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LAKELAND COMMUNITY COLLEGE - COURSE OUTLINE FORM\*

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\*\*\* WORK-IN-PROCESS VERSION, NOT YET APPROVED \*\*\*

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**ORIGINATION DATE:** 8/10/17      **APPROVAL DATE:**  
**LAST MODIFICATION DATE:** 11/16/17      **EFFECTIVE TERM/YEAR:** FALL/ 18  
**PRINTED:** 8/8/2018

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**COURSE ID:** WELD2330  
**COURSE TITLE:** Advanced GTAW (TIG) Welding

	<b>LECTURE</b>	<b>LAB</b>	<b>CLINICAL</b>	<b>TOTAL</b>	<b>OBR MIN</b>	<b>OBR MAX</b>
<b>CREDITS:</b>	1.00	2.00	0.00	3.00	2.00	3.00
<b>CONTACT HOURS:</b>	1.00	4.00	0.00	5.00		

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**PREREQUISITE:**

WELD 1040 (can be taken concurrently), WELD1330; or permission of instructor

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**COURSE DESCRIPTION:**

This course introduces students to advanced concepts associated with using the Gas Tungsten Arc Welding (GTAW) or (TIG) process to produce fillet and groove welds in the vertical and overhead positions in carbon steel, stainless steel, and aluminum. Emphasis is on proper weld joint design, familiarization with advanced power sources, set-up of equipment, trouble shooting, and the electrode manipulation techniques that must be utilized to produce high-quality welds. Laboratory experience includes project-based learning, blueprint reading, and familiarization with basic concepts relating to welding economics and cost-effective manufacturing. At the conclusion of this course students take either a 3F,4F,5F, 6F,3G or 4G pass/fail welder qualification test using the GTAW (TIG) process. An Industry Recognized Certification of Qualification will be awarded to students passing the test. The student must furnish: long pants; welding helmet (shade #10 or above); safety glasses; work gloves; 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 12oz ball peen hammer. 4 1/2" grinder is optional.

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**RATIONALE FOR COURSE:**

This course provides practical welding experience and knowledge for students wanting to understand and perform GTAW (TIG) fillet and groove welding in the vertical and overhead positions (3F,4F,5F,6F,3G, and 4G). This course will provide a pathway for employment in a welding field such as aerospace, watercraft, high performance automotive fabrication, high end exotic metal fabrication, and for welding certification.

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**OUTCOMES:**

**The course will**

1. Reinforce student's understanding of essential welding safety equipment and procedures.

2. Provide knowledge as to the equipment, base materials and consumables used to make GTAW (TIG) fillet and groove welds in carbon steel, stainless steel and aluminum in the vertical and overhead positions (3F, 4F, 5F, 6F, 3G and 4G).
  3. Introduce students to proper design, set-up, and techniques to produce a cost effective fillet and groove weldment using the GTAW (TIG) process in the 3F, 4F, 5F, 6F, 3G and 4G positions.
  4. Provide instruction and fillet and groove welding skill in the GTAW (TIG) process for carbon steel, stainless steel, and aluminum in the 3F, 4F, 5F, 6F, 3G, and 4G positions.
  5. Introduce students to the different types of purging processes and to understand the importance of purging.
  6. Provide students with alternative technique for the different position such as 3F, 4f, 5F, 6F, 3G and 4G.
  7. Introduce how to properly build up and repair, edges, and cracks on damaged parts.
  8. Develop students' ability to analyze welds for quality.
  9. Provide instruction in the various tests and examinations for the qualification of a welder per the American Welding Society (AWS) D1.1 code.
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## PERFORMANCE INDICATORS:

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

1. Identify and apply safety procedures when working with welding equipment.
  2. Produce an acceptable fillet, lap and groove GTAW weld on aluminum, carbon, and stainless steel.
  3. Describe the complete functionality of a GTAW welding machine.
  4. Produce an acceptable weld for aerospace, watercraft, high performance automotive fabrication, high end exotic metal fabrication, and applications using the GTAW process in the 3F, 4F, 5F, 6F, 3G and 4G positions.
  5. Set-up and operate purge line, purge block and advance gas tungsten arc welding machine.
  6. Demonstrate proficiency in the GTAW process by producing welds in carbon steel, stainless steel and aluminum in the 3F, 4F, 5F, 6F, 3G and 4G positions that meet the visual inspection quality requirements of the AWS D1.1 code as taken from the plates prepared and tested by the Instructor.
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## COURSE OUTLINE:

- I. Safety
  - A. Protective equipment
  - B. Hazards
  - C. Additional concerns when making vertical and overhead welds
    1. Special positioning necessary for head and body
    2. Additional protective clothing required

- II. Review Process Fundamentals
    - A. Power sources and related equipment
    - B. Welding torches
    - C. Electrodes
    - D. Filler materials
    - E. Shielding gases
    - F. Gas flow meters and regulators
    - G. Polarity
    - H. Effect of various current wave forms and pulsing
    - I. High frequency starting options
  
  - III. Changes Necessary When Making Welding in the 3F, 4F, 5F, 6F, 3G and 4G Positions
    - A. Body Positions
    - B. Line of sight
    - C. Current
    - D. Electrode stick out
  
  - IV. Torch Manipulation
    - A. Walking the cup
    - B. Freehand
    - C. Key hole
    - D. Weaving patterns
  
  - V. Depositing Filler Metal
    - A. Rod angles
    - B. Rod dipped into weld pool not arc
    - C. Rod kept under cup to keep filler clean from contamination
  
  - VI. Welder Qualification Test
    - A. Hands-on skills test of student's ability to make acceptable GTAW welds
      - 1. Can make either 3F or 4F welds using GTAW
      - 2. Pass/fail test
      - 3. Industry Recognized Certification of Qualification is awarded to students passing independent 3<sup>rd</sup> party test of welds made using a qualified or pre-qualified Welding Procedure Specification.
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## INSTRUCTIONAL PROCEDURES THAT MAY BE UTILIZED:

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

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## GRADING PROCEDURES:

Examinations and/or quizzes  
Class participation and discussion  
Individual projects, papers or reports and/or  
Homework

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## 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**

<b>LEARNS ACTIVELY</b>	<b>I</b>	<b>R</b>	<b>D</b>
1. Takes responsibility for his/her own learning.			
2. Uses effective learning strategies.			
3. Reflects on effectiveness of his/her own learning strategies.			
<b>THINKS CRITICALLY</b>	<b>I</b>	<b>R</b>	<b>D</b>
4. Identifies an issue or idea.			
5. Explores perspectives relevant to an issue or idea.			
6a. Identifies options or positions.			D
6b. Critiques options or positions.			D
7. Selects an option or position.			D
8a. Implements a selected option or position.			D
8b. Reflects on a selected option or position.			
<b>COMMUNICATES CLEARLY</b>	<b>I</b>	<b>R</b>	<b>D</b>
9a. Uses correct spoken English.			
9b. Uses correct written English.			
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.			
<b>USES INFORMATION EFFECTIVELY</b>	<b>I</b>	<b>R</b>	<b>D</b>
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.			
<b>INTERACTS IN DIVERSE ENVIRONMENTS</b>	<b>I</b>	<b>R</b>	<b>D</b>
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.