

### Course Outline for WLDT 61B

#### ADVANCED SMAW AND FCAW THEORY

Effective: Spring 2018

#### I. CATALOG DESCRIPTION:

WLDT 61B — ADVANCED SMAW AND FCAW THEORY — 1.00 units

Theory and safety of Stick (SMAW) and Flux-core Arc (FCAW) welding of steel, flame cutting, plasma and carbon arc cutting. American Welding Society nomenclature, electrode and wire selection, job opportunities. Blueprint reading, welding symbols for welders and hazardous material regulations.

1.00 Units Lecture

#### Corequisite

WLDT 61AL - Beginning SMAW and FCAW Skills Lab  
or

WLDT 61BL - Advanced SMAW and FCAW Skills Lab

#### Grading Methods:

Letter or P/NP

#### Discipline:

- Welding

	<b>MIN</b>
<b>Lecture Hours:</b>	18.00
<b>Total Hours:</b>	18.00

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 1

III. PREREQUISITE AND/OR ADVISORY SKILLS:

IV. MEASURABLE OBJECTIVES:

**Upon completion of this course, the student should be able to:**

- Describe and apply advanced theory and safe use of Shielded Metal Arc Welding (SMAW);
- Describe and apply advanced theory and safe use of Flux-Core Arc Welding (FCAW);
- Explain metallurgy of steel, stainless steel, other ferrous alloys and numbering systems;
- Recall the AWS electrode numbering systems and uses for SMAW;
- Recall the AWS electrode wire numbering systems and uses for FCAW;
- Apply advanced orthographic and isometric blueprint reading skills;
- Explain of welding inspection and testing as it relates to SMAW and FCAW;
- List welder qualifications and testing per AWS standards;
  - Use and understand American Welding Society (AWS) welding symbols and nomenclature;
- Describe raw material manufacturing processes;
- Catalog and identify basic structural shapes, sheet and plate used in industry;
- Catalog and identify basic pipe and tubing used in industry;
- Recall hazardous material regulations in the welding trade;
- Report on career opportunities in the welding trade.

V. CONTENT:

- SMAW advanced theory, safety and process basics
  - Advanced technique
  - Power supplies, AC and DC, Constant Current
  - Equipment and supplies
  - Electrodes
  - Uses and limitations
  - Safety
  - Industrial applications
  - Industry trends
- FCAW advanced theory, safety and process basics
  - advanced technique
  - Power supplies, AC and DC, Constant voltage
  - Equipment and supplies

4. Electrodes
5. Uses and limitations
6. Safety
7. Industrial applications
8. Industry trends
- C. Understand basic metallurgy and numbering systems for steel, stainless steel, and other ferrous alloys
  1. Advanced steel metallurgy
  2. Stainless steel metallurgy
  3. Other ferrous alloy metallurgy
  4. Welding effects on metallurgy
  5. Heat Affected Zone (HAZ)
  6. AISI/SAE numbering system
  7. ASTM numbering system
  8. UNS numbering system
- D. Demonstrate knowledge of AWS electrode numbering systems and uses for SMAW
  1. AWS numbering system for SMAW electrodes
  2. Steel
  3. Stainless Steel
  4. Other ferrous alloys
  5. Hard facing electrodes
  6. Uses of different electrode classes
- E. Demonstrate knowledge of AWS electrode wire numbering systems and uses for FCAW
  1. AWS numbering system for FCAW electrode wires
- F. Apply advanced orthographic and isometric blueprint reading skills
  1. Blueprint uses and applications
  2. Isometric drawings
  3. Orthographic drawings
  4. Assembly drawings
  5. Detail drawings
  6. Line types
  7. Dimensions
  8. Views
  9. Sections
  10. Notes
  11. Title block
  12. Bill of materials
- G. Welding inspection and testing as it relates to SMAW and FCAW
  1. Inspection and testing for SMAW
  2. Inspection and testing for FCAW
  3. Visual testing
  4. Magnetic Particle testing
  5. Penetrant testing
  6. Ultrasonic testing
  7. Radiographic testing
  8. Mechanical testing
- H. Welder qualification and testing per AWS standards
  1. Qualification
  2. Certification
  3. Welder testing requirements
  4. Typical tests and materials preparation and selection
  5. Documentation
  6. Welding Procedure Specification (WPS)
  7. Welding Procedure Qualification (WPQ)
  8. Procedure Qualification Record (PQR)
  9. The role of the Certified Welding Inspector (CWI)
- I. Use and understand American Welding Society (AWS) welding symbols and nomenclature
  1. AWS standard weld symbols
  2. AWS nomenclature
  3. Uses and applications
- J. Raw material manufacturing processes
  1. Ferrous
  2. Non-Ferrous
- K. Basic structural shapes, sheet and plate used in industry
- L. Basic pipe and tubing used in industry
- M. Understand material hazards in the welding trade
  1. Material hazards
  2. Welding hazards
  3. MSDS
  4. OSHA
  5. Other safety
- N. Career opportunities in the welding trade
  1. Typical work
  2. Work environment
  3. Basic skills
  4. Apprenticeship
  5. Wages
  6. Advancement
  7. Outlook

## VI. METHODS OF INSTRUCTION:

- A. **Lecture** -
- B. Correlation with real world industrial applications
- C. Visual aids
- D. **Discussion** -

## VII. TYPICAL ASSIGNMENTS:

- A. Weekly reading assignments from text
- B. Quizzes based on weekly reading assignments
- C. Tests based on entire body of knowledge in course

### VIII. EVALUATION:

#### A. **Methods**

1. Exams/Tests
2. Quizzes
3. Class Participation
4. Class Work
5. Home Work

#### B. **Frequency**

1. The midterm will be administered near the halfway point in the course followed by a two hour final exam during finals week
2. Quizzes will be administered periodically during the semester on an as needed basis
3. Participation will be evaluated daily
4. Classwork evaluated as assigned
5. Homework evaluated as assigned

### IX. TYPICAL TEXTS:

1. American Welding Society (2012). *SPECIFICATION FOR WELDING PROCEDURE AND PERFORMANCE QUALIFICATION* (2012 ed.). Miami, Florida: American Welding Society.
2. American Welding Society (2015). *Structural Welding Code - Steel* (2015 ed.). Miami, Florida: American Welding Society.
3. Jeffus, L. (2012). *Welding Principles and Practices* (7th ed.). Clifton Park, NY: Delmar.

### X. OTHER MATERIALS REQUIRED OF STUDENTS: