Journal entries will serve as a resource by which the students can review their learning; comprehend how far they have progressed; and reflect on their personal work ethics, values, attitudes, beliefs, and motivations. In addition to promoting independent thinking, journals will encourage students to take responsibility for their learning by making them more autonomous and active in the learning process. Learning journals will assist learners in processing new information by motivating them to monitor their goals, interrelate ideas and concepts that will assist them in understanding and meaning, and increase their self-awareness.	2 5	2 5	WS 11-12.6 WS 11-12.7
2. **Beginner:** Students will explore in detail a welding career of their choice. The paper will be 3-5 pages in length, double-spaced. Students will incorporate online research, results from informal assessments, and information gathered through industry and post-secondary tours. Each paper will be organized into six parts as follows: • Part 1: Introduction - Personal Assessment • Part 2: Requirements for entry into the career • Part 3: Describing the job • Part 4: Describing the profession today • Part 5: Outlining the steps to go from here to there • Part 6: Works cited	2	2	WS 11-12.6 WS 11-12.7
3. **Beginner:** Students will write 250 word essays on the following prompts throughout the year: • What is the importance of a professional looking project? • What math skills are needed to excel as a welder? • Why must a welder know about the nature and properties of metal? • How do businesses and government agencies work to create a safe work environment?	2	2	WS 11-12.6 WS 11-12.7

4. **Beginner:** Electronic Instruction Manual – Students will practice technical writing by writing an electronic instruction manual or guide on how to use a piece of welding gear safely. Students will explain welding vernacular in terms easy to understand by 8th grade visitors that know nothing about welding and are interested in learning more about the Welding pathway. Students will utilize technical resources by posting the manual online, contributing to an online resource library.	2 4	2 4	WS 11-12.6 WS 11-12.7
5. **Advanced:** Students will write a 500 word essay on the following prompt: • Identify a potential shop hazard that can occur when protective equipment is not effectively utilized, and the steps a welder must take to prevent injury from occurring to them and/or others?	2	2	WS 11-12.6 WS 11-12.7
6. **Advanced:** Students will write 250 word essays on the following prompts throughout the year: • How are prints the language of manufacturing? • How do welders determine the type of weld test to be conducted? • How does weld testing ensure product quality? • How would a welder show initiative on the job? • Define "pride in workmanship" and discuss how you model that pride in class.	2	2	WS 11-12.6 WS 11-12.7
7. **Advanced:** Students will connect academic classroom experiences to the field of Welding. As second year students within the Integrated Welding pathway, students will be asked to reflect on their academic experiences and connect their learning to the field of Welding. Students will incorporate online research, results from informal assessments, and information gathered through industry and post-secondary tours into a 3-5 page paper. Each paper will be organized into 5 parts: • 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	2 3 4	2 3 4	WS 11-12.6 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