

# Lakeland Community College COURSE SYLLABUS

## WELD 1300 Thermal Cutting, Gouging, Soldering and Brazing – 2 credits

Lecture

Lab

**Instructor:** NAME OF 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 oxyfuel cutting, carbon arc gouging, plasma arc cutting, oxyfuel hand and machine cutting, oxyfuel braze welding, brazing and soldering. Laboratory experience includes the oxy-acetylene cutting of low carbon steels, and manual oxy-acetylene and straight-line oxy-propane machine cutting of low carbon steel as well as carbon arc gouging on low carbon steel. Students learn how to plasma arc cut, use a plasma arc cutting table, and learn the basics in brazing and soldering on sheet metal and copper tubing. Laboratory experience includes an emphasis on individual instruction. The student must furnish: welding helmet (shade #10 or above); welding goggles (shade 3-5); safety glasses; work gloves; long pants; welding jacket; leather work boots, preferably steel toe; 8" crescent wrench; soapstone and holder; tape measure; combination square; chipping hammer; wire brush; tool bag; center punch; and 12 oz. ball peen hammer. 4 1/2" grinder is optional.

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

1. Identify and apply safety procedures when working with thermal cutting equipment.
2. Perform oxyfuel cutting utilizing the hand-held torch on metal thicknesses of 1/8 to 1/2 in. steel plate.
3. Perform oxy-acetylene cutting utilizing the hand-held torch on metal thicknesses of 1/8 to 1/2 in. steel plate.
4. Perform oxy-propane cutting utilizing a cutting machine with straight-line capability, for low carbon steel of 3/16 to 1 in. plate thickness.
5. Perform carbon arc gouging on various joint configurations (t-joints, lap joints, butt joints, edge joints, corner joints and around pipe).
6. Perform plasma arc cutting on various ferrous and non-ferrous materials 20 gauge up to 1/2 inch.
7. Perform basic programming of the CNC plasma-cutting table. Create and cut out a project.
8. Demonstrate all processes in each position: Flat, horizontal, vertical (up & down), and overhead.
9. Compare the quality and merits of various cutting processes.
10. Perform brazing and soldering technique on sheet metal and copper tubing using the different joint configurations lap, t-joint, butt, corner, and edge joints.

### COURSE OUTLINE:

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- A. Personal protective equipment
- B. Safe handling of compressed gas cylinders and related equipment
- C. Fire hazards
- D. Hot work permit
- E. Unique dangers associated with oxygen, acetylene and other gasses
- F. Confined space
- G. Safe practices when cutting tanks and other containers.

## II. Oxyfuel Cutting

- A. Oxygen supply
  - 1. Safety handling
  - 2. Liquid air process
- B. Acetylene supply
  - 1. Safety handling
  - 2. Manufacturing process
- C. Equipment
  - 1. Cylinders
  - 2. Valves
  - 3. Regulators
  - 4. Hoses
  - 5. Touch
- D. Set-up
  - 1. Pressure settings
  - 2. Tip sizes
- E. Practical Cutting
  - 1. Lighting/ Shut Down Procedures
  - 2. Setting your Flame
    - a. Carburizing/ Reducing
    - b. Neutral
    - c. Oxidizing
  - 3. Touch angles and speed
  - 4. Visual Inspection
    - a. Drag Lines
    - b. Kurf
    - c. Dross
  - 5. Metal gages 10 to 1/2in thick cutting
  - 6. Demonstration, practice, and evaluation

## III. Oxyfuel Cutting (Hand-Held Torch)

- A. Principle of cutting

- B. Plate preparation
- C. Touch settings
- D. Speed of operation
- E. Demonstration, practice, evaluation

IV. Oxyfuel Machine Cutting

- A. Comparison of different gases for cutting
- B. Cutting machine operation
- C. Comparison of different types of cutting machines
- D. Electronic tracing explanation
- E. Demonstration, practice, evaluation

V. Carbon Arc Gouging

- A. Electrode Holder
- B. Polarity
- C. Air Supply
  - 1. Air Pressure
- D. Electrode Extension
- E. Positions
- F. Types of Materials
  - 1. Ferrous and Non-ferrous
- G. Demonstrate, Practice, and Evaluation

VI. Plasma Arc Cutting

- A. Air Quality
- B. Parts of the Torch
- C. Air Pressure
- D. Materials Thicknesses
- E. Material Types
- F. Material Positioning
- G. Fourth State of Matter
- H. Demonstrate, Practice, and Evaluation

VII. Basic Oxyfuel Cutting, Plasma Arc Cutting and Carbon Arc Gouging Metallurgy

- A. Heat-affected zone
- B. Audition of carbon from the oxy-acetylene flame
- C. Distortion
- D. Hard surfacing
- E. Annealing

## VIII. Plasma Arc Cutting Table

- A. Basic Programming
- B. Advantages of manufacturing with a cutting table
- C. Duplication of parts
- D. Quality, craftsmanship, and tolerances.

## IX. Project Based Learning

- A. Basic Layout
  - 1. Soapstone
  - 2. Center Punch
  - 3. Scribe
  - 4. Blue Dykem
  - 5. Tape measure
  - 6. Ruler
  - 7. Speed Square
  - 8. Compass
- B. Basic Blueprint Reading
- C. Demonstrate, Practice, and evaluation

## X. Brazing, Braze Welding and Soldering

- A. Joint design
  - 1. Lap
  - 2. Butt
- B. surface preparation
  - 1. Commercial Solvent
  - 2. Pickling in acid
  - 3. Sanding, filing, wire brush
- C. Fluxes& AWS numbering system
  - 1. Boric acid 3a
  - 2. Borates 3a
  - 3. Fluoride 1
  - 4. Fluoroborates 3b
  - 5. Chlorides 2
- D. Stopoffs
  - 1. Material used to outline areas not to be brazed
- E. Filler metals AWS classification
  - 1. B designates brazing process
    - a. BAlSi (Aluminum-silicon)
    - b. BCuP (copper-phosphorus)
    - c. BAu (precious Metals)
    - d. BCuZn (copper-Zinc)
    - e. BNi (nickel)
    - f. BMg (Magnesium)
- F. Methods
  - 1. Furnace
  - 2. Torch

- 3. Induction
- 4. Dip
- 5. Resistance
- G. Temperature
  - 1. Brazing
    - a. 840 degrees F and higher
  - 2. Soldering
    - a. Less than 840 degrees F

**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	<u>BASIS FOR GRADES:</u>
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 ----- 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.”**

<p>Lakeland Community College Learning Outcomes</p> <p>Learns Actively</p> <p>Thinks Critically</p> <p>Communicates Clearly</p> <p>Uses Information Effectively</p> <p>Interacts in Diverse Environment</p> <p>Essential skills for personal and professional growth</p>
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COURSE SCHEDULE:

Class #	Date:	Topic:	Preparation/Comments:
1			
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The course and services are available without regard to a participant's race, color, religion, ancestry, age, handicap, sex, marital status or national origin. The number for TDD/TYY or relay services is 440-525-7006.



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