MENG 131 – Fluid Power Course Outline

Course: MENG 131 – Fluid Power, 2019F
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Calendar Description

An introduction to hydraulic and pneumatic fluid power systems. Students will work with reservoirs, pumps, compressors, conductors, valves, linear and rotary actuators, motors and fluid conditioning components along with their symbolic representation. Circuit design, control and component selection, along with troubleshooting, maintenance and safety will be emphasized.

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

Only open to students in the Mechanical Engineering Technology program.

Intended Learning Outcomes

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

- Identify and describe components used in hydraulic and pneumatic systems.
- Select suitable fluids for power transmission and the correct type and size of conductor.
- Select the correct pump or compressor and power source for a hydraulic or pneumatic system.
- 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 a hydraulic or pneumatic system.
- Analyze fluid power systems for energy loss, pump requirements, flow rates, operating pressures, actuators, and control criteria.

Text & References

Industrial Hydraulics Manual, 2015, 6th Ed., Eaton's Hydraulics Group
Fluid Power Technology, 1994, 1st. Ed., F. Don Norvelle, Delmar Publishers Inc.

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Course Content and Schedule (subject to modification, if necessary)

Week	Lab	Assignment	Course Content	Quiz
1	-	-	Course Information. Learning outcomes, Course outline, Detail schedule, Lab schedule and group, Evaluation and grading system. Introduction. Chapters 1&2. A brief review of the history of hydraulics and pneumatics.	-
2	Lab 1	Assignment 1	Introduction. Chapters 1&2. Fluid mechanics background, Pascal law, Bernoulli equation, Continuity law etc. Lab Safety	-
3	Lab 2	Assignment 2	Hydraulic Fluids. Chapter 3. Fluid properties: Density, Viscosity, Bulk Modulus, Specific Weight, etc.	Quiz 1
4	Lab 3	Assignment 3	Hydraulic Pumps. Chapter 15. Pump characteristics, Types of pumps, Positive displacement pump, Fixed displacement pump, Gear pump, Variable displacement pump, Piston pump, Pump selection etc.	Quiz 2
5	Lab 4	Assignment 4	Hydraulic Actuators. Chapter 7. Hydraulic cylinders, Hydraulic motors, Actuator selection and calculations	Quiz 3
6	Lab 5	Assignment 5	Hydraulic Valves. Chapters 8, 10, 11, 12 (optional), 13 and 14. Directional valves, Pressure control valves, Flow Control valves, Proportional valves, Servo valves etc.	Quiz 4
7	-	-	Hydraulic Valves (Cont.), Chapters 8, 10, 11, 12 (optional), 13 and 14.	-
8	Lab 6	-	Midterm Review, Midterm Exam	Quiz 5
9	Lab 7	Assignment 6	Hydraulic Connectors and Ancillary. Chapters 4, 5, 6, 17. Hydraulic pipes, tubes, and hoses. Hydraulic fittings, Reservoirs (Tanks), Filters, Seals, Accumulators, Coolers, Heaters, etc.	-
10	Lab 8	Assignment 7	Hydraulic Systems. Chapter 18. Introduction of hydraulic circuit design. Typical industrial hydraulic circuits. Pressure compensation, Load sensing design	Quiz 6
11	-	-	Hydraulic Systems (Cont.). Chapter 18.	-
12	Lab 9	Assignment 8	Introduction of Pneumatic Systems. Air compressors, Pneumatic actuators (cylinders and motors), pipes, tubes, hoses, fittings, seals, filters and typical pneumatic circuit design.	Quiz 7
13	Lab 10	-	Introduction of Pneumatic Systems (Cont.).	-
14	-	-	Final Review	Quiz 8
15	-	-	Final Exam	-

Laboratory Reports

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

Assignments

Assignments are to be handed in when due. No late assignments will be accepted.

Basis of Student Assessment (Weighting)

Assignments	15%
Labs	15%
Quizzes	10%
Midterm Exam	25%
Final Exam	35%

All tests (Quizzes, Midterm Exam and Final Exam) in this course will be closed-book tests.
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 **ST UDE NT S ERV IC E S** 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.