

# WELDING TECHNOLOGY

## Contact Information

### Division

Business and Technology

### Dean

Amy Schulz

### Associate Deans

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### Division Office

B3, Rocklin Campus

## Overview

The Welding Technology curriculum provides training in the field of commercial and industrial welding and fabrication. Students enrolled in Welding Technology courses will receive both the theoretical technical knowledge and the hands-on skills that will prepare them for a career in welding. An associate degree, a certificate of achievement, and skills certificates may be earned in the Welding Technology program.

## Faculty

### Jesus de la Torre

#### Professor, Welding Technology

B.A., Sonoma State University

### Scott Johnson

#### Assistant Professor, Welding Technology

A.S., Sierra College

B.S., California State University, Fresno

### Aleda Vaughn

#### Professor, Welding Technology

A.S., American River College

A.A., Cosumnes River College

## Degrees/Certificates

### Associate Degree

- Welding Technology (p. 1)

### Certificate of Achievement

- Welding (p. 1)

### Skills Certificates

- Gas Metal Arc Welding (p. 2)
- Gas Tungsten Arc Welding (p. 2)
- Metal Fabricator and Designer (p. 2)
- Shielded Metal Arc Welding (p. 3)
- Welding Entrepreneurship (p. 3)

## Welding Technology

### AA or AS Degree

Successful completion of the degree pattern in Welding Technology prepares students for transfer to the California State University system in industrial-related degree programs. It also provides the broad background education necessary to compete successfully in commercial and industrial

welding and related fabrication fields. Students must fulfill the following major requirements with grades of "C" or better, complete a minimum of 60 degree-applicable semester units (12 of which must be completed at Sierra College) with a grade point average of at least 2.0 and complete one of the following three general education patterns:

- Sierra College Associate Degree Requirements (<http://catalog.sierracollege.edu/student-resources/general-education/associate-degree-requirements/>);
- California State University General Education Breadth (<http://catalog.sierracollege.edu/student-resources/general-education/california-state-university-general-education-breadth-requirements/>) pattern;
- Intersegmental General Education Transfer Curriculum (IGETC) (<http://catalog.sierracollege.edu/student-resources/general-education/intersegmental-general-education-transfer-curriculum-igetc/>).

### Required Courses

Code	Title	Units
WELD 0001B	Principles of Fabrication	2
WELD 0002A	Gas Metal Arc Welding (MIG) of Carbon Steel Sheet and Plate	2
WELD 0003B	Gas Tungsten Arc Welding (TIG) of Stainless Steel and Aluminum Sheet and Plate	2
WELD 0005A	Shielded Metal Arc Welding (SMAW) of Carbon Steel on Plate	2
WELD 0005B	Shielded Metal Arc Welding of Carbon & Stainless Steel, and Aluminum on Grooved Plate	2
WELD 0005C	Structural Steel Welding Certification	1
WELD 0011	Welding Metallurgy	3
WELD 0015A	Shielded Metal Arc Welding on Pipe	2
<b>Select 4-6 units from the following:</b>		<b>4-6</b>
ADVM 0001	Technical Drafting I	
ADVM 0002	Technical Drafting II	
ADVM 0066	CNC Machining Level 1	
WELD 0001A	Introduction to Welding and Fabrication	
WELD 0003A	Gas Tungsten Arc Welding (TIG) of Carbon Steel on Sheet and Plate	
WELD 0015B	Pipe Welding Certification - Uphill	
WELD 0015C	Pipe Welding Certification - Downhill	
WELD 0095	Internship in Welding Technology	

**Total Units** **20-22**

## Welding

### Certificate of Achievement

Successful completion of the curriculum in Welding provides students with employable skills in commercial and industrial welding processes. Completion of the certificate requirements prepares students for State Certification tests. Testing and Certification is offered. A certificate is designed to provide career technical skills; it is not equivalent to an associate degree.

### Required Courses

Code	Title	Units
WELD 0001B	Principles of Fabrication	2
WELD 0002A	Gas Metal Arc Welding (MIG) of Carbon Steel Sheet and Plate	2
WELD 0003B	Gas Tungsten Arc Welding (TIG) of Stainless Steel and Aluminum Sheet and Plate	2
WELD 0005A	Shielded Metal Arc Welding (SMAW) of Carbon Steel on Plate	2
WELD 0005B	Shielded Metal Arc Welding of Carbon & Stainless Steel, and Aluminum on Grooved Plate	2
WELD 0005C	Structural Steel Welding Certification	1
WELD 0011	Welding Metallurgy	3
WELD 0015A	Shielded Metal Arc Welding on Pipe	2
<b>Select one of the following:</b>		<b>3-6</b>
MATH 0000A	Elementary Algebra	
MATH 0000E	Practical Mathematics	
MATH 0000G	B-STEM Intermediate Algebra	
Or more advanced mathematics course		
<b>Select 4-6 units from the following:</b>		<b>4-6</b>
ADVM 0001	Technical Drafting I	
ADVM 0002	Technical Drafting II	
ADVM 0066	CNC Machining Level 1	
ART 0022	Metal Arts	
WELD 0001A	Introduction to Welding and Fabrication	
WELD 0003A	Gas Tungsten Arc Welding (TIG) of Carbon Steel on Sheet and Plate	
WELD 0015B	Pipe Welding Certification - Uphill	
WELD 0015C	Pipe Welding Certification - Downhill	
WELD 0028	Independent Study	
WELD 0095	Internship in Welding Technology	
<b>Total Units</b>		<b>23-28</b>

## Gas Metal Arc Welding

### Skills Certificate

The Gas Metal Arc Welding Skills Certificate prepares students for a broad understanding of the wire feed processes of GMAW using solid wires on Carbon Steel and Aluminum with multiple types of metal transfer modes. In addition, Flux Core wire processes, both gas shielded and self shielded are studied in the earning of this certificate. A skills certificate is designed to provide career technical skill for the focused subject area; it is not equivalent to the Welding Certificate and does not replace Welder Certification which is solely skill performance based.

### Required Courses

Code	Title	Units
WELD 0001A	Introduction to Welding and Fabrication	2
WELD 0002A	Gas Metal Arc Welding (MIG) of Carbon Steel Sheet and Plate	2
WELD 0003A	Gas Tungsten Arc Welding (TIG) of Carbon Steel on Sheet and Plate	2

WELD 0005A	Shielded Metal Arc Welding (SMAW) of Carbon Steel on Plate	2
<b>Total Units</b>		<b>8</b>

## Gas Tungsten Arc Welding

### Skills Certificate

The Gas Tungsten Arc Welding Skills Certificate prepares students for using complex emerging technological aspects of this welding process developed by welding equipment manufacturers since 2005. By exposure to welding a broad range of metals, with a concentration on sheet thicknesses, the student is earning the knowledge for the industry and artistic application of GTAW. A skills certificate is designed to provide career technical skill for the focused subject area; it is not equivalent to the Welding Certificate and does not replace Welder Certification which is solely skill performance based.

### Required Courses

Code	Title	Units
WELD 0001A	Introduction to Welding and Fabrication	2
WELD 0003A	Gas Tungsten Arc Welding (TIG) of Carbon Steel on Sheet and Plate	2
WELD 0003B	Gas Tungsten Arc Welding (TIG) of Stainless Steel and Aluminum Sheet and Plate	2
WELD 0005A	Shielded Metal Arc Welding (SMAW) of Carbon Steel on Plate	2
<b>Total Units</b>		<b>8</b>

## Metal Fabricator and Designer

### Skills Certificate

The Metal Fabricator and Designer Skills Certificate provides students knowledge of the processes, manner and techniques of metalworking used in the welding industry or artistic metal expression applications. It can be a lead into employment with a typical metal fabrication organization and may parallel the manner of methods used by Ironworkers, Boilermakers and Millwrights; however, each of these specialty areas of metalwork encompasses their own system of apprenticeship which this skills certificate is not designed to replace. A skills certificate is designed to provide career technical skill for the focused subject area; it is not equivalent to the Welding Certificate and does not replace Welder Certification which is solely skill performance based.

### Required Courses

Code	Title	Units
ART 0022	Metal Arts	3
WELD 0001B	Principles of Fabrication	2
WELD 0002A	Gas Metal Arc Welding (MIG) of Carbon Steel Sheet and Plate	2
WELD 0003A	Gas Tungsten Arc Welding (TIG) of Carbon Steel on Sheet and Plate	2
WELD 0005A	Shielded Metal Arc Welding (SMAW) of Carbon Steel on Plate	2
WELD 0015A	Shielded Metal Arc Welding on Pipe	2
<b>Total Units</b>		<b>13</b>

## Shielded Metal Arc Welding

### Skills Certificate

The Shielded Metal Arc Welding Skills Certificate prepares students for the type of work performed with this welding process. With a focus of Structural Steel Plate as well as Pipe Welding Carbon Steel applications, this certificate validates a knowledge base in this welding process. A skills certificate is designed to provide career technical skill for the focused subject area; it is not equivalent to the Welding Certificate and does not replace Welder Certification which is solely skill performance based.

#### Required Courses

Code	Title	Units
WELD 0003A	Gas Tungsten Arc Welding (TIG) of Carbon Steel on Sheet and Plate	2
WELD 0005A	Shielded Metal Arc Welding (SMAW) of Carbon Steel on Plate	2
WELD 0005B	Shielded Metal Arc Welding of Carbon & Stainless Steel, and Aluminum on Grooved Plate	2
WELD 0005C or WELD 0015B	Structural Steel Welding Certification Pipe Welding Certification - Uphill	1-1.5
WELD 0015A	Shielded Metal Arc Welding on Pipe	2
WELD 0015C	Pipe Welding Certification - Downhill	0.5
<b>Total Units</b>		<b>9.5-10</b>

## Welding Entrepreneurship

### Skills Certificate

This skills certificate is designed to prepare students wanting to open their own welding or welding related business. Completion of this skills certificate provides students with basic skills in welding technology and small business management. A skills certificate is designed to provide career technical skill for the focused subject area; it is not equivalent to the Welding Certificate and does not replace Welder Certification which is solely skill performance based.

#### Required Courses

Code	Title	Units
BUS 0145	Planning, Financing and Operating a Small Business	3
BUS 0242	Entrepreneurship - Small Business Management	3
WELD 0001B	Principles of Fabrication	2
WELD 0003A	Gas Tungsten Arc Welding (TIG) of Carbon Steel on Sheet and Plate	2
WELD 0005A	Shielded Metal Arc Welding (SMAW) of Carbon Steel on Plate	2
<b>Total Units</b>		<b>12</b>

## Courses

Understanding course descriptions (<http://catalog.sierracollege.edu/student-resources/course-information/understanding-course-descriptions/>)

### WELD 0001A. Introductory Welding for Metalworking

*Units: 2*

Formerly known as WELD 15

Hours: 72 (18 lecture, 54 laboratory)

Hands-on survey class that focuses on the three common welding processes of Shielded Metal Arc Welding, Gas Metal Arc Welding, and Gas Tungsten Arc Welding, including correct setup and "how to" techniques. Plasma Arc Cutting and Oxyacetylene Cutting processes are also covered. This class is a survey of basic welding, cutting and fabrication used by the welding industry, metalworking artists, and interested hobbyists. Perfect for students who have never welded before. (CSU)

### WELD 0001B. Principles of Fabrication

*Units: 2*

Formerly known as WELD 70

Prerequisite: Completion of WELD 1A and completion of WELD 2A, WELD 3B or WELD 5A with grades of "C" or better

Hours: 72 (18 lecture, 54 laboratory)

Foundation fabrication course includes elements of design and fabrication methods, tool and equipment utilization, materials planning, and print reading. Designed for welding students wanting to learn the foundation skills of steel fabrication and construction process. (not transferable)

### WELD 0002A. Wire Feed Welding Processes - Career Path

*Units: 2*

Formerly known as WELD 40

Hours: 72 (18 lecture, 54 laboratory)

Designed for those interested in beginning stages of welding. Various forms of wire feed welding include Gas Metal Arc and Flux Core Welding processes. Explores the various modes of metal transfer when using the Gas Metal Arc Welding process. In Flux Cored Arc Welding, both Self Shielding and Dual Shielding, are covered. (not transferable)

### WELD 0002B. Gas Metal Arc Welding of Stainless Steel

*Units: 2*

Prerequisite: Completion of WELD 2A with grade of "C" or better

Hours: 72 (18 lecture, 54 laboratory)

Covers equipment, metal preparation, and welding of stainless steels in all positions using Gas Metal Arc Welding. Students will learn to read and correctly complete welding procedures performed in industry. Helps prepare students for employment in high demand jobs. (not transferable)

### WELD 0003A. Introduction to Gas Welding - Preparing for GTAW

*Units: 2*

Formerly known as WELD 10

Hours: 72 (18 lecture, 54 laboratory)

History and development of joining metals, metalworking, and gas welding methods. Students will learn the fundamentals of Oxyacetylene gas welding and gain manipulative skills that will prepare them for Gas Tungsten Arc Welding. Creativity, gas welding and fabrication techniques will be utilized to complete a student project. (CSU)

**WELD 0003B. Gas Tungsten Arc Welding (TIG) - Career Path***Units: 2*

Formerly known as WELD 50

Prerequisite: Completion of WELD 3A with grade of "C" or better

Advisory: Completion of WELD 1A with grade of "C" or better

Hours: 72 (18 lecture, 72 laboratory)

Tungsten Inert Gas Welding methods and techniques used to weld carbon steel, stainless, aluminum, and alloy steels. Instruction in equipment setup for different metals, filler selection, material identification, and welding techniques using Gas Tungsten Arc Welding. Laboratory exercises include multiple positions of fillet and groove welds with carbon steel, stainless steel and aluminum assignments on sheet materials and techniques as applied in tubing or pipe. (CSU)

**WELD 0004. Welding Operator Orientation***Units: 0.5*

Prerequisite: Completion of WELD 2A and 5A with grades of "C" or better

Hours: 9 lecture

Orientation course to prepare students for enrollment in WELD 84 (pass/no pass grading) (not transferable)

**WELD 0005A. Introduction to Shielded Metal Arc Welding (SMAW) - Career Path***Units: 2*

Formerly known as WELD 20

Advisory: Concurrent enrollment in WELD 1A or previous welding experience

Hours: 72 (18 lecture, 54 laboratory)

An introduction to the principles of shielded metal arc welding (SMAW), setup/use of SMAW equipment, and safe use of tools and equipment including oxyacetylene cutting. Provides instruction in welding carbon steel weld joints in various positions. This is a required foundation welding technology course for students who wish to pursue a career in structural or pipe welding outdoors at various construction sites. (C-ID WELD 101X) (not transferable)

**WELD 0005B. Intermediate Shielded Metal Arc Welding (SMAW) - Career Path***Units: 2*

Formerly known as WELD 25

Prerequisite: Completion with grade of "C" or better or concurrent enrollment in WELD 5A

Hours: 72 (18 lecture, 54 laboratory)

Students expand on knowledge and skills gained to perform structural plate welding using Shielded Metal Arc Welding (SMAW or Stick). Oxyacetylene Cutting (OAC) and Air Carbon Arc Cutting (CAC-A) are also performed. Intended as an intermediate level welding course for students following a career path in structural or pipe welding fields. Students are advised that WELD 5A and WELD 5B can be taken at the same time. (not transferable)

**WELD 0005C. Structural Steel Welding Certification***Unit: 1*

Formerly known as WELD 80

Prerequisite: Completion of WELD 5B and WELD 2A with grades of "C" or better

Advisory: Students must be competent in vertical and overhead position welding using certification welding processes of SMAW, FCAW-G and FCAW-S

Hours: 42 (6 lecture, 36 laboratory)

Designed to certify the welder within the guidelines of American Welding Society (AWS) Structural Steel Code D1.1. Focus on manipulative skill development with SMAW E-7018 in 4G and 3G, FCAW-G in 3G and FCAW-S in 3G and 4G in preparation for the actual certification test. (not transferable)

**WELD 0011. Welding Metallurgy***Units: 3*

Formerly known as WELD 60

Prerequisite: Completion of WELD 2A, WELD 3A or WELD 5A with grade of "C" or better

Hours: 90 (36 lecture, 54 laboratory)

Exploration of the production and properties of ferrous metals used in the welding industry. The chemical and physical properties of metals, crystallization, and theoretical concepts of alloying. Laboratory experiments in metal identification, hardness and destructive testing, heat treating, sample preparation, and microphotography. (CSU)

**WELD 0015A. Shielded Metal Arc Welding on Pipe***Units: 2*

Formerly known as WELD 30

Prerequisite: Completion of WELD 5B with grade of "C" or better

Hours: 72 (18 lecture, 54 laboratory)

Welding of pipe using accepted practices of industry with Shielded Metal Arc Welding Process. Emphasis on the welding techniques used for out-of-position welding (2G, 5G, 6G, and 6GR pipe full penetration welds). (CSU)

**WELD 0015B. Pipe Welding Certification - Uphill***Unit: 1.5*

Formerly known as WELD 82

Prerequisite: Completion of WELD 15A with grade of "C" or better and completion with grade of "C" or better or concurrent enrollment in WELD 5C

Advisory: Students must be competent in horizontal, vertical and overhead position welding with open root groove joints using the welding processes of SMAW; if GTAW root pass certification is the goal, WELD 3B skill set competency for GTAW is also needed

Hours: 54 (14 lecture, 40 laboratory)

Designed to certify the welder within the guidelines of Section IX of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, or the American Petroleum Institute (API) Standard 1104 Welding of Pipelines and Related Facilities. Focus on manipulative skill development using SMAW, GTAW and GMAW processes in preparation for the actual certification test. (CSU)

**WELD 0015C. Pipe Welding Certification - Downhill**

*Units: 0.5*

Formerly known as WELD 83

Prerequisite: Completion with grade of "C" or better or concurrent enrollment in WELD 15B

Advisory: Student must be competent in SMAW pipe welding with E-6010 electrode in positions of 2G, 5G and 6G

Hours: 36 (5 lecture, 31 laboratory)

Downhill pipe welding to prepare to qualify within the guidelines of American Petroleum Institute - welding of cross-country pipelines. Focus on manipulative skill development in preparation for certification test using downhill techniques. (not transferable)

**WELD 0028. Independent Study**

*Units: 1-3*

Designed for students interested in furthering their knowledge at an independent study level in an area where no specific curriculum offering is currently available. Independent study might include, but is not limited to, research papers, special subject area projects, and research projects. See Independent Study page in catalog. (CSU)

**WELD 0095. Internship in Welding Technology**

*Units: 0.5-4*

Designed for advanced students to work in an area related to their educational or occupational goal. Provides new on-the-job technical training under the direction of a worksite supervisor, allowing students to expand knowledge and skills in the chosen field. Mandatory orientation session and faculty approval to determine eligibility. One unit of credit is equal to 54 hours of work. Students may earn up to a total of 16 units in internship courses (any course numbered 95 and PDEV 94). (CSU-with unit limitation)

## Program Student Learning Outcomes (PSLOs)

- Be aware of and demonstrate a high level of understanding of safety practices expected with metal-working equipment in a welding environment.
- Accept personal responsibility in developing manipulative skills of the craft with the knowledge and creativity to recognize, analyze, problem solve to successful completion.
- Apply reading, writing, and listening practice to interpret welding terminology, blueprints, procedures, and directions along with active verbal communication to facilitate mutual understanding in the workforce.