



## CAMOSUN COLLEGE

### School of Trades and Technology

Mechanical Engineering Department

### **MENG 263** **Fluids and Heat Transfer** **Fall 2020**

## COURSE OUTLINE

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The calendar description is available on the web @ <https://online.camosun.ca/d2l/le/content/176693/Home>

*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.*

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### 1. Instructor Information

(a) Instructor	Sam Behfarshad
(b) Office hours	Fri - 9:30-12:30
(c) Location	TEC 264
(d) Phone	250-370-4445 <b>Alternative:</b> _____
(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:

- Determine the best pipe diameter to use for a variety of flow situations
- Predict the flow in naturally flowing (gravity/pressure only) flow systems
- Determine head loss in piping systems
- Specify and select pumps to enable the correction of operation of both open and closed-loop flow systems
- Do an analysis of pump inlets and predict correct pump operation
- Work through flow prediction calculations for parallel flow arrangements using the Hardy-Cross method
- Calculate the rate of conductive heat transfer through arrangements of solids and stationary liquids and gases
- Calculate the rate of heat transfer in convective situations (moving liquids and gases).
- Determine the convective heat transfer coefficient and Nusselt number for a variety of convective geometries
- Examine finned convective heat exchangers and predict their performance (natural convection, forced convection).
- Predict the performance of tube-and-shell heat exchangers (counter-flow, parallel-flow, LMTD and NTU methods)

- Explore aspects of radiant heat transfer and predict the rate of heat transfer between bodies under certain conditions
- Examine applications of heat transfer in an engineering and real world context

### 3. Required Materials

#### Main Textbooks:

- Applied Fluid Mechanics, By: Robert L Mott; Joseph A Untener, 7th Ed., Publisher: Pearson, 2015.
- Heat and Mass Transfer: Fundamentals and Applications, by Yunus A. Cengel, Afshin J. Ghajar, 6th Ed, McGraw Hill, 2020

### 4. Course Content

#### 1. Fluids

- Series Pipe Flow:** Review of the basics of fluids & fluid flow. Determination of: energy losses and additions, volume flowrate in gravity feed systems and optimal pipe diameter.
- Parallel pipeline systems:** Systems with two branches, iterative methods for three or more branches (Hardy Cross Analysis).
- Pumps:** Types of pumps & performance data. Torque and head equations for impeller design conditions. Effect of pump speed and impeller diameter, specific speed, net positive suction head.
- Forces due to fluids in motion:** Impulse - momentum equation applied to fluids, forces on bends in pipelines, forces on stationary objects, forces on moving objects.
- Flow measurement:** Variable head meters, coefficients of contraction velocity and discharge, other forms of flow meters, pitot tubes.
- Flow around immersed bodies:** Streamline flow, flow patterns, coefficients of drag, boundary layer flow, lift and drag on airfoils.

#### 2. Heat Transfer

- Introduction:** Heat transfer at an atomic scale.
- Conductive Heat Transfer:** Materials, establish overall thermal resistance.
- Convective Heat Transfer:** Forced and natural convection, fin cooling, enhancing heat transfer, heat exchangers
- Radiant Heat Transfer:** Introduction

#### Schedule:

##### Lectures:

Mon- 9:30-10:20 am,  
Wed- 8:30am– 10:20 pm,

##### Lab/Tutorials:

Tue 10:30– 12:20 pm, X01 B  
Thu 12:30– 2:20 pm, X01 A

## 5. Basis of Student Assessment (Weighting)

(Should be directly linked to learning outcomes.)

- |     |              |     |
|-----|--------------|-----|
| (a) | Quizzes      | 20% |
| (b) | Midterm Exam | 35% |
| (c) | Final exam   | 45% |

## 6. Grading System

- Standard Grading System (GPA)
- Competency Based Grading System

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

### Supplementary Textbook:

Introduction to Fluid Thermal Sciences, by Cengel, Cimbala and Turner, 5th Ed, McGraw Hill, 2017

## 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.