

## Lansing Community College

### Course Cover Sheet



#### M-CAM Training Area:

☐ CNC/Machining ☒ Multi-Skilled Mechatronics ☐ Production Operation ☐ Welding/Fabrications

**Program(s):** Intro to Mechatronics Block 1-3

**Course:** PLC Allen-Bradley/Rockwell

#### Course Description:

An overview of Allen-Bradley PLCs system architecture, basic numbering systems, computer terminology, industrial communications.

Student will learn about wiring and configurations of I/O modules, ladder logic programming, function block programming and related information.

Delivery method is hybrid, open entry/open exit.

**Date Created:** January, 2017.

**Employer/Industry Partner:** Magna/DexSys, Lansing, Michigan and various manufacturing companies in Mid-Michigan.

**Faculty Developer(s)/Instructional Designers(s):** Sean Hickman/Ann Lapo

**College Contact:** Jill Doederlein

**Phone:** 517.483.9665

**Email:** doederj@lcc.edu

**Additional Information/Comments:** Due to the increased need to offer a flexible delivery format to meet the needs of students'/workers' busy schedules, LCC partnered with AMTEC (Automotive Manufacturing Technical Education Collaborative) led by Kentucky Community Technical College to offer open entry open exit modular courses in a hybrid format (lessons online and hands-on labs with an instructor on campus). LCC instructors added content based on the needs of local industry.

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**DESCRIPTION:**

An overview of Allen-Bradley PLCs system architecture, basic numbering systems, computer terminology, industrial communications.

Student will learn about wiring and configurations of I/O modules, ladder logic programming, function block programming and related information.

**TOTAL TIME REQUIREMENT** for the course is approximately 100 hours.

**PREREQUISITES:** Reading Level 4. Writing Level 4. Math Level 5. All Introduction to Mechatronics Block 1 and Block 2 courses or equivalent knowledge.

**OBJECTIVES: (for a complete list of objectives, see each module)**

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

- Describe the components of a typical PLC System.
- Describe Rockwell PLC system architectures.
- Explain basic PLC functions, program structures, and language standards.
- Construct a basic program.
- Describe the ControlLogix memory and project organization.
- Describe the various types of tags used within ControlLogix.
- Describe and interpret I/O addresses.
- Choose the appropriate type of task execution and configure tasks.
- Connect a PC to a PLC.
- Configure I/O in a project.
- Replace a processor module.
- Upload/download project files and create back-ups.
- Replace and wire I/O modules.
- Discuss failure modes in an automated system and use available information to restore a system to Automatic operation.
- Write a basic ladder logic program.
- Utilize math instructions within a ladder logic program.
- Describe the differences between arithmetic, relational, logical trigonometric, and conversion instruction categories.
- Explain the special instructions within RSLogix 5000 and how they are typically used.
- Create a simple sequential function chart routine.
- Describe the levels and types of communications used in a conventional industrial network.
- Describe the difference between data communicated via Producer/Consumer Tags and the Message (MSG) instruction.
- Use a Message (MSG) instruction to communicate data from one processor to another when the data does not need to be updated at specific intervals.
- Analyze the types of communications used on the AMTEC Manufacturing Systems Simulator.

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**103ab PLC: Allen-Bradley consists of four modules:**

**1031ab** – Introduction to Allen-Bradley PLCs (4 lessons to read on your own, no labs. 10 total hours)  
*Introduces various elements of basic PLCs including the identification of programmable logic control systems as well as an overview of PLC system architectures. Provides instruction in basic numbering systems, computer terminology, PLC functions, program structures, language standards, point addressing basics.*

**1032ab** – Allen-Bradley Hardware and Software (7 lessons, 10 labs, 30 total hours).  
*Introduces memory and project organization within a PLC processor, the installation, wiring and configuration of I/O modules, as well as how to start a new project.*

**1033ab** – Programming Allen-Bradley PLCs (9 lessons, 6 labs, 30 total hours)  
*Introduces various elements of programming PLCs. Addresses the basic elements of PLC programming and routines. Requires student to program using ladder logic, structured text, sequential function chart, and function block languages*

**1034ab** – Allen-Bradley PLC Communication (3 lesson, 2 labs, 30 total hours)  
*Introduces various elements of industrial communications using PLCs. Addresses common types of control communications in an industrial environment. Includes discussion of PLC addressing used in communications*

**MATERIALS:**

***Online portion of the class:***

**Software:** Internet access, Web browser, word-processing software, Adobe Reader, up-to-date virus protection for the online portion of this course.

- Go to [elearning.autoworkforce.org](http://elearning.autoworkforce.org) – modules 1031ab, 1032ab, 1033ab, 1034ab, to access the lessons, labs specifications and assessments for this course.

***Hands-on labs portion of the class:***

- Tools and equipment specified in the Resources section—per module — for each hands-on lab.

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**GRADING POLICY:**

- Successful completion of all Labs (at least 80% recommended). Rubrics provided in AMTEC online specify how grading is determined.
- Successful completion of each module's post-assessment (at least 80% recommended).

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](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](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](http://www.lcc.edu/catalog/policies_procedures/studentrulesguidelines.aspx#code).

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Subject Matter Expert (SME) Course Review Summary	
<b>College:</b> Lansing Community College	
<b>M-CAM Training Area:</b> <input type="checkbox"/> CNC/Machining <input checked="" type="checkbox"/> Multi-Skilled/Mechatronics <input type="checkbox"/> Production Operation <input type="checkbox"/> Welding/Fabrication	
<b>Degree Program Name:</b>	
<b>Title of Course:</b> Mechatronics PLC Allen Bradley Rockwell	
<b>Subject Matter Expert (SME) Reviewer Information</b>	
<b>Name:</b> Robert C. Hess <b>Title:</b> Senior Instructional Designer/Trainer <b>Phone:</b> 566-322-1033 <b>Email:</b> bob.hess@mhtechnologies.net <b>Organization/Affiliation:</b> MH Technologies	
<b>Attach Resume or provide credentials (showing years of experience and work experience that is relevant to course content):</b>	
<b>Synopsis of Findings:</b> 1. All labs good 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.

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## Experience

- |  |                                     |                             |
|--|-------------------------------------|-----------------------------|
| <b>2015 – Present</b>  | <b>M H Technologies LLC</b>         | <b>Warren, MI</b>           |
| <b>Senior Instructional Designer/Trainer</b>   |                                     |                             |
| <ul style="list-style-type: none"><li>• Perform Needs Analysis and quote training programs</li><li>• Develop on-line training programs, system manuals, student workbooks, and job aids</li><li>• Deliver on-site training programs</li></ul>  |                                     |                             |
| <b>2002 – 2015</b>   | <b>R.C. Technologies</b>            | <b>Shelby Twp. MI</b>       |
| <b>Business Owner – R.C. Technologies</b>  |                                     |                             |
| <ul style="list-style-type: none"><li>• Research and quote training programs</li><li>• Development of training programs for Ford Motors, DaimlerChrysler, General Motors, Kuka Robotics, Fame Conveyor, Lamb Technicon, Delphi, Magna, and SPX</li><li>• Design training programs, system manuals, student workbooks, PowerPoint presentations, and job aids</li><li>• Deliver on-site training programs</li><li>• Professional Industrial photography</li></ul> |                                     |                             |
| <b>1995 – 2002</b>   | <b>DCT Inc.</b>                     | <b>Sterling Heights, MI</b> |
| <b>Training Designer</b>   |                                     |                             |
| <ul style="list-style-type: none"><li>• Research and quote training programs</li><li>• Design training programs, system manuals, student workbooks, and job aids</li><li>• Deliver on-site training programs</li></ul>   |                                     |                             |
| <b>1990 – 1995</b>   | <b>Bond Robotics</b>                | <b>Sterling Heights, MI</b> |
| <b>Training Manager / Field Service Engineer</b>   |                                     |                             |
| <ul style="list-style-type: none"><li>• Managed Training Department</li><li>• Research and quote training programs</li><li>• Design operation and maintenance manuals plus training guides</li><li>• Deliver all training programs</li><li>• Perform on-site electrical and mechanical customer support for installation, start-up, and debugging of pressroom automation</li></ul>  |                                     |                             |
| <b>1986 – 1990</b>   | <b>Robotic Vision Systems, Inc.</b> | <b>Sterling Heights</b>     |
| <b>Field Service Engineer / Trainer</b>  |                                     |                             |
| <ul style="list-style-type: none"><li>• Research, installation, programming and training of 3D vision guided robotic welding and sealant systems for military, aerospace, and automotive industry</li></ul>  |                                     |                             |

<b>Education</b>	<b>1977 – 1981</b>	<b>Ferris State University</b>	<b>Big Rapids, MI</b>
		<ul style="list-style-type: none"><li>• BSEE</li></ul>	