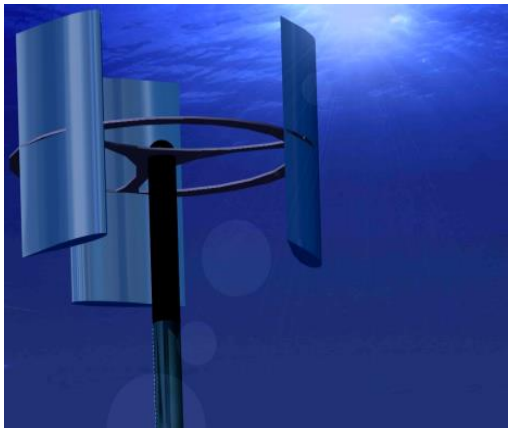
INDUSTRIAL FLUID MECHANICS

MECH 386

Contact information

Dr. Dana Grecov
Mechanical Engineering
CEME 2060
604-822-6710
dgrecov@mech.ubc.ca



Teaching Assistants

Nick Yeh, PhD candidate

ICICS X221, 604-822-0939

Office hours: Thursdays 11:30 -12:30

Marjan Zare, PhD candidate

CEME 1051

Office hours: Tuesdays 11-12

Class Format

Three 1-hour classes each week (M,W,F – 14.00-15.00) - SWNG 305

Course Synopsis

This course is an introduction to industrial fluid mechanics. According to J. C. R. Hunt (a famous fluid mechanics specialist): "industrial fluid mechanics broadly covers those aspects of the design, manufacture, and operation of industrial products that are related to fluid-flow problems; the subject includes the related fluid-mechanics research and its application, as well as the technology associated with fluid flow." In general, such flows are too complex to be analyzed exactly.

Why study Industrial Fluid Mechanics?

By studying typical industrial problems, you will develop the skills needed to perform a good analysis and diagnosis on the types of engineering and research problems which may be faced during your professional career, and devise ways to solve them.

Learning Objectives

By the end of the course it is expected that students will be able to:

- Extend what you have learned to more complicated "industrial" systems
- Obtain exposure to a broader range of fluid mechanical problems
- Provide ability to extend to other problems

Textbook

Lecture notes will be provided on the course website. Informational sources could be found via the following textbook:

Fluid Mechanics – Fundamentals and Applications, Yunus Cengel and John Cimbala

Midterms

Three midterms of 1 hour duration will be given during the term. Typically they will have the open-book/notes format. They will represent 66 % of the final grade. You must pass the midterms in order to pass the course.

Problem sets

After each major topic (5), a take-home quiz based on a problem set will be distributed.

Term Project

For this project you will make contact with a local company (e.g. Ballard, Scott Paper, Lafarge, etc.) and ask an engineer at the company to describe some industrial fluid mechanics problem they face or faced (e.g. designing a new piping network, monitoring flow conditions somewhere, etc.). A one-page proposal needs to be approved first. Then, in a formal technical report you will document both options the company considered and any additional options that you think they should have considered, for addressing this problem. This report must be quite specific, and include appropriate engineering calculations and drawings and appendices with instrumentation specifications. A template will be provided.

Each team (2 students) will have 10 minutes to present a progress report on their project to their colleagues. The presentation will be evaluated by all students and the instructor.

Grading Scheme

Term project (final report + presentation)	31 %
Assignments	-
Midterm Exams (3)	69 %

Academic Integrity

The academic enterprise is founded on honesty, civility, and integrity. As members of this enterprise, all students are expected to know, understand, and follow the codes of conduct regarding academic integrity. At the most basic level, this means submitting only original work done by you and acknowledging all sources of information or ideas and attributing them to others as required. This also means you should not cheat, copy, or mislead others about what is your work. Violations of academic integrity (i.e., misconduct) lead to the breakdown of the academic enterprise, and therefore serious consequences arise and harsh sanctions are imposed. For example, incidences of plagiarism or cheating may result in a mark of zero on the assignment or exam and more serious consequences may apply if the matter is referred to the President's Advisory Committee on Student Discipline. Careful records are kept in order to monitor and prevent recurrences.

COURSE SYLLABUS

1. General review
2. Non Newtonian fluid flow
    - Fluid types
    - Measurement of viscosity
    - Rheology of fluids
3. Turbulence

- Models of closure used in CFD
- Flow measurement

4. Pipe Flow
    - Non-Newtonian pipe flow
    - Turbulent pipe flow

      Compressible pipe flow
    - Pipe network analysis
5. Pumps
    - Non dimensional variables and specific speed
    - Positive displacement pumps
    - Systems of pumps
    - Industrial practice (Guest speaker)
6. Renewable energy technologies
    - Wind turbine
    - Wave energy (Wells turbine)
    - Tidal power
7. Flow in porous media
    - Darcy's law
8. Multiphase flows
    - Equations of motion
    - Fluid-solid flow
    - Fluidized beds