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: Machine Tool Operations

Course Description:
This course emphasizes safe application of machining procedures and machines used by multi-skilled industrial maintenance technicians. It covers various types of tools: Measuring the Layout Tools, Hand and Power Tools, Saws, Drill Press, Lathes, Milling.

Delivery method is hybrid, open entry/open exit.

Date Created: September, 2015. Revised February, 2017

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

Faculty Developer(s)/Instructional Designers(s): Gregg Butts/Gary Reemsnyder/Ann Lapo

College Contact: Jill Doederlein

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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 emphasizes safe application of machining procedures and machines used by multi-skilled industrial maintenance technicians. It covers various types of tools: Measuring the Layout Tools, Hand and Power Tools, Saws, Drill Press, Lathes, Milling.

TOTAL TIME REQUIREMENT for the course is approximately 100 hours.

PREREQUISITES: Reading Level 4. Writing Level 4. Math Level 5. Basic OSHA Safety.

OBJECTIVES: (for a complete list of objectives, see each module)
After completing this course, the student should be able to:

- Define machining.
- Describe the purpose of a metal saw.
- Describe the purpose of a drill press.
- Describe the purpose of an engine lathe.
- Describe the purpose of a milling machine.
- Demonstrate general shop safety and safety specific to metal cutting.
- Identify the types of cutting tools and materials used in machining.
- Calculate speeds and feeds for machine tools.
- Perform semi-precision measurement.
- Perform precision measurement.
- Perform semi-precision layout.
- Perform precision layout.
- Demonstrate knowledge of hand tools used in machining environments.
- Demonstrate knowledge of power tools used in machining environments.
- Describe how to operate a press brake.
- Demonstrate knowledge of horizontal bandsaws.
- Perform sawing operations.
- Demonstrate knowledge of the sensitive drill press and accessories.
- Perform drill press operations.
- Demonstrate knowledge of the engine lathe.
- Perform turning operations.
- Demonstrate knowledge of the vertical milling machine.
- Perform milling operations.
- Setup and align a milling machine vise.
- Perform drilling operations on the vertical milling machine

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120 Machine Tool Operations consists of seven modules:

1201 – Introduction (3 lessons to read on your own, no labs)
This module introduces the student to machining operations. Emphasis is on the safe application of the most common machining procedures and machines used by multi-skilled industrial maintenance technicians.

1202 – Measuring and Layout Tools (3 lessons, 8 labs to do at LCC West Campus with an instructor)
This module explains the measuring and layout tools commonly found in industrial environments. Emphasis will be on the safe application of the most common tools used by multi-skilled industrial maintenance technicians.

1203 - Hand and Power Tools (3 lessons, 4 labs)
This module explains the safe and effective use of hand and power tools. Emphasis is on the application of the most common tools used by multi-skilled industrial maintenance technicians.

1204 - Saws (4 lessons, 7 labs)
This module explains the safe operation of saws, primarily the horizontal and contour bandsaw. Included are the various types of metal saws used in industry, their component parts, and associated safety precautions. Emphasis is on the most common sawing operations required by multi-skilled industrial maintenance technicians.

1205 - Drill Press (3 lessons, 3 labs)
This module explains the safe operation of drill presses, primarily the sensitive drill press. Included are the various types of drilling machines used in industry, their component parts, and associated safety precautions. Emphasis is on the most common drilling operations required by multi-skilled industrial maintenance technicians.

1206 - Turning (3 lessons, 3 labs)
This module explains the safe operation of lathes, primarily engine and tool room lathes. Included are the various types of lathes used in industry, their component parts, and associated safety precautions. Emphasis is on the most common lathe operations required by multi-skilled industrial maintenance technicians.

1207 - Milling (4 lessons, 3 labs)
This module explains the safe operation of milling machines, primarily vertical milling machines. Included are the various types of milling machines used in industry, their component parts, and associated safety precautions. Emphasis is on the most common milling operations required by multi-skilled industrial maintenance technicians.

Plan on 1-3 hours for each lab you attend at LCC. See the "Time Requirements" section of each Student Guide for details.

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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 – modules 1201, 1202, 1203, 1204, 1205, 1206, 1207 to access the lessons, labs specifications and assessments for this course.

Hands-on labs portion of the class:

- Tools and equipment specified per module for each lab below.

AMT 1201: Introduction to Machining Operations has no labs.

AMT 1202: Measuring and Layout Tools

NOTE: *1202-Lab 3 at LCC should use Digital or Dial Calipers instead of Vernier Calipers*

Lab 1: Measurement #1
Steel rule
Gage block builds
Lab 2: Measurement #2
Steel rule
Micrometer
Vernier Calipers
Socket Heads
Shoulder Bolts
Lab 3: Measurement #3
Steel rule
Micrometer
Vernier Calipers
Gage Blocks
Lab 4: Measurement #4
Micrometer
Gage Pins
Lab 5: Measurement #5
Height Gage
Gage Blocks
Lab 6: Measurement #6
Height Gage
Gage Blocks
Lab 7: Layout #1
Layout Tools
3" x 6" x 1/4" Cold Rolled Steel Stock

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MATERIALS: *(continued)*

AMT 1202: Measuring and Layout Tools *continued*

Lab 8: Layout #2
Layout Tools
1.97 x 3.00 x .47 Cold Rolled Steel Stock

AMT 1203: Hand and Power Tools

Lab 1: Hand Tool #1
Layout tools
File
Grinder
1" x 3" x 5" Cold-Rolled Steel
Lab 2: Hand Tool #2
Layout tools
Drill Press
Drill Bits
Reamer
Taps
1" x 3" x 5" Cold-Rolled Steel
Note: Use same piece from Lab 1: Hand Tool #1.

Lab 3: Hand Tool #3
Layout tools
Hand Tools
(4) 1/4" Roll Pins
(1) 5/16" Socket Head Cap Screw
(1) 5/16" Pan Cross Head Screw
(1) 3/8" Hex Head Screw
1" x 3" x 5" Cold-Rolled Steel
Note: Use same piece from Lab 2: Hand Tool #2.

Lab 4: Hand Tools #4
Layout tools
File
Grinder
Tap and Die Set
1/2" x 3" Cold-Rolled Steel

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MATERIALS: *(continued)*

AMT 1204: Saws

Lab 1: Saw #1
Horizontal Band Saw
1/2" X 3" Rectangular Bar
Lab 2: Saw #2
Horizontal Band Saw
1/2" X 3" Rectangular Bar
Lab 3: Saw #3
Horizontal Band Saw
Ø 1-1/2" Round Bar
Lab 4: Saw #4
Horizontal Band Saw
Ø 1-1/2" Round Bar
Lab 5: Saw #5
Horizontal Band Saw
Ø 1-1/2" Round Bar
Lab 6: Saw #6
Horizontal Band Saw
Ø 1-1/2" Round Bar
Lab 7: Saw #7
Horizontal Band saw
1/2" X 3" Square Bar

1205: Drill Press

Lab 1: Drill Press #1
Drill Press
Drill Bit Set
Countersink
Lab 2: Drill Press #2
Drill Press
Drill Bit Set
Reamer
Lab 3: Drill Press #3
Drill Press
Drill Bit Set
Countersink
Reamer

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MATERIALS: *(continued)*

1206: Turning

Lab 1: Turn #1
Engine Lathe
Journal
Lab 2: Turn #2
Engine Lathe
Journal
Lab 3: Turn #3
Engine Lathe
Journal
Drill bit
Tap Set
Countersink
Reamer

1207: Milling

Lab 1: Mill #1
Vertical Milling Machine
Blank
Lab 2: Mill #2
Vertical Milling Machine
Blank
Lab 3: Mill #3
Vertical Milling Machine
Blank
Drill bits
Tap Set
Countersink
Reamer

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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

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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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: AMTEC Mechatronics
Title of Course: Machine Tool Operations
Subject Matter Expert (SME) Reviewer Information **Name: Robert C. Hess** **Title: Senior Instructional Designer** **Phone: 586-322-1033** **Email: bob.hess@mhtechnologies.net** **Organization/Affiliation: MTEC Warren**
Attach Resume or provide credentials (showing years of experience and work experience that is relevant to course content):
Synopsis of Findings: **Overall, the new format looks great. The biggest issue is the references between where parts are created in one lab, and where they are to be used in following labs. I suggest someone verify the cross reference between the labs where parts are created and where they are going to be used for future labs. There are discrepancies between what is saved, and where it is to be used. Ideally, there would be a reference on the originating lab to what module/lab it is to be used. Also the same in the referenced lab for the previously created part.** **Something like this:** **1203 – Lab 1, Save for 1204 – Lab X, Y and Z. – This on originating lab** **1204 – Lab X - Part created in 1204, Lab 1 – This reference would be on the reference, or current lab.** **This will alleviate any questions about what part from what lab is to be used.**

Reviewers Signature Robert C. Hess Date: 8/14/2017

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		
Comments or recommendations:			

Michigan Coalition for Advanced Manufacturing
Subject Matter Expert Course Review

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