

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: Basic Electrical

Course Description:

Introduces various elements of basic electricity such as the identification of electrical symbols as well as interpretation of schematics, cross referencing prints, tracing circuits, interpreting charts.

Explains different electrical measurement instruments with safe measuring techniques emphasized. Various circuits as well as combinational and sequential ladder logic designs are examined.

Delivery method is hybrid, open entry/open exit.

Date Created: June, 2016

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

Faculty Developer(s)/Instructional Designers(s): Fred Ford, 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:

Introduces various elements of basic electricity such as the identification of electrical symbols as well as interpretation of schematics, cross referencing prints, tracing circuits, interpreting charts.

Explains different electrical measurement instruments with safe measuring techniques emphasized. Various circuits as well as combinational and sequential ladder logic designs are examined.

TOTAL TIME REQUIREMENT for the course is approximately 64 hours.

PREREQUISITES: Reading Level 4. Math Level 5. All Introduction to Mechatronics Block 1 courses (Safety, Computer Literacy, Print Reading, Machine Tool Operations, Welding) or equivalent.

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

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

- Describe the importance of observing electric safety.
- Identify electrical symbols.
- Explain the characteristics of insulators and conductors.
- Explain the process of current flow.
- List the requirements of an electrical circuit.
- Interpret the resistor color code.
- Explain how to connect various types of switches and pushbuttons for various types of applications.
- Operate a clamp-on current meter, describe what it is used for and the theory of its operations.
- List the four major control sections of the oscilloscope.
- Explain the purpose of triggering, and the function of the following trigger controls: scope, level, auto, normal.
- Given the waveform of two sine waves displayed on a scope, determine the phase difference between them in degrees, and identify which one leads or lags the other one.
- List the various names used for industrial control circuits that show its layout of components and wiring configurations.
- Identify the four fundamental elements of a ladder control circuit and describe the function of each one.
- Describe the properties of conductors, semiconductors, and insulators.
- Describe how to forward and reverse bias semiconductor diodes, and what the applied voltages that are required at the anode and cathode for each of these conditions.
- Describe the operation of a light emitting diode, what is the purpose of its current limiting resistor, and how the LED should be connected in a circuit.
- For each section of a DC power supply, draw the waveforms of the input and outputs at each one.
- List the advantages of fiber optic cable.
- Explain the behavior of laser light.

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107 Basic Electrical consists of four modules:

1071 - Introduction to Basic Electricity (9 lessons to read on your own, 22 labs to do at LCC with an instructor, 22 total hours)

This module introduces the student to the various elements of basic electricity including the identification of electrical symbols as well as interpretation of schematics, cross referencing prints, tracing circuits, interpreting sequential function charts, line drawings and time charts.

1072 - Instruments (1 lesson, 6 labs, 6 total hours)

An introduction to electrical measurement instruments. Main devices introduced include digital and analog multimeters, clamp-on ammeters, meggers, and the oscilloscope. Hands-on Lab time is spent with each device type. Safe measuring techniques are emphasized. Additional devices covered are the pressure gauge, chart recorders, heat sensor and chain stretch monitor.

1073 - Components and Circuits (3 lessons, 6 labs, 22 total hours)

This module concentrates on control logic components and circuit function. Combinational and sequential ladder logic design are thoroughly examined with great attention to reliability of function. Various circuits are constructed that demonstrate key component functionality concepts. Troubleshooting is practiced with analytical techniques utilizing multimeters, chart recorders, and oscilloscopes.

1074 - Solid State Devices (4 lessons, 9 labs, 14 total hours)

An introduction to solid state devices and applications. Covers semiconductor theory and operational characteristics of devices such as the diode, bipolar junction transistor (BJT) and field effect transistor (FET). The basic DC power supply is examined in the lab. Concepts such as polarity, biasing, rectification and amplification are also addressed. Commonly used automotive manufacturing equipment serve as examples of solid state device application. Discussed are the camera-type vision system, barcode reader and laser etcher.

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 1071, 1072, 1073, 1074 to access the lessons 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

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:

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

Degree Program Name:

Title of Course:

Subject Matter Expert (SME) Reviewer Information

Name:

Title:

Phone:

Email:

Organization/Affiliation:

Attach Resume or provide credentials (showing years of experience and work experience that is relevant to course content):

Synopsis of Findings:

Fredric Ford

Date: _____

**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.			
Prerequisites and/or any required competencies are clearly stated.			
Learning objectives are specific and well-defined.			
Learning objectives describe outcomes that are measurable.			
Outcomes align to occupational focus (industry skills and standards).			
Comments or recommendations:			
2. Material and Resources	Exceptional	Satisfactory	Ineffective
The instructional materials contribute to the achievement of the course learning objectives.			
The materials and resources meet/reflect current industry practices and standards.			
The instructional materials provide options for a variety of learning styles.			
Resources and materials are cited appropriately. If applicable, license information is provided.			
Comments or recommendations:			
3. Learning Activities	Exceptional	Satisfactory	Ineffective
Provide opportunities for interaction and active learning.			
Help understand fundamental concepts, and build skills useful outside of the learning object.			
Activities are linked to current industry practices and standards.			
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.			
Measure stated learning objectives and link to industry standards.			
Align with course activities and resources.			
Include specific criteria for evaluation of student work and participation.			
Comments and recommendations:			
5. Equipment/Technology	Exceptional	Satisfactory	Ineffective
Meets industry standards and needs.			
Supports the course learning objectives.			
Provides students with easy access to the technologies required in the course/module.			
Comments and recommendations:			

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Michigan Coalition for Advanced Manufacturing Subject Matter Expert Course Review

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FREDRIC H FORD

6455 Pleasant River Dr., Dimondale, Michigan 48821 ♦ H: 517-488-7341 ♦ coachford@sbcglobal.net

PROFESSIONAL SUMMARY

A manufacturing professional with an extensive, broad-base background of diversified responsibilities and accomplishments in automotive industries. Well established knowledge in business operation areas including information systems, facilities management, production operations and public relations. Excellent team builder with strong employee development skills. Reputation of getting tasks completed with high quality results.

SKILLS

- Strong collaborator
- Technological instruction
- Positive learning environment
- Creative questioning
- Critical thinking
- Student motivation
- Interpersonal skills
- Outstanding social skills
- Positive reinforcement
- Effective time management
- Creative learning strategies
- Classroom discipline

INTERESTS

License, Master Electrician, State of Michigan License, Electrical Contractor, State of Michigan MEMBERSHIPS / AFFILIATIONS / AWARDS Holt/South Lansing Rotary (Past President Elect) Holt Board of Education, Treasure, (Past), Friendship House of Prayer Baptist Church, Deacon

WORK HISTORY

Career Liaison Region 7, 10/2013 to 11/2015

Lansing Community College

- Career Liaison Region 7 Support ways to connect employers, educators and students together.
- I utilize industry data from both state and local resources, collaborating with nonprofit, Michigan Works.
- The Career Liaison is to better inform the students\ Parents / Guardians and Educators about jobs and training.
- The liaison role is to increase enrollment in high demand training programs and reduce the skills gap in Michigan.
- Prior Learning Assessment (PLA Coach) Define the Prior Learning Assessment process and how it works.
- Identify educational goals for the assessment of credit.
- Explore methods to organize your learning.
- Develop a learning portfolio.
- Compile supporting documents.
- Developed program to work with students and increase interest in higher learning.
- Consistently received positive teacher evaluations from students.

01/2004 to 01/2009

GENERAL MOTORS – Lansing, Michigan

Material Shift Leader, 01/2004 to 01/2009

Lansing Delta Township

- Manufacturing professional with extensive years of experience ranging from basic engineering, material short lead time, and total program management at the department head level.
- Managed a material staff with over three hundred hourly and 32 salaried employees. Responsible for supply chain management of four (4) manufacturing facilities.
- Commodities included steel, steel stamping, mechanical assemblies, capital equipment and vehicle parts from beginning of build to end of build and shipping.

- Interviewed and successfully hired over 300 salary personnel for the launch team for start up of new plants.
- Averaged 25% cost reduction over a five year period, primarily through efficiency gains.
- Reduced lead time by implementing in house sequencing cost savings of \$2.3 million.
- Saved \$1.8 million in one year by converting nine receiving docks to dolly prep.
- Area of safety credited for no lost work days in five years.

Superintendent Manufacturing Engineering, 01/2002 to 01/2004

- Responsible for manufacturing equipment and the reliability and quality of all parts.
- Reduced plant downtime by developing a manual back up plan through the continuous improvement process.

Production Superintendent of Body, 01/1997 to 01/2002

- Set and monitored budget and business plan goals.
- Supported Global Manufacturing System principles by increasing diversity awareness within the shop.
- Reduced structural cost; reinforced core values, customer enthusiasm, continuous improvement, and efficiency gains.
- Received accolades and recognition for superior management skills in leading productivity and quality, averaging over 60 jobs built per hour in each department which also set quality standards for others.

Maintenance Coordinator, 01/1993 to 01/1997

Lansing Car Assembly

- Supervised maintenance and environmental salaried employees.
- Reviewed breakdowns and engaged in problem solving and decision making.
- Interviewed prospective supervisors and evaluated current supervisor productivity, absenteeism budget monitoring and cost control.
- In plant facilitator Quality Network Maintenance and Production Maintenance Partnership.

Lansing Car Assembly Maintenance Supervisor, 01/1980 to 01/1992

- Scheduled mechanical and electrical repairs, installations and directed.
- Millwrights, pipefitters and electricians.
- Elected by my superiors to change the culture of the maintenance department from working out central maintenance to area maintenance.

EDUCATION

BA:

Northwood University - Midland, Michigan

AS:

Lansing Community College - Lansing, Michigan

Journeyman Electrician: Electrical Apprenticeship, 1977

I.B.E.W. Lansing Community College -

Electrical Apprenticeship

ADDITIONAL INFORMATION

- License, Master Electrician, State of Michigan License, Electrical Contractor, State of Michigan
- MEMBERSHIPS / AFFILIATIONS / AWARDS** Holt/South Lansing Rotary (Past President Elect) Holt Board of Education, Treasure, (Past) Friendship House of Prayer Baptist Church, Deacon Phi Beta Sigma Fraternity, Inc., Epsilon Tau Sigma Chapter, Lansing, Michigan GM President Award, Holt Sports Hall of Fame Competitive Manufacturing 2000 Effective Small Team Implementation Award