CAMOSUN COLLEGE

MECHANICAL ENGINEERING DEPARTMENT

COURSE OUTLINE

Calendar Description

MENG 263 Fluids & Heat Transfer

Students will be introduced to piping system design and layout along with pump selection and installation for a variety of series piping arrangements. Aspects of other types of turbo-machinery will be covered. Techniques of flow analysis within parallel flow networks and their applications will be highlighted. Modes of heat transfer (conduction, convection and radiation) will be explored along with applications such as finned heat transfer surfaces and heat exchangers.

OFFERED:	Fall Semester
CREDIT:	3
IN-CLASS WORKLOAD:	3 hours / week of lecture, 2 hours / week of lab
OUT-OF-CLASS WORKLOAD	5 hours / week
PREREQUISITES	C grade in both or MENG 132 and MENG 162

LEARNING OUTCOMES;

- Upon successful completion of this course a student will be able to:
- Determine the best pipe diameter to use for a variety of flow situations
- Predict the flow in naturally flowing (gravity/pressure only) flow systems
- Determine head loss in piping systems
- Specify and select pumps to enable the correction of operation of both open and closed-loop flow systems
- Do an analysis of pump inlets and predict correct pump operation
- Work through flow prediction calculations for parallel flow arrangements using the Hardy-Cross method
- Calculate the rate of conductive heat transfer through arrangements of solids and stationary liquids and gases
- Calculate the rate of heat transfer in convective situations (moving liquids and gases).
- Determine the convective heat transfer coefficient and Nusselt number for a variety of convective geometries
- Examine finned convective heat exchangers and predict their performance (natural convection, forced convection).
- Predict the performance of tube-and-shell heat exchangers (counter-flow, parallel-flow, LMTD and NTU methods)
- Explore aspects of radiant heat transfer and predict the rate of heat transfer between bodies under certain conditions
- Examine applications of heat transfer in an engineering and real world context

OUTLINE

1. Fluids

   a. **Series Pipe Flow**: Review of the basics of fluids & fluid flow. Determination of: energy losses and additions, volume flowrate in gravity feed systems and optimal pipe diameter.

   b. **Parallel pipeline systems:** Systems with two branches, Iterative methods for three or more branches (Hardy Cross Analysis).

   c. **Pumps:** Types of pumps & performance data. Torque and head equations for impeller design conditions. Effect of pump speed and impeller diameter, specific speed, net positive suction head.

   d. **Forces due to fluids in motion**: Impulse - momentum equation applied to fluids, forces on bends in pipelines, forces on stationary objects, forces on moving objects.

   e. **Flow measurement**: Variable head meters, coefficients of contraction velocity and discharge, other forms of flow meters, pitot tubes.

   f. **Flow around immersed bodies**: Streamline flow, flow patterns, coefficients of drag, boundary layer flow, lift and drag on airfoils.

2. Heat Transfer

   a. **Introduction**: Heat transfer at an atomic scale.

b. **Conductive Heat Transfer**: Materials, establish overall thermal resistance.
c. **Convective Heat Transfer**: Forced and natural convection, fin cooling, enhancing heat transfer, heat exchangers
d. **Radiant Heat Transfer**: Introduction

Distribution of Marks:

Midterm Test	**25%**	A+	90 → 100%	B-	70 → 72%
Quizzes/Assignments	**15%**	A	85 → 89%	C+	65 → 69%
Laboratories	**25%**	A-	80 → 84%	C	60 → 64%
Final Exam	**35%**	B+	77 → 79%	D	50 → 59 %

A weighted average of 50% must be attained on test/examinations. Late assignments will have marks deducted; if handed in after assignments returned to class, then 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!

Instructor:

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