

SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO



Sault College

COURSE OUTLINE

COURSE TITLE: FLUIDS AND THERMODYNAMICS
CODE NO. : IIM702 **SEMESTER:** INT.
PROGRAM: INDUSTRIAL INSTRUMENT MECHANIC
AUTHOR: Bill Armstrong
DATE: JANUARY **PREVIOUS OUTLINE DATED:** NEW
2004
APPROVED:

		_____ DEAN	_____ DATE
TOTAL CREDITS:	5		
PREREQUISITE(S):	IIM 601 IIM602 4		

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School of Technology, Skilled Trades & Natural Resources
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I. COURSE DESCRIPTION:

This course introduces the basic principles of fluid mechanics and thermodynamics. The course will focus on solving problems related to flow measurement 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
- Define the term 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 behaviour of fluids at rest

Potential Elements of the Performance:

- Discuss the three forms of fluid energy
- Describe Pascal's law
- Express the fluid energy as head
- Derive the relationships between pressure and elevation
- Define Archimedes principle
- 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:

- Characterize laminar flow and turbulent flow
- Derive and apply continuity equation
- Apply the concept of energy conservation 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. 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

5. Apply the principles of fluid mechanics to flow measurement.

Potential Elements of the Performance:

- Derive general flow equation for variable head meter
- Understand the different type of head meters
- Derive the equation relating coefficients of discharge, velocity and contraction
- Calculate the velocity of flow using Pitot-static tube

6. Understand the basic concepts of thermodynamics..

Potential Elements of the Performance:

- Define Boyle's, Charle's and the general gas laws.
- Perform basic calculations involving gas laws
- Discuss compressibility and expansion
- Perform flow calculations for compressible fluids
- Describe the sources of heat energy
- Define temperature, heat, laws of thermodynamics and specified heat
- Define sensible heat, latent heat of evaporation, saturation temperature and superheat.
- Perform basic calculations of heat quantities
- Describe the laws related to heat
- Provide an awareness of steam tables

III. TOPICS:

1. Fluid Properties
2. Fluid Statics
3. Fluid Kinematics
4. General Energy Equation
5. Flow Measurement
6. Thermodynamic concepts

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:

Mott, Robert, (1994), Applied Fluid Mechanics, Fourth Edition, Charles E. Merrill Publishing Company, Toronto

Verma, S. C. (1993), Hydraulics - Course Manual, Sault College
Instrumentation Lab Manual and Assignments

V. EVALUATION PROCESS/GRADING SYSTEM:

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

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

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 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.

<include any other special notes appropriate to your course>

VII. PRIOR LEARNING ASSESSMENT:

Students who wish to apply for advanced credit in the course should consult the professor. Credit for prior learning will be given upon successful completion of a challenge exam or portfolio.

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.