

Application Date
2011-05-11



California Community Colleges

SUBSTANTIAL CHANGES TO AN APPROVED CREDIT PROGRAM

Welding Processes		Margaret Mauldin
TITLE OF PROPOSED PROGRAM Welding Technology		CONTACT PERSON Instruction Office Specialist
TITLE OF EXISTING PROGRAM (IF DIFFERENT) 095650		TITLE (760) 384-6257
EXISTING PROGRAM T.O.P. CODE CERRO COSO	EXISTING PROGRAM CONTROL NUMBER 1946	PHONE NUMBER mmauldin@cerrocoso.edu
COLLEGE 08/22/2011	DISTRICT KERN	E-MAIL ADDRESS
PROJECTED START DATE FOR CHANGE		
GOAL(S) OF PROGRAM (CHECK ALL THAT APPLY):		
<input checked="" type="checkbox"/> CAREER TECHNICAL EDUCATION (CTE) <input type="checkbox"/> TRANSFER <input type="checkbox"/> OTHER		

Type of change requested: Check only one.

Add new Certificate of Achievement
 Add Degree to Existing Certificate Program
 Add new Major or Area of Emphasis to Existing Degree

TYPE OF PROGRAM (SELECT ONLY ONE):

A.A. DEGREE
 A.S. DEGREE
 AA-T DEGREE (for transfer)*
 AS-T DEGREE (for transfer)*

CERTIFICATE OF ACHIEVEMENT:

18+ semester (or 27+ quarter) units
 12-18 semester (or 18-27 quarter) units

* The AA-T and AS-T degrees fulfill the requirements of California Education Code sections 66745-66749, also known as the Student Transfer Achievement Reform Act. See special instructions provided [here](#).

Planning Summary:

Projected Start Date (mm/dd/yyyy) Projected Annual Completers


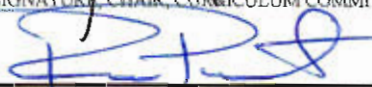
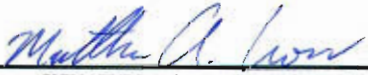
FIELDS	AS LISTED IN CURRENT INVENTORY	AS REVISED
Program Control Number	1946	1946
TOP Code	095650	095650
Local Title	Welding Technology	Welding Processes
Units for Degree Major or Area of Emphasis	20 to 20	
Total Units for Degree		
Certificate Units	0 to 0	12 to 12

REQUIRED SIGNATURES

Title of Proposed Program Welding Processes Certificate College Cerro Coso Community College

LOCAL CURRICULUM APPROVAL:

Changes proposed in this application have been approved by the curriculum committee and instructional administration, and all applicable requirements of Title 5 regulations have been satisfied.

<u>5/12/11</u> DATE	<u></u> SIGNATURE, CHAIR, CURRICULUM COMMITTEE	<u>Dr. Corey Marvin, CIC Chair</u> TYPED OR PRINTED NAME
<u>5-18-11</u> DATE	<u></u> SIGNATURE, CHIEF INSTRUCTIONAL OFFICER	<u>Richard Post, Interim V.P. Academic Aff.</u> TYPED OR PRINTED NAME
<u>12 May 2011</u> DATE	<u></u> SIGNATURE, ACADEMIC SENATE PRESIDENT	<u>Matthew Crow, Academic Senate Pres.</u> TYPED OR PRINTED NAME

CAREER TECHNICAL EDUCATION ONLY:

Program fulfills the requirements of employers in the occupation, provides students with appropriate occupational competencies, and meets any relevant professional or licensing standards.

<u>12 May 2011</u> DATE	<u></u> SIGNATURE, ADMINISTRATOR OF CTE	<u>Valerie Karnes, CTE Dean</u> TYPED OR PRINTED NAME
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Changes proposed in this application been reviewed by the Career Technical Education Regional Consortium, and approval was recommended on _____ (date).

_____ DATE	_____ SIGNATURE, CHAIR, REGIONAL CONSORTIUM	_____ TYPED OR PRINTED NAME
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COLLEGE PRESIDENT:

All provisions of Title 5, Section 55130 have been considered. All factors, taken as a whole, support establishment and maintenance of the proposed changes to an existing, approved program.

<u>5/15/11</u> DATE	<u></u> SIGNATURE, PRESIDENT OF THE COLLEGE	<u>Jill Board, President</u> TYPED OR PRINTED NAME
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DISTRICT APPROVAL (check one):

On _____ (date), the governing board of the _____ District approved the proposed changes to this existing program attached to this request.

The governing board has delegated to me the authority to approve substantial changes to existing programs, and I have approved the associate degree or certificate attached to this request.

_____ DATE	_____ SIGNATURE, SUPERINTENDENT/CHANCELLOR OF DISTRICT	<u>Sandra V. Sorrano</u> TYPED OR PRINTED NAME
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Please retain the original signature page for your records and upload a scan of the signature page as an attachment.

PROGRAM OF STUDY

CC Welding Processes Cert Certificate of Achievement

WELDING PROCESSES CERTIFICATE: This certificate provides a focus on the major welding and cutting processes for building or upgrading skills and is also a foundation for the two-year degree.

Career Opportunities in Welding

Areas in which welders work include mining, manufacturing, marine welding , ship building, metal art sculpting, machine shops, construction, railroads, automotive, plumbing and pipefitting, as well as the aircraft, aerospace, and renewable energy industries.

Complete all of the following core courses:

WELD C101	Oxyacetylene Welding	3
WELD C102	Shielded Metal Arc Welding	2
WELD C200	Gas Metal Arc Welding (GMAW)	2
WELD C203	Gas Tungsten Arc Welding (GTAW)	2
WELD C201	Welding Fabrication	3

Total Units

12

PID 457

DEVELOPMENT CRITERIA NARRATIVE & DOCUMENTATION

Welding Processes Certificate of Achievement

Criteria A. Appropriateness to Mission

1. Statement of goals and objectives for existing program, including new changes.

Department Mission: It is the mission of the Industrial Technology Department is to provide quality curricula that reflect the cutting edge developments of industry standards so students who complete the program are well prepared for the workforce environment.

The Industrial Technology Department will offer relevant up-to-date programs to students both in the daytime and evening timeslots to provide maximum opportunities for both full time students and others in the workforce returning to update technical skills.

Program Mission: The mission of the Welding Program teaches students in multiple welding processes and is designed to prepare them for an entry level welding position in diverse fields. Safe and clean work habits are practiced and personal protective equipment is covered.

Areas in which welders work include: mining, manufacturing, marine welding , ship building, metal art sculpting, machine shops, construction, railroads, automotive, as well as the aircraft, aerospace and renewable energy industries.

2. Catalog description for existing program, including new option.

PROGRAM NAME: WELDING TECHNOLOGY ASSOCIATE OF SCIENCE DEGREE

PROGRAM DESCRIPTION: (60 units total, 20 units in the major) This program trains students in multiple welding processes and is designed to prepare them for an entry level welding position in diverse fields. Safe and clean work habits are practiced and personal protective equipment is required.

Areas in which welders work include: mining, manufacturing, marine welding , ship building, metal art sculpting, machine shops, construction, railroads, automotive, as well as the aircraft, aerospace and renewable energy industries.

Job prospects of graduates from this program are excellent.

COURSES:

Complete all of the following courses:

Course Number	Course Name	Units
MATH C056	Technical Math for Trades	3
DRFT C108	Reading Technical Drawings	3
MCTL C107	Basic Hand Tools	2
WELD C101	Oxyacetylene Welding	3
WELD C102	Shielded Metal Arc Welding (SMAW)	2
WELD C200	Gas Metal Arc Welding (GMAW)	2
WELD C201	Welding Fabrication	3
WELD C203	Gas Tungsten Arc Welding (GTAW)	2

20 Units

PROGRAM NAME: WELDING TECHNOLOGY CERTIFICATE (20 units) Any student completing 20 units required for the major qualifies for a certificate of Welding Technology.

COURSES:

Complete all of the following courses:

Course Number	Course Name	Units
MATH C056	Technical Math for Trades	3
DRFT C108	Reading Technical Drawings	3
MCTL C107	Basic Hand Tools	2
WELD C101	Oxyacetylene Welding	3
WELD C102	Shielded Metal Arc Welding (SMAW)	2
WELD C200	Gas Metal Arc Welding (GMAW)	2
WELD C201	Welding Fabrication	3
WELD C203	Gas Tungsten Arc Welding (GTAW)	2

20 Units

PROGRAM LEARNING OUTCOMES: Upon successful completion of the program, the student will be able to:

- A. Demonstrate competency in major welding processes used in industry. This will be assessed through final projects in all the courses in the program and scored with a rubric.
- B. Apply welding processes, use of hand tools and shop equipment to fabricate metal projects. This will be assessed through final projects in all the courses in the program and scored with a rubric.
- C. Read, interpret and use shop drawings and specifications in the fabrication of metal projects. This will be assessed through final projects in select courses in the program and scored with a rubric.
- D. Apply and practice workplace safety policies and procedures in the course of learning welding and related skills. This will be assessed through examination and safety practice during all the courses in the program and will be scored using a rubric.

MATRIX:

Courses	Program Learning Outcomes			
	A.	B.	C.	D.
MATH 056		X	X	
DRFT C108			X	
MCTL C107		X		X
WELD C101	X	X		X
WELD C102	X	X		X
WELD C200	X	X		X
WELD C201	X	X	X	X
WELD C203	X	X		X

3. New program requirements.

PROGRAM NAME: WELDING PROCESSES CERTIFICATE

PROGRAM DESCRIPTION: (12 Units) This certificate provides a focus on the major welding and cutting processes for building or upgrading skills and is also a foundation for the two-year degree.

COURSES:

Complete all of the following courses:

- WELD C101 Oxyacetylene Welding 3
- WELD C102 Shielded Metal Arc Welding (SMAW) 2
- WELD C200 Gas Metal Arc Welding (GMAW) 2
- WELD C201 Welding Fabrication 3
- WELD C203 Gas Tungsten Arc Welding (GTAW) 2

12 units

PROGRAM LEARNING OUTCOMES: Upon successful completion of the program, the student will be able to:

- A. Demonstrate competency in major welding processes used in industry.
- B. Apply welding processes and the use of hand tools and shop equipment to fabricate projects.
- C. Accurately fabricate items from technical drawings using appropriate math skills.
- D. Apply and practice workplace safety policies and procedures while learning welding and related skills.

Courses	Program Learning Outcomes			
	A.	B.	C.	D.
WELD C101	X	X		X
WELD C102	X	X		X
WELD C200	X	X		X
WELD C201	X	X	X	X
WELD C203	X	X		X

4. Optional: Discussion of background and rationale (if needed).

The purpose of this application is to record the existing local certificate in the state inventory.

The 12 certificate is a starting point for some students to prepare them for the degree program. Other students use completion of the certificate to augment their other work experience in order to find jobs or advance in existing employment.

Criteria B. Need

5. Enrollment and Completer Projections: As of Spring 2011 there are 52 declared majors in Welding.

Enrollment has been around 114 students per semester. 20 - 22 completers per semester is projected.

The Welding Technology Associate of Science program is expanding to meet the documented labor market demand for degree and certificate completers. The program has just entered the fourth year of reorganization including curriculum updates and ongoing attention to lab and equipment upgrades. The number of declared majors in this field is growing 2007 (5) to 2009 (46). The cycle of course offerings is about to show a major increase in graduates to meet the known demand for welders in our area. In the Cerro Coso service area there are many known jobs that are not documented because employer's corporate offices are out of state. For example, new welding positions and training of existing employees required by the naval air warfare center, NAWS (China Lake), Searles Minerals (Trona), plus existing and renewable energy industries such as Terragen (Coso Operating Company-Geothermal) as well as their wind and solar assets, are not captured in reporting systems because the corporate offices are located outside our service area. Further, companies such as Searles minerals send their existing employees (several per semester) for training to enable employees to advance to millwright status.

6. Place of proposed change in the curriculum - relation to existing program and options; relation to other programs at your college:

The Welding Processes Certificate of Proficiency exists at the local level as a 12 unit certificate. This application is to include this certificate on the state inventory so it will appear on the transcripts for the many students who achieve this certificate for advancement and placement in existing and new jobs.

7. Discussion of Impact on other colleges in region:

The program does not represent unnecessary duplication of training programs and other regional colleges offering a similar program are too far away to impact employer's needs in our service area.

8. Analysis of labor market need or job availability (for career technical education only).

The four county region includes 1,614 occupational jobs in 2010 and projected 1649 jobs in 2015 with annual openings of 58 with a median hourly earnings of \$23.70. However, new welding positions and training of existing employees required by the naval air warfare center, NAWS (China Lake), Searles Minerals (Trona), plus existing and renewable energy industries such as Terragen (Coso Operating Company-Geothermal) as well as their wind and solar assets, are not captured in reporting systems because the corporate offices are located outside our service area. Further, companies such as Searles minerals send their existing employees (at least ten at this time) to enable employees to advance to millwright status.

According to researchers at reputable sources like the Wall Street Journal the demand for welders is at an all time high. An article entitled "Where are all the welders?" describes companies needing welders "...like a starving person needs food." The Journal has stated there is a shortage of Welders; the average age of welders is currently 54 and climbing.

At our own Employer Summit Meetings, practically all of the industries represented expressed a need for welders. The American Welding Society said that last year (2010) the demand for skilled welders outstripped supply by about 200,000.

In an article published by Ray Shook the Executive Director for the American Welding Society entitled Welding Trends for 2010 and Beyond

<http://www.weldingandgasestoday.org/index.php/2009/12/welding-trends-for-2010-and-beyond/>

He states;

As we begin 2010 and examine what we can expect for the future of welding, we see that the industry is exploding with new opportunities, both for those already in the field and for those looking toward a new career path.

For the past few years, the metal fabrication and construction industries have faced a challenge in finding skilled welders. With approximately 500,000 welders in the workforce, the average welder today is in his or her mid-50s and nearing retirement. With welders retiring at twice the pace of new welders coming into the field, it's anticipated that in the years to come, we will have a significant shortfall of qualified welders. Since welding is the most common way to join metals—which is critical to manufacturing, construction, energy and infrastructure—it is vital to rebuild our welding workforce.

Looking toward the future, the trends in welding will continue to be the growth of technology in manufacturing and quality, but with it will come the increasing demand to have skilled welders available to do the jobs we need to keep America going. Whether it's repairing an aging bridge, welding together parts for more effective wind power, or monitoring an arc welding robot, we will continue to realize the importance of attracting personnel and training skilled welders for the future workforce as we move forward.

Excerpt from Practical Welding Today;

Close to a half-million people held a job as a welder, cutter, or welding machine operator last year, three-fourths of them in manufacturing and services. Include other trades, such as ironworkers, boilermakers, and pipefitters, and the total surges to about 2 million. That's 10 percent of the work force, according to the [Department of Labor's Bureau of Statistics](#).

Criteria C. Curriculum Standards

9. Transfer applicability to **two** 4-year institutions (if applicable).

Attachment: Course outlines for required courses (required for all applications).

Attachment: Articulation Agreements (if applicable).

If applicable to revised program:

10. **Criteria D-Adequate Resources:** Currently, the program offerings, including the 12 unit local certificate are covered by one full time and one adjunct instructor.

11. **Criteria E-Compliance:** Enrollment restrictions and licensing or accreditation standards

**CERRO COSO COMMUNITY COLLEGE
ASSOCIATE DEGREE COURSE OUTLINE**

Approved: Updated 11/30/07

Course TOPS Code: 0956.50

Classification: I

Transferability: A/CSU

Stand-Alone Status:

Not Stand-Alone: Welding Technology

Blanket Approval:

Stand-Alone:

Other Dates of Approval

Content Review: Updated 11/30/07

Online Delivery: None

CSU Cert:

IGETC:

UC Transfer:

Stand-Alone:

1. SUBJECT DISCIPLINE AND COURSE NUMBER: WELD C101
2. COURSE TITLE: Oxyacetylene Welding
3. UNITS: 3.0
4. INSTRUCTIONAL METHODS / TOTAL HOURS: 90

Lecture	36
Lab	54
Activity	
Open Lab	
Work Experience	
5. REQUISITES:

Prerequisite	
Co-requisite	
Advisory	Reading Level 1, Writing Level 2
6. CATALOG COURSE DESCRIPTION: This course provides practical experience in welding, brazing, soldering, and cutting of steel using oxyacetylene. Topics include safety, metals and their physical properties, setup and use of oxyacetylene equipment, and welding and cutting techniques.
7. STUDENT LEARNING OUTCOMES AND ASSESSMENTS: Upon successful completion of the course, the student will be able to:
 - A. practice clean and safe working habits that are consistent with trade practices to OSHA standards. This will be assessed through direct observation and scored with rubric and exam.
 - B. demonstrate proper care and handling of tanks, regulators, and torches. This will be assessed through direct observation and scored with a rubric.
 - C. install and correctly adjust regulators, light and adjust torches. This will be assessed through direct observation and scored with a rubric.

- D. identify different types of metals and the appropriate welding/cutting process. This will be assessed and scored with an exam.
- E. make a variety of oxyacetylene welds with and without filler rod and cut metal using the cutting torch. This will be assessed with a project and scored with a rubric.
- F. perform soldering and brazing tasks. This will be assessed with a project and scored with a rubric.

8. DETAILED TOPICAL OUTLINE:

- A. Introduction (A)
 - 1. Welding Safety
 - 2. Burn Classification
 - 3. Face, Eye, and Ear Protection
 - 4. Respiratory Protection
 - 5. Ventilation
 - 6. Special Protective Clothing
 - 7. Fire Protection
 - 8. Shop Orientation
- B. Oxyfuel Welding and Cutting Equipment Setup and Operation (A-B)
 - 1. Pressure Regulators
 - 2. Regulator Gauges
 - 3. Safety Release Device
 - 4. Fittings
 - 5. Safety Precautions
 - 6. Regulator Care and Use
 - 7. Welding and Cutting Torches Design and Service
 - 8. Mixing the Gasses
 - 9. Torch care and Use
 - 10. Welding and Heating Tips
 - 11. Tip Care and Use
 - 12. Reverse Flow and Flashback Valves
 - 13. Care of Reverse Flow and Flashback Arresters
 - 14. Hose and Fittings
 - 15. Hose Care and Use
 - 16. Backfires and Flashbacks
 - 17. Types of Flames
 - 18. Leak Detection
- C. Practice (C)
 - 1. Setting Up an Oxyfuel Torch Set
 - 2. Turning On and Testing a Torch
 - 3. Lighting and Adjusting an Oxyacetylene Flame
 - 4. Shutting Off and Disassembling Oxyfuel Welding Equipment
- D. Oxyfuel Gasses and Filler Materials (C-D)
 - 1. Uses of the Oxyfuel Flame
 - 2. Characteristics of the Oxyfuel Flame
 - 3. Characteristics of the Fuel Gas Flame
 - 4. Fuel Gasses
 - 5. Flame Rate of Burning
 - 6. Acetylene (C₂H₂)
 - 7. Heat and Temperature
 - 8. Liquefied Fuel Gasses
 - 9. Pressure
 - 10. Production
 - 11. Temperature and Heat
 - 12. MAPP
 - 13. Propane and Natural Gas
 - 14. Hydrogen

15. Filler Metals
 - i. Ferrous Metals
16. Mild Steel
 - i. Cast Iron
- E. Oxyacetylene Welding (E)
 1. Mild Steel Welds
 2. Factors Affecting the Weld
 3. Characteristics of the Weld
 4. Practice
 5. Pushing a Molten Weld Pool
 6. Beading
 7. Stringer Bead Flat Position
 8. Practice
 9. Outside Corner Joint
 10. Practice
 11. Butt Joint, Flat Position
 12. Butt Joint w/ 100% Penetration
 13. Butt Joint w/ Minimum Distortion
 14. Practice
 15. Lap Joint
 16. Tee Joint
 17. Out of Position Welding
 18. Practice
 19. Vertical Welds
 20. Butt Joint
 21. Lap Joint
 22. Tee Joint
 23. Horizontal Welds
 24. Practice
 25. Horizontal Stringer Beads
 26. Butt Joint
 27. Lap Joint
 28. Tee Joint
- F. Soldering, Brazing, and Braze Welding (F)
 1. Advantages of Soldering and Brazing
 2. Physical Properties of the Joint
 3. Fluxes
 4. Soldering and Brazing Methods
 5. Filler Metals
 6. Joint Design
 7. Building Up Surfaces and Filling Holes
 8. Silver Brazing
 9. Soldering
 10. Practice
 11. Brazed Stringer Bead
 12. Brazed Butt Joint
 13. Brazed Tee Joint
 14. Brazed Lap Joint
 15. Soldered Tee Joint
 16. Soldered Copper Pipe
- G. Flame Cutting (E)
 1. Metals Cut by the Oxyfuel Process
 2. Eye Protection for flame Cutting
 3. Cutting Torches and Tips
 4. Oxyfuel Cutting, Setup, and Operation
 5. Selecting the Correct Tip and Setting the Pressure
 6. Practice

7. Flat cut
 8. Cutting holes
 9. Beveling
 10. Vertical Straight
9. LAB CONTENT DESCRIPTION: Students complete guided tutorials and perform practical exercises during lab.
 10. METHODS OF PRESENTATION: Course instructional methods may include but are not limited to
 - A. Lecture
 - B. Textbook tutorials
 - C. Synchronous video training aids
 - D. Practical exercises
 11. ASSIGNMENTS AND METHODS OF EVALUATION: Assessment of student performance may include but is not limited to:
 - A. Instructor assigned homework and readings to supplement and augment class lectures and demonstrations. (A-D)
Example: Characteristics of the Oxyfuel flame.
 - B. Practical assignments making specific types of welds and flame cuts. (E, F)
Example: Joining mild steel using a horizontal lap joint weld.
 - C. Exams on readings and handouts. (A-D)
 - D. Final written and practical exam. (A-F)
 12. OUT OF CLASS ASSIGNMENTS:

Text readings
 13. REQUIRED TEXTS: Reading assignments are required and may include but are not limited to

Jeffus, L. F. (2008). *Welding: Principles and Applications*. 6th ed. New York, NY: Thompson Delmar Learning.
 14. REPEATABILITY: None
 15. GRADING METHOD: Standard Letter Grade
 16. CREDIT BY EXAM: No
 17. MATERIALS FEE: \$40

If yes, justification: For consumable welding materials.
 18. SAM CODE: C
 19. PROGRAM IDENTIFICATION: Welding Technology
 20. GENERAL EDUCATION APPLICABILITY:

Cerro Coso
CSU Cert
IGETC
 21. COURSE DISCIPLINE LIST: Welding

SIGNATURE PAGE

SUBJECT DISCIPLINE AND COURSE NUMBER: WELD C101

James O'Connor COURSE PROPOSER	2/29/08 DATE
Dennis I. VanderWerff CIC CHAIR	2/29/08 DATE
Dr. James Fay VICE PRESIDENT OF ACADEMIC AFFAIRS	3/13/08 DATE

**CERRO COSO COMMUNITY COLLEGE
ASSOCIATE DEGREE COURSE OUTLINE**

Approved: Updated 11/30/07

Course TOPS Code: 0956.50

Classification: I

Transferability: A/CSU

Stand-Alone Status:

Not Stand-Alone: Welding Technology

Blanket Approval:

Stand-Alone:

Other Dates of Approval

Content Review: Updated 11/30/07

Online Delivery: None

CSU Cert:

IGETC:

UC Transfer:

Stand-Alone:

1. SUBJECT DISCIPLINE AND COURSE NUMBER: WELD C102
2. COURSE TITLE: Shielded Metal Arc Welding
3. UNITS: 2.0
4. INSTRUCTIONAL METHODS / TOTAL HOURS: 72

Lecture	18
Lab	54
Activity	
Open Lab	
Work Experience	
5. REQUISITES:

Prerequisite	WELD C101
Co-requisite	
Advisory	
6. CATALOG COURSE DESCRIPTION: This course provides practical, hands-on experience in Shielded Metal Arc Welding (SMAW) as well as lectures on safety, different types of SMAW machines, identification of metals, electrode selection and electrical theory.
7. STUDENT LEARNING OUTCOMES AND ASSESSMENTS: Upon successful completion of the course, the student will be able to:
 - A. practice clean and safe working habits that are consistent with trade practices to OSHA standards. This will be assessed through direct observation and scored with rubric and exam
 - B. demonstrate the safe setup and use SMAW equipment. This will be assessed through direct observation and scored with a rubric
 - C. identify types of metal that can be SMAW welded and the compatible electrodes, select the correct type of machine and current for a specific welding task. This will be assessed and scored with an exam.

- D. produce acceptable welds in a variety configurations and positions. This will be assessed with a project and scored with a rubric.

8. DETAILED TOPICAL OUTLINE:

- A. Safety (A)
 - 1. Burn Classification
 - 2. Face, Eye, and Ear Protection
 - 3. Respiratory Protection
 - 4. Ventilation
 - 5. Special Protective Clothing
 - 6. Fire protection
 - 7. Electrical Safety
- B. SMAW Equipment Setup and Operation (A-B)
 - 1. Welding Current
 - 2. Types of Welding Power
 - 3. Open Circuit Voltage
 - 4. Operating Voltage
 - 5. Arc Blow
 - 6. Types of Power Sources
 - 7. Generators and Alternators
 - 8. Rectifiers
 - 9. Duty Cycle
 - 10. Welding Cables
 - 11. Electrode Holders
 - 12. Work Clamps
 - 13. Setup
- C. SMAW Welding of Plate (C)
 - 1. Effects of Too High or Too Low Current Settings
 - 2. Electrode Size and Heat
 - 3. Arc Length
 - 4. Electrode Angle
 - 5. Electrode Manipulation
 - 6. Positioning of the Welder and Plate
- D. Practice Welds (D)
 - 1. Stringer Beads
 - a. Stringer Beads in the Flat Position
 - b. Stringer Beads in the Vertical Up Position
 - c. Horizontal Stringer Beads
 - 2. Square Butt Joint
 - a. Welded Square Butt Joint in the Flat Position
 - b. Vertical Up Welded Square Butt Weld
 - c. Welded Horizontal Square Butt Weld
 - 3. Edge Weld
 - a. Edge Weld, Flat Position
 - b. Edge Joint, Vertical Down Position
 - c. Edge Joint, Vertical Up Position
 - d. Edge Joint, Horizontal Position
 - e. Edge Joint, Overhead Position
 - 4. Outside Corner Joint
 - a. Outside Corner Joint, Flat Position
 - b. Outside Corner Joint, Vertical Down Position
 - c. Outside Corner Joint, Vertical up Position
 - d. Outside Corner Joint, Horizontal Position
 - e. Outside Corner Joint, Overhead Position
 - 5. Lap Joint
 - a. Lap Joint, Flat Position

- b. Lap Joint, Horizontal Position
 - c. Lap Joint, Vertical Position
 - d. Lap Joint, Overhead Position
- 6. Tee Joint
 - a. Tee Joint, Flat Position
 - b. Tee Joint, Horizontal Position
 - c. Tee Joint, Vertical Position
 - d. Tee Joint, Overhead Position
- 9. LAB CONTENT DESCRIPTION: Students complete guided tutorials and perform practical exercises during lab.
- 10. METHODS OF PRESENTATION: Course instructional methods may include but are not limited to:
 - A. Lecture
 - B. Demonstration
 - C. Synchronous video training aids
 - D. Textbook tutorials
 - E. Practical exercises
- 11. ASSIGNMENTS AND METHODS OF EVALUATION: Assessment of student performance may include but is not limited to:
 - A. instructor assigned homework and readings that supplement and augment class lectures and demonstrations. (A-C)
Example: Effects of too high or too low current settings.
 - B. practical assignments making specific types of welds. (D)
Example: Joining mild steel using a horizontal lap joint weld.
 - C. exams on readings and handouts. (A-C)
 - D. final written and practical exam. (A-D)
- 12. OUT OF CLASS ASSIGNMENTS: Text Readings
- 13. REQUIRED TEXTS: Reading assignments are required and may include but are not limited to
Jeffus, L. F. (2008). *Welding: Principles and Applications*. 6th ed. New York, NY: Thompson Delmar Learning.
- 14. REPEATABILITY: None
- 15. GRADING METHOD: Standard Letter Grade
- 16. CREDIT BY EXAM: No
- 17. MATERIALS FEE: \$40
If yes, justification: For consumable welding materials.
- 18. SAM CODE: C
- 19. PROGRAM IDENTIFICATION: Welding Technology
- 20. GENERAL EDUCATION APPLICABILITY:
Cerro Coso
CSU Cert
IGETC
- 21. COURSE DISCIPLINE LIST: Welding

SIGNATURE PAGE

SUBJECT DISCIPLINE AND COURSE NUMBER: WELD C102

James O'Connor COURSE PROPOSER	2/29/08 DATE
Dennis I. VanderWerff CIC CHAIR	2/29/08 DATE
Dr. James Fay VICE PRESIDENT OF ACADEMIC AFFAIRS	3/13/08 DATE

**CERRO COSO COMMUNITY COLLEGE
ASSOCIATE DEGREE COURSE OUTLINE**

Approved: New 11/30/07

Course TOPS Code: 0956.50

Classification: I

Transferability: A/CSU

Stand-Alone Status:

Not Stand-Alone: Welding Technology (Proposed)

Blanket Approval:

Stand-Alone:

Other Dates of Approval

Content Review: New 11/30/07

Online Delivery:

CSU Cert:

IGETC:

UC Transfer:

Stand-Alone:

1. SUBJECT DISCIPLINE AND COURSE NUMBER: WELD C200
2. COURSE TITLE: Gas Metal Arc Welding (GMAW)
3. UNITS: 2.0
4. INSTRUCTIONAL METHODS / TOTAL HOURS: 72

Lecture	18
Lab	54
Activity	
Open Lab	
Work Experience	
5. REQUISITES:

Prerequisite	
Co-requisite	
Advisory	Reading Level 1, Writing Level 2
6. CATALOG COURSE DESCRIPTION: This course provides practical experience in Gas Metal Arc Welding (GMAW) (MIG) as well as lectures on safety, welding and identification of ferrous and non-ferrous metals, shielding gasses, bare and flux cored electrodes, and proper selection of welding materials for different applications.
7. STUDENT LEARNING OUTCOMES AND ASSESSMENTS: Upon successful completion of the course, the student will be able to:
 - A. practice clean and safe working habits that are consistent with trade practices to OSHA standards. This will be assessed through direct observation and scored with rubric and exam
 - B. describe the more commonly used GMAW filler metals. This will be assessed and scored with an exam.
 - C. Explain the various methods of metal transfer. This will be assessed and scored with an exam.

- D. Demonstrate how to set up a GMAW installation. This will be assessed through direct observation and scored with a rubric
- E. Demonstrate how to control deposition rate and efficiency. This will be assessed with a project and scored with a rubric.
- F. Select the proper shielding gas and flow rate. This will be assessed through direct observation and scored with a rubric
- G. Control the quality of the weld by changing the electrode extension, and gun angle. This will be assessed with a project and scored with a rubric.
- H. Produce proper welds in butt joints, lap joints, and tee joints in all positions that can pass the specified standard. This will be assessed with a project and scored with a rubric.

8. DETAILED TOPICAL OUTLINE:

- A. Safety (A)
 - 1. Burn classification
 - 2. Face, eye, and ear protection
 - 3. Respiratory protection
 - 4. Ventilation
 - 5. Special protective clothing
 - 6. Fire protection
 - 7. Electrical protection
- B. GMAW Equipment Setup and Operation (B-C)
 - 1. Introduction
 - 2. Metal Transfer
 - 3. Filler Metal Specifications
 - 4. Wire Melting and Deposition Rates
 - 5. Welding Power Supplies
 - 6. Molten Weld Pool Control
 - 7. Equipment
- C. Gas Metal Arc Welding (D-F)
 - 1. Setup
 - 2. Gas Density and Flow Rates
 - 3. Arc-voltage and Amperage Characteristics
 - 4. Electrode Extension
 - 5. Welding Gun Angle
 - 6. Effects of Shielding Gas on Welding
 - 7.
- D. Practices (E-H)
 - 1. Metal Preparation
 - 2. Flat Position, 1G and 1F Positions
 - 3. Vertical Up 3G and 3F Positions
 - 4. Vertical Down 3G and 3F Positions
 - 5. Horizontal 2G and 2F Positions
 - 6. Overhead 4G and 4F Positions
 - 7. Globular Metal Transfer 1G Position
 - 8. Axial Spray

9. LAB CONTENT DESCRIPTION (if applicable): Students complete guided tutorials and perform practical exercises during lab.

10. METHODS OF PRESENTATION: Course instructional methods may include but are not limited to:

- A. Lecture
- B. Demonstration
- C. Synchronous video training aids
- D. Textbook tutorials

- E. Practical exercises
11. ASSIGNMENTS AND METHODS OF EVALUATION: Assessment of student performance may include but is not limited to:
 - A. Instructor assigned homework and readings that supplement and augment class lectures and demonstrations. (A-G)
Example: Effects of shielding gas on welding
 - B. Practical assignments making specific types of welds. (E-H)
Example: Vertical up weld in 3G and 3F positions
 - C. Exams on readings and handouts. (A-G)
 - D. Final written and practical exam. (A-H)
 12. OUT OF CLASS ASSIGNMENTS: Text readings
 13. REQUIRED TEXTS: Reading assignments are required and may include but are not limited to:

Jeffus, L. F. (2008). *Welding: Principles and Applications*. 6th ed. New York, NY: Thompson Delmar Learning.
 14. REPEATABILITY: None
 15. GRADING METHOD: Standard Letter Grade
 16. CREDIT BY EXAM: No
 17. MATERIALS FEE: \$40

If yes, justification: For consumable welding materials.
 18. SAM CODE: D
 19. PROGRAM IDENTIFICATION: Welding Technology (Proposed)
 20. GENERAL EDUCATION APPLICABILITY:
Cerro Coso
CSU Cert
IGETC
 21. COURSE DISCIPLINE LIST: Welding

SIGNATURE PAGE

SUBJECT DISCIPLINE AND COURSE NUMBER: WELD C200

James O'Connor COURSE PROPOSER	2/29/08 DATE
Dennis VanderWerff CIC CHAIR	2/29/08 DATE
Dr. James Fay VICE PRESIDENT OF ACADEMIC AFFAIRS	3/13/08 DATE

Cerro Coso Community College

COURSE OUTLINE OF RECORD

Form A (Course Description)		Date	10/12/2008	Page 1 of 1
Discipline	WELD	Course No.	C201	Units
Course Title	Welding Fabrication			
Non-Credit Category				

Revision Due Date	Final Approval due NOT LATER THAN	10/31/08
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[Click link to view instructions for completing COR Form A.](#)

Methods of Instruction/Total Hours of Instruction

Lecture	(1.0 unit = 18 hours)	36
Lab	(1.0 unit = 54 hours)	54
Open Lab	(1.0 unit = 54 hours)	
Activity	(1.0 unit = 54 hours)	
Work Experience	(1.0 unit = 60 hours (volunteer); 75 hours (paid))	
Total Hours		90

Catalog Course Description

This course is designed to enable the student to construct welded projects using the processes learned in previous courses. The student learns how to read technical drawings and interpret welding symbols, produce shop drawings, and use trade related math in the in the layout and assembly process.

Conditions of Enrollment

Pre-Requisite	WELD C203
Co-Requisite	
Advisory	

Repeatability	None	Grading Method	Standard Letter Grade	Credit by Exam	No
Materials Fee	yes	Amount	\$50		
Justification	Materials fee				
SAM Code	B Advanced Occupational				

Program Identification

Welding Technology, Trade Practices

General Education Applicability	Cerro Coso	CSU Certification	IGETC
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Minimum Qualifications Discipline List

Master's Degree Required	
Master's Degree Not Required	Welding

Office Use Only

Approval Type	Revision	BT Action	12/11/08
Course TOPS Code	0956.50	Stand Alone Status	N/A
		Stand Alone Approval	

Transferability			
A/CSU	Cerro Coso GE	CSU GE Certification	IGETC

Form Submission					
COR Part A	10/17/09	COR Part B	10/17/08	Content Review	10/17/08
DE Addendum	Click here to enter a date.	GE Addendum	Click here to enter a date.	Course Deletion	Click here to enter a date.
Signature Page	8/24/09				

Approval Dates					
First Review	10/17/09	Second Review	10/17/09	Final Review	8/28/09

Cerro Coso Community College

COURSE OUTLINE OF RECORD

Form B (Course Content)		Date	10/12/2008		Page 1
Discipline	WELD	Course No.	C201	Units	3.00
Course Title	Welding Fabrication				
Non-Credit Category	Click here to choose Non-Credit Category.				

Student Learning Outcomes & Assessments

Upon successful completion of the course, the student will be able to:

SLO	Learning Outcome Description	Outcome Assessment Definition
A	Practice safe working habits in a manner consistent with OSHA regulations	This will be assessed through direct observation and scored with a rubric
B	Demonstrate an understanding of the basic concepts of joint design	This will be assessed with a project and scored with a rubric
C	Interpret and sketch technical drawings	This will be assessed with a project and scored with a rubric
D	Define welding symbols	This will be assessed and scored with an exam
E	Employ basic trade math during project layout	This will be assessed with a project and scored with a rubric
F	Demonstrate proper layout and fitting procedures for welding of structural shapes	This will be assessed through direct observation and scored with a rubric

Detailed Topical Outline

A		Weld Joint Design	B
	1	Joint type	
	2	Edge preparation	
	3	Joint dimensions	
	4	Welding process	
	5	Base metal	
	6	Plate welding positions	
	7	Pipe welding positions	
	8	Metal thickness	
	9	Code or standards requirements	
	10	Welder skill	
	11	Acceptable cost	
B		Mechanical Drawings	C
	1	Lines	
	2	Types of drawings	
	3	Projection drawings	
	4	Special views	
	5	Dimensioning	
C		Welding Symbols	D
	1	Indicating types of welds	
	2	Weld location	
	3	Location significance of arrow	
	4	Fillet welds	
	5	Plug welds	
	6	Spot welds	

Cerro Coso Community College

COURSE OUTLINE OF RECORD

Form B (Course Content)		Date	10/12/2008	Page 2
Discipline	WELD	Course No.	C201	Units
Course Title	Welding Fabrication			3.00
Non-Credit Category	Click here to choose Non-Credit Category.			

	7	Seam Welds	
	8	Groove welds	
	9	Backing	
	10	Flanged welds	
	11	Nondestructive testing symbols	
D		Fabrication layout	A-F
	1	Safety	
	2	Shop math	
		a. Measuring	
		b. Tolerances	
		c. Basic math	
		d. Conversions	
		e. Charts	
		f. Basic geometry	
	3	Structural shapes	
	4	Layout square, rectangular, and triangular shapes	
	5	Laying out circles, arcs, and curves	
	6	Nesting	
	7	Bill of materials	
	8	Kerf space	
	9	Material shapes	
F		Assembly	A-F
	1	Clamps	
	2	Fixtures	
	3	Fitting	
	4	Tack welding	
	5	Welding	
	6	Finishing	

Lab Content Description (if applicable)

Students complete guided tutorials and perform practical exercises during lab.

Methods of Presentation

Course instructional methods may include but are not limited to:

- A. Lecture
- B. Textbook tutorials
- C. DVD tutorials
- D. Demonstration

COURSE OUTLINE OF RECORD

Form B (Course Content)		Date	10/12/2008		Page 3
Discipline	WELD	Course No.	C201	Units	3.00
Course Title	Welding Fabrication				
Non-Credit Category	Click here to choose Non-Credit Category.				

Assignments & Methods of Evaluation

Assessment of student performance may include but is not limited to:

- A. Instructor assigned homework and readings to supplement and augment class lectures and demonstrations. (B-D)
 - a. Example: Define welding symbols on displayed on a technical drawing.
- B. Practical assignments.
 - a. Example: Layout and assemble an instructor assigned project. (A-F)
- C. Final written and practical exam. (A-F)

Out of Class Assignments

Textbook readings

Required Texts

Reading assignments are required and may include but are not limited to:

Jeffus, Larry F. (2008) *Welding: Principles and Applications Sixth Edition*. New York: Thompson Delmar Learning.

**CERRO COSO COMMUNITY COLLEGE
ASSOCIATE DEGREE COURSE OUTLINE**

Approved: Updated 4/25/08

Course TOPS Code: 0956.50

Classification: B

Transferability: A/CSU

Stand-Alone Status:

Not Stand-Alone: Welding Technology, Trade Practices

Blanket Approval:

Stand-Alone:

Other Dates of Approval

Content Review: Updated 4/25/08

Online Delivery:

CSU Cert:

IGETC:

UC Transfer:

Stand-Alone:

1. SUBJECT DISCIPLINE AND COURSE NUMBER: WELD C203

2. COURSE TITLE: Gas Tungsten Arc Welding (GTAW)

3. UNITS: 2.00

4. INSTRUCTIONAL METHODS / TOTAL HOURS: 72

Lecture 18

Lab 54

Activity

Open Lab

Work Experience

5. REQUISITES:

Prerequisite WELD C102 or equivalent experience

Co-requisite

Advisory

6. CATALOG COURSE DESCRIPTION: This course provides practical experience in Gas Tungsten Arc Welding (GTAW) (TIG) as well as lectures on safety, welding and identification of exotic metals, types of filler metals and shielding gasses.

7. STUDENT LEARNING OUTCOMES AND ASSESSMENTS: Upon successful completion of the course, the student will be able to:

- A. practice clean and safe working habits that are consistent with trade practices to OSHA standards. This will be assessed through direct observation and scored with rubric and exam.
- B. name the applications for which the gas tungsten welding process is more commonly used. This will be assessed and scored with an exam.
- C. demonstrate how to set up a GTAW installation. This will be assessed through direct observation and scored with a rubric.

- D. determine the correct machine settings for the minimum and maximum welding current for the machine used, the types and sizes of tungsten, and the metal types and thickness. This will be assessed through direct observation and scored with a rubric.
 - E. determine maximum and minimum gas flow settings for each nozzle size, tungsten size, and amperage setting. This will be assessed through direct observation and scored with a rubric.
 - F. produce properly made GTAW welds in butt joints, lap joints, and tee joints in all positions that can pass the specified standard. This will be assessed with a project and scored with a rubric.
8. DETAILED TOPICAL OUTLINE:
- A. Safety (A)
 - 1. Burn classification
 - 2. Face, eye, and ear protection
 - 3. Respiratory protection
 - 4. Ventilation
 - 5. Special protective clothing
 - 6. Fire protection
 - 7. Electrical protection
 - B. Introduction (B-D)
 - 1. Tungsten
 - 2. Types of tungsten electrodes
 - 3. Shaping the tungsten
 - 4. GTAW equipment
 - 5. Types of welding current
 - 6. Shielding gasses
 - 7. Remote controls
 - C. Gas Tungsten Arc Welding of Plate (E)
 - 1. Torch angle
 - 2. Filler rod manipulation
 - 3. Tungsten contamination
 - 4. Current setting
 - 5. Gas flow
 - D. Practice Welds (E-F)
 - 1. Low carbon and mild steels
 - 2. Stainless steel
 - 3. Aluminum
 - 4. Metal preparation
 - 5. Stringer beads, flat position, 45degree vertical position, 3G position, 4G position
 - 6. Outside corner joint 1G position
 - 7. Butt joint, 1G position, 45 degree vertical position, 3G position, 2G position, 4G position
 - 8. Lap joint 1F position, 45 degree vertical position, 3F position, 2F position, 4F position
 - 9. Tee joint 1F position, 45 degree vertical position, 3F position, 2F position, 4F position
9. LAB CONTENT DESCRIPTION (if applicable): Students complete guided tutorials and perform practical exercises during lab.
10. METHODS OF PRESENTATION: Course instructional methods may include but are not limited to:
- A. Lecture
 - B. Demonstration
 - C. Synchronous video training aids
 - D. Textbook tutorials
 - E. Practical exercises
11. ASSIGNMENTS AND METHODS OF EVALUATION: Assessment of student performance may include but is not limited to:

- A. Instructor assigned homework and readings that supplement and augment class lectures and demonstrations. (A-E)
Example: Types of tungsten electrodes
 - B. Practical assignments making specific types of welds. (F)
Example: Outside corner joint 1G position
 - C. Exams on readings and handouts (A-E)
 - D. Final written and practical exam (A-F)
12. OUT OF CLASS ASSIGNMENTS:
- A. Text readings
13. REQUIRED TEXTS: Reading assignments are required and may include but are not limited to:
- Jeffus, Larry F. (2008) *Welding: Principles and Applications Sixth Edition*. New York: Thompson Delmar Learning.
14. REPEATABILITY: Three times
15. GRADING METHOD: Standard Letter Grade
16. CREDIT BY EXAM: Written/practical
17. MATERIALS FEE: \$40
- If yes, justification: For consumable welding materials
18. SAM CODE: C
19. PROGRAM IDENTIFICATION: Welding
20. GENERAL EDUCATION APPLICABILITY:
- Cerro Coso
 - CSU Cert
 - IGETC
21. COURSE DISCIPLINE LIST: Welding

SIGNATURE PAGE

SUBJECT DISCIPLINE AND COURSE NUMBER: WELD C203

<hr/> <i>/s/ James O'Connor</i> COURSE PROPOSER – James O'Connor	<hr/> 7/15/09 DATE
<hr/> <i>/s/ Dr. Dennis I. VanderWerff</i> CIC CHAIR	<hr/> 8/24/09 DATE
<hr/> <i>/s/ Dr. James Fay</i> VICE PRESIDENT OF ACADEMIC AFFAIRS	<hr/> 8/24/09 DATE