Effective: Spring 2019
Last Reviewed: 05/04/2018

Course Outline

BASIC COURSE INFORMATION

Course Number: WELD 270A

Course Title: BASIC WELDING

Total Student Hours and Credit			
		Hours/Week	Hours/Term
Lecture Hours	in-class	2.00	36.00
	out-of-class	4.00	72
Lab Hours	in-class	4.00	72.00
	out-of-class	0	0
Activity Hours	in-class		0
	out-of-class	0	0
TBA Hours Per Term			0
Total Student Hours Per Term:			180.00
Hours-per-unit Divisor			54.00
Units of Credit:			3.00

Fall semester term is 18 weeks. Spring semester term is 17 weeks. The term length multiplier is 17.5 weeks. Curriculum is calculated based on 18 weeks.

Catalog Description:
Provides basic instruction in oxyacetylene and shielded metal arc welding. Begins with the fundamentals and quickly progresses through intermediate skills for welding steel. Includes information on cutting, braze welding, metallurgy, vertical arc welding and non-ferrous welding. Emphasizes the development of good manipulative welding skills for joining steel in the flat and horizontal positions.

Schedule Description:
Provides basic instruction in oxyacetylene and shielded metal arc welding. Transfer: CSU. (Formerly WELD70A)

Division: Engineering & Technology

Department: Welding

Minimal Qualification Discipline Designation (MQDD): Welding

Degree Applicability: Credit - Degree Applicable

Methods of Instruction:

- Lecture and/or discussion
- Laboratory/Studio/Activity
- Lecture/Lab

Grading Method:

- Letter Grade or P/NP

Repeatability: 0

Course Cap: 20

STUDENT LEARNING OUTCOMES

1. Demonstrate proper safety practices when working in a welding environment.
2. Apply integrated knowledge with incremental skill improvement resulting in functional application of welding techniques.
3. Use proper hand, measuring and layout tools to fabricate welding projects.
4. Apply academic skills in reading, mathematics, chemistry and physics to the application of welding skills

COURSE CONTENT

Objectives:
Upon completion of this course the student will be able to:

1. Perform welding exercises using the Shielded Metal Arc Welding (SMAW) process.
    - Class Performance(s)
    - Performance Exams
    - Quizzes/Exams
    - Written/Typed Homework
2. Perform welding exercises using the Oxy Acetylene Welding (OAW) process.
    - Class Performance(s)
    - Performance Exams
    - Quizzes/Exams
    - Written/Typed Homework
3. Perform welding exercises using the Gas Metal Arc Welding (GMAW) process.
    - Class Performance(s)
    - Performance Exams
    - Quizzes/Exams
    - Written/Typed Homework
4. Perform welding exercises using the Gas Tungsten Arc Welding (GTAW) process.

- Class Performance(s)
- Performance Exams
- Quizzes/Exams
- Written/Typed Homework

5. Perform welding exercises using the Flux Cored Arc Welding (FCAW) process.
    - Class Performance(s)
    - Performance Exams
    - Quizzes/Exams
    - Written/Typed Homework
6. Perform cutting exercises using the Oxy Fuel Cutting (OFC) and Plasma Arc Cutting (PAC) processes.
    - Class Performance(s)
    - Performance Exams
    - Quizzes/Exams
    - Written/Typed Homework
7. Apply industry standard safety practices to all applied welding and cutting processes.
    - Class Performance(s)
    - Performance Exams
    - Quizzes/Exams
    - Written/Typed Homework
8. Interpret the effects of distortion that results in weldments as a result of the heating and cooling induced by the various welding processes.
    - Class Performance(s)
    - Performance Exams
    - Quizzes/Exams
    - Written/Typed Homework
9. Identify the metallurgical implications of welding on various carbon steels.
    - Class Performance(s)
    - Quizzes/Exams
    - Written/Typed Homework
10. Identify the various non destructive and destructive testing procedures which are utilized when determining weld soundness.
    - Class Performance(s)
    - Quizzes/Exams
    - Written/Typed Homework
11. Demonstrate the use of welding drawings and symbols as applied to basic project fabrication.
    - Class Performance(s)
    - Performance Exams
    - Quizzes/Exams
    - Written/Typed Homework
12. Identify the means by which procedures and people's performance are qualified/certified in the welding industry.
    - Quizzes/Exams
    - Written/Typed Homework
13. Demonstrate ability to perform Vertical Up welding progression (3F position) utilizing the SMAW welding process.
    - Class Performance(s)

- Performance Exams
- Written/Typed Homework

14. Summarize the challenges presented when welding Cast Iron.
    - Quizzes/Exams
    - Written/Typed Homework

Topics & Scope:

1. Shielded Metal Arc Welding (SMAW)
   Theory (Science and principles of the process)
   Equipment/Tools
   Techniques
   (Obj 1, 13)
2. Oxy Acetylene Welding (OAW)
   Theory (Science and principles of the process)
   Equipment/Tools
   Techniques
   (Obj 2)
3. Gas Metal Arc Welding (GMAW)
   Theory (Science and principles of the process)
   Equipment/Tools
   Techniques
   (Obj 3)
4. Gas Tungsten Arc Welding (GTAW)
   Theory (Science and principles of the process)
   Equipment/Tools
   Techniques
   (Obj 4)
5. Flux Cored Arc Welding (FCAW)
   Theory (Science and principles of the process)
   Equipment/Tools
   Techniques
   (Obj 5)
6. Oxy Fuel Cutting (OFC) and Plasma Arc Cutting (PAC)
   Theory (Science and prinicples of the process)
   Equipment/Tools
   Techniques (measuring, layout and cutting)
   (Obj 6)
7. Safety
   ANSI Z49.1 Shop Practices
   Personal Protective Equipment (PPE)
   Job Safety Analysis
   (Obj 7)
8. Distortion
   Predicting distortion in weldments
   Preventing distortion in weldments
   (Obj 8)
9. Metallurgy

Basic Structure of Carbon Steel (Micro and Macro structures)
Affect of Carbon in Carbon Steels
Welding implications of steels with elevated carbon
(Obj 9)

10. Non Destructive and Destructive Testing
    Methods
    Equipment/Tools
    Application
    (Obj 10)
11. Welding Drawings and Welding Symbols
    3 View Shop Prints
    Types of Welding Symbols
    Applying the drawings and symbols to fabricated projects (measuring, layout and calculation of bill of materials)
    (Obj 11)
12. Procedure and Performance Qualification
    Codes and Standards
    Welding Procedure Specifications (WPS)
    Procedure Qualification Record (PQR)
    Welder Performance Qualification Record (WPQR)
    (Obj 12)
13. Vertical Welding Position
    Fundamentals of Vertical SMAW
    Techniques
    (Obj 13)
14. Cast Iron
    Identification
    Challenges when welding
    Techniques
    (Obj 14)

Assignments:
Examples of independent assignments to fulfill 72 total hours of required out-of-class work:

1. Questions for study at end of textbook chapters (Obj 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14)
2. Completion of skills worksheets for each process (Obj 1, 2, 3, 4, 5, 6, 7)

Class participation and assignments require and develop critical thinking.

1. "Shielded Metal Arc Welding" 1. Horizontal single and multi-pass fillet welds on 1/4 inch thick steel using 1/8 inch diameter E-6011, E-6013, E-7024 and E-7018 electrodes. (Obj 1)
2. "Oxyacetylene Welding" 1. Horizontal fillet welds and flat butt welds on 16 ga. steel. (Obj 2)
3. "Gas Tungsten Arc Welding" 1. Flat butt weld on .100" thick aluminum. (Obj 4)
4. "Gas Metal Arc Welding" 1. Horizontal single and multiple pass fillet welds on 16 ga.

and 11 ga. steel. (Obj 3)
5. "Flux Core Arc Welding" 1. Horizontal multiple pass fillet on 5/8" thick steel with gas shielded flux core wire. (Obj 5)
6. "Oxyacetylene Cutting" 1. Freehand cutting of 1/4 inch thick steel plate. (Obj 6)

Methods of Evaluation:

- Written/Typed Homework
- Class Performance(s)
- Quizzes/Exams
- Performance Exams

Texts, Readings, and Materials:

- **Textbooks**
  Moniz & Miller *Welding Skills* (5th/e). American Technical Publishers, Inc., Homewood, IL (2015).

CSU Transfer Course

California Polytechnic State University