

## **ECET 235: PLC Control 2**

### **Description**

Building on skills and knowledge gained in ECET 234, students will program, interface, and troubleshoot real-world processes using a PLC. Students will examine powerful PLC functions, including PID controller, sequencer, quadrature encoder high-speed inputs, and analog signals. LabVIEW software will be used to communicate directly with the PLC. Students are introduced to concepts of human machine and hardware protocols

### **Contact Information**

**Instructor:** Todd Rayson  
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**Pre-requisites:** C in ECET 234

**Co-requisites:** N/A

**Exclusions:** N/A

### **Course Type**

- *Face-to-face fixed-pace instruction generally on campus*
- *Lecture: 3 Hours per Week*
- *Lab: 2.5 Hours per Week*
- *Out of Class Work: 4 to 8 Hours per Week*

**Credits: 3.0**

### **Intended Learning Outcomes**

**Upon successful completion of this course, a student will be able to:**

- Write a complex program that interfaces between inputs and outputs while complying to local safety codes
- Document the operation of PLC controls including: description of operations, ladder diagrams, I/O list, external wiring, and illustrations of the process
- Determine the effects of the PLC control system on other systems
- Install, design and troubleshoot complex PLC control systems using instructions and hardware diagnostic techniques
- Program HMI interface for a PLC
- Select the appropriate communication buses to Control PLC I/O that are appropriate for the task

## GRADING SYSTEM

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- Letter Grades as per Camosun College Policies

## IMPORTANT NOTES

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### **Course completion requires:**

- **Lab attendance is mandatory**
  - Failure to attend labs will result in an F grade
- All Labs **MUST** be passed with a minimum of 50%
- *If you are **late** for the lab your mark will be reduced by **20%** for that lab*
- All course material must be handed in **before** the final project
- Late penalties of **50% and 5% per day** will be applied to late submission of any course material
- A lab grade of zero will not be awarded for missed labs without a valid reason for the absence and a doctor's note if sick
- Your final project must score  $\geq 60\%$
- **Please communicate with your instructor if you know you will be late or absent prior to the start of the class or lab**

## COURSE EVALUATION

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Assignments	15%
Labs	50%
Final Exam/Project	35%

## TEXT BOOKS AND REFERENCES

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- ◆ Text: D2L Documents
- ◆ D2L
- ◆ In Class Handouts
- ◆ Web Resources

### **Notes:**

- Lab grades will not be awarded for missed labs without a valid reason for absence and a doctor's note if sick

### **To Pass**

- You must achieve a **minimum of 60%** on your final project
- You must have an **average of 50%** in assignments and tests

### **Final Project**

- The final project/exam will be in week 14 during your lab time

## Lab Topics (Subject to Change)

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1. Studio 5000
  - a. Emulate
  - b. Logix Designer
  - c. Panel View Plus
2. RS Linx
3. Lab Station Hardware
  - a. Component Layout
  - b. PLC and IO Modules
4. Function Block
5. Structured Text
6. HMI Introduction with Ethernet Communication
7. HMI Design with System Status
8. AC Motor Control
9. Troubleshooting
10. Integrated Architecture Builder

## **Course Material:**

### **Studio 5000 Logix Designer**

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- Introduction
  - Software User Interface
- FactoryTalk
- Modules:
  - I/O
  - Graphics Terminal/HMI
  - Communications
  - Motor Controllers
- Logix Emulate/ Simulation Interface

### **Hardware**

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- CompactLogix Family
  - 5069-L310ERM
- PanelView 7 Graphic Terminal
- Router/Switch
- Contactors
- AC Drive
- Servo Drive
- Sensors

### **Design Procedure and Methodology**

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- Description
- I/O Table
- I/O Testing
- Block Diagrams
- Flow Charts
- Comments
- Test Plan
  - System Tests

### **HMI**

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- Graphics
- I/O
- Monitoring/Status
- Data
- Alarms

### **Communication**

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- Remote PC programming
- Ethernet IP

### **Sensors**

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- Sensor Types
- Interfaces

### **Data Logging**

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- Local
- Remote PC

### **Fault Conditions and Troubleshooting**

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- Recording

## Grading System

Standard Grading System (GPA)

Competency Based Grading System

## Recommended Materials or Services to Assist Students to Succeed Throughout the Course

### LEARNING SUPPORT AND SERVICES FOR STUDENTS

There are a variety of services available for students to assist them throughout their learning. This information is available in the College Calendar, Student Services or the College web site at <http://www.camosun.bc.ca>

### STUDENT CONDUCT POLICY

There is a Student Conduct Policy. It is the student's responsibility to become familiar with the content of this policy. The policy is available in each School Administration Office, Registration, and on the College web site in the Policy Section.

<http://www.camosun.bc.ca/policies/policies.html>

## A. GRADING SYSTEMS [HTTP://WWW.CAMOSUN.BC.CA/POLICIES/POLICIES.PHP](http://www.camosun.bc.ca/policies/policies.php)

THE FOLLOWING TWO GRADING SYSTEMS ARE USED AT CAMOSUN COLLEGE:

### 1. STANDARD GRADING SYSTEM (GPA)

PERCENTAGE	GRADE	DESCRIPTION	GRADE POINT EQUIVALENCY
90-100	A+		9
85-89	A		8
80-84	A-		7
77-79	B+		6
73-76	B		5
70-72	B-		4
65-69	C+		3
60-64	C		2
50-59	D		1
0-49	F	Minimum level has not been achieved.	0

### 2. Competency Based Grading System (Non GPA)

This grading system is based on satisfactory acquisition of defined skills or successful completion of the course learning outcomes

GRADE	DESCRIPTION
COM	The student has met the goals, criteria, or competencies established for this course, practicum or field placement.
DST	The student has met and exceeded, above and beyond expectation, the goals, criteria, or competencies established for this course, practicum or field placement.
NC	The student has not met the goals, criteria or competencies established for this course, practicum or field placement.

## B. Temporary Grades

Temporary grades are assigned for specific circumstances and will convert to a final grade according to the grading scheme being used in the course. See Grading Policy at <http://www.camosun.bc.ca/policies/E-1.5.pdf> for information on conversion to final grades, and for additional information on student record and transcript notations.

TEMPORARY GRADE	DESCRIPTION
I	<i>Incomplete:</i> A temporary grade assigned when the requirements of a course have not yet been completed due to hardship or extenuating circumstances, such as illness or death in the family.
IP	<i>In progress:</i> A temporary grade assigned for courses that are designed to have an anticipated enrollment that extends beyond one term. No more than two IP grades will be assigned for the same course.
CW	<i>Compulsory Withdrawal:</i> A temporary grade assigned by a Dean when an instructor, after documenting the prescriptive strategies applied and consulting with peers, deems that a student is unsafe to self or others and must be removed from the lab, practicum, worksite, or field placement.

## **STUDENT RESPONSIBILITY**

Enrolment at Camosun assumes that the student will become a responsible member of the College community. As such, each student will display a positive work ethic, assist in the preservation of College property, and assume responsibility for their education by researching academic requirements and policies; demonstrating courtesy and respect toward others; and respecting expectations concerning attendance, assignments, deadlines, and appointments.

## **SUPPORTS AND SERVICES FOR STUDENTS**

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Camosun College offers a number of services to help you succeed in and out of the classroom. For a detailed overview of the supports and services visit <http://camosun.ca/students/>.

Support Service	Website
Academic Advising	<a href="http://camosun.ca/advising">http://camosun.ca/advising</a>
Accessible Learning	<a href="http://camosun.ca/accessible-learning">http://camosun.ca/accessible-learning</a>
Counselling	<a href="http://camosun.ca/counselling">http://camosun.ca/counselling</a>
Career Services	<a href="http://camosun.ca/coop">http://camosun.ca/coop</a>
Financial Aid and Awards	<a href="http://camosun.ca/financialaid">http://camosun.ca/financialaid</a>
Help Centres (Math/English/Science)	<a href="http://camosun.ca/help-centres">http://camosun.ca/help-centres</a>
Indigenous Student Support	<a href="http://camosun.ca/indigenous">http://camosun.ca/indigenous</a>
International Student Support	<a href="http://camosun.ca/international/">http://camosun.ca/international/</a>
Learning Skills	<a href="http://camosun.ca/learningskills">http://camosun.ca/learningskills</a>
Library	<a href="http://camosun.ca/services/library/">http://camosun.ca/services/library/</a>
Office of Student Support	<a href="http://camosun.ca/oss">http://camosun.ca/oss</a>
Ombudsperson	<a href="http://camosun.ca/ombuds">http://camosun.ca/ombuds</a>
Registration	<a href="http://camosun.ca/registration">http://camosun.ca/registration</a>
Technology Support	<a href="http://camosun.ca/its">http://camosun.ca/its</a>
Writing Centre	<a href="http://camosun.ca/writing-centre">http://camosun.ca/writing-centre</a>

*If you have a mental health concern*, please contact Counselling to arrange an appointment as soon as possible. Counselling sessions are available at both campuses during business hours. If you need urgent support after-hours, please contact the Vancouver Island Crisis Line at 1-888-494-3888 or call 911.

## **COLLEGE-WIDE POLICIES, PROCEDURES, REQUIREMENTS, AND STANDARDS**

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### **Academic Accommodations for Students with Disabilities**

The College is committed to providing appropriate and reasonable academic accommodations to students with disabilities (i.e. physical, depression, learning, etc). If you have a disability, the [Centre for Accessible Learning](#) (CAL) can help you document your needs, and where disability-related barriers to access in your courses exist, create an accommodation plan. By making a plan through CAL, you can ensure you have the appropriate academic accommodations you need without disclosing your diagnosis or condition to course instructors. Please visit the CAL website for contacts and to learn how to get started: <http://camosun.ca/services/accessible-learning/>

### **Academic Integrity**

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.13.pdf> for policy regarding academic expectations and details for addressing and resolving matters of academic misconduct.

### **Academic Progress**

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.1.pdf> for further details on how Camosun College monitors students' academic progress and what steps can be taken if a student is at risk of not meeting the College's academic progress standards.

### **Course Withdrawals Policy**

Please visit <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.2.pdf> for further details about course withdrawals. For deadline for fees, course drop dates, and tuition refund, please visit <http://camosun.ca/learn/fees/#deadlines>.

### **Grading Policy**

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.5.pdf> for further details about grading.

### **Grade Review and Appeals**

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf> for policy relating to requests for review and appeal of grades.

### **Mandatory Attendance for First Class Meeting of Each Course**

Camosun College requires mandatory attendance for the first class meeting of each course. If you do not attend, and do not provide your instructor with a reasonable reason in advance, you will be removed from the course and the space offered to the next waitlisted student. For more information, please see the "Attendance" section under "Registration Policies and Procedures" (<http://camosun.ca/learn/calendar/current/procedures.html>) and the Grading Policy at <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.5.pdf>.

### **Medical / Compassionate Withdrawals**

Students who are incapacitated and unable to complete or succeed in their studies by virtue of serious and demonstrated exceptional circumstances may be eligible for a medical/compassionate withdrawal. Please visit <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.8.pdf> to learn more about the process involved in a medical/compassionate withdrawal.



### **Sexual Violence and Misconduct**

Camosun is committed to creating a campus culture of safety, respect, and consent. Camosun's Office of Student Support is responsible for offering support to students impacted by sexual violence. Regardless of when or where the sexual violence or misconduct occurred, students can access support at Camosun. The Office of Student Support will make sure students have a safe and private place to talk and will help them understand what supports are available and their options for next steps. The Office of Student Support respects a student's right to choose what is right for them. For more information see Camosun's Sexualized Violence and Misconduct Policy: <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.9.pdf> and [camosun.ca/sexual-violence](http://camosun.ca/sexual-violence). To contact the Office of Student Support: [oss@camosun.ca](mailto:oss@camosun.ca) or by phone: 250-370-3046 or 250-3703841

### **Student Misconduct (Non-Academic)**

Camosun College is committed to building the academic competency of all students, seeks to empower students to become agents of their own learning, and promotes academic belonging for everyone. Camosun also expects that all students to conduct themselves in a manner that contributes to a positive, supportive, and safe learning environment. Please review Camosun College's Student Misconduct Policy at <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.5.pdf> to understand the College's expectations of academic integrity and student behavioural conduct.

**Changes to this Syllabus:** Every effort has been made to ensure that information in this syllabus is accurate at the time of publication. The College reserves the right to change courses if it becomes necessary so that course content remains relevant. In such cases, the instructor will give the students clear and timely notice of the changes.