

COURSE SYLLABUS



COURSE TITLE: ENGR-292 Fluids and Thermodynamics

CLASS SECTION: X01

TERM: Winter 2022

COURSE CREDITS: 3

DELIVERY METHOD(S): In Person

Camosun College campuses are located on the traditional territories of the Lək̓ʷəŋən and W̱SÁNEĆ peoples. We acknowledge their welcome and graciousness to the students who seek knowledge here.

Learn more about Camosun's [Territorial Acknowledgement](#).

For COVID-19 information please visit <https://camosun.ca/about/covid-19-updates>

Camosun College requires mandatory attendance for the first class meeting of each course. If you do not attend, and do not provide your instructor with a reasonable explanation in advance, you will be removed from the course and the space offered to the next waitlisted student.

INSTRUCTOR DETAILS

NAME: Sam Behfarshad

EMAIL: behfarshadg@camosun.bc.ca

OFFICE: TEC 264

HOURS: Tuesdays 1:00-2:00pm and Wednesdays 11:30am-12:30pm

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

In this course, the topics covered include: fluid properties, equations of state, pressure, buoyancy, hydrostatic forces, pressure measurement, conservation of mass, momentum, and energy; Bernoulli's equation, dimensional analysis, modeling; turbulent flow in pipes; turbo-machinery; conduction and convection. The following principles of mathematics are applied; partial and directional derivatives; maxima and minima; Lagrange multipliers and second derivative test; multiple integrals and application.

PREREQUISITE(S): C in MATH 250A

Pre or Co-requisites

All of:

C in MATH 250B

C in MATH 252

C in PHYS 295

COURSE LEARNING OUTCOMES / OBJECTIVES

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

- Calculate how pressure varies with depth in a stationary fluid.
- Calculate force and moment due to pressure on a submerged surface.
- Describe buoyant force and apply it for submerged and floating bodies.
- Explain why and when control volume analysis is used in fluids and thermodynamics.
- Identify an appropriate control volume.
- Apply control volume analysis of mass and momentum conservation to solve problems in steady and unsteady fluid mechanics and thermodynamics.
- Apply Bernoulli's equation.
- Explain the physical significance of each of the terms in the Navier-Stokes equations.
- Determine the non-dimensional parameters for a problem from a list of relevant dimensional parameters.
- Apply scaling to predict full-scale behavior from experimental data on a model.
- Describe the fundamental differences between laminar and turbulent flow.
- Use the Moody diagram to determine pressure loss in a fully-developed pipe flow.
- Account for minor losses in a pipe system.
- Determine a system curve for a pipe system.
- Use a pipe system curve and pump performance data to predict performance and select an appropriate pump.
- Define a thermodynamic system and its boundary interactions.
- Apply the First Law of Thermodynamics to both 'closed' and 'open' systems.
- Describe the implications of the Second Law of Thermodynamics and entropy generation.
- Calculate entropy change for 'open' and 'closed' systems.
- Perform a cycle analysis for ideal power generation and refrigeration cycles.

REQUIRED MATERIALS & RECOMMENDED PREPARATION / INFORMATION

Main Textbook: Fundamentals of Thermal-Fluid Sciences, 6th Edition
by Yunus A. Cengel, J.M. Cimbala & A.F. Ghajar, McGraw Hill, 2022

Lecture notes will be provided on D2L as well.

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 or DATE RANGE	ACTIVITY or TOPIC	OTHER NOTES
W 1	Fluid Mechanics – Fluid properties, shear forces, viscosity, compressibility, pressure, buoyancy.	-
W 2	Fluid Mechanics – Control volumes, conservation of mass, the balance of linear momentum, the Navier-Stokes equations.	-
W 3	Fluid Mechanics – The balance of angular momentum, conservation of energy, Bernoulli's equation.	-
W 4	Fluid Mechanics – Functions, dimensional analysis, the Buckingham Pi theorem, system scaling and experimentation.	-
W 5	Fluid Mechanics – Laminar and turbulent flow, the Moody diagram, friction and minor losses in a piping system.	-
W 6	Fluid Mechanics – Piping system curves, pump performance curves and pump selection, NPSH.	-

WEEK or DATE RANGE	ACTIVITY or TOPIC	OTHER NOTES
W 7	Reading Break	-
W 8	Summary and review of fluid mechanics principle. Midterm Exam	-
W 9	Thermodynamics – Thermodynamic systems, open and closed systems, the 1st Law of thermodynamics, the ideal gas law.	-
W 10	Thermodynamics – The 2nd Law of thermodynamics, the Clausius inequality, entropy, entropy production.	-
W 11	Thermodynamics – Examples using entropy and the 2nd Law, air standard analysis, air power cycles.	-
W 12	Thermodynamics – Vapor power cycles, thermodynamic efficiency, the ideal Rankine cycle.	-
W 13	Thermodynamics – Ideal refrigeration cycles, coefficients of performance.	-
W 14	Thermodynamics – Summary and review of thermodynamics principles- Prep for Final Exam	-

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](http://camosun.ca/services/accessible-learning/exams.html). <http://camosun.ca/services/accessible-learning/exams.html>

EVALUATION OF LEARNING

DESCRIPTION	WEIGHTING
Assignments	10%
Quizzes	20%
Mid-term Exam	30%
Final Exam	35%
Attendance	5%
	TOTAL
	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](http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf) policy for more information. <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf>

COURSE GUIDELINES & EXPECTATIONS

Students should be present and punctual for all classes.

Regular class attendance will maximize student's learning outcomes.

Turn off cell phones while being in class/lab/tutorial sessions

You are encouraged to work together to solve problems in tutorial sessions. However, you must complete your own work.

It is expected that students will conduct themselves with integrity.

SCHOOL OR DEPARTMENTAL INFORMATION

School of Trades and Technology- Department of Mechanical Engineering technology

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 <http://camosun.ca/students/>.

Support Service	Website
Academic Advising	http://camosun.ca/advising
Accessible Learning	http://camosun.ca/accessible-learning
Counselling	http://camosun.ca/counselling
Career Services	http://camosun.ca/coop
Financial Aid and Awards	http://camosun.ca/financialaid
Help Centres (Math/English/Science)	http://camosun.ca/help-centres
Indigenous Student Support	http://camosun.ca/indigenous
International Student Support	http://camosun.ca/international/
Learning Skills	http://camosun.ca/learningskills
Library	http://camosun.ca/services/library/
Office of Student Support	http://camosun.ca/oss
Ombudsperson	http://camosun.ca/ombuds
Registration	http://camosun.ca/registration
Technology Support	http://camosun.ca/its
Writing Centre	http://camosun.ca/writing-centre

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 Accommodations for Students with Disabilities

The College is committed to providing appropriate and reasonable academic accommodations to students with disabilities (i.e. physical, depression, learning, etc). If you have a disability, the [Centre for Accessible Learning](#) (CAL) can help you document your needs, and where disability-related barriers to access in your courses exist, create an accommodation plan. By making a plan through CAL, you can ensure you have the appropriate academic accommodations you need without disclosing your diagnosis or condition to course instructors. Please visit the CAL website for contacts and to learn how to get started:

<http://camosun.ca/services/accessible-learning/>

Academic Integrity

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.13.pdf> for policy regarding academic expectations and details for addressing and resolving matters of academic misconduct.

Academic Progress

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/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 <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.2.pdf> for further details about course withdrawals. For deadline for fees, course drop dates, and tuition refund, please visit <http://camosun.ca/learn/fees/#deadlines>.

Grading Policy

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.5.pdf> for further details about grading.

Grade Review and Appeals

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf> for policy relating to requests for review and appeal of grades.

Mandatory Attendance for First Class Meeting of Each Course

Camosun College requires mandatory attendance for the first class meeting of each course. If you do not attend, and do not provide your instructor with a reasonable reason in advance, you will be removed from the course and the space offered to the next waitlisted student. For more information, please see the "Attendance" section under "Registration Policies and Procedures"

(<http://camosun.ca/learn/calendar/current/procedures.html>) and the Grading Policy at <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.5.pdf>.

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. Please visit <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.8.pdf> 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: <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.9.pdf> and camosun.ca/sexual-violence. To contact the Office of Student Support: oss@camosun.ca or by phone: 250-370-3046 or 250-3703841

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 <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.5.pdf> to understand the College's expectations of academic integrity and student behavioural conduct.

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.