



CAMOSUN COLLEGE
School of Trade and Technology
Mechanical Engineering Department

MECH 176- Fluid Dynamics,
Winter 2020

COURSE OUTLINE

The calendar description is available on the web

@<https://online.camosun.ca/d2l/le/content/162820/Home>

Fluid properties (density, compressibility, viscosity), absolute pressure and gauge pressure, fluid statics (forces on submerged planes, pressure vessels, buoyancy) will be detailed. Fluid dynamic theory will be examined including: laminar and turbulent flows, energy continuity, fluid flow measurement, friction losses, and the design of piping systems. Hydraulic system design including pumps, motors, control valves, reservoirs and filtration will be covered.

Ω Please note: This outline will not be kept indefinitely. It is recommended students keep this outline for their records, especially to assist in transfer credit to post-secondary institutions.

1. Instructor Information

(a) Instructor	Sam Behfarshad
(b) Office hours	Tue and Thur. 11:30am-12:30pm
(c) Location	TEC 264
(d) Phone	250-370-4445 Alternative:
(e) E-mail	behfarshadg@camosun.bc.ca
(f) Website	

2. Intended Learning Outcomes

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

Describe and compute fluid properties (density, compressibility, viscosity, specific weight, specific gravity, etc)

Compare absolute pressure and gauge pressure,

Compute forces on submerged planes, pressure vessels, and buoyancy of bodies in fluids under static condition

Describe laminar and turbulent flows, energy and continuity equations, fluid flow measurement, friction losses, and the design of piping systems

Describe hydraulic system including pumps, motors, control valves, reservoirs, filtration and compute pump and motor power and efficiencies

3. Required Materials

No textbook required but the following texts would be beneficial:

- a) Applied Fluid Mechanics
By: Robert L Mott; Joseph A., Untener, 7th Ed.
Publisher: Pearson, 2015,
- b) “Industrial Hydraulics Manual: Your Comprehensive Guide to Industrial Hydraulics”
EATON Fluid Power Training Series,
By: Eaton Corporation, 2010

4. Course Content and Schedule

Course Content (subject to modification if necessary):

Introduction to Fluid Dynamics

- Concept of fluid
- Dimensions, Standard units and conversions
- Basic fluid properties
- Compressibility
- Pressure
- Viscosity
- Temperature

Pressure Distribution in a Fluids

- Pressure and Pressure gradient
- Hydrostatic pressure distribution
- Application of Barometer/Manometry
- Hydrostatic forces on plane surfaces
- Hydrostatic forces on Curved surfaces
- Hydrostatic forces on layered fluids
- Buoyancy and Stability
- Pressure distribution in rigid-body motion
- Pressure measurements

Basic Laws of Fluid Dynamics

- Conservation of mass
- Continuity equation
- Flow rates
- Frictionless flow: The Bernoulli's equation
- Torricelli's theorem
- Conservation of energy
- General Energy Equation

Viscous Flow in Ducts

- Fluid viscosity
- Reynolds number regimes
- Internal versus external flows
- Head loss
- Friction factor

Laminar fully developed pipe flow
Turbulent pipe flow
Minor or local losses in pipe system
Flow measurement

Hydraulics

Basics and benefits
Hydraulic components and symbols
Fluid power standards
Hydraulic schematics
Work and power
Power in fluid power system

Hydraulic Pumps/motors

Types of pumps
Pump efficiencies
Cavitation
Pump selection criteria
Types of motors
Motor efficiencies
Motor selection criteria

Control Valves

- a) Pressure control valves
- b) Directional control valves (DCV)
- c) Flow control valves

Ancillary Devices

- a) Fluids
- b) Reservoirs
- c) Accumulators
- d) Filters
- e) Seals, etc.

Schedule:

- **Lectures :**
 - Tue- 1:30-2:20 pm, Rm CBA 121
 - Wed- 8:30am– 10:20 pm, Rm CBA 121
 - Mon - 3:30-5:20 pm, Rm TEC 174
- **Lab:**
 - Thur - 2:30– 4:20 pm, Rm TEC-106

5. Basis of Student Assessment (Weighting)

- Quizzes 5%
- Assignments 10%
- Lab Report 15%
- Midterm 30%
- Final Exam 40%

6. Grading System

Standard Grading System (GPA)

Competency Based Grading System

7. Recommended Materials to Assist Students to Succeed Throughout the Course

N/A

8. 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	<i>Incomplete:</i> 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	<i>In progress:</i> 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	<i>Compulsory Withdrawal:</i> 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.