Lansing Community College

Course Cover Sheet

M-CAM Training Area:
☐CNC/Machining ☐Multi-Skilled Mechatronics ☐Production Operation ☒Welding/Fabrications

Program(s): Welding Basics

Course: Welding Basics

Course Description:
This 96-hour course introduces the safe operation and application of oxyacetylene, torch cutting, plasma cutting, Shielded Metal Arc Welding and Gas Metal Arc Welding. It incorporates practice and theory to help students build their skills. Using these methods, students will join steel in the horizontal, flat and vertical positions.

In addition to basic welding, this course also has a team building component.

Delivery method is hybrid.

Date Created: February, 2017

Employer/Industry Partner: various manufacturing companies in Mid-Michigan. Advisory Board members to LCC's Technical Careers Division.

Faculty Developer(s)/Instructional Designers(s): Scott Poe/Ann Lapo

College Contact: Jill Doederlein

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Additional Information/Comments: Added use of the virtual welders. Curriculum was customized to an entry-level workforce with the goal of job acquisition.

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DESCRIPTION:
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TOTAL TIME REQUIREMENT for the course is 96 hours.

PREREQUISITES: Reading Level 4.

LOCATION: Welding Lab and classroom.

TOPICS:

- Welding safety and fundamentals
- Gas Welding
- Brazing and Soldering
- Oxyacetylene Cutting (OAC)
- SMAW Fundamentals
- SMAW E6010 and SMAW E7018
- Plasma Arc & Air Carbon Arc Cutting
- Gas Metal Arc Welding
- Team Build (4 hrs)

OBJECTIVES:
After completing this course, the student should be able to:

- **Welding Safety and Fundamentals**
    - Choose the protection that should be worn for welding.
    - Demonstrate cautionary handling of high pressure cylinders.
    - Describe how to ventilate a welding area.
    - Explain how to avoid electric shock.
    - Identify and avoid possible health hazards for welding.
    - Prevent fires in the welding shop.
    - Identify and explain the safety devices built into oxygen and acetylene tanks.
    - Distinguish between a fillet and groove weld.
    - List the five basic welding joints.
    - Name the four weld positions.
    - Apply the Five Essentials of welding.
    - Identify the parts of a weld, such as toes, legs, throat, fusion, and root.

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- **Welding Safety and Fundamentals** *(OBJECTIVES continued)*
    - Identify discontinuities and defects including overlap, undercut, and porosity, and use nondestructive and destructive testing to evaluate welds.
    - Interpret oxyacetylene tip chart by choosing the correct tips for various base metals and different metal thickness.
    - Determine if regulators, both single and double stage, are functioning safely.
    - Explain the steel designation system.
    - Explain the elements of mild steel and the three categories of mild steel and weldability.
    - Describe the functions of fluxes in making brazing joints.
    - Identify different alloys and the temperature differences in brazing and soldering.

- **Oxyacetylene Cutting (OAC)**
    - Explain how the flame cutting process works.
    - Set up an oxyacetylene cutting torch.
    - Safely use an oxyacetylene gas cutting torch to make a variety of cuts.
    - Clean a cutting tip.
    - Check tip seal for leaks.

- **SMAW Fundamentals**
    - Set up and safely operate shielded metal arc welding equipment.
    - Identify the different types of power supplies used in welding.
    - List the Five Essentials of welding.
    - Explain the advantages and disadvantages of SMAW.
    - Explain the fundamentals of alternating and direct current; as well as the application and principles of polarity.
    - Explain and determine the amperage and voltage used, and the variables of amperage, for different material thicknesses.
    - Describe the primary electrical device that is used to produce low-voltage, high-amperage current.
    - Explain and demonstrate how to minimize and relieve stress and distortion.
    - Choose the types of electrodes for different applications.
    - Identify ferrous metals and non-ferrous metals.

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- **Plasma Arc and Air Carbon Arc Cutting**
  - Demonstrate safety procedures for plasma arc cutting.
  - Describe an electrical plasma.
  - Explain how a plasma cutting machine and torch function.
  - Set up and operate plasma arc cutting equipment
  - Identify plasma arc cutting accessories.
  - List the advantages and disadvantages of using a plasma arc cutting torch.
  - Demonstrate safety procedures for carbon arc gouging.
  - Set up and operate carbon arc gouging equipment.
  - Explain the difference between a CAC-A torch and an electrode holder.
  - Identify the base metals and electrodes used in CAC-A.

- **Gas Metal Arc Welding**
  - Provide Technical understanding and applications of Gas Metal
  - Demonstrate the safety procedures used in Gas Metal Arc Welding
  - Define and use the major metal transfers in short circuit and spray metal transfers.
  - Explain the consumable wire classification system for solid wire used in MIG Welding.
  - Demonstrate the welding procedures and proper set-up for amperage (wire feed speed), effects of proper voltage, gas flow, wire stick out and MIG gun angles.

- **Behavioral Styles and Their Impact in the Workplace (DiSC)**
  - Identify the four behavioral styles.
  - Compare and contrast the strengths and weaknesses of each style
  - Identify their own behavioral style.
  - Demonstrate their behavioral strengths appropriately.

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MATERIALS:

Text:

- Welding: Principles & Applications, 8th Ed
- Modern Welding: Complete Coverage of the Welding Field
- Attitude, Protect Your Most Priceless Asset

Arlo Steel

- 5 -sheets of 48”x96”x11 gauge Hot rolled mild steel
- 5 -sheets of 48”x96” x 7 gauge hot rolled steel
- 1 - sheets of 48”x96”x16 gauge hot rolled steel
- ¼”x7”x20’ hot rolled steel (cut in half)
- 10’x3”schedule 40 pipe

Air Gas

- 9 cylinders of 75/25 Shielding Gas

Purity

- 5 packs (10 in each) of .35 MIG Tips Part #KP2744-035
- 10 each Nozzles Part #KP2742-1-62R
- 4 each SURARC S-6 .035 spool (44#) Part #ED030614
- 12 Medium Welding Gloves

Grainger

- Safety Glasses/participant

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GRADING POLICY:

- Satisfactory completion of training (at least 75%) recommended. Required competencies must be met for certification.

College Grading Standards	Percent
4.0 Excellent	91-100%
3.5	86-90%
3.0 Good	81-85%
2.5	76-80%
2.0 Satisfactory	71-75%
1.5	66-70%
1.0	60-65%
0.0	0-59%

ACCEPTABLE USE POLICY:
Computer Resources

Use of College-owned computer resources is a privilege extended by the College to students, employees, and other authorized users as a tool to promote the mission of the College. All users agree to be bound by the terms and conditions of the LCC Acceptable Use Policy at the time they complete an account application form. Copies of the LCC Acceptable Use Policy are available at the Library Circulation Desk and may also be accessed on the World Wide Web. The URL is http://www.lcc.edu/policy/policies_1.aspx#ACCEPTABLE_USE_POLICY

Transfer Potential

For transferability information, please consult the Transfer Equivalency Information located at the LCC website at http://www.lcc.edu/transfer. For additional transferability information, contact the LCC Academic Advising Center, (517) 483-1904.

The MACRAO Transfer Agreement simplifies the transfer of students from one Michigan institution to another. The most current MACRAO Transfer Agreement information can be found at http://www.lcc.edu/transfer/macrao_agreement.aspx.

Student Code of Conduct and General Rules and Guidelines

LCC supports a positive educational environment that will benefit student success. In order to ensure this vision, the College has established the LCC Student Code of Conduct and the Student General Rules and Guidelines to ensure the protection of student rights and the health and safety of the College community, as well as to support the efficient operation of College programs. In addition, the College has established guidelines for the redress of grievances by individuals accused in such proceedings. A copy of the most current Code can be found on the College's website at http://www.lcc.edu/catalog/policies_procedures/studentrulesguidelines.aspx#code.

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Welding Basics Lesson Plan

WEEK 1

Day 1	
8:00am to 3:00pm class time=6 hours (one hour for lunch)	Weld safety and Fundamentals Safety movie: Welding Safely-- The way the pros do it. Power Point Ch. 2 of Welding Principles and Applications Intro to VRTEX welding machine "GMAW" Lesson 1: Set up and functions Lesson 2: Welding a single pass Tee Joint

Day 2	
8:00am to 3:00pm	Power Point Chapter 3 SMAW Set up and Operation of SMAW VRTEX Lesson 3: Weld a single pass Tee Joint with 6013 Rod Lesson 4: Welding a three pass Tee Joint with 7018 Rod Lesson 5: Weld a Stringer Bead with 6010 Rod

Day 3	
8:00am to 3:00pm	Chapter 11- GMAW Power sources Lab: Intro GMAW welding machines and lab procedures Flat Pad – Short Circuit Transfer

Day 4	
8:00am to 3:00pm	Lecture- weld joint Design and Welding Symbols Lab: Horizontal Padding

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WEEK 2

Day 5	
8:00am to 3:00pm	Lecture: Common weld discontinuities and defects Lab: Horizontal Tee 3 pass on 3/16" steel Horizontal Tee on 1/16" steel

Day 6	
8:00am to 3:00pm	Lecture: GMAW set up Power Point ch. 10 Lab: Horizontal Lap 3/16" steel Flat Butt on 1/8" steel

Day 7	
8:00am to 3:00pm	Lecture Ch. 27 Wire classifications Lab. Outside Corner 1/8" steel Outside Corner 3/16" steel

Day 8	
8:00am to 3:00pm	Lecture: GMAW Transfers Lab: Vertical down Tee on 1/16" steel Vertical down Tee on 1/8" steel Vertical down butt on 1/8" steel

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WEEK 3

Day 9	
8:00am to 3:00pm	Lecture: Oxy acetylene Cutting Lab: OFC Straight cut OFC Piercing Holes

Day 10	
8:00am to 3:00pm	Lecture Plasma Arc and Carbon Arc Cutting Lab. PAC Cutting Shapes Vertical up Tee 3/16" steel Vertical up Lap 3/16" steel

Day 11	
8:00am to 3:00pm	Ch. 26 Weldability of metals Lab: Overhead lap 1/8" steel Overhead Tee 3 pass 3/16" steel

Day 12	
8:00am to 3:00pm	AWS numbering system Lab. Pipe to Plate 3 pass Vertical up butt 1/8" steel

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WEEK 4

Day 13	
8:00am to 3:00pm	Ch. 23 Testing and inspection Lab: Spray Transfer 3 pass tee ¼" steel Spray Transfer flat butt 3/8" steel

Day 14	
8:00am to 3:00pm	Ch. 22&24 Welder Certification Lab: FCAW horizontal Tee ¼" steel FCAW horizontal lap 3/16 steel

Day 15	
8:00am to 3:00pm	Ch. 14 other potential processes Lab: FCAW vertical up tee ¼" steel Pipe to Plate

Day 16	
8:00am to 3:00pm	Review processes and procedures Lab: Finish all welds and cuts.

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Subject Matter Expert (SME) Course Review Summary
College: Lansing Community College
M-CAM Training Area: ☐CNC/Machining ☐Multi-Skilled/Mechatronics ☐Production Operation ☒Welding/Fabrication
Degree Program Name: non-degree
Title of Course: Welding Basics
Subject Matter Expert (SME) Reviewer Information **Name: Robert C. Hess** **Title: Senior Instructional Designer/Trainer** **Phone: 566-322-1033** **Email: bob.hess@mhtechnologies.net** **Organization/Affiliation: MH Technologies**
Attach Resume or provide credentials (showing years of experience and work experience that is relevant to course content):
Synopsis of Findings: **This course is a 96 hour course which meets the requirements for credit per the Lead Faculty of Welding.** **Acceptable for training.**

Reviewers Signature Robert C. Hess Date: 3/8/17

Michigan Coalition for Advanced Manufacturing
Subject Matter Expert Course Review

1. Course Overview and Objectives	Exceptional	Satisfactory	Ineffective
The goals and purpose of the course is clearly stated.		X	
Prerequisites and/or any required competencies are clearly stated.		X	
Learning objectives are specific and well-defined.		X	
Learning objectives describe outcomes that are measurable.		X	
Outcomes align to occupational focus (industry skills and standards).		X	
Comments or recommendations:			

2. Material and Resources	Exceptional	Satisfactory	Ineffective
The instructional materials contribute to the achievement of the course learning objectives.		X	
The materials and resources meet/reflect current industry practices and standards.		X	
The instructional materials provide options for a variety of learning styles.		X	
Resources and materials are cited appropriately. If applicable, license information is provided.		X	
Comments or recommendations:			

3. Learning Activities	Exceptional	Satisfactory	Ineffective
Provide opportunities for interaction and active learning.		X	
Help understand fundamental concepts, and build skills useful outside of the learning object.		X	
Activities are linked to current industry practices and standards.		X	

Michigan Coalition for Advanced Manufacturing
Subject Matter Expert Course Review

Comments or recommendations:			
4. Assessment Tools/Criteria for Evaluation	**Exceptional**	**Satisfactory**	**Ineffective**
The course evaluation criteria/course grading policy is stated clearly on syllabus.		X	
Measure stated learning objectives and link to industry standards.		X	
Align with course activities and resources.		X	
Include specific criteria for evaluation of student work and participation.		X	
Comments and recommendations:			
5. Equipment/Technology	**Exceptional**	**Satisfactory**	**Ineffective**
Meets industry standards and needs.		X	
Supports the course learning objectives.		X	
Provides students with easy access to the technologies required in the course/module.		X	
Comments and recommendations:			

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Robert C. Hess

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Qualifications

Dedicated, articulate, and enthusiastic with strong analytical and organizational abilities. Effective communication and interpersonal skills. Ability to work independently or as an integral part of a team to accomplish goals. Experience prioritizing and completing numerous concurrent responsibilities while meeting time and organizational goals. Sound professional attitude, strong work ethic and pride in personal performance.

Experience

2015 – Present **M H Technologies LLC** **Warren, MI**
Senior Instructional Designer/Trainer

- Perform Needs Analysis and quote training programs
- Develop on-line training programs, system manuals, student workbooks, and job aids
- Deliver on-site training programs

2002 – 2015 **R.C. Technologies** **Shelby Twp. MI**
Business Owner – R.C. Technologies

- Research and quote training programs
- Development of training programs for Ford Motors, DaimlerChrysler, General Motors, Kuka Robotics, Fame Conveyor, Lamb Technicon, Delphi, Magna, and SPX
- Design training programs, system manuals, student workbooks, PowerPoint presentations, and job aids
- Deliver on-site training programs
- Professional Industrial photography

1995 – 2002 **DCT Inc.** **Sterling Heights, MI**
Training Designer

- Research and quote training programs
- Design training programs, system manuals, student workbooks, and job aids
- Deliver on-site training programs

1990 – 1995 **Bond Robotics** **Sterling Heights, MI**
Training Manager / Field Service Engineer

- Managed Training Department
- Research and quote training programs
- Design operation and maintenance manuals plus training guides
- Deliver all training programs
- Perform on-site electrical and mechanical customer support for installation, start-up, and debugging of pressroom automation

1986 – 1990 **Robotic Vision Systems, Inc.** **Sterling Heights**
Field Service Engineer / Trainer

- Research, installation, programming and training of 3D vision guided robotic welding and sealant systems for military, aerospace, and automotive industry

Education **1977 – 1981** **Ferris State University** **Big Rapids, MI**

- BSEE