UNIVERSITY OF GUELPH
SCHOOL OF ENGINEERING
ENGG*2230
FLUID MECHANICS
Winter 2013

Instructor

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Teaching Assistants

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Required Text

F.M. White, 2011, Fluid Mechanics, 7th Edition, McGraw-Hill

Lectures	Tue & Thu	2:30 – 3:50 PM	ROZH 101
Tutorials	Tue	10:30 – 11:20 AM	MACK 238
	Wed	2:30 – 3:20 PM	MACK 238
	Wed	4:30 – 5:20 PM	MACK 238
	Fri	10:30 - 11:20 AM	MACK 233
	Fri	12:30 - 1:20 PM	MACK 238
Laboratories	Mon	2:30 – 4:20 PM	THRN 1193
	Tue	8:30 – 10:20 AM	THRN 1193
	Tue	12:30 – 2:20 PM	THRN 1193
	Thu	8:30 – 10:20 AM	THRN 1193
	Thu	12:30 – 2:20 PM	THRN 1193
	Fri	2:30 – 4:20 PM	THRN 1193

Course Description

This course introduces the fundamentals of fluid mechanics for engineers. The emphasis of the course is on the basics of fluid statics and fluid motion with applications in a variety of engineering fields. An outline of the course topics is given below.

Course Notes

The lectures will revolve around a sequence of PowerPoint slides with elaboration and examples during the lectures. These will be generally available on CourseLink before the lecture – it is expected that you will have a copy of these available during the lectures.

Topics

1. Introduction
   - fluid properties: viscosity, density, vapour pressure, elasticity, temperature effects
   - Newtonian and non-Newtonian fluids

2. Fluid Statics
   - pressure and its measurement
   - hydrostatics: pressures, forces
   - buoyancy and stability

3. Fluid Flow Concepts
   - control volume analysis
   - continuity: mass, volume, steady, unsteady flow
   - energy: Bernoulli Equation.
   - momentum: Navier-Stokes Equations

4. Dynamic Similitude and Dimensional Analysis
   - similarity
   - Buckingham PI theorem
   - modelling

5. Viscous Flow
   - streamlines
   - laminar vs. turbulent flow
   - steady vs. unsteady flow

6. Pipe Flow
   - friction losses: Darcy
   - Darcy-Weisbach Eq., Moody Diagram
   - minor losses, equivalent lengths
   - piping systems

7. Pumps
   - pump types, characteristics
   - pump and system curves
   - net positive suction head, cavitation

8. Open Channel Flow Principles
   - specific energy
   - Manning equation
   - hydraulic jumps

9. Boundary Layer Theory
   - viscous drag
   - forces on 3-D objects
   - lift forces

Method of Evaluation

Final grades will be determined in the following manner:

CFD Assignment	5%
Lab Reports	20%
Midterm Exam	25%
Final Exam	50%
Total	100%

Note: If you fail (<50%) both the midterm and the final exams, you will receive a failing grade in the course equal to average of the midterm and the final.

Laboratory

The laboratory forms a vital part of the course; material introduced in the lab may be part of the final and midterm exams. Labs will be done in groups of three (3) students **during your scheduled lab times**. Sign-up sheets will be posted outside the Fluids Lab (THRN 1193) where you may choose your group with fellow students in the **same scheduled lab time**. Each lab will be run over 2 weeks. If you sign up for the first week, you will always have your lab during the first week it is offered (and if you sign up for the second week, you will always have your lab during the second week). Be sure to sign up for a group before 5:00 PM on **Thursday, January 10th** as **labs begin on Monday, January 14th**. Be sure to choose your group members wisely because you will work with them for the whole semester!

Lab	Group in Week 1	Group in Week 2
Flow Measurements	Jan 14 – Jan 18	Jan 21 – 25
Pipe Friction	Jan 28 – Feb 1	Feb 4 – 8
Minor Losses	Feb 11 – 15	Feb 25 – Mar 1
Discharge over Weirs	Mar 4 – 8	Mar 11 – 15
Impact of a Jet	Mar 18 – 22	Mar 25 – 29
Open lab week	Apr 1 – 5	Apr 1 – 5

All laboratory reports are due one week after you perform the experiment

There are 5 labs in total for the course. Attendance in the lab is mandatory. **No grades will be issued to any group member who is not in attendance when the lab is completed by the group.** Before arriving to the laboratory to perform an experiment, each group must have read and understood the corresponding information in the lab manual. The lab manual is available on CourseLink and you are expected to print a copy for yourself. You are expected to do the intermediate calculations and, in some cases, all of the calculations before leaving the lab. Each group is to submit a single report for each experiment. It is to be no longer than 10 pages, the format of which is described in the lab manual. Note that these 10 pages include **everything** (one page for the title page, one page for the signed raw data sheet, and the remainder in 8 pages).

The laboratory reports are due in the course assignment drop box at 5:00 pm one week after you performed the laboratory. A late report will be penalized by 50% per day late. The reports must be entirely original. Plagiarism, of any form, will not be tolerated and will be forwarded to the Dean of the College of Physical and Engineering Science for consideration of Academic Misconduct. Each lab report is to include the raw data sheet used to record the data while doing the experiment. This sheet is to be signed and dated by either the lab manager or the GTA for the course before you leave the lab.

Tutorials and Assignments

Each tutorial (seminar) session will be led by a GTA and is meant to be a time to ask questions regarding the supplementary problems and weekly assignments. Attendance is not mandatory but any information given out during the tutorials will be considered part of the course material, and this information will not be available on CourseLink. Assignments will be posted weekly (in general) on CourseLink. **Assignments are not marked, BUT TO BE SUCCESSFUL IN THE CLASS YOU SHOULD ATTEMPT ALL ASSIGNMENTS ON A WEEKLY BASIS, AND HAVE THEM FINISHED ONE WEEK AFTER THEY ARE ASSIGNED.** You must make **substantial effort** to succeed in this course. Solutions will be posted on CourseLink generally two weeks after they have been assigned.

CFD Assignment

All students will be required to submit a computational fluid dynamics (CFD) project. Details on this assignment will be made available later in the course.

Examinations

A midterm examination will be given on **Thursday, February 28th**, during the normally scheduled class time. The final examination is scheduled for **Tuesday, April 16th** from 7:00 to 9:00 PM (room TBA). The material covered will include the last lecture prior to the exam. The exams will be closed book. Permitted aids will be announced prior to each exam. Failure to attend the exam will lead to a zero for the exam. **There will be no exceptions** (other than for students with medical excuses signed by a physician).

Engineering Peer Helpers

The peer helper program, staffed by upper year engineering students, offers regular workshops aimed at developing problem solving skills and new learning tools specific to core engineering courses such as Fluid Mechanics. Your peer helpers for Fluid Mechanics are:

Laura Christensen, Kevin Lees and Emma Thompson

Contact information:
engpeers@uoguelph.ca
http://www.uoguelph.ca/engineering/peer_helper

University Policy on Academic Misconduct

Academic misconduct, such as plagiarism, is a serious offence at the University of Guelph. Please consult the Undergraduate Calendar 2012-2013 and School of Engineering programs guide, for offences, penalties and procedures relating to academic misconduct.
http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml