SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

COURSE TITLE:	FLUIDS & COMBUSTIONS		
CODE NO. :	ELR211	**SEMESTER:**	THREE
PROGRAM:	INSTRUMENTATION TECHNICIAN		
AUTHOR:	RANDY CLOUTHIER		
DATE:	SEPT 2010	**PREVIOUS OUTLINE DATED:**	SEPT 2009
APPROVED:	*"Corey Meunier"*		
	CHAIR		DATE
TOTAL CREDITS:	FIVE		
PREREQUISITE(S):			
HOURS/WEEK:	FOUR		

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.   Perform unit conversions using the procedure of unit cancellation.

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

2.   Define, express and relate the properties of fluids.

Potential Elements of the Performance:
- 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

3.   Describe the behavior of fluids at rest.

Potential Elements of the Performance:
- Discuss the three 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

4. ***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

5. ***Modify Bernoulli's equation to general energy equation.***

   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

6. ***Apply the principles of fluid mechanics to flow measurement.***

   Potential Elements of the Performance:
   - 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

7. ***Identify factors affecting fluid flow and compute the head loss in a fluid flow system.***

   Potential Elements of the Performance:
   - 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

8. ***Perform related lab activities.***

III. **TOPICS:**

   1. Systems of Units
   2. Fluid Properties
   3. Fluid Statics

4.   Fluid Kimematics
5.   General Energy Equation
6.   Flow Measurement
7.   Energy Losses
8.   Application of Bernoulli

IV.   REQUIRED RESOURCES/TEXTS/MATERIALS:
Handouts will be provided by the instructor.

V.   EVALUATION PROCESS/GRADING SYSTEM:

Two Tests   -   60%
Lab Work & Assignments   -   30%
Attendance & Attitude   -   10%

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.

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 students 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.

VII.   COURSE OUTLINE ADDENDUM:

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