WELD - 15 - Basic Welding for Allied Fields

COURSE OUTLINE OF RECORD

VIII. General Course Information

Subject:* WELD

Course Number:* 15

Descriptive Title:* Basic Welding for Allied Fields

Course Disciplines:* Automotive Technology | Welding

Division: Industry and Technology

Department:* Welding

Catalog Description:* This is a basic course to support trade skills for students in allied fields. The course introduces students to welding equipment, nomenclature, safety, plasma and mechanical cutting, metallurgical exploration of ferrous and non-ferrous material, ductility of materials, effects of cold working and heat treating.

Conditions of Enrollment:

Prerequisite:

Co-requisite:

Recommended Preparation:

Enrollment Limitation:

Limitation:

Course Length: ☑ Full Term

Hours Lecture (per week): 2

Hours Laboratory (per week): 4

Outside Study Hours:* 4

Total Hours:* 108

Course Units:* 3

Grading Method: Letter Grade only

Credit Status: Credit, degree applicable

Transfer CSU: ☑ Yes ☐ No

Effective Date: Prior to July 1992

Transfer UC: ☐ Yes ☑ No

Effective Date:

General Education ECC:

Term:

Other:

CSU GE:

Term:

Other:

IGETC:

Term:

Other:

IX. Outcomes and Objectives

A. Student Learning Outcomes SLOs (The course student learning outcomes are listed below.

Student Learning Outcomes:

SLO #1 Welding Concepts
Students will be able to demonstrate basic knowledge of welding concepts.

SLO #2 Safe Setup & Operation
Students will be capable of the safe set up and operation of welding equipment.

SLO #3 Welding Process Selection
Capability to choose an electrode or process that suits the metal thickness, joint fit up, and alloy composition.

B. Course Objectives (The major learning objectives for this course are listed below.

Course Objectives:

1. Demonstrate safety procedures for safe operation of tools, machines and welding equipment.
2. Set up, pressurize, operate, and break-down the oxy-acetylene manifold system or cylinders for cutting.
3. Exercise knowledge of effects of heat on weldment.
4. Prepare cuts using both the manual and plasma cutting process.
5. Complete gas tungsten arc weldments on butt joints using mild steel and aluminum.
6. Utilize the gas metal arc process to produce a quality tee joint.
7. Demonstrate competency in shielded metal arc welding to produce tee joints in the horizontal and flat positions.
8. Demonstrate knowledge of electrode specification in accordance with American Welding Society (AWS) standards.

X. Outline of Subject Matter

(Topics should be detailed enough to enable an instructor to determine the major areas that should be covered to ensure consistency from instructor to instructor and semester to semester.)

Example:

I. Main Topic (3 hours, lecture)
- **A. Sub topics**
- **B. Sub topics**
  - **1. Super sub topic**

2. Super sub topic

Major Topics:

I. OVERVIEW OF WELDING FOR ALLIED FIELDS (2 hours, Lecture)

1. Safety procedures
2. Personal protective gear

II. OVERVIEW OF EQUIPMENT (4 hours, Lab)

1. Safe set up of various machines
2. Constant Current
3. Constant Voltage

III. SHIELDED METAL ARC WELDING (SMAW) (3 hours, Lecture)

1. Equipment settings
2. Work and travel electrode angles
3. Arc length

IV. SMAW (8 hours, Lab)

1. Control of the puddle
2. Observation of welding parameters
3. Equal leg fillet welds
4. Flush face cover

V. CUTTING PROCESSES – REVIEW (4 hours, Lab)

1. Loss of metal due to kerf
2. Oxy-acetelyne
3. Plasma
4. Iron worker shear
5. Bandsaw

VI. METAL CROSS PREPARATION (2 hours, Lab)

1. Downhand welding
2. Equal legs
3. Observation of fusion face

VII. AWS CLASSIFICATION OF ELECTRODES (5 hours, Lecture)

1. Mild steel
2. Low alloyed steel
3. Stainless steel
4. Aluminum alloys
5. Solid wire
6. Flux cored wire
7. Fluxed covered electrodes

VIII. THERMAL PROPERTIES OF WELDING (4 hours, Lecture)

1. Effects of heat on weldment

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2. Stress effects of overwelding
3. Mechanical applications - heat caused by friction
4. Grain structure changes

IX. SMAW - UTILIZING CONTROL OF HEAT EFFECTS (8 hours, Lab)

1. Excessive voltage on the control of electric arc welding
2. Long arcing or push angle is too extreme
3. Out of position welds
4. Controlling the puddle

X. JOINT PREPARATIONS (6 hours, Lab)

1. Tacking and fit-up techniques
2. Fillet weld versus groove weld
3. Strength correlation to full penetration

XI. GAS METAL ARC WELDING (GMAW) (2 hours, Lecture)

1. Equipment
2. Gases
3. Filler metals
4. Settings

XII. GMAW (5 hours, Lab)

1. Machine set-up
2. Weld perimeters
3. Contact to work distance

XIII. PROPERTIES OF METAL (6 hours, Lecture)

1. Weldability
2. Ferrous and non-ferrous
3. Applications and welding processes

XIV. FORMING EXERCISES (6 hours, Lab)

1. Cold working
2. Heat treating - normalizing material
3. Grain growth
4. Experimenting with the properties of ductility versus brittle

XV. GAS TUNGSTEN ARC WELDING (GTAW) (6 hours, Lecture)

1. Equipment
2. Adjustments: Alternating Current (AC), Direct Current (DC), frequency
3. Applications

XVI. GTAW – FERROUS (6 hours, Lab)

1. Surfacing beads on ferrous metal
2. Butt joint - full penetration

2. Butt joint - full penetration
3. Distortion control

XVII. GTAW - NON FERROUS (8 hours, Lab)

1. Non-ferrous welding
2. AC polarity
3. Characteristics of high heat conducting metal

XVIII. PHYSICAL AND MECHANICAL PROPERTIES OF METAL (8 hours, Lecture)

1. Welders control
2. Print specifications to control
3. Code specifications contributing to control of altering these properties

XIX. CHARACTERISTICS OF JOINT DESIGN (7 hours, Lab)

1. Work angles
2. Travel angles
3. Use of various electrode sizes

XX. CONTROLING DIRECTION OF ELECTRODE HEAT (8 hours, Lab)

1. Welding dissimilar thicknesses of metal
2. Control distortion
3. Control heat direction
4. Observe effects of travel speed and distortion
5. Electrode choice
6. Polarity choice

Total Lecture Hours:	36
Total Laboratory Hours:	72
Total Hours:	108

XI. Primary Method of Evaluation and Sample Assignments

A. Primary Method of Evaluation (choose one):

Primary Method of Evaluation	3) Skills demonstration

B. Typical Assignment Using Primary Method of Evaluation

Typical Assignment Using Primary Method of Evaluation:	Join the steel practice plates provided with a square butt weld using process of choice. Check the welds for penetration and uniform size. Submit plates to the instructor.

C. College-level Critical Thinking Assignments

Critical Thinking Assignment 1: Select the appropriate electrodes to join mild carbon steel in different thicknesses. Weld the assembly using proper polarity and mechanical clamping. Submit weldment to the instructor.

Critical Thinking Assignment 2: Make a uniform weld on an outside corner joint of the practice bracket using the vertical up positions with E7018 electrodes. Assess the weldment by performing a destructive test and submit structurally sound weldment to the instructor.

D. Other Typical Assessment and Evaluation Methods

Other Evaluation Methods: Class Performance | Completion | Essay Exams | Homework Problems | Laboratory Reports | Other Exams | Performance Exams | Quizzes | Written Homework

If Other:

XII. Instructional Methods

Note: In compliance with Board Policies 1600 and 3410, Title 5 California Code of Regulations, the Rehabilitation Act of 1973, and Sections 504 and 508 of the Americans with Disabilities Act, instruction delivery shall provide access, full inclusion, and effective communication for students with disabilities.

Instructional Methods: Demonstration | Discussion | Group Activities | Lab | Lecture | Multimedia presentations

If other:

XIII. Work Outside of Class

Work Outside of Class Problem solving activity | Required reading | Skill practice | Study

If Other:

XIV. Texts and Materials

A. Up-to-date Representative Textbooks: (Please use the following format: Author, Title, Edition, Publisher, Year. If you wish to list a text that is more than 5 years old, please annotate it as a "discipline standard".)

Up-To-Date Representative Textbooks: Andrew Daniel Althouse, Carl H. Turnquist, William A. Bowditch, Kevin E. Bowditch. Modern Welding. 11th ed. Goodheart-Willcox, 2013.
Qualifier Text: INDUSTRY STANDARD

Qualified Texts: INDUSTRY STANDARD

B. Alternative Textbooks: (Please use the following format: Author, Title, Edition, Publisher, Year. If you wish to list a text that is more than 5 years old, please annotate it as a "discipline standard".)

Alternative Textbooks:

C. Required Supplementary Readings

Required Supplementary Readings:

D. Other Required Materials

Other Required Materials: Notebook

Leather welding gloves

Safety glasses

Welding helmet

brushes and chipping hammer

XV. Conditions of Enrollment

A. Requisites (Course Prerequisites and Corequisites) Skills needed without which a student would be highly unlikely to succeed.

Requisite

Category

Requisite course:

Requisite and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s).

B. Requisite: (Non-Course Prerequisite and Corequisites) Skills needed without which a student would be highly unlikely to succeed.

Requisite:

Requisite and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s). if applicable

C. Recommended Preparations (Course) (Skills with which a student's ability to succeed will be strongly enhanced.)

Requisite course:

Requisite and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s).

D. Recommended Preparation (Non-Course) (Skills with which a student's ability to succeed will be strongly enhanced.)

Requisite:

Requisite and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s). if applicable

E. Enrollment Limitations

Enrollment Limitations and Category:

Enrollment Limitations Impact:

Course Created by: Samuel Dantzler **Date:** 09/01/1986

Board Approval Date:		**Last Board Approval Date:**	01/20/2016
Last Reviewed and/or Revised by:	RENEE NEWELL	**Date:**	10/23/2019