SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

COURSE TITLE:	Fluids & Combustions		
CODE NO. :	ELR211	**SEMESTER:**	THREE
PROGRAM:	Electrical Engineering Technician - Power Generation - Instrumentation Technician		
AUTHOR:	Frank Musso		
DATE:	September 2015	**PREVIOUS OUTLINE DATED:**	September 2014
APPROVED:	*"Corey Meunier"* **CHAIR**		
TOTAL CREDITS:	5		
PREREQUISITE(S):			
HOURS/WEEK:	4		

I. COURSE DESCRIPTION:

This course introduces the basic principles of fluid mechanics and the application of these principles to practical and applied problems. After completing this course the student should have a firm foundation in the field to continue learning. This course will provide the understanding of basic concepts of fluid mechanics and application of these concepts to solve real world problems in the area of Instrumentation and Process Control.

II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

Upon successful completion of this course, the student will demonstrate the ability to:

1. Define, express and relate the properties of fluids

Potential Elements of the Performance:

- Define the terms fluids and fluid mechanics
- Derive units of force, energy and pressure in SI and English systems of units
- Perform unit conversions and cancellations
- Select the appropriate significant figures
- Define the tem density, weight density and specific gravity
- Derive the relationship between mass density and weight density
- Express pressure as equivalent liquid column
- Differentiate between gauge pressure and absolute pressure
- Explain the role of viscosity in fluid flow

2*. *Describe the behavior of fluids at rest

Potential Elements of the Performance:

- Discuss the different forms of fluid energy
- Express the fluid energy as head
- Derive the relationships between pressure and elevation
- Measure fluid pressure using manometers and gauges
- Calculate the forces acting on retaining walls and buoyant forces on bodies immersed in fluids

3. Apply the principles of mass conservation and energy conservation to fluids in motion.

Potential Elements of the Performance:

- Derive and apply continuity equation to size the pipes
- Apply the concept of energy conversation to write Bernoulli's equation
- Recognize the limitations of Bernoulli"s equation
- Define Toricelli's theorem
- Describe the working principles of variable head meters

4. Apply the principles of fluid mechanics to flow measurement

Potential Elements of the Performance:

- Identify hydraulic mechanics like pumps and turbines
- Expand Bernoulli's equation to include the terms head added and head lost apply energy equation to solve practical problems
- Calculate the power required to drive pumps
- Draw hydraulic and energy grade line for a fluid system
- Derive general flow equation for variable head meter
- Study a venturi meter in the laboratory
- Derive the equation relating coefficients of discharge, velocity and contraction
- Calculate the velocity of flow using Pitot-static tube
- Apply weirs formula to estimate flow in open channel
- Characterize laminar flow and turbulent flow
- Use Moody's chart to determine friction factor
- Compute frictional head loss by applying Darcy Weisbach flow equation
- Calculate minor losses due to expansion, contraction and fittings
- Calculate total losses and use this in the general energy equation

5. Describe the Products of Combustion

Potential Elements of the Performance

- Define Combustion and its properties
- Fuels
- Molecular structure of fuels
- Write balanced Combustion equations
- Describe Stoichiometric Ratio
- Describe heating Value of Fuels

6. Describe Flue gases and Flue gases Analyses

Potential Elements of the Performance

- Describe the products of Combustion
- Boiler efficiency and Excess Air

III. TOPICS:

1. Fluid Properties
2. Behavior of Fluids at Rest
3. Behavior of Fluids in Motion
4. Principles of Flow Measurement
5 Combustion
6.. Flue Gases

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:

Applied Fluid Mechanics (Robert L. Mott Sixth Edition)

V. EVALUATION PROCESS/GRADING SYSTEM:

Three Tests	-	70%
Lab Work	-	20%
Assignments	-	10%
Total		**100%**

The following semester grades will be assigned to students:

Grade	**Definition**	*Grade Point Equivalent*
A+	90 – 100%	4.00
A	80 – 89%	
B	70 - 79%	3.00
C	60 - 69%	2.00
D	50 – 59%	1.00
F (Fail)	49% and below	0.00

CR (Credit)	Credit for diploma requirements has been awarded.
S	Satisfactory achievement in field /clinical placement or non-graded subject area.
U	Unsatisfactory achievement in field/clinical placement or non-graded subject area.
X	A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course.
NR	Grade not reported to Registrar's office.
W	Student has withdrawn from the course without academic penalty.

If a faculty member determines that a student is at risk of not being successful in their academic pursuits and has exhausted all strategies available to faculty, student contact information may be confidentially provided to Student Services in an effort to offer even more assistance with options for success. Any student wishing to restrict the sharing of such information should make their wishes known to the coordinator or faculty member.

UPGRADING OF INCOMPLETES:

When a student's course work is incomplete or final grade is below 60%, there is the possibility of upgrading to a pass when a student meets all of the following criteria:

1. The student's attendance has been satisfactory.
2. An overall average of at least 50% has been achieved.
3. The student has not had a failing grade in all of the theory tests taken.
4. The student has made reasonable efforts to participate in class and complete assignments.

The nature of the upgrading requirements will be determined by the instructor and may involve one or more of the following: completion of existing labs and assignments, completion of additional assignments, re-testing on individual parts of the course or a comprehensive test on the entire course.

LABS:
Lab activities represent a very important component of this course. Because of this, **attendance is mandatory** and the evaluation of all lab work will be done in class. *It is the student's responsibility to discuss absences from regularly scheduled labs with the instructor so that alternate arrangements (where possible) can be made to complete the lab requirements.*

VI. SPECIAL NOTES:

Attendance:
Sault College is committed to student success. There is a direct correlation between academic performance and class attendance; therefore, for the benefit of all its constituents, all students are encouraged to attend all of their scheduled learning and evaluation sessions. This implies arriving on time and remaining for the duration of the scheduled session.

Any make up test will be completed after classes end and before marks are due.

VII. COURSE OUTLINE ADDENDUM:

The provisions contained in the addendum located in D2L and on the portal form part of this course outline.