EL CAMINO COLLEGE

COURSE OUTLINE OF RECORD

I. Course Information

Course Acronym:* WELD

Course Number:* 40A

Descriptive Title:* Introduction to Gas Tungsten Arc Welding (GTAW)

Division: Industry and Technology

Department:* Welding

Course Disciplines: Welding

Catalog Description:* This course is designed for the beginning student. Students develop manipulative skills using the Gas Tungsten Arc Welding (GTAW) process on ferrous and non-ferrous alloys. Related classroom instruction covers technical data pertaining to this welding process with special emphasis on operational parameters of inverter type machines. This course begins preparation for eligibility for American Welding Society (AWS) D17.1 certification.

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 Course Hours:***	108

Course Units:* 3

Grading Method: Letter Grade only

Credit Status: Credit, degree applicable

Transfer CSU:	Yes	**Effective Date:**	Prior to July 1992
Transfer UC:	No	**Effective Date:**	

General Education:
ECC

Term: **Other:**

CSU GE:

Term: **Other:**

IGETC:

Term: **Other:**

II. Outcomes and Objectives

A. Student Learning Outcomes (SLOs) **(The course student learning outcomes are listed below.)**
SLO revisions are completed via the SLO Change Form available on the College Curriculum Committee website.

Student Learning Outcomes:

SLO #1 TIG Weld Concepts
Students will be able to express a basic knowledge of TIG welding concepts.
SLO #2 GTAW Gases
Students will be able to demonstrate a knowledge of the gases used for the GTAW processes.
SLO #3 Constant Current Welding
Students will be able to correctly set up and use a constant current welding machine.

B. Course Objectives **(The major learning objective for in this course are listed below.)**

Course Objectives:

1. Complete a welding safety test covering the operation of tools, machines and equipment.
2. Perform GTAW on ferrous and nonferrous alloys, welding various joints in all positions.
3. Assemble a torch set up, adjust machine for proper current, amperage and gas flow pressures required to produce weldments meeting industry standards.

III. 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 GTAW (2 hours, lecture)

A. Safety precautions and practices

B. Safety test

C. History of GTAW

II. EQUIPMENT/POWER SUPPLIES (3 hours, lecture)

A. Tungsten selection and tip shaping

B. Selection of polarity and current

C. Gas flow

III. TORCH (4 hours, lab)

A. Torch set up

B. Tungsten selection and sharpening techniques

C. Equipment set up, adjustment and shutdown

D. Regulator and flow meter operation

E. Surfacing beads

IV. FUNDAMENTALS OF GTAW (8 hours, lecture)

A. Principles of operation

B. GTAW process and material preparation

C. Alloying tungsten to affect performance with base metals and the color coding system

V. BUTT JOINT ON CARBON STEEL (8 hours, lab)

A. Push torch angle

B. Dip method/feeding rod into leading edge of puddle

VI. BUTT JOINT (6 hours, lab)

A. Partial versus full penetration

B. Open root/closed root

VII. THE EFFECT OF PROCESS VARIABLES ON THE WELDING ARC (4 hours, lecture)

A. Rod angles and torch angles

B. Metal thickness, tungsten size, gas flow rate and cup size

C. Current settings

VIII. SURFACE BEADS ON ALUMINUM (2 hours, lab)

A. Autogenous

B. Using filler metal

IX. GASES (1 hour, lecture)

A. Argon

B. Helium

C. Hydrogen

D. Gas mixtures

E. Preflow and postflow

F. Back purging

X. BUTT JOINT ON ALUMINUM (12 hours, lab)

A. Closed root

B. Open root

XI. EDGE AND CORNER JOINTS (8 hours, lab)

A. Filler metal

B. Autogenous

XII. LAP JOINT (10 hours, lab)

A. Configuration of torch angle to joint

B. Configuration of push angle and filler metal

XIII. JOINTS (3 hours, lecture)

A. Types of joints

B. Design

1. Weld procedure

2. Weld sequence

3. Proper fixturing

XIV. CHARACTERISTICS OF ALUMINUM (7 hours, lecture)

A. Welding with Alternating Current (AC) on aluminum

B. Continuous arc frequency

C. Using a heat conducting metal

XV. TEE JOINT (10 hours, lab)

A. Single fillet

B. Multi-pass fillet

XVI. METALLURGY OF METALS (4 hours, lab)

A. Cold-working effects on carbon steel and aluminum

B. Effects of the annealing process

XVII. WELDING TERMS (2 hours, lecture)

A. General terms

B. Certification exams and procedures in industry

C. Aircraft industry terms

XVIII. PERFORMANCE EVALUATIONS (6 hours, lecture)

A. Defects and discontinuities

B. Heat control/burn through

C. Filler metal consistencies

XIX. PERFORMANCE EVALUATIONS (8 hours, lab)

A. Defects and discontinuities

B. Heat control/burn through

C. Filler metal consistencies

Total Lecture Hours: 36

Total Laboratory Hours: 72

Total Hours: 108

IV. Primary Method of Evaluation and Sample Assignments

A. Primary Method of Evaluation (choose one):

1) Substantial writing assignments

2) Problem solving demonstrations (computational or non-computational)

3) Skills demonstrations

Primary Method of Evaluation: 3) Skills demonstration

B. Typical Assignment Using Primary Method of Evaluation

Typical Assignment Using Primary Method of Evaluation: Weld a complete penetration, butt joint using the GTAW welding process. Submit butt joint to the instructor.

C. College-level Critical Thinking Assignments

Critical Thinking Assignment 1: Select the correct filler metal and plan the steps needed to gas tungsten arc weld an aluminum lap joint. Analyze the joint for correct weld angles and penetration. Write the steps needed on a one-page report and submit to the instructor.

Critical Thinking Assignment 2: GTAW weld different joint configurations utilizing the correct torch angle to perform a proper weldment. Submit weldment to the instructor.

D. Other Typical Assessment and Evaluation Methods

Examples: **Class Performance, Objective Exam, Clinical Evaluation, Oral Exams, Completion, Other Exams, Embedded Questions, Performance Exams, Essay Exams, Presentation, Fieldwork, Quizzes, Homework Problems, Reading Reports, Journal kept throughout course, Term or Other Papers, Laboratory Reports, True/False, Matching Items, Written Homework, Multiple Choice, Other (specify)**

Other Evaluation Methods:
Class Performance
Multiple Choice
Performance Exams
Quizzes

True/False

V. Instructional Methods

Examples: **Lecture, Group Activities, Lab, Role play/simulation, Discussion, Guest Speakers, Multimedia presentations, Field trips, Demonstration, Other (specify)**

Instructional Methods:
Demonstration
Discussion
Lab
Lecture
Multimedia presentations

If other:

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.

VI. Work Outside of Class

Work Outside of Class:*
Answer questions
Problem solving activity
Study

If Other:

VII. Texts and Materials

A. Up-to-date Representative Textbooks: Please use the following format(s):

Printed Text - Author, Title, Edition, Publisher, Year.
Digital Text (OER Text) - Author (last name first). Title. Edition or Version (if beyond 1st). Publisher, Publication year or Revision date. URL. License.
Sample: ***Dillon, Dave. Blueprint for Success in College and Career. Version 1.3. Rebus Community, 2018. press.rebus.community/blueprint2/. Licensed under CC BY 4.0.***

If you wish to list a text that is more than 5 years old, please annotate it as a "discipline standard".

Multiple textbooks may be listed.

Up-To-Date Representative Textbooks:
Hobart Institute of Welding Technology, EW369 Technical Guide to Gas Tungsten Arc Welding, Hobart Institute of Welding Technology, 2010. (Discipline Standard)

Hobart Institute of Welding Technology, EW470 Technical Guide to Gas Tungsten Arc Welding, Hobart Institute of Welding Technology, 2002. (Discipline Standard)

B. Alternative Textbooks: Please use the following format(s): if applicable

Printed Text - Author, Title, Edition, Publisher, Year.

Digital Text (OER Text) - Author (last name first). Title. Edition or Version (if beyond 1st). Publisher, Publication year or Revision date. URL. License.

Sample: *Dillon, Dave. Blueprint for Success in College and Career. Version 1.3. Rebus Community, 2018. press.rebus.community/blueprint2/. Licensed under CC BY 4.0.*

If you wish to list a text that is more than 5 years old, please annotate it as a "discipline standard".

Multiple textbooks may be listed.

Alternative Textbooks:

C. Required Supplementary Readings

Required Supplementary Readings:

D. Other Required Materials

Other Required Materials:
Notebook
Gloves
Safety glasses
Protective clothing
Welding helmet
Stainless steel brush
Pliers

VIII. 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(s): List both prerequisites and corequisites in this box.

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

corresponding course objective under each skill(s).

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

Requisite Skill:

Requisite Skill and Matching Skill(s): Bold the requisite 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 Skill:

Requisite Skill 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: J.W. Lewis and C. Boxwell **Date:** 09/01/1963

Original Board Approval Date:

Last Reviewed and/or Revised by: Nick Colin **Date:** 05/10/2023

Last Board Approval Date: 11/20/2023 effective FALL 2024