

# Lakeland Community College COURSE SYLLABUS

## WELD 1370 Pipe Welding 3 credits

Lecture

Lab

**Instructor:**

**Contact:** Email:           alternate:

**Phone:** cell: alternate:

## Textbook Required:

## HELP/TUTORING:

Available at the Learning Center Office, Rm A1044 Phone 525-7019

## COURSE DESCRIPTION:

This course introduces students to the basic American Society of Mechanical Engineers (ASME), American Petroleum Industry (API) and American Welding Society (AWS) pipe welding standards. Students will choose one of these three standards to develop their welding skills in the laboratory. Laboratory sessions will provide hands-on time to develop skills to produce quality welds on flat plate and then on pipe in the flat and horizontal positions. The course covers functions and specific uses of manual-welding equipment, various welding techniques, prepping and fitting of pipe coupons, and welding certification requirements. Students must furnish: long pants; welding helmet (shade #10 or above); safety glasses; work gloves; welding jacket; leather work boots, preferable steel toe; 8" crescent wrench; soapstone and holder; tape measure; combination square; chipping hammer; wire brush; center punch; 12 oz. ball peen hammer; and tool bag. 4 1/2" grinder is optional.

## RATIONALE FOR COURSE:

This course is designed to introduce students how to prep, fit, tack, and weld pipe to the ASME or API standards in the flat and horizontal pipe position.

## COURSE OBJECTIVES, at the conclusion of this course, the student should be able to:

1. Describe the various safety hazards involved in arc welding.
2. Describe the safety equipment and its function in welding.
3. Explain the different positions 1G and 2G.
4. Weld 6" schedule 40 pipe to ASME or API standard in flat and horizontal position.
5. Properly set the machine controls for the transformer, rectifier, and motor generator power sources for the specific welding task.
6. Produce an acceptable pipe weld in the positions flat and horizontal position using the shielded metal arc welding method.
7. Produce an acceptable flat or horizontal root pass depending on code or standard the welder has chosen weld using E6010 electrodes.
8. Produce an acceptable flat or horizontal fill and cap weld using E6010 and 7018 electrodes determined by code or standard chosen.
9. Produce a quality flat and horizontal 6" schedule 40 test pipe and cut out and bend specimens.
10. Describe the qualification tests as used by API and ASME, and demonstrate the proper welding and fit up technique.
11. Identify the difference between API and ASME standards

## COURSE OUTLINE

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- I. Pipe Welding Codes and Standards
  - A. ASME
    - 1. American Society of Mechanical Engineering
      - a. Most of the time done in the up-hill position
      - b. Power plants in house piping
  - B. API
    - 1. American Petroleum Institute
      - a. Most of the time done in the down-hill position
      - b. Oil and gas industry Cross country pipeline
  - C. AWS
    - 1. American Welding Society
      - a. Structural
- II. Safety
  - A. E205 safety hand out
  - B. ANSI Z49.1
  - C. MSDS Sheets
  - D. Safety Glasses
  - E. Warning
  - F. Safety Label
- III. Position for Pipe Welding
  - A. 1G Rotated parallel to the ground
  - B. 2G Fixed Pipe vertical weld is horizontal
- IV ASME and API Fit Up
  - A. Bevel angles
    - 1. 30 to 37.5 degrees
  - B. Root face (land)
    - 1. 3/32 or 1/8
  - C. Root opening (gap)
    - 1. 3/32 or 1/8
  - D. Typically welded vertical up
- V. API Fit Up
  - A. Bevel
    - 1. 30 degree +or- 5 degrees
  - B. Root face (land)
    - 1. 1/16 +or- 1/64
  - C. Root opening (gap)
    - 1. 1/16 +or- 1/64
  - D. Typically welded vertical down
- VI. Pipe Welding Fit Up
  - A. Root face (land)
    - 1. Grinder
    - 2. File
    - 3. Mechanical beveller
  - B. Root opening (Gap)
    - 1. Bare electrodes
    - 2. Nickle or a dime
    - 3. Sheet metal shims
    - 4. Anything that is equal to the gap on the pipe
  - C. Internal alignment of the pipe (high Low)

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VII. Tack Up

- A. Tack
  - 1.  $\frac{1}{2}$ " to  $\frac{3}{4}$ " long
    - a. If it tack good it will weld good
    - b. Adjust your amps while you are tacking up your pipe
- B. 12 o'clock
- C. 6 o'clock
- D. 3 o'clock
- E. 9 o'clock

VIII. Grinding of Tacks

- A. Feathering
  - 1. Grind tack welds leading and back edge very thin so the transition from the root to tack ties in.

IX. Root Pass Stringer Bead

- A. Drag technique
  - 1. ASME
    - a. DC+ 1/8" 6010 80 to 90 amps
- B. Stitch technique
  - 1. ASME
    - a. DC+ 1/8" 6010 70 to 80 amps
- C. Drag technique
  - 1. API
    - a. DC+ 1/8" 6010 80 to 90 amps
      - i. Typically down vertical down Cellulose electrode

X. Wagon Tracks

- A. Slag trapped alongside of the root pass

XI. Grinding of the Root Pass

- A. Grind down the high spot on the root pass to expose the wagon tracks

XII. Hot Pass ASME

- A. Burn out the wagon track DC+ ten amps greater than that of the root Pass
- B. 10 minutes to put in the hot pass after the root pass is put in

XIII. Fill Passes (Could Be Multiple Passes) ASME

- A. 7018
  - 1. Slight drag or weave
- B. 6010
  - 1. Shuffle or whip

XIV. API Hot Pass

- A. Shuffle step
  - 1. Burn out wagon tacks
  - 2. Rod angle 10 to 15 degree drag angle

XV. Fill and Stripper Pass

- A. Shuffle step
  - 1. Stripper pass is the fill pass on the pipe between 2 O'clock and 5 O'clock and between 7 O'clock and 10 O'clock this is where the weld might become thin because of the travel speed was

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picked up because of gravity and fluidity of the puddle.

XVI. API Cap Pass

- A. Stinger
- B. Weave
  - 1. Europe full stove means Vertical down welding full joint
  - 2. Dolly Mix means Vertical up root vertical down fill and cap

XVII. Six Things That Control The Key Hole

- A. Land
  - 1. Too large- small key hole
  - 2. Too Small- large Key Hole
- B. Gap
  - 1. Too large Big key hole
    - a. Decrease Amps stitch Technique
  - 2. Too small-small Key hole
    - a. Switch polarity DC- A.S.M.E. increase amps
- C. Amperage
  - 1. Too many- Large key hole
    - a. Decrease amps
  - 2. Too few - small key hole
    - a. Increase amps
- D. Travel speed
  - 1. Too fast- lack of penetration and window
    - a. Slow down
  - 2. Too slow- excessive burn through and internal reinforcement
    - a. Speed up
  - 3. With ideal travel speed you will see a small flickering "keyhole"
- E. Rod angle
  - 1. 5 to 10 degree to pipe center
  - 2. A.S.M.E.
    - a. Too much lead angle excessive weld internal reinforcement
    - b. Too much push angle lack of penetration
  - 3. A.P.I.
    - a. Too much lead angle- decrease penetration
    - b. Too much push angle- increase penetration
- F. Pressure
  - 1. Too much- small keyhole
    - a. Relax pressure
  - 2. Too little- big keyhole
    - a. Increase pressure
  - 3. Pressure- force applied to the electrode in the pipe joint root opening

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**FEDERAL CREDIT COMPLIANCE STATEMENT:**

It is expected that students will spend two to three hours, minimally, outside of the classroom/laboratory performing course related work such as reading, research, homework assignments, practice, studio work, and other academic work for every hour of instruction spent in the classroom/laboratory.

**STUDENTS WITH DOCUMENTED DISABILITIES:**

Lakeland Community College is committed to providing all students equal access to learning opportunities. The Student

Accommodation Center works with students with documented disabilities to provide and/or arrange reasonable accommodations. If you have a disability (e.g. learning, attention, psychiatric, vision, hearing, physical, or systemic) and feel it may create a barrier to your education, contact the Student Accommodation Center at 440-525-7020 or stop by the office, Room A-1042.

### **SUBSTANCE ABUSE NOTICE:**

The Lakeland Community College Welding Program is committed to a safe learning environment in the classroom and the laboratory. Students are expected to report to lecture and lab classes properly prepared and unimpaired by alcohol and/or drugs. If the instructor believes a student is under the influence of alcohol and/or drugs, the instructor will ask the student to leave the classroom to ensure the health and safety of all students. Any student asked to leave the classroom faces potential Student Conduct Code charges.

### **ACADEMIC INTEGRITY:**

Honesty, as the basic component of trust is essential to both individual and institutional integrity. With this premise in mind, Lakeland Community College has set forth certain behaviors as being forms of academic misconduct, and thus potentially diminishing Lakeland's integrity, reputation for academic quality, and ability to function as an academic community. The institution's faculty and administration, therefore, regard academic misconduct as a serious offense. Established as violations of academic misconduct at Lakeland Community College are cheating, plagiarism, fabrication of material included in academic work, denying others access to information or material, enabling academic misconduct, and deception in order to gain academic advantage. Policies dealing with violations of academic misconduct may be obtained by visiting <http://www.lakelandcc.edu/web/about/student-development> or from the Student Development Office.

### **GRADING:**

The final grade for this three-credit hour course will be calculated based on scores achieved on attendance, homework, quizzes, a midterm exam and a final exam. The instructor has the option of grading on a curve if the average grade is less than 80%.

91 – 100% .....	= A	<b><u>BASIS FOR GRADES:</u></b>	
83 - 90.99% .....	= B	Attendance (Missing 20% of classes = 0) ---	20%
75 – 82.99% .....	= C	Homework -----	10%
68 – 74.99%.....	= D	Laboratory Assignments-----	15%
67.99 or below .....	= F	Quizzes -----	10%
Failure, non-attendance .....	= FNA	Midterm -----	20%
		<u>Final Exam -----</u>	<u>25%</u>
			Total --- 100%

### **ATTENDANCE (20% of final grade):**

Attendance is a very important part of this course since the Instructor will at times be presenting and explaining information in the lecture sessions that will not be in the text book but may be included in quizzes and exams. Furthermore, employers expect employees to show up on time for every scheduled work day and this attendance requirement is intended to help students develop this ability.

**ON THE FIRST DAY OF CLASS:** You should make arrangements with two or more classmates so if you are late or have to be absent you can get any missed assignments from them. As you are expected to attend every class it is not the instructor's responsibility or obligation to re-teach material to students who are absent.

**IF YOU ARE LATE OR ABSENT:** A student can be late for class one time; thereafter, arriving late will count as being absent for half a class. This course consists of 16 classes, so each class missed will reduce student's final course score by 6.25% and missing three classes will result in 20% of students final course score being zero.

### **LABORATORY WORK/HOMEWORK: (25% of final grade):**

Students will frequently be given laboratory work or homework assignments, such as answering end-of-chapter questions or completing an alternate assignment handed out in class, such as measuring lines or distances, creating a 3-

view drawing, putting weld symbols on a drawing, etc. Homework turned in late will only get half credit. Students will, however, be given an opportunity to make up lost points by (a) participating in voluntary plant tours or (b) researching the facility offering the tour and then writing a cover letter with a resume applying for employment at that facility and submitting it to the class Instructor or (c) attending an American Welding Society meeting or event.

**QUIZZES: (10% of final grade):**

Quizzes will not necessarily be announced in advance; therefore, it is important for students to arrive on time for every class. Students who arrive late to class will not be given additional time to complete a quiz. In this course the lowest quiz score will be dropped when the student's course grade is being calculated. Students will not be allowed to make up a missed quiz. The Instructor has the discretion to include pop-quizzes as part of their teaching method and students should be prepared for this to be done in this course.

**EXAMS: (Midterm – 25% of final grade; Final – 25%):**

Exams will commence and terminate at the pre-announced time. It is the student's responsibility to arrive on time and complete the exam within the stated time. No additional time will be given. If a student is ill on the scheduled Midterm or Final Exam dates, he/she must phone the Instructor at least one hour before the exam is to begin. If you reach voice mail or an answering machine leave a message, clearly stating and spelling your first and last names and provide your telephone number including area code. In this message, state when you plan to take the missed exam in the Lakeland Learning Center testing room (A-1040). **NOTE: The exam must be taken within 48 hours of its scheduled administration time to avoid penalty unless an alternate time is arranged with the Instructor before the 48 hour deadline has passed.** Students must provide a picture ID for the Testing Center monitor. The student is responsible for determining Testing Center hours.

**COURSE POLICY:**

The policies and procedures for this course shall be consistent with the college policies and procedures explained in the current Student Handbook and Calendar.

**Cell phones** are to be turned off or silenced in class and lab, and photographing or video recording of class sessions and/or materials presented is not allowed without the Instructor's permission. Cell phones cannot be used during quizzes or exams, and the Instructor reserves the right to collect and hold them while quizzes or tests are being taken. Non-compliance with this policy may result in a student being expelled from class.

**Adds, drops, and withdrawals** are per standard policies of Lakeland Community College. A student's failure to attend the class does not constitute a withdrawal and will ultimately lead to a failing grade. Those who wish to withdraw from class should contact the Counseling Center to initiate the withdrawal procedure.

**For cancellations due to bad weather**, call the Lakeland Emergency Closing Hotline at (440) 525-7242, or check Lakeland's web page, local radio or TV stations.

**Methods of Presentation:**

Text book reading assignments

Lecture

Audio/Visual Media

Demonstration

On-line presentation

Individualized instruction

**The policies, requirements and other information contained in this syllabus are subject to change at the discretion of the Instructor**

**LAKELAND COMMUNITY COLLEGE'S MISSION STATEMENT:**

**"To provide quality learning opportunities to meet the social and economic needs of the community."**

Lakeland Community College Learning Outcomes

Learns Actively

**COURSE SCHEDULE:**

Class #	Date:	Topic:	Preparation/Comments:
1			
2			
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16			

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