Course: MECH 178 – Pneumatics & Hydraulics, 2024F
Instructor: Murray Love, MASc
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Calendar Description

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

Offered:	Fall Semester
Credit:	3
In-class workload:	4 hours lecture, 2 hours laboratory
Out-of-class workload:	5 hours
Prerequisites:	None

This course is restricted to DND students.

Intended Learning Outcomes

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

Course Content

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

Week	Lab	Assignment	Course Content
1	-	-	Course Information. Fluid Mechanics Background Review
2	-	Assignment 1	Fluid Mechanics Background Review (cont.)
3	1	-	Hydraulic Fluids: Viscosity, Bulk Modulus, Fluid Analysis Hydraulic Pumps: Displacement, Efficiency, Types
4	-	Assignment 2	Hydraulic Actuators Hydraulic Motors: Delivery, Efficiency, Types
5	-	-	Hydraulic Actuators Hydraulic Cylinders: Extension Speeds and Forces, Regeneration
6	2	Assignment 3	Hydraulic Ancillary Components: Connectors, Fittings, Seals, Reservoirs, Filters, Accumulators, Heaters, Coolers Hydraulic Valves 1: Terminology, Center Types
7	-	-	Hydraulic Valves 2: Directional Control, Pressure Control, and Flow Control
8	3	-	Midterm Review and Midterm Exam
9	-	Assignment 4	Electrohydraulics: Solenoid, Proportional, and Servo Valves
10	4	-	Pneumatic Systems: Gas Laws, Basic Pneumatic Components
11	-	Assignment 5	Pneumatic Systems (2): Basic Pneumatic Components (cont), Schematic Symbols
12	5		Pneumatic Systems (3): Basic Pneumatic Circuits, Pneumatic Logic, Valve Sizing, Flow Coefficients, Series and Parallel Valves, Air Line Friction Losses
13	-		Pneumatic Systems (4): Air Line Friction Losses (cont), Introduction to PLCs, Servo Control and Solenoid Feedback
14	-	-	Final Review

Text & References

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 ©.

Laboratory Reports

Formal laboratory reports are expected for some labs. The reports are due one week after the lab period. There will be one lab report for each student. No late laboratory reports will be accepted.

Assignments

Assignments are to be handed in when due. No late assignments will be accepted. Assignments must be submitted either to D2L or during the lecture of the due date to the instructor.

Evaluation

Assignments	***15%***
Labs	***20%***
Midterm Exam	***30%***
Final Exam	***35%***

The Midterm and Final Exam in this course will be closed-book tests. Students will be permitted one 8.5'' x 11'' formula sheet.

Lab work and assignments are to be handed in when due and must be completed to the instructor's satisfaction prior to sitting the final exam.

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

College Supports, Services and Policies

Immediate, Urgent, or Emergency Support
If you or someone you know requires immediate, urgent, or emergency support (e.g. illness, injury, thoughts of suicide, sexual assault, etc.), **SEEK HELP**. Resource contacts @ http://camosun.ca/about/mental-health/emergency.html or http://camosun.ca/services/sexual-violence/get-support.html#urgent

College Services
Camosun offers a variety of health and academic support services, including counselling, dental, disability resource centre, help centre, learning skills, sexual violence support & education, library, and writing centre. For more information on each of these services, visit the **STUDENT SERVICES** link on the College website at http://camosun.ca/

College Policies
Camosun strives to provide clear, transparent, and easily accessible policies that exemplify the college's commitment to life-changing learning. It is the student's responsibility to become familiar with the content of College policies. Policies are available on the College website at http://camosun.ca/about/policies/. Education and academic policies include, but are not limited to, Academic Progress, Admission, Course Withdrawals, Standards for Awarding Credentials, Involuntary Health and Safety Leave of Absence, Prior Learning Assessment, Medical/Compassionate Withdrawal, Sexual Violence and Misconduct, Student Ancillary Fees, Student Appeals, Student Conduct, and Student Penalties and Fines.

A. Grading Systems *http://camosun.ca/about/policies/index.html*

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://camosun.ca/about/policies/index.html for information on conversion to final grades, and for additional information on student record and transcript notations.

Temporary Grade	Description
I	*Incomplete*: 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	*In progress*: 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	*Compulsory Withdrawal*: 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.