

SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

Course Title            PHYSICS FOR MECHANICAL TECHNICIANS  
 Code No. :              NONE ( M<sup>r</sup>^ - ^ - : o c- . ' )  
 Program :                MECHANICAL TECHNICIAN  
 Semester :              THREE  
 Date :                    MAY 20, 1983  
 Author :                 W. J. ADOLPH

New:    X                    Revision

APPROVED:

*Progetto*  
 Chairperson

Date

CALENDAR DESCRIPTION

PHYSICS FOR MECHANICAL TECHNICIANS

Course Name

Course Number

PHILOSOPHY/GOALS:

See Next Page.

METHOD OF ASSESSMENT (GRADING METHOD):

There are tests at the conclusion of each of the four topics. Numerical grading and letter grades are related as below:

85 - 100    A

70 - 84     B

55 - 69     C

Tests will be announced at least one week in advance.

TEXTBOOK(S):

None Required.

Notes are provided as needed

PHYSICS FOR TECHNICIAMS

GENERAL OBJECTIVES:

The objectives of this course reflect the prerequisites of the 4th semester course in fluids for technicians. The program requires proficiency in understanding of the gas laws for gases and the laws which apply to incompressible liquids.

The general objectives are as follows:

1. The course provides a foundation of the fundamental principals of Heat and Fluids with practical application through problems. There is no laboratory component,
2. The course requires the student to learn and apply the units of both the Imperial System and the International System of measurement.

SUMMARY OF TOPICS:

1. Concepts of Heat, Temperature and Inter<sup>^^</sup>i Energy
2. Thermal Properties of Solids and Liquids
3. Thermal Properties of Compressible Fluids
4. Properties of Incompressible Fluids

Topic #1: Concepts

Historical Sketch  
Heat, Temperature and Internal Energy  
Temperature Metrology  
The Temperature Scales  
Relationship between Work and Heat  
Specific Heat of Solids and Liquids  
Change of State  
The Processes of Evaporation and Condensation  
The Processes of Melting and Freezing  
The processes of Regelation and Sublimation  
Humidity

Topic #2: Thermal Properties of Matter

Structure of Matter

Thermal Expansion in Solids and Liquids

The Relationship between Thermal Expansion and Load Strain

Topic #3: Kinetic Theory of Gases

The Gas Laws of Charles and Boyle

Ideal Gas Laws

The Gas Constant

Topic #4: Fluid Basics

Hydrostatic Pressure

Measurement of Pressure, Manometry

Pascal's Law: Hydraulic Jacks

Buoyancy and Archimedes Principle

Bernoulli's Theorem and Applications

SPECIFIC OBJECTIVES:

TOPIC #1

The student will be able to:

1. Explain the origin and meanings of such terms as caloric, frigorific, phlogiston, and explain the work of Count Rumford.
2. Define "internal energy", heat and temperature.
3. Explain how the electrical, magnetic and optical properties of matter can be exploited in the metrology of heat.
4. Sketch and describe the following:
  - a) The Liquid Thermometer
  - b) The Bimetal Strip
  - c) The Constant Volume Gas Thermometer
- 5- Describe a procedure for calibrating a liquid thermometer by utilizing the freezing and boiling temperatures of water.
6. Using the changes of state temperatures of water, differentiate between the Celsius and Fahrenheit thermometer scale readings.
- 7- Define the Kilojoule and the British Thermal Unit.
8. Define the units:
  - a) Newton
  - b) Pound Force
  - c) Newton Meter
  - d) Foot Pound
9. Define:
  - a) Kinetic Energy
  - b) Potential Energyand state the formula for each.
10. State the relationship between Btu's and ftlbf.
11. Define Specific Heat of a Substance.
12. State the specific heat of ice, water, and steam, in both Imperial and S.I. systems-
13. State the formula relating heat transferred, specific heat, mass and change in temperature.

14. Explain the likely mechanisms that take place at the molecular level when matter freezes and melts, vapourizes and condenses.
15. Define the Heat of Fusion and the Heat of Vapourization.
16. State the values of the heats of fusion and vapourization in both systems. Imperial and S.I.
17. Draw the triple point diagram for water, labelling all parts.
18. Explain, using the triple point chart, how boiling and freezing can occur simultaneously.
19. Define sublimation.
- 20- Define regelation and provide an example.
- 21, Define:
  - a) Absolute Humidity
  - b) Relative Humidity
22. Answer completely and correctly the following question and problem sets of Unit 1.