

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:** Robotics

**Course Description:**

This course introduces basic components, types of robots, safety, programming, and integrating PLC with robot applications.

Students will also cover robot maintenance, preventative maintenance, and troubleshooting robots using error codes.

Delivery method is hybrid, open entry/open exit.

**Date Created:** July, 2016. Revised February, 2017

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

**Faculty Developer(s)/Instructional Designers(s):** Nathan Webb/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:**

This course introduces basic components, types of robots, safety, programming, and integrating PLC with robot applications.

Students will also cover robot maintenance, preventative maintenance, and troubleshooting robots using error codes.

**TOTAL TIME REQUIREMENT** for the course is approximately 72 hours.

**PREREQUISITES:** Reading Level 4. Writing Level 4. Math Level 5. All Introduction to Mechatronics Block 1 courses (Safety, Computer Literacy, Print Reading, Machine Tool Operations, Welding) or equivalent. Knowledge of Basic Electricity is helpful, but not required.

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

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

- Define a robot.
- Explain the importance of industrial robot safety: lock out/tag out, controls for stopping a robot in emergencies, safety devices, safety training
- Describe difference parts of the robot body.
- Describe coordinate systems.
- Describe servo motors.
- Describe teach pendant.
- Describe the reasons manufacturers use robots.
- Identify Cartesian axes.
- Describe types of paths robots can be programmed to take.
- Describe robot simulator programs.
- Describe robot sensors.
- Perform robot start-up; control coordinate systems and motion systems.
- Create and write programs.
- Copy, delete and edit programs.
- Program instructions.
- Master the robot backup system.
- Perform PM on robot components: lubrication of robotic systems, maintenance of EOAT and sensors.
- Read robot error codes.
- Use error codes to return robots to normal operations.
- Describe the processes involved in system integration.
- Describe the basic elements associated with developing a controls architecture.
- Describe the elements required when integrating robotic applications with PLC-controlled systems.
- Describe the major concepts associated with vision applications within manufacturing.
- Describe various types of FANUC I/O and FANUC software.

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**105 Robotics consists of five modules:**

**1051** – Introduction to Robotics (6 lessons to read on your own, 3 labs to do at LCC with an instructor, 8 total hours)

*Introduces robotics safety, types of robots, applications, basic components, terms and definitions.*

**1052** – Programming/Editing Robots (6 lessons, 6 labs, 32 total hours).

*Emphasizes the fundamentals of robot control: robotic systems and programming: system application, automated system safety, robotic system composition, robotic motion control, fundamental programming commands, and program editing.*

**1053** – Robot Maintenance and PM (3 lessons, 1 lab, 4 total hours)

*Instruction on how to master a robot and replace battery backups. This module is intended for operators, technicians, engineers, programmers or students.*

**1054** – Troubleshooting Robots using Error Codes (1 lesson, 1 lab, 20 total hours)

*A focus on error codes and how to interpret them. This module is intended for operators, technicians, engineers, programmers or students.*

**1055** - Integration of PLC with Robotics (11 lessons, 1 lab, 8 total hours)

*Addresses the multi-phase process where all of the various components that comprise an automated system are interconnected using both hardware and software to accomplish a specific manufacturing task.*

**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 1051, 1052, 1053, 1054, 1055 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).

<b>College Grading Standards</b>	<b>Percent</b>
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**

**College:** Lansing Community College

**M-CAM Training Area:** CNC/Machining Multi-Skilled/Mechatronics Production Operation Welding/Fabrication

**Degree Program Name:**

**Title of Course:** Mechatronics Robotics

**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:**

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:			
<b>4. Assessment Tools/Criteria for Evaluation</b>	<b>Exceptional</b>	<b>Satisfactory</b>	<b>Ineffective</b>
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:			
<b>5. Equipment/Technology</b>	<b>Exceptional</b>	<b>Satisfactory</b>	<b>Ineffective</b>
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>   |                                     |                                |                       |