SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO

Sault College

COURSE OUTLINE

COURSE TITLE:	FLUIDS

CODE NO. :	ELR 211	**SEMESTER:**	3

PROGRAM: INSTRUMENTATION TECHNICIAN

AUTHOR: Bill Armstrong

DATE:	January 2000	**PREVIOUS OUTLINE DATED:**	June 1997

APPROVED:

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                   DEAN   **DATE**

TOTAL CREDITS: 5

PREREQUISITE(S):

LENGTH OF COURSE:	15 weeks	**TOTAL CREDIT HOURS:**	75

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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

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3. Describe the behaviour 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 buouant 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:**

Mott, Robert, (1994), Applied Fluid Mechanics, Fourth Edition, Charles E.
Merrill Publishing Company, Toronto
Verma, S. C. (1993), Hydrualics - Course Manual, Sault College
Instrumentation Lab Manual and Assignments

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V. EVALUATION PROCESS/GRADING SYSTEM:

The final grade will be derived from the results of the tests and labwork and assignments, weighted as follows:

Tests	-	**70%**
Lab Work	-	**30%**

To pass the course a minimum of 60% is required in the weighted average plus a minimum of 60% in at least one of the tests.

The following semester grades will be assigned to students in postsecondary courses:

Grade	Definition	Grade Point Equivalent
A+	90 - 100%	4.00
A	80 - 89%	3.75
B	70 - 79%	3.00
C	60 - 69%	2.00
R (Repeat)	59% or below	0.00
CR (Credit)	Credit for diploma requirements has been awarded.	
S	Satisfactory achievement in field placement or non-graded subject areas.	
U	Unsatisfactory achievement in field placement or non-graded subject areas.	
X	A temporary grade. This is used in limited situations with extenuating circumstances giving a student additional time to complete the requirements for a course (see *Policies & Procedures Manual – Deferred Grades and Make-up*).	
NR	Grade not reported to Registrar's office. This is used to facilitate transcript preparation when, for extenuating circumstances, it has been impossible for the faculty member to report grades.	

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VI.   SPECIAL NOTES:

Special Needs:
If you are a student with special needs (e.g. physical limitations, visual impairments, hearing impairments, or learning disabilities), you are encouraged to discuss required accommodations with your instructor and/or the Special Needs office. Visit Room E1204 or call Extension 493, 717, or 491 so that support services can be arranged for you.

Retention of course outlines:
It is the responsibility of the student to retain all course outlines for possible future use in acquiring advanced standing at other postsecondary institutions.

Plagiarism:
Students should refer to the definition of "academic dishonesty" in *Student Rights and Responsibilities*. Students who engage in "academic dishonesty" will receive an automatic failure for that submission and/or such other penalty, up to and including expulsion from the course/program, as may be decided by the professor/dean. In order to protect students from inadvertent plagiarism, to protect the copyright of the material referenced, and to credit the author of the material, it is the policy of the department to employ a documentation format for referencing source material.

Course outline amendments:
The Professor reserves the right to change the information contained in this course outline depending on the needs of the learner and the availability of resources.

Substitute course information is available in the Registrar's office.

Attendance:
Eighty percent attendance is required for anyone to be considered for supplementary examination.

Assignments/Laboratory Work:
Home assignments are due one week after they are assigned. Late submissions will be penalized.
Laboratory work is an important component of this course. The concepts discussed in the theory class will be reinforced by performing laboratory experiments.
If required, changes will be made. However, students will be notified prior to any changes.

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VII. PRIOR LEARNING ASSESSMENT:

Students who wish to apply for advanced credit in the course should consult the instructor.

VIII. DIRECT CREDIT TRANSFERS:

Students who wish to apply for direct credit transfer (advanced standing) should obtain a direct credit transfer form from the Dean's secretary. Students will be required to provide a transcript and course outline related to the course in question.

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