

Lakeland Community College COURSE SYLLABUS

WELD 1320 Basic SMAW (Stick) Welding 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 Shielded Metal Arc Welding (SMAW) of carbon steel. Laboratory experience develops the skill to produce acceptable fillet and groove welds in the flat and horizontal positions and includes functions and specific uses of manual welding equipment, various SMAW (Stick) welding techniques, special metals handling, and welding certification requirements. Students must furnish: welding helmet (shade #10 or above); safety glasses; work gloves; long pants; 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 to SMAW (Stick) Welding in the flat and horizontal positions.

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

1. Identify and apply safety procedures when working with welding equipment.
2. Make an acceptable weld (one that meets the visual quality requirements of AWS D1.1) in 12-gage or thicker plate using E6010 electrodes.
3. Make an acceptable weld in 12-gage or thicker plate using E7018 electrodes.
4. Properly set the machine controls for the transformer, rectifier, and motor generator power sources for specific welding tasks.
5. Use the SMAW process and E6010 and E7018 electrodes to produce acceptable flat and horizontal fillet, lap and butt welds.
6. Produce acceptable vertical down t-joint and lap welds using E6010 and E6011 electrodes.
7. Describe the qualification tests as used by AWS and American Society of Mechanical Engineers (ASME) to qualify welders for making welds in the 1F, 2F, 1G and 2G positions, and demonstrate the proper welding techniques according to the respective codes.
8. Demonstrate the difference between T-joint, lap, corner, edge, and butt welds

COURSE OUTLINE:

Introduction to Shielded Metal Arc Welding

A. Safety

1. Personal Protective equipment
2. Fumes and gases
3. Electric shock can kill
4. Burns
5. UV and IR rays

B. Overview of the SMAW process

1. How an SMAW weld is made
 - a. Definition of a weld
 - b. Heat for melting metal produced by an electric arc
 - c. Parts of a weld
2. Equipment
 - a. Power source
 - b. Welding leads and connectors
 - c. Electrode
 - d. Electrode holder

II. Power Sources and Basic Electricity as Related to Welding

A. Types of power sources used for welding

1. Constant Current
 - a. SMAW, GTAW and Sub Arc
2. Constant Voltage
 - a. GMAW and FCAW
3. Transformer

-
- a. Home owner's AC input current
 - 4. Transformer Rectifier
 - a. Rectifier= and electrical device that will change AC current into DC current
 - 5. DC Motor generator
 - a. Portable delivers only DC current
 - 6. Inverter
 - a. Light weight, energy efficient, portable and smaller
 - 7. Rectified alternator
 - a. Engine driven AC DC polarity
 - B. Duty Cycle
 - 1. Percentage of a 10-minute period that a welder can operate at a given current output setting
 - C. Polarity
 - 1. Direction of current flow
 - a. DC+ max. penetration min. build up
 - b. DC- max. build up min. penetration
 - c. AC 50% build up 50% penetration
 - 2. All electrodes will weld on DC some will Weld on AC
 - D. Open Circuit Voltage
 - 1. OCV
 - a. Voltage at the output terminals of a welding machine when it energized and current is not being drawn.
 - E. Factors that determine the current used for welding
 - 1. Thickness of the plate
 - 2. Diameter of the electrode
 - 3. Position of plate

III. Electrodes

- A. Purpose of the coating of the electrode
 - 1. Shields the puddle from the atmosphere
 - a. atmosphere: 78% nitrogen, 21% Oxygen, .93%Argon and .07% Miscellaneous
 - 2. Stabilizes the arc
 - 3. Slows the cooling rate of the weld
- B. AWS numbering system for mild steel electrodes
 - 1. E6010

-
- a. E=Electrode
 - b. 60x1000=60,000 Minimum tensile strength
 - c. 1=all 2=flat and horizontal
 - d. Last two numbers together represent group and coating

C. The Electrode Groups

1. Fill-freeze
2. Fast-freeze
3. Low hydrogen
4. Fast fill

D. Low hydrogen group LH

1. Must be stored in a rod oven
 - a. 250 Degrees 300 Degrees
2. H4R
 - a. 4 ml. of Hydrogen per 100 grams of weld metal
 - b. R = moisture resistance up to 9 hours
 - c. Heavy sections of steel 5/8 or greater

IV. Weld Joints and General Requirements of A Weld

A. Types of weld joints

B. Different parts of a weld

1. Legs of a weld
2. Toes of a weld
3. Face
4. Throat
5. Root
6. Root penetration\

C. Welding objectives

1. Flat face
 - a. Rod angles for single and multi-pass welds
 - i. 45 degrees
 - ii. 60 degrees
 - iii. 30 Degrees
2. Proper placement
 - a. Coverage
 - i. 1st pass even in the corner
 - ii. 2nd pass cover 1st pass 75 to 90%

iii. 3rd pass cover 2nd pass 50%

3. Fairly uniform
 - a. Technique
 - b. 6010 and 11
 - i. Whip rod and stack ripples
 - c. All other electrodes we drag
4. Good wash-in and avoidance of "rollover"
 - a. Undercut (concave)
 - i. too hot
 - ii. too fast
 - iii. undercut on one plate not the other wrong rod angle.

D. Mechanical properties

1. Tensile strength = breaking point
2. Yield strength = permanent deformation
3. Ductility = ability for material to stretch
4. Hardness = to resist indentation and or penetration
5. Toughness = Impact strength = energy absorbed when broken
 - a. CVN = Charpy V-notch test values, measured in ft-lb.

E. Introduction to Welding Procedure Specifications, welder qualification and other documentation

F. Introduction to weld quality inspection methods and acceptance standards

V. Manipulative Variables and Techniques for Producing Fillet and Groove Welds in the Flat and Horizontal Positions

A. Manipulative variables that must be adhered to when welding:

1. Travel speed
2. Travel angle
3. Transverse (work) angle
4. Tip to work distance
5. Tip location

B. Manipulative techniques

1. Drag
2. Whip

C. Techniques for starting and stopping welds

D. Arc blow

1. Arc blow is a phenomenon encountered in DC welding current where the magnetic field does not follow the shortest path
 - a. Occurs beginning and end of the plates

E. Vertical up vs vertical down

-
1. 1/4" rule
 - a. 1/4" and thicker vertical Up
 - b. 1/4" and thinner vertical Down
-

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	BASIS FOR GRADES:
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 student's 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
 Thinks Critically
 Communicates Clearly
 Uses Information Effectively
 Interacts in Diverse Environment
 Essential skills for personal and professional growth

COURSE SCHEDULE:

Class #	Date:	Topic:	Preparation/Comments:
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			

This workforce product was funded by a grant awarded by the U.S. Department of Labor’s Employment and Training Administration. The product was created by the grantee and does not necessarily reflect the official position of the U.S. Department of Labor. The U.S. Department of Labor makes no guarantees, warranties, or assurances of any kind, express or implied, with respect to such information, including any information on linked sites and including, but not limited to, accuracy of the information or its completeness, timeliness, usefulness, adequacy, continued availability, or ownership. 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.



This work is licensed under the Creative Commons Attribution 4.0 International License. It is attributed to Ohio TechNet. To view a copy of this license, visit <http://creativecommons.org/licenses/by/4.0/>.

