
LAKELAND COMMUNITY COLLEGE - COURSE OUTLINE FORM*

*** APPROVED VERSION, EFFECTIVE Fall/ 18

ORIGINATION DATE:	10/10/17	APPROVAL DATE:	12/5/17
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COURSE ID: WELD1040
COURSE TITLE: Introduction to Metal Fabrication and Mechanized Welding

	LECTURE	LAB	CLINICAL	TOTAL	OBR MIN	OBR MAX
CREDITS:	2.00	1.00	0.00	3.00	3.00	3.00
CONTACT HOURS:	2.00	3.00	0.00	5.00		

PREREQUISITE:

COURSE DESCRIPTION:

This course provides instruction and laboratory work to gain knowledge and skills related to metal fabricating - including the hands-on use of basic metal fabricating machines and mechanized arc and resistance welding equipment. Students do not do any hands-on manual or semi-automatic welding in this course. Topics include safety and health concerns; print reading and sketching; welding symbols and weld gauges; measuring devices and instruments; lay-outs; metal fabricating processes; operation of metal fabricating machines and related material handling equipment; operation of resistance spot welding and mechanized or robotic semi-automatic welding equipment; and the design, building and use of jigs and fixtures. Students must provide long pants, safety glasses, work gloves, work boots with steel toes and a calculator capable of calculating square roots for this course.

RATIONALE FOR COURSE:

Supplemental knowledge and skills are necessary for the successful welder. The most critically needed supplementary skills related to welding are presented in this course

OUTCOMES:

The course will

1. Develop basic skills in reading prints and shop drawings, sketching, working with welding symbols and using weld gauges.
2. Develop basic skills in using a tape measure, micrometer and other measuring devices and instruments.
3. Familiarize students with basic metal-fabricating processes, related material handling equipment and mechanized welding equipment - including resistance spot welders
4. Illustrate proper use of metal fabricating machines, related material handling equipment and mechanized welding equipment - including resistance spot welders.
5. Develop basic skills in the layout and fabrication of piece-parts and the design, construction and use of various types of jigs and fixtures.

6. Provide a basic understanding of electricity as related to a fabricating shop

PERFORMANCE INDICATORS:

Upon completion of the course, the student should be able to

1. Interpret welding drawings and welding symbols
2. Draw simple sketches.
3. Lay out and measure piece-parts using a tape measure and other basic measuring instruments.
4. Properly perform basic metalworking and mechanized welding operations.
5. Properly operate resistance spot welding and mechanized arc welding equipment.
6. Discuss the design, construction and benefits of using jigs and fixtures.
7. Discuss basic concepts of electricity.

COURSE OUTLINE:

- I Safety and Health Concerns Associated With Metal Fabricating.
 - A. General safety and health issues in a metal fabricating facility
 - B. Avoiding dangers associated with energized equipment and machines
 - C. Lock-out tag-out procedures
 - D. Confined spaces
 - E. Fall protection
 - F. Hand held grinders
 - G. Safe use of torches and handling of compressed gas cylinders
 - H. Dangers of oxygen and other gases used in metal fabricating operations
 - I. Other safety and health concerns
- II. Use of Tape Measures, Measuring Instruments and Basic Math
 - A. Fractions, decimals, measuring distances, and metric conversions.
 - B. Calculating areas, volumes and weight of welds, sheets and plates
 - C. How to do lay-outs
- III. Basic Electricity
 - A. Basic electric components and meters
 - B. Ohm's law and power
 - C. Series circuits
 - D. Parallel circuits
 - E. Power
 - F. Magnetism
 - G. Introduction to transformers
 - H. Three-phase power
- IV. Types of Shop Equipment and Proper Operation
 - A. Material handling equipment
 1. Fork lifts, pallet jacks and cranes
 - B. Saws
 1. Horizontal and vertical band saws
 2. Abrasive and cold saws
 3. Reciprocating saws
 - C. Plasma and oxyfuel cutting equipment
 1. Manual and mechanized
 - D. Shears
 1. Mechanical and hydraulic

- E. Press and leaf brakes
 - 1. Mechanical and hydraulic
 - F. Bending rolls
 - 1. Manual and powered
 - G. Tube, pipe and bar benders
 - H. Ironworkers
 - I. Drills and drilling machines
 - 1. Hand-held
 - 2. Magnetic
 - 3. Drill presses
 - 4. Production drilling machines
 - J. Hole punching machines
 - K. Lathes and milling machines
 - L. Grinders and grinding machines
 - 1. Hand-held
 - 2. Bench-mounted and pedestal
 - 3. Blanchard and other production grinders
- V. Resistance Welding
- A. Basic principles and safety concerns
 - B. Typical machines and equipment
 - 1. Spot vs seam welding
 - 2. Hand-held, rocker-arm and press welders
 - 3. Multiple head machines
 - C. Materials welded
 - D. Set-up and operation
 - 1. Some typical weld schedules
 - E. Typical defects and methods of assuring quality
- VI. Submerged Arc Welding
- A. Basic principles and safety concerns
 - B. Typical machines and equipment
 - 1. Hand-held, tractor-mounted and beam carriage
 - 2. Single wire vs multiple wires
 - A. Materials welded
 - B. Set-up and operation
 - 1. Some typical weld schedules
 - C. Typical defects and methods of assuring quality
- VII. Orbital Pipe and Tube Welding Machines
- A. Basic principles and safety concerns
 - B. Typical machines and equipment
 - 1. GTAW root and fill
 - 2. Modified GMAW root and GMAW-P fill
 - 3. Modified GMAW root w/FCAW fill
 - C. Materials welded
 - D. Set-up and operation
 - E. Some typical weld schedules
 - F. Typical defects and methods of assuring quality
- VIII. Robotic Welding
- A. Basic principles and safety concerns
 - B. Typical machines and equipment
 - 1. Used for arc, spot, submerged arc and laser welding operations
 - 2. Major parts - controller, teach pendant, base, manipulator, end effector
 - 3. Programming using teach pendant vs on-line or off-line programming
 - 4. Special considerations and equipment needed when used for arc welding
 - 5. Typical robotic welding cell and optional ancillary equipment
 - C. Set-up and operation
 - D. Typical defects and methods of assuring quality

- IX. How to Read Shop Drawings and Prints
 - A. Basic types of views
 - B. Lines and what they represent
 - C. Dimensioning and tolerance stack-ups
 - D. Sections and other special views
 - E. Notes and conventions
 - F. Understanding welding symbols

 - X. Types and Shapes of Materials
 - A. Commonly used metals
 - 1. Industry designations
 - B. Sheet and plate
 - 1. Standard gauges
 - 2. Types of processing (HR, CR, P and Q, etc.)
 - C. Structural shapes
 - D. Pipe and pipe schedules

 - XI. Jigs and Fixtures
 - A. Purpose and benefits of using
 - B. Types and functions
 - 1. Production runs vs limited use
 - 2. For use in machining vs use in welding
 - C. Supporting and locating principles
 - D. Clamping and work holding principles
 - E. Basic construction principles
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INSTRUCTIONAL PROCEDURES THAT MAY BE UTILIZED:

Lectures videos, online, or handouts may be used for instruction of the fundamental concepts. Students set up and practice welding using various types of welding equipment during laboratory.

GRADING PROCEDURES:

Examinations and/or quizzes
Class participation and discussion
Lab work, individual projects, papers or reports and/or
Homework

COURSE EVALUATION PROCEDURES:

This course will be reviewed bi-annually by faculty and the Advisory Committee. Students will complete course evaluations each semester.

****See pages 17-19 of Curriculum Procedures & Guidelines for definitions of course outline terms.***

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LAKELAND STUDENT LEARNING OUTCOMES

LEARNS ACTIVELY	I	R	D
1. Takes responsibility for his/her own learning.			
2. Uses effective learning strategies.			
3. Reflects on effectiveness of his/her own learning strategies.			
THINKS CRITICALLY	I	R	D
4. Identifies an issue or idea.			
5. Explores perspectives relevant to an issue or idea.			
6a. Identifies options or positions.			
6b. Critiques options or positions.			
7. Selects an option or position.			D
8a. Implements a selected option or position.			D
8b. Reflects on a selected option or position.			
COMMUNICATES CLEARLY	I	R	D
9a. Uses correct spoken English.	I		
9b. Uses correct written English.	I		
10. Conveys a clear purpose.			
11. Presents ideas logically.			
12a. Comprehends the appropriate form(s) of expression.			D
12b. Uses the appropriate form(s) of expression.			D
13. Engages in an exchange of ideas.			
USES INFORMATION EFFECTIVELY	I	R	D
14. Develops an effective search strategy.			
15a. Uses technology to access information.			
15b. Uses technology to manage information.			
16. Uses selection criteria to choose appropriate information.			
17. Uses information responsibly.			
INTERACTS IN DIVERSE ENVIRONMENTS	I	R	D
18a. Demonstrates knowledge of diverse ideas.			
18b. Demonstrates knowledge of diverse values.			
19. Describes ways in which issues are embedded in relevant contexts.			
20a. Collaborates with others.			
20b. Collaborates with others in a variety of situations.			
21. Acts with respect for others.			

Definitions:

Introduces (I)

Students first learn about key ideas, concepts, or skills related to the performance indicator. This usually happens at a general or very basic level, such as learning one idea or concept related to the broader outcome.

Reinforces (R)

Students are given the opportunity to synthesize key ideas of skills related to the performance indicator at increasingly proficient levels.

Demonstrates (D)

Students should demonstrate mastery of the performance indicator with the level of independence expected of a student attaining an associate's degree.