

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 164

**Course Description:** Programmable Logic Controllers | 2-credit, 3-contact hour course

**Date Created:**

**Faculty Developer(s)/Instructional Designers(s):** Roger Kelley

**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 11<sup>th</sup> and 12<sup>th</sup> 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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
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## EL 164 - Programmable Logic Controllers

(2/3)

Students learn the basic concepts of programmable logic controllers (PLCs). Understanding of hardware components, programming techniques, installation, and maintenance of complete systems. Some hands-on programming of PLCs is utilized. Three hours lecture/lab combination.

Recommended Skills: EL 162 , EL 132 Three hours lecture/lab combination.





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# EL 164 – Programmable Logic Controllers

## Course Syllabus

### General Information

#### EL 164 Course Description:

Students learn the basic concepts of programmable logic controllers (PLCs). They will receive an understanding of hardware components, programming techniques, installation, and maintenance of complete PLC systems. Hands-on programming and hardware of PLCs is emphasized.

**Credits:** 2

**Contacts:** 3

9:00 AM – 1:00 PM Wednesdays  
1/11/2017 – 3/29/2017 Winter 2017  
Last day to drop 3/5/2017

This course is a 4.0 hours lecture/lab combination that meets once a week for eleven weeks. We are going to cover a lot of material in eleven weeks. You will need to study four-five hours between each class meeting.

#### Instructor Contact Information:

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

[rkelley@gccc.edu](mailto:rkelley@gccc.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.)

#### Student Course Learning Outcomes:

- Understand the parts of a PLC System
- Discern Logic concepts
- Compare all LED lights and fully understand their indication
- Develop working PLC programs (software)
- Trouble Shoot PLC systems

### Materials Required:

- Programmable Logic Controllers, 5<sup>th</sup> Edition, 2016, Petruzella, Frank, D. McGraw Hill. ISBN # 9781259684739  
OR (either book is required)
- Programmable Logic Controllers, 4<sup>th</sup> Edition, 2011, Petruzella, Frank, D. McGraw Hill. ISBN # 9780073510880
- Technical Calculator  
(Cell phones will NOT be allowed during lectures, quizzes, or tests)
- Safety glasses are required when working on more than 50 volts

### Recommended Courses before this course:

There are no prerequisites for this course.

Completion of EL 106 & EL107 (or EL 144) is highly recommended before taking this course. Completion of MA 104 or EL 132, and EL 162 are also recommended. Technical Reading skills need to be at a college level.

### PLC Courses at GRCC:

This course EL 164 is a Prerequisite for EL 166 (Advance PLC's).  
You should earn at least 75% in EL 164 before taking EL 166.  
The same book is used for both EL 164 & EL 166.

## 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 or lab 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 or Lab 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. For every Lab missed zero points for the lab will be given (no Lab make-ups).*

### Assessments:

Labs & Lab Quizzes	250	25%	(10 x 10+15pts)
Unit tests	250	25%	(4 x 63pts)
Final Exam	100	10%	(100) (Unit 5 and Final)
Homework	250	25 %	(10 assignments for a total 250)
*Engagement	50	5%	(5 x 10pts)
Lab Final	100	10%	(100)
**Total	<u>1000</u>	<u>100%</u>	

\* Engagement will include Activities, Quizzes, or Exercises

\*\* Attendance will subject from total

**For Unit Objectives and Reading Assignments see the Unit Outline Sheets & Schedule on Blackboard. All homework will be done on Blackboard.**

**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.

**Blackboard:**

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

**Grading Scale:** (see College Handbook and Catalog)

A =	1000 - 930 points	100-93%
A- =	929 - 900 points	92-90%
B+ =	899 - 880 points	89-88%
B =	879 - 820 points	87-82%
B- =	819 - 800 points	81-80%
C+ =	799 - 780 points	79-78%
C =	779 - 720 points	77-72%
C- =	719 - 700 points	71-70%
D+ =	699 - 680 points	69-68%
D =	679 - 620 points	67-62%
D- =	619 - 600 points	61-60%
E =	599 - 000 points	59 -0%

**Course Outline:**

1. The parts and principles of operation of a programmable logic controller (PLC)
2. Applications of PLCs
3. Types and specifications of input/output (I/O) modules
4. The hardware functional parts of each input/output point.
5. The basic functions and truth tables for NOT, AND, and OR logic functions and be able to program each of them.
6. Program basic input and output functions of a ladder diagram
7. Relay ladder diagram and PLC ladder diagram
8. Counters in PLC's
9. Timers in PLC's
10. Control instructions in a PLC
11. Data manipulation instructions in a PLC
12. Troubleshoot a PLC system and locate a defective module
13. Safety procedures and Standards that need to use a PLC system
14. RS 5000 software and hardware

**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.

**Homework:**

Homework is required and will be done on Blackboard. Homework is due by 10:00 PM on Tuesday, the day before the next class. Late homework will NOT be graded.

**Engagement:**

Activities are normally done outside the classroom (at home). 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 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.

**Lab Reports:**

During the Lab session you will need to complete the required work in the Lab room and turn in a Lab report before you leave as required. Lab quizzes will be due at the start of the next class session or before you leave. Lab stations and partners will be assigned. There will be no make ups for Labs. If you miss a Lab you will receive zero points for that lab.

Late Lab quizzes will follow the same reductions as Activities.

**Unit Tests:**

Unit tests will cover any material in that unit including textbook, lecture, or Lab material.

Unit Tests must be made-up prior to the next class session. Contact me to arrange a time and place. No Unit test will be given after the next class meeting. A ten page essay maybe used as a replacement for an unit test make-up as I determine.

**Final Tests:**

Final Text test will cover any material in the course including textbook or Lab material it will be limited to 60 minutes and be closed book. The Final Lab test will require you to program and trouble shooting a PLC system by yourself. A limit of 60 minutes for the Lab Final program portion will be given.

**Classroom/Lab:**

Any storage devices including graphing calculators, phones, computers, etc. will NOT be allowed for tests or quizzes. The use of cell phones, pagers, 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 or lab time. Covered drinks will be allowed however no food in the Classroom or Lab. 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](http://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](http://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](http://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](http://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.

## EL64 Thursday PM Winter 2017 Class Schedule

Class	Unit	Lab	Text Chapter(s)	Topics	Homework	Homework Due Date	Test
1	Jan. 12	Thurs.	1	1	1	Jan. 18	
2	Jan. 19	Thurs.	2 & 4	2	2	Jan. 25	
3	Jan. 26	Thurs.	3 & 5	3	3	Feb. 1	Unit 1
4	Feb. 2	Thurs.	6	4	4	Feb. 8	
5	Feb. 9	Thurs.	7	5	5	Feb. 15	Unit 2
6	Feb. 16	Thurs.	8 & 9	6	6	Feb. 22	
7	Feb. 23	Thurs.	10 & 12	7	7	March 1	Unit 3
8	March 2	Thurs.	11	8	8	March 15	
off	March 9	Spring Break					
9	March 16	Thurs.	13 & 14	9	9	March 22	Unit 4
10	March 23	Thurs.	15	10	10	March 29	
11	March 30	Thurs.	Final	Review/Make-up & Final Exam			Final





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 Cert. Rate.

Title of Course: EL 164. Programmable Logic Controllers

Subject Matter Expert (SME) Reviewer Information

Name: Ben Smith, Kate Pursis

Title: Contras Tech manager, Talent Recruiter

Phone: 616 337 9797

Email: Bsmith@jrauto.com; kpursis@jrauto.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:

looks great!

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>No comments for improvement, looks very comprehensive for one course</i>			X	
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: <i>Assuming mostly hands-on / project based.</i>			X	
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>Good</i>			X	

**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>Looks like a tough course! Definitely aligned to industry standards.</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: <i>RSlog's steel is great. As long as students come out of these types of programs with Allen Bradley or Siemens, they will be much better off!</i>			

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



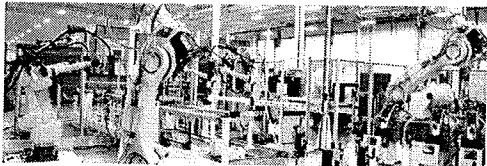
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You and Kate both know Cindy Clark, Daniel Mac Naughton, MISI, and 3 others

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1,948 followers

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Kate Puisis on LinkedIn  
December 8, 2016



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Kate liked



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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

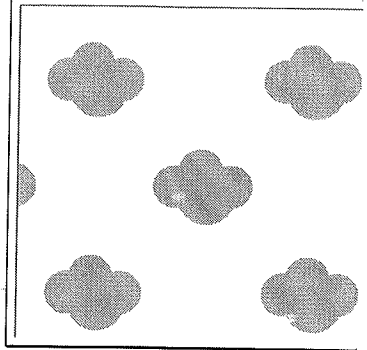
Jan 2014 – Dec 2016 • 3 yrs



#### Technical Writer

JR Automation

Apr 2012 – Jan 2014 • 1 yr 10 mos



Kate's Profile

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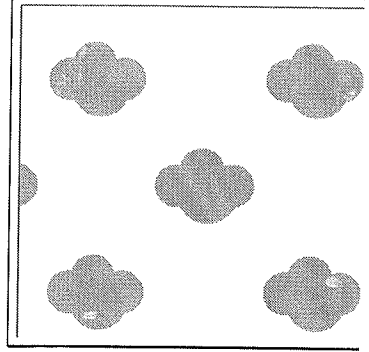
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### Grand Valley State University

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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Recruiter

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