

SAULT COLLEGE  
of Applied Arts and Technology  
Sault Ste. Marie

COURSE OUTLINE

PHY-110-5

PHYSICS AND ELECTRICAL FUNDAMENTALS

DAMENTALS

Kpwiqp/-j by R. E. Heath, September, 1981



## COURSE OUTLINE

PHY-110-5 - Physics and Electrical Fundamentals for  
CHE2 and ML2

### COHERENT UNITS OF MEASUREMENT

Ref: Notes, "Coherent Units of Measurement", 1980 R. E. Heath

The three presently used coherent unit systems.

Base quantities and base units.

Derived quantities and derived units.

The distinction between mass and weight.

Standard gravitational acceleration.

The conversion of units of measure.

Dimensionless quantities.

Rules for symbols for quantities and units of measure.

The metric prefixes, their symbols and use.

The proper use of coherent units in coherent equations.

The recognition of coherent and non-coherent equations.

Devices and methods for pressure measurement.

Special units (as litre-atmosphere).

### Temperature Measurement and Control

Physical properties that change with temperature.

Liquid expansion temperature measuring devices.

Solid expansion temperature devices, esp. the bimetal type  
and applications as a strip, coil and helix.

Semiconductor as a temperature sensor and applications.

Thermocouple as a temperature sensor; characteristics, types  
and applications.

The mercury switch.

Comparison of thermocouple thermometer to liquid and  
semiconductor types.

ELECTRIC CURRENT AND RESISTANCE

REF: Smith and Cooper, Elements of Physics, 9th Edition, Chapter 33,

Currents and their Effects

The direction of a current.

Ohm's Law for a Resistor.

Joule's Law of Heating.

Resistivity.

Temperature Coefficient of Resistance.

Resistors in Series.

Resistors in Parallel.

ELECTRIC CIRCUITS

REF: Smith and Cooper, Elements of Physics, 9th Edition, Chapter 34.

Electromotive Force.

The Conservation of Energy in a Simple Circuit.

The Resistances of Sources of Electromotive Force.

Charging a Battery.

Cells in Series.

Ohm's Law for a Complete Circuit.

Kirchhoff's Laws.

THE TOASTER

REF: "The Toaster" (Physics of Technology Series) - McGraw-Hill

The meaning of energy, power, specific heat, heat capacity and coefficient of linear expansion.

Relations among current, voltage, energy, time and power.

Numerous energy units and their interrelationships.

Measurement of the heat capacity of water and a toaster-

Coefficient of thermal expansion.

Behaviour of the bimetallic strip.

Thermal control system of a common toaster.

Identification of transformations of energy during an ongoing process.

Determination of the angle of deflection of a bimetal strip.

Determination of the displacement at the end of a bimetal strip by both experiment and calculation.

General temperature control systems with the bimetal strip.

#### LIGHT

REF: Notes, "Refractometry"

Refraction, Snell's Law.

Index of refraction in terms of light velocities.

Velocity of light in free space and normal air.

Variation of refractive index of a sucrose solution.

Refraction of water waves with changing wave velocity.

Variation of refractive index with light wavelength.

Dispersion and angle of dispersion.

Colour fringeing.

Wavelength standard for refractive indices.

Critical angle and total internal reflection.

Applications of total internal reflection: the binocular, fibre optics.

The superiority of the 45° prism to the common mirror as a reflector.

Displacement of a light beam when passing through a glass plate at an acute angle. ^B

The converging lens.

Focal length, object distance, image distance and their interrelationship.

Image formation with emphasis upon point sources and light bundles -

The simple lens and chromatic light.

Chromatic aberration.

The doublet lens.

Lens movement and focusing range of the 35 mm camera.

The similarity of the simple camera and the human eye.

The astronomical telescope.

The terrestrial telescope.

The details of how a simple refractometer makes use of the critical angle concept to create an image with a sharp transition between light and dark areas.

Variables affecting liquid refractive index.

Function of the Amici prism.

The structural features and light paths in the Erma Abbe refractometer.

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PHY-11D-5 Physics and Electrical Fundamentals  
for CHE2 and ML2

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The three presently used coherent unit systems.

Base quantities and base units.

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### ELECTRIC CURRENT AND RESISTANCE

REF: Smith and Cooper, Elements of Physics, 9th Ed, Chapter 33

Current: and their Effects

The direction of a current.

Ohm's Law for a Resistor.

Joule's Law of Heating,  
Resistivity.  
Temperature Coefficient of Resistance.  
Resistors in Series  
Resistors in Parallel.

### Electric Circuits

REF: Smith and Cooper, Elements of Physics, 9th Ed., Chapter 30  
Electromotive Force  
The Conservation of Energy in a Simple Circuit.  
The Resistances of Sources of Electromotive Force,  
Charging a Battery.  
Cells in Series.  
Ohm's Law for a Complete Circuit.  
Kirchhoff's Laws.

### THE TOASTER

REF; "The Toaster" (Physics of Technology Series) - McGraw-Hill  
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