

COURSE SYLLABUS



COURSE TITLE: MENG 181 – Mechanical Control Programming
CLASS SECTION: X01AB and X02AB
TERM: 2021F
COURSE CREDITS: 3
DELIVERY METHOD(S): Lectures and laboratories

Camosun College campuses are located on the traditional territories of the Lək̓ʷəŋən and W̱SÁNEĆ peoples. We acknowledge their welcome and graciousness to the students who seek knowledge here.
Learn more about Camosun's [Territorial Acknowledgement](#).

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: R. Derek C. Wakefield, P.Eng.
EMAIL: derekw@camosun.bc.ca
OFFICE: TEC111
TELEPHONE: 250-370-4505
HOURS: Monday 10:30 to 11:20 AM, Tuesdays from 11:30 AM to 12:20 PM, Wednesdays from 12:30 to 1:20 PM, Thursdays from 12:00 Noon to 12:50 PM and Fridays from 1:30 to 2:20 PM.

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-alone 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
EXCLUSION(S): 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 will be available in the labs at the beginning of the quarter. Other laboratory supplies will be available at the time of the lab. Students are encouraged to obtain supplies of their own to enable further experimentation with microcontrollers at home.

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.

Section X01A

Lectures: Monday, TEC174 from 8:30 to 9:20 AM
Tuesday, CBA101 from 9:30 to 11:20 AM
Laboratory: Thursday, TEC135 from 1:00 to 2:50 PM

Section X01B

Lectures: Monday, TEC174 from 8:30 to 9:20 AM
Tuesday, CBA101 from 9:30 to 11:20 AM
Laboratory: Wednesday, TEC135 from 8:30 to 10:20 AM

Section X02A

Lectures: Monday, TEC174 from 9:30 to 10:20 AM
Friday, TEC181 from 2:30 to 4:20 PM
Laboratory: Tuesday, TEC135 from 12:30 to 2:20 PM

Section X02B

Lectures: Monday, TEC174 from 9:30 to 10:20 AM
Friday, TEC181 from 2:30 to 4:20 PM
Laboratory: Wednesday, TEC135 from 10:30 AM to 12:20 PM

WEEK(S)	DATES	ACTIVITY or TOPIC	LABS
1 & 2	Sep 7 - 17	Introduction to the Arduino Uno Microcontroller Board Microcontroller Architecture I/O Pins and Registers Clocks and Resonators Packages and Ratings Memory	Lab #1 – Intro to the Arduino Uno Lab #2 – Numbering Systems
3 & 4	Sep 20 to Oct 1	Interfacing to Microcontrollers Inputs & Outputs Basic Electricity Resistors & Potentiometers Voltage Dividers Switches Pull-Up & Pull-Down Resistors LEDs	Lab #3 – Logic Elements Lab #4 - Transistors
5	X01 – Oct 5 X02 – Oct 8	Midterm #1 (1 Hour 50 Minutes)	
5 & 6	Oct 4 to 15	Preparing for Programming Flowchart Blocks & Signals Flowchart Applications Electronic Circuit Diagrams I/O Pin Tables Programming the Arduino Uno	Lab #5 – Speed Control of DC Motors Lab #6 – Analog-to-Digital Converters
7	Oct 18 to 22	Numbering Systems Decimal, Binary, Octal & Hexadecimal Conversion between Numbering Systems Binary Numbers – Addition & Subtraction	Lab #7 – Interrupts, Subroutines and For Loops
8 & 9	Oct 25 to Nov 5	Programming Languages C-Language, Assembler, Machine Code Arduino Uno Programming Language Program Flow Advanced Program Flow	Lab #8 – Pedestrian Cross Walk (2 weeks)
10	X01 – Nov 9 X02 – Nov 12	Midterm #2 (1 Hour 50 Minutes)	
10	Nov 8 to 12	Introduction to PLCs The Construction of PLCs Inputs (contacts) and Outputs (coils) Opto-Isolation and Electromagnetic Relays	Lab #9 – Introduction to PLCs
11	Nov 15 to 19	Introduction to Ladder Logic Event-Oriented vs Sequential Programming Ladder Logic Diagrams Intro to Ladder Logic Commands	Lab #10 – Simple PLC-Controlled Pneumatic System
12	Nov 22 to 26	Basic Ladder Logic Continued Additional Ladder Logic Commands	Lab #11 – Advanced PLC-Controlled Pneumatic Systems
13	Nov 29 to Dec 3	Advanced Ladder Logic Commands Examples of Advanced PLC Applications	Lab #12 – PLC Control of Multiple Cylinders
14	Dec 6 to 10	Summary of PLCs Preparation for the Final Exam	

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](#).

EVALUATION OF LEARNING

DESCRIPTION	WEIGHTING
Midterm Exam #1	20%
Midterm Exam #2	20%
Laboratories	30%
Final Exam	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 a class missed, including notes, hand-outs, changed exam dates etc.

Laboratory Attendance

Laboratory participation is essential to the course objectives, and largely involves application of the basic theories and procedures learned in the lectures. It is also an opportunity for students to ask questions and learn from myself and each other. The grade is assigned based on the weekly lab report, which will be shared with a lab partner for in-person learning or individually if the labs are delivered online.

Due Dates and Late Lab Reports

The due dates are established in accordance with the course and term duration. The purpose of the due dates is to help both you and I to get the assignments done so that they can be assessed in a timely manner. Just as you need time to complete the lab reports, I need enough time to grade them. As such, the due dates are fixed and it is expected that students will hand them in on time. Lab marks, comments, and feedback will be returned to students in a timely manner, usually within 1-2 weeks.

All lab reports must be handed in at the beginning of the following lab period.

Exam Procedures

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, an alternate 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.

Please note: the use of cell phones during a test or quiz is not allowed and may result in a zero for that assessment.

Study Habits

Good and regular study habits are essential to do well in this course. You should plan on a weekly minimum of 5 hours outside of scheduled class time for the completion of lab reports and for general studying. Joining a study group can help make this more achievable.

Please take advantage of office hours if you need extra clarification and help.

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.

DEPARTMENTAL INFORMATION

The Mechanical Engineering Technology program differs from traditional Mechanical Engineering because of the focus on relevant applied skills. The program includes an emphasis on Computer-Aided-Design and Computer-Aided-Manufacturing (CAD/CAM) technology, as well as an introduction to robotics and automation.

Students also have the option to include co-operative education or an internship.

Mechanical engineering is a growing industry, offering incredible opportunities for graduates. You'll be involved in the analysis, design, production, and maintenance of machinery and mechanical devices. Career opportunities are available in manufacturing, transportation, mining, communications, paper, construction, and also consulting.

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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 250-370-3841

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.