WELDING TECHNOLOGY

Contact Information

Division
Liberal Arts

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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

Aleda Vaughn
Assistant Professor, Welding Technology
A.S., American River College
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William L. Wenzel
Professor, Welding Technology
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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. 2)
- Welding Entrepreneurship (p. 3)

Welding Technology

AA or AS Degree

(formerly Metals and Manufacturing Technology)

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/archive/2017-2018/student-resources/general-education/associate-degree-requirements);
- California State University General Education Breadth (http://catalog.sierracollege.edu/archive/2017-2018/student-resources/general-education/california-state-university-general-education-breadth-requirements) pattern;
- Intersegmental General Education Transfer Curriculum (IGETC) (http://catalog.sierracollege.edu/archive/2017-2018/student-resources/general-education/intersegmental-general-education-transfer-curriculum-igetc).

Required Courses

WELD 0020	Introduction to Welding Technology - Career Path	3
WELD 0025	Intermediate Welding Technology - Career Path	3
WELD 0030	Advanced Shielded Metal Arc Welding of Structural Plate and Pipe	3
WELD 0040	Wire Feed Welding Processes - Career Path	2
WELD 0050	Gas Tungsten Arc Welding (TIG) - Career Path	3
WELD 0060	Welding Metallurgy	3
WELD 0070	Principles of Fabrication	2.5
WELD 0080	Structural Steel Welding Certification	1
Select 4-6 units from the following:		4-6
WELD 0010	Exploring Metals/Introduction to Gas Welding	
WELD 0015	Introductory Welding for Metalworking	
WELD 0066	CNC Mill 3D Manufacturing	
WELD 0074	Computer-Aided Metal Cutting Design	
WELD 0076	Ornamental Iron Fabrication I	
WELD 0082	Pipe Welding Certification - Uphill	
WELD 0083	Pipe Welding Certification - Downhill	
WELD 0095	Internship in Welding Technology	
DES 0001	Technical Drafting I	
DES 0002	Technical Drafting II	
Total Units		24.5-26.5

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

WELD 0020	Introduction to Welding Technology - Career Path	3
WELD 0025	Intermediate Welding Technology - Career Path	3

WELD 0030	Advanced Shielded Metal Arc Welding of Structural Plate and Pipe	3
WELD 0040	Wire Feed Welding Processes - Career Path	2
WELD 0050	Gas Tungsten Arc Welding (TIG) - Career Path	3
WELD 0060	Welding Metallurgy	3
WELD 0080	Structural Steel Welding Certification	1
Select one of the following:		3-5
MATH 0000A	Elementary Algebra	
Or more advanced mathematics course		
Select 4-6 units from the following:		4-6
WELD 0010	Exploring Metals/Introduction to Gas Welding	
WELD 0015	Introductory Welding for Metalworking	
WELD 0028	Independent Study	
WELD 0066	CNC Mill 3D Manufacturing	
WELD 0074	Computer-Aided Metal Cutting Design	
WELD 0076	Ornamental Iron Fabrication I	
WELD 0082	Pipe Welding Certification - Uphill	
WELD 0083	Pipe Welding Certification - Downhill	
WELD 0095	Internship in Welding Technology	
ART 0022	Creative Design in Metal	
DES 0001	Technical Drafting I	
DES 0002	Technical Drafting II	
Total Units		25-29

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

WELD 0010	Exploring Metals/Introduction to Gas Welding	2
WELD 0015	Introductory Welding for Metalworking	2
WELD 0020	Introduction to Welding Technology - Career Path	3
WELD 0040	Wire Feed Welding Processes - Career Path	2
Total Units		9

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

WELD 0010	Exploring Metals/Introduction to Gas Welding	2
WELD 0015	Introductory Welding for Metalworking	2
WELD 0020	Introduction to Welding Technology - Career Path	3
WELD 0050	Gas Tungsten Arc Welding (TIG) - Career Path	3
Total Units		10

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

WELD 0010	Exploring Metals/Introduction to Gas Welding	2
WELD 0020	Introduction to Welding Technology - Career Path	3
WELD 0030	Advanced Shielded Metal Arc Welding of Structural Plate and Pipe	3
WELD 0040	Wire Feed Welding Processes - Career Path	2
WELD 0070	Principles of Fabrication	2.5
ART 0022	Creative Design in Metal	3
Total Units		15.5

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

WELD 0010	Exploring Metals/Introduction to Gas Welding	2
WELD 0020	Introduction to Welding Technology - Career Path	3
WELD 0025	Intermediate Welding Technology - Career Path	3

WELD 0030	Advanced Shielded Metal Arc Welding of Structural Plate and Pipe	3
WELD 0080	Structural Steel Welding Certification	1-1.5
or WELD 0082	Pipe Welding Certification - Uphill	
WELD 0083	Pipe Welding Certification - Downhill	0.5
Total Units		12.5-13

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

BUS 0000B	Planning, Financing and Operating a Small Business	3
BUS 0140	Small Business Management	3
WELD 0010	Exploring Metals/Introduction to Gas Welding	2
WELD 0020	Introduction to Welding Technology - Career Path	3
WELD 0070	Principles of Fabrication	2.5
Total Units		13.5

Courses

Understanding course descriptions (http://catalog.sierracollege.edu/archive/2017-2018/student-resources/course-information/understanding-course-descriptions)

WELD 0004. Welding Operator Orientation
Units: 0.5
Prerequisite: Completion of WELD 0020 and 0040 with grades of "C" or better
Hours: 9 lecture
Orientation course to prepare students for enrollment in WELD 0084. A required component of the Department of Labor American Apprenticeship Initiative. Restricted enrollment based on apprenticeship eligibility requirements. (pass/no pass grading) (not transferable)

WELD 0010. Exploring Metals/Introduction to Gas Welding
Units: 2
Hours: 72 (18 lecture, 54 laboratory)
History and development of joining metals, metalworking, and welding methods. Modern welding and fabrication techniques. Proper and safe use of modern metal fabrication equipment and hands-on experience with Oxy-Acetylene (Gas) welding based on an assigned student project. (CSU)

WELD 0015. Introductory Welding for Metalworking
Units: 2
Advisory: Completion with grade of "C" or better or concurrent enrollment in WELD 10
Hours: 72 (18 lecture, 54 laboratory)
Focuses on the three common metal working processes of Stick, MIG, and TIG welding, including correct setup and "how to" techniques. Plasma arc cutting and Oxy-fuel cutting processes also covered. Designed for both students interested in the metal art field as a companion to ART 22, and for students wishing to pursue a career in welding by continuing on to WELD 20. (CSU)

WELD 0020. Introduction to Welding Technology - Career Path
Units: 3
Advisory: Completion of WELD 10 or 15 with grade of "C" or better, or previous welding experience
Hours: 90 (36 lecture, 54 laboratory)
Theory, techniques and practice in position welding of Shielded Metal Arc, Gas Metal Arc, and Oxyacetylene welding. Plasma and Flame Cutting are also employed. Intended as a foundation welding technology course for students on the welding career path. (not transferable)

WELD 0025. Intermediate Welding Technology - Career Path
Units: 3
Prerequisite: Completion with grade of "C" or better, or concurrent enrollment in WELD 20
Hours: 90 (36 lecture, 54 laboratory)
Emphasis on position welding techniques in Shielded Metal Arc (SMAW) and Oxy-Acetylene welding (OAW). Flux Core Arc (FCAW), Oxy-fuel flame Cutting (OFC) and Air Carbon Arc Cutting (CAC-C) are also performed. Intended as an intermediate level welding course for students following a career path in the welding field. Students who have taken WELD 30 are advised not to enroll in WELD 25. (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 0030. Advanced Shielded Metal Arc Welding of Structural Plate and Pipe
Units: 3
Prerequisite: Completion of WELD 20 with grade of "C" or better
Advisory: Completion with grade of "C" or better or concurrent enrollment in WELD 25
Hours: 90 (36 lecture, 54 laboratory)
Advanced course on welding of structural plate and pipe using accepted practices of industry with Shielded Metal Arc (Stick) Process. Emphasis on the welding techniques used for out-of-position welding (3G-4G plate and 5G-6G pipe full penetration welds). (CSU)

WELD 0040. Wire Feed Welding Processes - Career Path
Units: 2
Prerequisite: Completion of WELD 10 or 15 with grade of "C" or better
Advisory: Completion of WELD 20 with grade of "C" or better
Hours: 72 (18 lecture, 54 laboratory)
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 0050. Gas Tungsten Arc Welding (TIG) - Career Path
Units: 3
Prerequisite: Completion of WELD 20 with grade of "C" or better
Advisory: Completion of WELD 15 with grade of "C" or better
Hours: 90 (36 lecture, 54 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. Laboratory exercises include multiple positions of fillet and groove welds using carbon steel, stainless steel and aluminum of different thicknesses. (CSU)

WELD 0060. Welding Metallurgy
Units: 3
Prerequisite: Completion of WELD 30 or 50 with grade of "C" or better
Advisory: Completion of CHEM A 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 0066. CNC Mill 3D Manufacturing
Units: 3
Advisory: Completion of WELD 74 with grade of "C" or better
Hours: 90 (36 lecture, 54 laboratory)
Principles and operative skills to setup, program, and operate Computer Numerical Control (CNC) milling machinery, with a focus on building the skills to work as a setup operator. Instruction includes an overview of the machining process, quality control, metrology, inspection, blueprint reading, Computer-Aided Manufacturing (CAM), beginning CNC operations and manual programming skills. (not transferable)

WELD 0070. Principles of Fabrication
Units: 2.5
Prerequisite: Completion of WELD 20 with grade of "C" or better
Advisory: Completion of WELD 30 with grade of "C" or better; OR completion of WELD 25 and WELD 40 with grades of "C" or better
Hours: 99 (18 lecture, 81 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 0074. Computer-Aided Metal Cutting Design
Units: 3
Prerequisite: Completion of WELD 15 or 20 with grade of "C" or better
Hours: 90 (36 lecture, 54 laboratory)
Study of Computer Numerically Controlled (CNC) cutting systems using industry standard hardware and development software. Topics include design principles, copyright, selection of materials appropriate for each cutting method, billing of materials and job estimating, comparison of plasma, water-jet, and laser cutting operations and methods, basic G and M code commands, use of consumables, cut quality evaluation, and trouble-shooting techniques. (not transferable)

WELD 0076. Ornamental Iron Fabrication I
Units: 2
Hours: 72 (18 lecture, 54 lab)
Metalworking methods and techniques used in the early industrialization to include introduction to blacksmith training. Basic traditional forging processes and techniques, applicable to ornamental metalwork fabrication, including forge welding, tool making, and basic joinery. (not transferable)

WELD 0080. Structural Steel Welding Certification
Unit: 1
Prerequisite: Completion of WELD 30 and 40 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 0082. Pipe Welding Certification - Uphill
Unit: 1.5
Prerequisite: Completion of WELD 30 and 40 with grades of "C" or better; concurrent enrollment in or completion of WELD 80 with grade of "C" or better
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 50 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 0083. Pipe Welding Certification - Downhill
Units: 0.5
Prerequisite: Completion with grade of "C" or better or concurrent enrollment in WELD 82
Advisory: Student must be competent in SMAW pipe welding with E-6010 electrode in position
Hours: 36 (5 lecture, 31 laboratory)
Downhill pipe welding to prepare to certify 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 0084. Welder Operator Certification
Units: 0.5
Prerequisite: Completion of WELD 0004 with passing grade
Hours: 16 (6 lecture, 10 laboratory)
Certification of welding operator to ISO standards. Requires use of mechanized welding equipment. Part of the WELD CONNECTION Apprenticeship. (not transferable)

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. 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.