

Grand Rapids Community College

Course Cover Sheet



M-CAM Training Area:

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

Program(s): Electrical Controls/Mechatronics Certificate

Course: EL 150

Course Description: Electrical Schematics, Electrical Standards, and Codes. 4-credit, 4-contact hour course

Date Created: 2014

Faculty Developer(s)/Instructional Designers(s): Roger Kelley, John Larson

Employer/Industry Partner: The Right Place, Talent 2025, Kellogg's, Roscam, JR Automation, Kent ISD

College Contact: David Lovell

Phone: 616-234-3168

Email: davidlovell@grcc.edu

Additional Information/Comments:

The Mechatronics one-year certification was developed as a result of 1) The Right Place (GRCC's economic developer) who identified need for this training program to attract advanced Manufacturers to the West Michigan area, 2) Data from Talent 2025 identifying a growing need for Industrial Maintenance employees, and 3) a collaboration with Kent Intermediate School District who was also developing a Mechatronics program from local 11th and 12th graders and wanted to develop a transfer pathway. Employer involved with developing the program were members of the Mechatronics advisory board, including Kellogg's, Roscam Baking, and JR Automation.

This workforce solution was funded by a grant awarded by the U.S. Department of Labor's Employment and Training Administration. The solution was created by the grantee and does not necessarily reflect the official position of the U.S. Department of Labor. The Department of Labor makes no guarantees, warranties, or assurances of any kind, express or implied, with respect to such information, including any information on linked sites and including, but not limited to, accuracy of the information or its completeness, timeliness, usefulness, adequacy, continued availability, or ownership.

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EL 150 - Electrical Schematics, Electrical Standards and Codes

(4/4)

Schematic print reading and comprehending Electrical Standards and Codes are essential for working safely on and understanding electrical systems. This course will review the different types of electrical prints concentrating on Electrical Schematics (Ladder Diagrams). EL 150 will also review the NFPA 79-Electrical Standard for Industrial Machinery, familiarize students in the NFPA 70-National Electrical Code (NEC), and explain the NFPA 70E-Standard for Electrical Safety in the Workplace. Upon passing a written exam, students will be issued a Training Certificate for completing the NFPA 70E Standard part of this course. As well, this course will also cover some other nationally recognized electrical safety standards as required by OSHA.

Recommended: Successful completion of EL 162 is recommended before taking this course.

Recommended Skills: EL 162, High School Technical Reading and Math Skills

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EL 150 – Electrical Schematics, Electrical Standards and Codes

Course Syllabus

W17

General Information

EL 150 Course Description:

Schematic print reading and comprehending Electrical Standards and Codes are essential for working safely on and understanding electrical systems. This course will review the different types of electrical prints concentrating on Electrical Schematics (Ladder Diagrams). EL 150 will also review the NFPA 79-Electrical Standard for Industrial Machinery, familiarize students in the NFPA 70-National Electrical Code (NEC), and explain the NFPA 70E-Standard for Electrical Safety in the Workplace. Upon passing a written exam, students will be issued a Training Certificate for completing the NFPA 70E Standard part of this course. As well, this course will also cover some other nationally recognized electrical safety standards as required by OSHA.

Credits: 4 **Contacts:** 4

Class meets: 5:30 PM – 9:30 PM Tuesday 1/10/2017-4/18/2017 Winter 2017
Last day to drop is 3/24/2017 (W grade)
Room #304 ATC

This course is a four hours lecture format that will include student engagement each week. We are going to cover a lot of material. You will need to have a plan be able to study between six and eight hours every week outside the classroom.

Instructional Strategies:

Lecture: 40-60%
Group Discussion: 10-15%
Worksheets and Activities: 15-25%
Assessments: 10-15%

Instructor Contact Information:

Mr. Roger Kelley – Assistant Professor
Applied Technology
Electrical/Electronics

rkelly@grcc.edu (Best way to communicate.)

Locations: Office Downtown GRCC ATC Building Room 314
Office at Holland MTEC Lab 201

Office Hours: Holland MTEC 5:00-6:00 PM Thursdays
ATC Downtown- 5:00-6:00 PM Monday & Wednesdays
4:30-5:30 PM & 9:30-10:30 Tuesdays

(Always best to make an appointment for office hours.)

Prerequisites: None

Highly Recommended before this course:

EL 132 OR TE 103 (or equivalent math courses) AND EL 162
Technical Reading and Math skills needs to be at a post High school level.

Student Learning Outcomes:

- Interpret Electrical Schematics
- Develop a technique for looking up NEC issues.
- Use NFPA 70E and NPFA 79 to be able to select standard and safe work practice and prevent from getting hurt with electrical circuits.
- Specify required Personal Protection Equipment for an electrical application.
- Predict possible Electrical Hazards and avoid them

Materials Required:

- **National Electrical Code (2014) Edition: N/A**
Author: Natl. Fire Protect Assn.
ISBN: 978-145590672-7
Copyright Year: 2014
- Technical Calculator
- Normal classroom materials including some graph paper
Other reference books will be supplied

Section policy

Attendance:

Regular attendance and participation in class is essential. While I recognize that circumstances sometimes prevent students from attending, the college administration sees absenteeism as a very serious matter. The College makes no distinction between "excused" and "unexcused" absences and neither do I. If students are not present in a class in which they are enrolled they are simply absent, regardless of the reason. Points will be deducted for every lecture not attended. Coming late or leaving early will also result in points being deducted from your total. "Attend" means that you are present in the physical classroom during the scheduled time. A phone call, e-mail, office visit, access to Blackboard, assignment submission, or any other attempt to contact or communicate shall not be considered attendance (although communication with me is appreciated).

For every Class missed twenty points will be deducted from your total regardless of the reason. For arriving late, or leaving early there will be ten points deducted from your total.

Assessments:

Approximately 1000 points possible. Final grade will be done by running percent.
Approximate backdown listed below:

Topic tests	375	37.5%	(3@125 points EACH)
Written Prints Homework	160	16. %	
Other Homework	100	10. %	
Blackboard Codes Homework	195	19.5. %	(13@15 points EACH)
*Engagement	170	17. %	
**Total	1000	100%	

*Engagement will include Activities, Quizzes, worksheets, or Exercises

**Lack of on-time Attendance or coming late will reduce your points

Extra Credit

You should plan on there being NO extra-credit during this course.

Grades:

All grades will be posted on blackboard and will be current within one week.

Grades will not be changed two weeks after they are posted.

Partial and selective grading will be used. Questions missed will be subtracted from a "set" number not the total number of questions.

Blackboard:

This class uses Blackboard® (<http://bb.grcc.edu>). You will need to use Blackboard to access assignments, course materials, and to check your grades.

See Blackboard for an orientation if needed.

Grading Scale:

A =	100-93%
A- =	92.9-90%
B+ =	89.9-88%
B =	87.9-82%
B- =	81.9-80%
C+ =	79.9-78%
C =	77.9-72%
C- =	71.9-70%
D+ =	69.9-68%
D =	67.9-62%
D- =	61.9-60%
E =	59.9 -0%

Course Outline:

Electrical Schematic print reading:

- Motor Controls symbols and terms
- Power and control circuits
- Motor Starters (3 phase, F/R, overloads)
- Multiple motors and sequencing
- Motor connections and Controllers

NFPA 70-National Electrical Code (NEC):

- Articles and Overview
- Article 1 General Requirements
- Article 2 Wiring and Protection
- Article 3 Wiring Methods and Materials
- Article 4 Equipment for General Use

NFPA 70E-Standard for Electrical Safety in the Workplace:

- Standards verses Codes
- Electrical Hazards
- Labels and Bounties
- PPE
- Documentation

NFPA 79-Electrical Standard for Industrial Machinery:

- Chapters and Overview
- Electrical Protection and Grounding
- Control devices and Equipment
- Wiring Protection and lighting
- Motors and Controllers

Expectations/Disabilities:

I have an expectation that you will work hard and engage in learning. If there is any reason you feel you cannot earn an "A" in this course, such as physical or learning disabilities, please email or see me in person during the first week of class (see Disability Support Services on next page).

Homework:

Some homework is required to be done on Blackboard. Blackboard Homework is due by 10:00 PM on Monday before the next class. Late blackboard homework will NOT be graded. Other homework (non-blackboard) will be due as announced and late points will be deducted the same as listed below.

Engagement:

Activities may include some on-line research, reports, special/extra homework. Activities are due the day announced in class. Activities that are late will have points reduced. If they are turned in after the start time of the due date until one class day beyond the due date 25 % off of possible. Two class days your grade will be reduced by 50%. Any later zero points will be given. Quizzes are normally unannounced and will be on lecture, homework, textbook, or lab material. There will be NO make-up quizzes.

Topic Tests:

Topic tests will cover any material including textbook, reference books, lecture, or handed out material. Topic Tests will be limited to 90 minutes if done in class. Topic Tests must be made-up prior to the next class session. Contact me to arrange a time and place. No topic test will be given after the next class meeting. A ten page essay maybe used as a replacement for an topic test make-up as I determine.

Final Tests:

There is NO Final test for this course.

Classroom:

Any storage devices including graphing calculators and cell phones will NOT be allowed for tests or quizzes. The use of cell phones, etc. continues to be a problem in the classroom. Their use in a classroom environment demonstrates a lack of respect for both the instructor and the rest of the class. In order not to disturb the classroom environment, please turn them off and put them away. If the occasion arises and you need to utilize such devices due to a personal situation, please leave the room. No audio or video electronic devices are to be used during class. Covered drinks will be allowed however no food in the Classroom. The classroom door will be closed during class. If you are late and need in please wait by the door until it is opened for you.

College Policies**GRCC Email and Course Communications**

You are responsible for all communications sent via Blackboard and to your GRCC email account. You are required to use your GRCC provided email account for all email communications at the College. You may access your GRCC student email account through Student Email (<http://email.grcc.edu>) and your Blackboard account through Blackboard (<http://bb.grcc.edu>).

Disability Support Services

If you need an accommodation for a disability, contact Disability Support Services (www.grcc.edu/dss) in Room 368 of the Student Center or at (616) 234-4140 to discuss disability documentation and how to register. You will be assigned a DSS counselor/advisor who will create an Accommodations Agreement that you will present to me and we will work together to provide you the appropriate accommodations. If you believe that you have a disability but do not have documentation, contact DSS to discuss options.

Student Code of Conduct

You are held accountable to the Student Code of Conduct (www.grcc.edu/studentconduct/studentcodeofconduct), which outlines expectations pertaining to academic honesty (including cheating and plagiarism), classroom conduct, and general conduct.

Title IX Reporting Policy

If you or another student are the victim of any form of sexual misconduct (including dating/domestic violence, stalking, sexual harassment), or any form of gender discrimination, GRCC can assist you. You can report a violation of our sexual misconduct policy (www.grcc.edu/sexualmisconduct) directly to our Title IX Coordinator at (616) 234-3169. You may also report the issue to a faculty member, who is required to notify the Coordinator, or you may make an appointment to speak confidentially to our Counseling and Career Center by calling (616) 234-3900.

Campus Police/Emergency Resources

You may review emergency services and resources at the GRCC Campus Police website (www.grcc.edu/campuspolice). Campus Police can be reached using the 'Code 2' button on any campus phone or by dialing x4911 on campus or (616) 234-4911 off campus. Dial 911 for off campus emergencies.

Changes to the Syllabus

I reserve the right to change the contents of this syllabus due to unforeseen circumstances. You will be given notice of relevant changes in class, through a Blackboard Announcement, or through GRCC e-mail. *See Blackboard for latest revision.*



Subject Matter Expert (SME) Course Review Summary

College: Grand Rapids Community College

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

Degree Program Name: Electrical Controls/Mechatronics Certificate

Title of Course: ELISO, Electrical Schematics, Electrical Standards, and Codes

Subject Matter Expert (SME) Reviewer Information

Name: Ben Smith, Kirk Papis

Title: Controls Tech manager & Talent Recruiter

Phone: (616) 337-9747

Email: BSmith@jrouto.com; kpapis@jrouto.com

Organization/Affiliation: JR Automation

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

Synopsis of Findings:

no issues with curriculum.
less lecture, more activities. Employers will expect them to learn hands-on. I understand that the course covers standards, maybe it's a good balance.

Reviewers Signature

Date: 3/13/17



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: <i>Looks good</i>			
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: <i>Schematic creation by need</i>			

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: <i>See synopsis: comments</i>			
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:			

This workforce solution was funded by a grant awarded by the U.S. Department of Labor's Employment and Training Administration. The solution was created by the grantee and does not necessarily reflect the official position of the U.S. Department of Labor. The Department of Labor makes no guarantees, warranties, or assurances of any kind, express or implied, with respect to such information, including any information on linked sites and including, but not limited to, accuracy of the information or its completeness, timeliness, usefulness, adequacy, continued availability, or ownership.

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2nd

Kate Puisis

Talent Acquisition Recruiter at JR Automation

JR Automation • Grand Valley State University

Holland, Michigan • 500+ &

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Connect

I am an in-house Talent Acquisition Recruiter for JR Automation Technologies in Holland, MI, Stevensville, MI, and Pickens, SC. As JR continues to expand our automation expertise, multi-industry experience, and interna... See more

Highlights



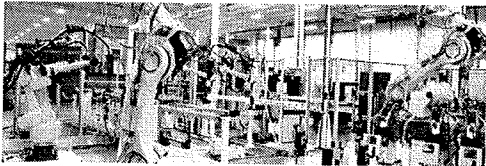
5 Mutual Connections

You and Kate both know Cindy Clark, Daniel Mac Naughton, MISA, and 3 others

Kate's Articles & Activity

1,948 followers

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Opportunities with a Growing Company!

Kate Puisis on LinkedIn
December 8, 2016



Meijer Leapfrogs Midwest Rivals In Rolling Out Home Delivery

Kate liked



This is a great organization in West Michigan.

Kate liked



Switch opens 'most advanced data campus' in former Steelcase pyramid

Kate liked

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Experience



Talent Acquisition Recruiter

JR Automation
Jan 2014 - Present • 3 yrs 3 mos • Holland, MI



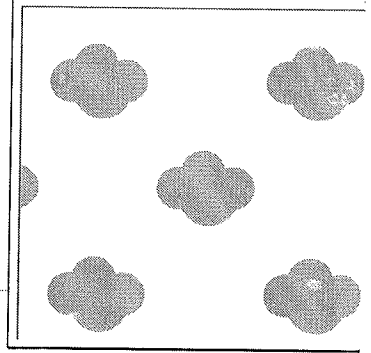
Technical Talent Acquisition and Marketing Specialist

Epoch Robotics
Jan 2014 - Dec 2016 • 3 yrs



Technical Writer

JR Automation
Apr 2012 - Jan 2014 • 1 yr 10 mos



Kate's Profile

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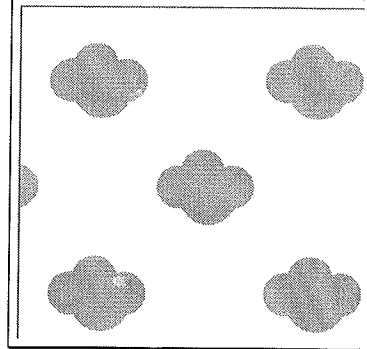
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Grand Valley State University

Bachelor of Arts (B.A.), Professional Writing & American Popular Culture
2009 - 2010

Michigan State University

Bachelor's Degree, Rhetoric and Composition/Writing Studies
2005 - 2008



Featured Skills & Endorsements

Technical Writing · 39



Endorsed by 16 of Kate's colleagues at JR Automation

Customer Service · 36



Endorsed by 13 of Kate's colleagues at JR Automation

Editing · 32



Endorsed by 13 of Kate's colleagues at JR Automation

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Accomplishments

4 Certifications
Recruiter

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English (English)

EL 150 Schedule Students Winter 2017

DATE	WEEK	TOPICS	Print Reading Black Book or Other homework	NEC Articles	1/1/2017 HW due date
1/10	1	Introduction to Print Reading NEC Introduction (types of prints)	Chapter 1 - Units 1 & 2	100 Dif. HW 1	1/16 1/17
1/17	2	NEC & Mechatronics NEC Power Point on BB Print Reading Symbols & Devices	(review slides 1-60) Chapter 1 - Unit 3 Chapter 2 - Unit 4	90-110 HW2	1/23 1/24 1/24 1/24
1/24	3	NEC NEC Power Point on BB Magnetic Controls	(review slides 61-118) Chapter 2 - Units 5 & 6	200-210 HW3	1/30 1/31 1/31
1/31	4	Mechatronics systems NEC Power Point on BB 3-wire Circuits & OCPDs	(review slides 119-139) Chapter 2 - Units 7 & 8	215-225 HW4	2/6 2/7 2/7
2/7	5	NEC NEC Power Point on BB NEC 310.15 Lights & Switches	(review slides 140-198) Worksheet Chapter 2 - Units 9 & 10	300-310 HW5 Homework PP	2/13 2/14 2/14 2/14
2/14	6	NEC 3 phase For/Rev NEC 310.15 worksheet Electricity can Kill - Bergwell The Shock Emergency	Chapter 3 - Units 11,12,13 & 14 Part 1 HW Part 2 HW	310-314 HW6	2/20 2/21 2/21 2/21 2/21
2/21	7	NEC Multi-motors & E-stop NEC Ampacity & fills worksheet The Importance of Grounding Emergency Response	Chapter 4 - Units 15&16 Part 3 HW Part 4 HW	220,230,240 HW7	2/27 2/28 2/28 2/28 2/28
2/28	8	NEC Disconnects, Protection NEC 250	Annex A - Units 17,18,19, 20 Worksheet	250 HW8	3/13 3/14 3/14
3/14	9	NEC Sizing Motor Circuits Practice NEC Test Motor, Motor Circuits	Worksheet 430 Homework Annex B	430 HW9	3/20 3/21 3/21 3/21
3/21	10	NFPA 79 Print Reading NEC Worksheet	NFPA 79 Written non BEHW 10 - NFPA 79 Print Reading TEST		3/28 3/28
3/28	11	NFPA 70E Introduction NFPA 79 Codes Trip Curves	NFPA 70E Assignment Assignment non-BB Homework	HW 12 70E HW 11 NFPA 79	4/3 4/4 4/4
4/4	12	NFPA 70E NEC TEST LOTO	Homework NEC TEST LOTO Worksheet	HW 13 70E	4/10 4/11 4/11
4/11	13	NFPA 70E NFPA 70E	Worksheet	HW 14 70E	4/17 4/18
4/18	14	NFPA 70E	NFPA 70E TEST Make up		