COURSE SYLLABUS

COURSE TITLE: **MENG 181 – Mechanical Control Programming**

CLASS SECTION: X01-A,B,C

TERM: Fall 2023

COURSE CREDITS: 3

DELIVERY METHOD(S): Lecture, Labs

Camosun College campuses are located on the traditional territories of the Ləḱʷəŋən and W̱SÁNEĆ peoples. We acknowledge their welcome and graciousness to the students who seek knowledge here.
Learn more about Camosun's

The COVID-19 pandemic has presented many challenges, and Camosun College is committed to helping you safely complete your education. Following guidelines from the Provincial Health Officer, WorkSafe BC, and the B.C. Government to ensure the health and wellbeing of students and employees, Camosun College is providing you with every possible protection to keep you safe. Our measures include COVID Training for students and employees, health checks, infection control protocols including sanitization of spaces, PPE and ensuring physical distancing. For details on these precautions please follow this link: http://camosun.ca/covid19/faq/covid-faqs-students.html. However, if you're at all uncomfortable being on campus, please share your concerns with your instructor. If needed, alternatives will be discussed.

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 explanation in advance, you will be removed from the course and the space offered to the next waitlisted student.

INSTRUCTOR DETAILS

NAME: Benj Birch

EMAIL: birchb@camosun.bc.ca

OFFICE: Tech 111

HOURS: See D2L and by appointment

As your course instructor, I endeavour to provide an inclusive learning environment. However, if you experience barriers to learning in this course, do not hesitate to discuss them with me. Camosun College is committed to identifying and removing institutional and social barriers that prevent access and impede success.

CALENDAR DESCRIPTION

Using programming of microcontroller-based control systems, students will be introduced to the creation of automated control systems for electro-mechanical applications. Programmable logic controllers (PLCs) and stand-along microcontrollers will be programmed and used. Program design and programming language syntax will be detailed. Devices such as switches, potentiometers, lights, a variety of sensors, and R/C servo motors will be used. Flowcharts and other programming related topics will be covered.

PREREQUISITE(S):	None	
CO-REQUISITE(S):	None	
EQUIVALENCIES:	None	

COURSE LEARNING OUTCOMES / OBJECTIVES

Upon completion of this course, the student will be able to:
1. Identify and describe the various components of a control system and their functions.
2. Describe a variety of control modes and the systems in which they will be used.
3. Set up and use a PLC control system (using ladder logic).
4. Identify, select and use the most appropriate on/off (buttons, contacts, opto-interrupt) and position (optical encoder, acceleration, temperature, etc.) sensors for a control system.
5. Describe and create a control sequence using flowchart and other descriptive techniques.
6. Apply the features of a stand-alone microcontroller including: I/O (digital, analogue, etc.), communication protocols, memory, peripheral devices, etc.
7. Use a high-level computer programming language for control systems.
8. Assemble and program a working electronic circuit with a stand-alone microcontroller system at its core that can interact with the real world in real time.

REQUIRED MATERIALS & RECOMMENDED PREPARATION / INFORMATION

All labs and lectures will be supported online at *http://online.camosun.ca*. This course is fully supported by Desire-2-Learn. Laboratory kits should be purchased by week 3 of the course or earlier.

COURSE SCHEDULE, TOPICS, AND ASSOCIATED PREPARATION / ACTIVITY / EVALUATION

The following schedule and course components are subject to change with reasonable advance notice, as deemed appropriate by the instructor.

Week	Dates	Lectures	Assignments Due
1	September 4, 2023	Intro - PLC, timers	-
2	September 11, 2023	Ladder logic, truth tables	-
3	September 18, 2023	Arduino Intro	1
4	September 25, 2023	programming flow	2
5	October 2, 2023	Arrays	3
6	October 9, 2023	Numbering Systems	4
7	October 16, 2023	Flow charts	5
8	October 23, 2023	Electricity Introduction	6
9	October 30, 2023	Serial Communication In	7, Mini Project 1
10	November 6, 2023	Midterm	-
11	November 13, 2023	Debugging Photoresistor	-
12	November 20, 2023	Examples project Lock	8
13	November 27, 2023	Logic, Joystick example	Mini Project 2
14	December 4, 2023	Isolation-review	9
15	December 11, 2023	Final Exams	
16	December 18, 2023		

Week	Dates	Lab
1	September 4, 2023	introduction to PLCs
2	September 11, 2023	PLC Controlled Pneumatic Systems
3	September 18, 2023	PLC Control of Multiple Cylinders
4	September 25, 2023	Introduction to Arduino Uno
5	October 2, 2023	Basic Inputs and Outputs
6	October 9, 2023	LED Bar
7	October 16, 2023	Binary subroutine on the LED Bar
8	October 23, 2023	Mini Project 1 Intro
9	October 30, 2023	Mini Project 1 follow-up
10	November 6, 2023	Serial and Pot control of an RGB LED
11	November 13, 2023	Switch statement and Menu creation
12	November 20, 2023	Mini Project 2 intro
13	November 27, 2023	LED matrix
14	December 4, 2023	DC motors and Servos and joysticks, oh my!
15	December 11, 2023	Final Exams
16	December 18, 2023	

Students registered with the Centre for Accessible Learning (CAL) who complete quizzes, tests, and exams with academic accommodations have booking procedures and deadlines with CAL where advanced noticed is required. Deadlines scan be reviewed on the CAL exams page. http://camosun.ca/services/accessible-learning/exams.html

REQUIRED MATERIALS & RECOMMENDED PREPARATION / INFORMATION

Engineering Mechanics: Dynamics or *Engineering Mechanics: Statics and Dynamics*, R.C. Hibbeler. Any edition but more recent preferred.

EVALUATION OF LEARNING

DESCRIPTION		WEIGHTING
Labs		20%
Midterm		20%
Assignments		5%
Coding Assignments (mini projects)		25%
Final		30%
	TOTAL	100%

If you have a concern about a grade you have received for an evaluation, please come and see me as soon as possible. Refer to the Grade Review and Appeals policy for more information. http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf

COURSE GUIDELINES & EXPECTATIONS

Lecture Attendance

To get the most out of this course, students are expected to attend all classes and be on time. It is your responsibility to acquire all information given during class, including notes, hand-outs, exam dates etc.

Labs/Tutorials

Lab sessions will consist of Arduino and then late PLC labs. You will work in teams of two or one to complete the labs. For most labs there will be a component of the lab which must be completed prior to lab attendance to establish the basics of the week's lab material. Labs are to be handed in at the start of the next weeks lab.

Late labs will be accepted with a deduction of 50% up to the next weeks lab. No marks rewarded after the next midterm/final.

Assignments

Assignments will be due the following Friday after they are assigned. Late assignments will receive a reduction with no marks given if handed in after the next midterm/final.

Exam Procedures

You must pass the final to achieve a passing mark in the course. All exams must be written at the scheduled times with the exception of students requiring an accommodation by CAL. It is understood that emergency circumstances do occur (e.g. severe illness or family emergency); for such circumstances accommodation may be offered at the discretion of the instructor, provided the student:

a) notifies the instructor in advance of the exam (not after), and
b) provides documented evidence of the circumstance (e.g. medical certificate).

If an exam is missed with an excused absence, it is up to the instructor's discretion as to how the mark will be made up. In most cases, a new exam will be scheduled for the student as soon as possible.

Be sure not to make travel plans for the end of semester until the final exam schedules are finalized and posted. Please ask any family members who might make travel plans on your behalf to consult you before booking tickets.

All exams are closed book and notes. Cell phones will be required to be left at your desk during the exam if a washroom break is required.

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

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/.

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

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

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. To contact the Office of Student Support: 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.