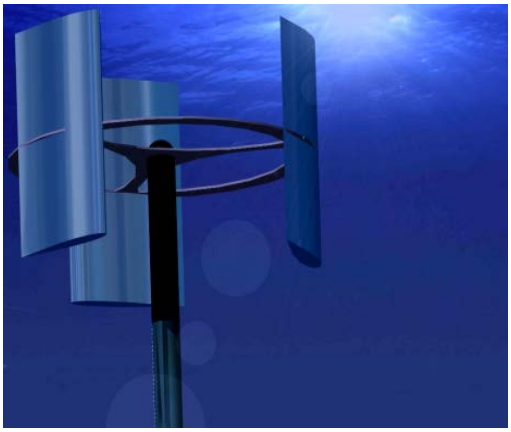
INDUSTRIAL FLUID MECHANICS

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 X227, 604-822-9129

Ashkan Babaie, PhD candidate

KAISER 2214, 6048274593

Class Format

Three 1-hour classes each week (M,W,F – 13.00-14.00) - Frank Forward 303

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

Quizzes

Three quizzes of 1 hour duration will be given during the term. Typically it will have the open-book/notes format. It will represent 60% of the final grade. You must pass the quizzes 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 5 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)	30 %
Quizzes	10%
Midterm Exam. (2-3)	60 %

COURSE SYLLABUS: MECH 386 (tentative)

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