

COURSE SYLLABUS



COURSE TITLE: MECH 178 – Pneumatics & Hydraulics

CLASS SECTION: BX01

TERM: F 2023

COURSE CREDITS: 3

DELIVERY METHOD(S): Hybrid (Online for lectures and in person for labs)

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

INSTRUCTOR DETAILS

NAME: Sam Behfarshad, PhD, P.Eng

EMAIL: behfarshads@camosun.ca

OFFICE: TEC 264

HOURS: Wed: 10:30- 11:20am, Fri: 9.30-10:20am

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

This course provides the foundation for the application of hydraulic theory by MARTECH. Topics include pneumatic & hydraulic circuit design and analysis, Component selection and sizing, Multi- sequencing, System fault diagnosis and maintenance.

PREREQUISITE(S): MECH 176

CO-REQUISITE(S): -

EQUIVALENCIES: -

COURSE LEARNING OUTCOMES / OBJECTIVES

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

- Explain basic hydraulic and pneumatic principles
- Determine flow/pressure in series/parallel circuits
- Construction and operate advanced pump controls
- Describe safety with respect to hydraulic and pneumatic systems
- Explain hydrostatic transmission principles
- Describe electro-hydraulic components and systems
- Describe aspects of electro-hydraulic servo and proportional systems
- Perform electro-hydraulic circuit troubleshooting
- Design and build basic fluid power circuits using industry standard symbols for manual, pneumatic, and PLC controlled & electrically-operated pneumatic

- and hydraulic systems
- Solve problems for flow and pressure, relating to pneumatic and hydraulic systems.
 - Identify and describe components used in pneumatic and hydraulic systems
 - Select suitable fluids for power transmission and the correct type and size of conductors for pneumatic and hydraulic systems.
 - Select the correct pump or compressor (including receiver) and power source for pneumatic and hydraulic systems.
 - Specify linear or rotary actuators based on force or torque, speed, fluid volumetric flow rate and pressure requirements
 - Specify the operation and control of flow, pressure, and directional control valves for pneumatic and hydraulic systems
 - Identify and draw graphic symbols of various components of pneumatic and hydraulic systems

REQUIRED MATERIALS & RECOMMENDED PREPARATION / INFORMATION

No textbook is needed but the following books are helpful.

Fluid Power Technology, F. Don Norvelle, West Publishing Company

Also for Hydraulics part: **Industrial Hydraulics Manual: Your Comprehensive Guide to Industrial Hydraulics**, EATON Fluid Power Training Series, By: Eaton Corporation, 2015

This course is fully supported by D2L ©.

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	ACTIVITY or TOPIC	OTHER NOTES
1	Course Information. Fluid Mechanics Background Review	-
2	Fluid Mechanics Background Review (cont.), Survey Quiz.	Assignment 1
3	Hydraulic Fluids: Viscosity, Bulk Modulus, Fluid Analysis Hydraulic Pumps: Displacement, Efficiency, Types	Lab 1
4	Hydraulic Actuators Hydraulic Motors: Delivery, Efficiency, Types	Assignment 2
5	Hydraulic Actuators Hydraulic Cylinders: Extension Speeds and Forces, Regeneration	Lab 2
6	Hydraulic Ancillary Components: Connectors, Fittings, Seals, Reservoirs, Filters, Accumulators, Heaters, Coolers Hydraulic Valves 1: Terminology, Center Types	Assignment 3
7	Hydraulic Valves 2: Directional Control, Pressure Control, and Flow Control	Lab 3
8	Midterm Review and Midterm Exam	Assignment 4

WEEK	ACTIVITY or TOPIC	OTHER NOTES
9	Electro-hydraulics: Solenoid, Proportional, and Servo Valves	Lab 4
10	Pneumatic Systems: Gas Laws, Basic Pneumatic Components	Assignment 5
11	Pneumatic Systems (2): Basic Pneumatic Components (cont), Schematic Symbols	Lab 5
12	Pneumatic Systems (3): Basic Pneumatic Circuits, Pneumatic Logic, Valve Sizing, Flow Coefficients, Series and Parallel Valves, Air Line Friction Losses	Assignment 6
13	Pneumatic Systems (4): Air Line Friction Losses (cont), Introduction to PLCs, Servo Control and Solenoid Feedback	Lab 6
14	Final Review	-

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 notice is required. Deadlines can be reviewed on the [CAL exams page](https://camosun.ca/services/academic-supports/accessible-learning/academic-accommodations-exams). <https://camosun.ca/services/academic-supports/accessible-learning/academic-accommodations-exams>

EVALUATION OF LEARNING

DESCRIPTION	WEIGHTING
Assignments	15%
Labs	10%
Quizzes	10%
Midterm Exam	30%
Final Exam	35%
	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](https://camosun.ca/sites/default/files/2021-05/e-1.14.pdf) policy for more information. <https://camosun.ca/sites/default/files/2021-05/e-1.14.pdf>

COURSE GUIDELINES & EXPECTATIONS

Formal individual laboratory report is expected for each lab. The reports are due one week after the lab period. No late laboratory reports will be accepted. Lab work and Assignments are to be completed to the instructor's satisfaction prior to sitting for the final exam.

Assignments are to be handed in when due. No late assignments will be accepted. Assignments must be submitted during the lecture times of the due day to Instructor, or at other time specified by the instructor. Assignments must

be submitted in hard copies ONLY.

All tests (Quizzes, Midterm Exam and Final Exam) in this course will be closed-book tests.

The final exam must be successfully completed (mark $\geq 50\%$) for a passing grade in the course.

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 camosun.ca/services.

Support Service	Website
Academic Advising	camosun.ca/services/academic-supports/academic-advising
Accessible Learning	camosun.ca/services/academic-supports/accessible-learning
Counselling	camosun.ca/services/health-and-wellness/counselling-centre
Career Services	camosun.ca/services/co-operative-education-and-career-services
Financial Aid and Awards	camosun.ca/registration-records/financial-aid-awards
Help Centres (Math/English/Science)	camosun.ca/services/academic-supports/help-centres
Indigenous Student Support	camosun.ca/programs-courses/iecc/indigenous-student-services
International Student Support	camosun.ca/international
Learning Skills	camosun.ca/services/academic-supports/help-centres/writing-centre-learning-skills
Library	camosun.ca/services/library
Office of Student Support	camosun.ca/services/office-student-support
Ombudsperson	camosun.ca/services/ombudsperson
Registration	camosun.ca/registration-records/registration
Technology Support	camosun.ca/services/its
Writing Centre	camosun.ca/services/academic-supports/help-centres/writing-centre-learning-skills

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 Integrity

Students are expected to comply with all College policy regarding academic integrity; which is about honest and ethical behaviour in your education journey. The following guide is designed to help you understand your responsibilities: <https://camosun.libguides.com/academicintegrity/welcome>
Please visit <https://camosun.ca/sites/default/files/2021-05/e-1.13.pdf> for Camosun's Academic Integrity policy and details for addressing and resolving matters of academic misconduct.

Academic Accommodations for Students with Disabilities

Camosun College is committed to achieving full accessibility for persons with disabilities. Part of this commitment includes arranging appropriate academic accommodations for students with disabilities to ensure they have an equitable opportunity to participate in all of their academic activities. If you are a student with a documented disability and think you may need accommodations, you are strongly encouraged to contact the Centre for Accessible Learning (CAL) and register as early as possible. Please visit the CAL website for more information about the process of registering with CAL, including important deadlines: <https://camosun.ca/cal>

Academic Progress

Please visit <https://camosun.ca/sites/default/files/2023-02/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 <https://camosun.ca/sites/default/files/2021-05/e-2.2.pdf> for further details about course withdrawals. For deadline for fees, course drop dates, and tuition refund, please visit <https://camosun.ca/registration-records/tuition-fees#deadlines>.

Grading Policy

Please visit <https://camosun.ca/sites/default/files/2021-05/e-1.5.pdf> for further details about grading.

Grade Review and Appeals

Please visit <https://camosun.ca/sites/default/files/2021-05/e-1.14.pdf> for policy relating to requests for review and appeal of grades.

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 ([see policy](#)). Please visit <https://camosun.ca/services/forms#medical> 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: <https://camosun.ca/sites/default/files/2021-05/e-2.9.pdf> and camosun.ca/services/sexual-violence-support-and-education. 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 <https://camosun.ca/sites/default/files/2021-05/e-2.5.pdf> to understand the College's expectations of academic integrity and student behavioural conduct.

Looking for other policies?

The full suite of College policies and directives can be found here: <https://camosun.ca/about/camosun-college-policies-and-directives>

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.