Energy and Particle Technology Laboratory
Prof. M Reza Kholghy
https://carleton.ca/eptl/
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613-520-2600 ext 7119

MAAE 2300 D, Fluid Mechanics I, Winter 2020

Lectures (From January 8th to April 3rd)**:** Wednesday & Friday, 14.35 to 15.55, UC 282

Instructor: M Reza Kholghy, **Office:** CB 3202, **Office Hours:** by appointment only

Teaching Assistants: to be announced by January 13th

Optional References: Fluid Mechanics by Frank M. White (8th Ed, McGraw Hill)

Introduction to Fluid Mechanics by Fox and McDonald (8th Edition, Wiley)

Prerequisites: MATH 1005, MATH 1104, ECOR 1101

Grading: Midterm: 25%, Final Exam: 55%, Labs: 20%.

You must pass the final exam (50% or higher), submit all laboratory reports and receive an overall passing grade for the reports to pass the course. All tests/exams are closed book with one personally hand-written note sheet allowed (8.5x11 both sides). Students who claim illness, injury, or other extraordinary circumstances beyond their control as a reason for missing the midterm exam must immediately inform the instructor and provide appropriate documentation. In such cases the weight normally attributed to the missed midterm exam will be transferred to the final exam in calculating the final course grade. The mark for each laboratory experiment is based on a lab report that is submitted to the TAs within seven (7) days of completing the laboratory experiment. Each student is to produce his/her lab report individually (reports will be checked for plagiarism). Late reports will receive a penalty as stated in the Lab Manual, however, even if late, all students must submit a completed report for all three labs.

Sign up for Piazza: https://piazza.com/carleton.ca/spring2020/maae2300
You can always ask questions on Piazza 24/7 and get help from me, TAs and your friends. Piazza is very helpful as you may have a question when reviewing course material for exam.

Lectures, Laboratory sessions and PA sessions

Each week (except for Winter Break), there will be two, one-and-a-half-hour lectures and starting the week of January 20th one three- hour laboratory/problem analysis (PA) session. Each student should register for a specific lab/PA session. Labs must be completed in the section you have registered for; however, you may attend any of the PA sessions throughout the week. Times and locations are provided below. Consult Carleton Central for the lab section for which you are registered. Information will be provided on the schedule and structure of the laboratory sessions during the first few weeks of lectures.

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Dates	Lectures	Tutorials
08.01 & 10.01	**Introduction.** Applications of fluid mechanics. Definitions: fluid, continuum concept, Fluid properties. Units and dimensions.	
15.01 & 17.01	**Fluid statics.** Pressure and shear stress. Pressure distribution in a fluid in a gravitational field. The atmosphere. Pressure measurement: mercury barometer, manometers.	
22.01 & 24.01	Forces on plane submerged surfaces. Centre of pressure. Examples. Forces on curved submerged surfaces. Forces on submerged bodies: buoyancy. Stability of submerged and floating bodies: center of buoyancy, metacentre.	PS 1. Q1-13
29.01 & 31.01	Fluid acceleration (linear and angular) no-slip condition.	PS 2. Q1-9
05.02 & 07.02	**Fluid dynamics.** Concepts (control volume, viscosity, no-slip condition, shear stress, boundary layer), continuity (volume flow rate)	PS 3. Fluid Statics
12.02 & 14.02	**Sample questions on Feb 12st and Midterm on Feb 14th**.	PS 3. Fluid Statics
26.02 & 28.02	Linear momentum equation for a control volume.	PS4 Q1-4
04.03 & 06.03	Bernouilli's equation (streamlines, streamtubes, stagnation), steady flow energy equation (1D) Applications of Bernoulli: measurement of flow rate (bell mouth inlet, venturi, orifice meter).	PS4 Q5-9
11.03 & 13.03	Steady-flow energy equation (SFEE). Effects of friction: losses. Pipe flow: head loss.	PS5
18.03 & 20.03	Viscous flow: laminar versus turbulent flow. Pipe flow analysis: Moody chart. “Minor” losses.	PS6 1-5
25.03 & 27.03	open channel flow (EGL, HGL, wave speed)	PS6 6-9, PS7 1-3
25.03 & 27.03	Angular momentum equation for a control volume. Application to steady flows.	PS7 4-14
01.04 & 03.04	Applications and Review.	

Plagiarism and Cheating: It is an instructional offence to use or pass off as one’s own idea which is the work of another without expressly giving credit to that other. It is also an instructional offence to copy the work of a fellow student. If students do plagiarize or cheat, the Dean’s office will be notified and appropriate action will be taken.

Missing the Midterm: Students who miss the midterm exam must inform the instructor before the exam date. In such cases the weight attributed to the missed midterm exam will be transferred to the final exam in calculating the final course grade.

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Academic accommodation: You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:

Pregnancy or religious obligation: Write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details see http://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf.

Academic accommodations for students with disabilities: The Paul Menton Centre for Students with Dis- abilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health dis- abilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website for the deadline to request accommodations for the formally-scheduled exam (if applicable).

Last piece of Advice: As with most things in life, those who benefit most from this course will be those that put the most into it. However, that does not mean you must be great at, or enjoy, everything presented. Fluids are ubiquitous in engineering and thus it is likely that no matter what you end up doing, some aspect of this course will be applicable. Given the variety of problems and scenarios that can be encountered there will inevitably be some that you do not enjoy. Do not be discouraged when this happens (indeed, there are some parts of this course that even the professor doesn't like!). Take refuge in the thought that it is quite likely that once you graduate and get a job with Ferrari, you may never again need to be able to calculate if a boat is stable or not (although it might come in handy when buying your yacht...), and let that thought be enough to sustain you. Of course, you might still want to understand it enough to do well if the question shows up on the midterm and/or final exam, but in the end this course is more about:

- understanding how to look at a problem
- determining what useful information you know
- and what useful information might you want to find

If you leave this course with these skills that will be far more valuable than remembering how to size a pump or knowing how an aircraft calculates its speed (and yes, these are both things we will learn here).