ENGR 292 – Fluids and Thermodynamics

Course Outline

Mechanical Engineering Technology
Camosun College

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 applications.

Offered:	3rd Quarter
Credits:	3
In-Class Workload:	3.5 hours lecture (per week)
Out-of-Class Workload:	3.5 hours (per week)
Prerequisites:	MATH 250A
Co-requisites:	MATH 250B, MATH 252 and PHYS 295

Objectives

Upon successful completion of this course, the student should be able to:

Fluid Mechanics:

- 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.

Thermodynamics:

- 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.

Outline

The course will work through the following topics:

- General
    - Fluid properties
    - Equations of state
- Fluid Statics
    - Pressure
    - Buoyancy
    - Hydrostatic forces
    - Pressure measurement
- Fluid Dynamics
    - Conservation of mass
    - Momentum and energy
    - Bernoulli's equation & Navier-Stokes equations
    - Laminar & Turbulent flow in pipes
    - Turbo-machinery
- Thermodynamics & Heat Transfer
    - Conduction
    - Convection
- Analytical Tools
    - Dimensional analysis
    - Modeling
    - LaGrange Multipliers
    - Second derivative test
    - Multiple Integrals and applications
- Other topics as required to ensure the student has a rounded knowledge of Fluid Dynamics, Thermodynamics & Heat Transfer.

Text Required: None.

Support: http://fireflylabs.com/disted

Department of Mechanical Engineering Technology

Student Evaluation System

COURSE:	Fluids and Thermodynamics	ACADEMIC TERM:	Q3
COURSE #:	ENGR 292	SECTION #:	
INSTRUCTOR:	Scott Li	YEAR:	Q3, 2017

COMPONENTS			COMMENTS
Assignments	30	%	
Quizzes		%	
Labs		%	
Projects		%	
Report(s)		%	
Instr. Assessment		%	
Midterm Exam(s)	30	%	
Final Exam	40	%	
Other		%	
TOTAL	100	%	

- A weighted average of 50% must be attained on tests/examinations and a 50% must be attained on the final examination, otherwise an F will be awarded.
- All labwork/assignments must be submitted prior to the student sitting the final examination. Late assignments will have marks deducted; if handed in after assignments have been returned to the class, no mark will be given - but all assignments must be submitted in order to qualify to write the final exam.
- Full attendance at Labs is mandatory.

GRADING SYSTEM

A+	90 – 100%	B-	70 - 72%
A	85 - 89%	C+	65 - 69%
A-	80 - 84%	C	60 - 64%
B+	77 - 79%	D	50 - 59%
B	73 - 76%	F	< 50%

COMMENTS:

SIGNATURE: **DATE:** 9 January 2017