SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY
SAULT STE. MARIE, ON

COURSE OUTLINE

COURSE TITLE: APPLIED PHYSICS II

CODE NO.: PHY118-3 SEMESTER: TWO

PROGRAMS: ARCHITECTURAL, CIVIL TECHNICIAN/TECHNOLOGY, CONSTRUCTION TECHNICIAN, ENVIRONMENTAL, PULP & PAPER, and WATER RESOURCES TECHNOLOGIES

AUTHOR: GEOFFREY N. DISANO

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APPROVED: _____
KITTY DEROSARIO, DEAN DATE
SCHOOL OF TECHNOLOGY, ENGINEERING
& TECHNICAL TRADES

TOTAL CREDITS: 3

PREREQUISITE(S): APPLIED PHYSICS I PHY100-4 (OR THE EQUIVALENT)

LENGTH OF COURSE: 3 HOURS/ WEEK FOR 16 WEEKS. TOTAL CREDIT HOURS: 48

I. COURSE DESCRIPTION:

This course is the second semester continuation of the semester one physics course, Applied Physics I, PHY100. Like it's semester one prerequisite, this course is intended to introduce the student to a number of fundamental concepts of physics which should prove useful to students in the Architectural, Civil, Construction, Environmental, Water Resources and Pulp & Paper Engineering Technician and Technology programs.

Topics to be covered include: the *mechanical properties of solids;* an introduction to the basics of *fluid statics* and *fluid dynamics; temperature*, *temperature scales* and *heat* and *heat transfer*; the *gas laws*; a brief study of the *first and second laws of thermodynamics*; *static electricity* and *direct current electricity.*

The assumption is that many of the students will be seeing most of these concepts for the first time. Because of the number of topics and the potential for difficulties in some of the more complicated areas, the emphasis will be placed on *introducing* the student to the *concepts* **rather than** a *rigorous mathematical analysis* of the topics.

II. LEARNING OUTCOMES AND ELEMENTS OF PERFORMANCE:

(Generic Skills Learning Outcomes placement on the course outline will be determined at a later date)

A. Learning Outcomes:

1) Write definitions for the concepts introduced, preferably in the student's own words.

2) Answer questions requiring a knowledge of the concepts presented in class.

3) Respond to questions requiring extrapolation of the course content.

4) Solve mathematical based problems requiring an understanding of the course theory.

5) Apply the knowledge learned in this course to other courses which are 'physics based'.

B. Topics To Be Covered: **Approximate Time Frames (Optional)**

I) MECHANICAL PROPERTIES OF SOLIDS

II) FLUID STATICS AND DYNAMICS

III) TEMPERATURE, HEAT AND HEAT TRANSFER

IV) THE GAS LAWS

V) THERMODYNAMICS

VI) STATIC ELECTRICITY

VII) DIRECT CURRENT ELECTRICITY

C. Learning Outcomes and Elements of the Performance:

Upon successful completion of this course the student will demonstrate the ability to:

I) MECHANICAL PROPERTIES OF SOLIDS

(a) Properties of Solids

1) List the characteristics of '*solids*' that distinguish them from the other '*states of matter*'.

(b) elasticity

1) Define what is meant by an '*elastic*' body.

2) List a number of examples of '*elastic bodies*'.

3) List a number of examples of '*inelastic bodies*'.

(c) Hooke's law

1) Write a verbal statement of '*Hooke's law*' as it pertains to ***springs*** *being stretched or compressed*.

2) Write a mathematical statement (an equation) of '*Hooke's law*' as it pertains to ***springs*** *being stretched or compressed*.

(d) <u>'stress' and 'strain' - 'Young's modulus of elasticity'</u>

1) Describe what is meant by: '*tensile stress*', '*compressive stress*' and '*shearing stress*'.

2) Explain what is meant by '*stress*' in a general sense and write an equation for '*stress*'.

3) List the proper units for *stress* in each of the *S.I. metric* and *Imperial systems of units*.

4) Describe what is meant by '*strain*' in a general sense.

5) Write equations for each of '*tensile strain*', '*compressive strain*' and '*shearing strain*'. Include diagrams that clearly illustrate the meaning of each of the variables in the equations.

6) Explain what is meant by the term '*elastic limit*'.

7) Explain what is meant by the term '*ultimate strength*'.

8) Write a verbal statement and a mathematical statement (an equation) for '*Hooke's law*' <u>in it's *most general form*</u>.

9) Explain what is meant by '*Young's modulus*' and state the units of *Young's modulus* in each of the *S.I. metric* and *Imperial systems of units*.

10) Solve the example problems as presented in class involving applications of '*stress*', '*strain*' and '*Young's modulus*'.

(e) <u>shear modulus</u>

1) Explain what is meant by '*shear modulus*' and state the units of *shear modulus* in each of the *S.I. metric* and *Imperial systems of units*.

2) Write an equation for '*shear modulus*' and include a diagram showing the meaning of each of the variables in the equation.

(f) <u>bulk modulus</u>

1) Explain what is meant by the term '*bulk modulus*' and state the units of *bulk modulus* in each of the *S.I. metric* and *Imperial systems of units*.

2) Write equations for *each of 'bulk modulus*'**, '***bulk stress*' and '*bulk strain*'. Include diagrams illustrating the meaning of each of the variables in the equations.

(g) <u>other physical properties of solids - in particular "metals"</u>

1) Write definitions for each of the following properties of metals: (i) '*hardness*', (ii) '*ductility*', (iii) '*malleability*' and (iv) '*conductivity*'.

2) Read chapter 11 of the reference text , sections 11.1 and 11.2.

3) Solve the problems as assigned from chapter 11 of the reference text.

4) Solve the problems as handed out on problem sheets dealing with '*stress'*, *'strain'* and *'moduli of elasticity'.*

II) <u>FLUID STATICS AND DYNAMICS</u>

(a) <u>Properties of Liquids</u>

1) List the characteristics of the '*state of matter*' known as '*liquids*' that distinguishes it from the other *states of matter*.

2) Explain what is meant by the terms '*cohesion*' and '*adhesion*', '*surface tension*',

'*viscosity*' and '*capillary action*' - terms which are used to describe certain mechanical characteristics of liquids.

3) Read chapter 11 section 11.3 of the reference text.

(b) <u>mass density</u>

1) Write a definition for the term '*mass density*'.

2) Write the equation for the term '*mass density*'.

3) List the proper units for *mass density* in each of the *S.I. metric*, *C.G.S metric* and *Imperial system of units*.

(c) <u>weight density</u>

1) Write a definition for the term '*weight density*'.

2) Write the equation for the term '*weight density*'.

3) List the proper units for *weight density* in each of the *S.I. metric*, *C.G.S. metric* and *Imperial systems of units*.

4) Write the equation that relates mathematically the two terms '*mass density*' and '*weight density*'.

(d) specific gravity

1) Write a definition for the term '*specific gravity*'.

2) Write 2 equations for the term '*specific gravity*'.

3) List the values for the *mass density*, the *weight density* and the *specific gravity* of pure water *at it's temperature of maximum density*.

(e) pressure

1) Write the general equation for the term *'pressure'*.

2) List the units used to measure pressure in the *S.I. metric* and the *Imperial systems of measurement*.

3) Identify the relationships that exist among the various units of pressure measurement including: *pounds per square inch*, *kilopascals*, *newtons per square metre*, *atmospheres*, *millibars*, *inches of mercury*, *centimetres of mercury*, *millimetres of mercury*, *feet of water* and *metres of water*.

(f) Pressure at a depth in a liquid

1) Write the two equations used to determine the pressure exerted by a column of liquid of known density and at a given depth beneath the surface.

2) Discuss the relationship that exists, if it exists at all, between the pressure at a given depth in a given liquid and the shape of the containing vessel.

(g) Pascal's law

1) Write a verbal statement of '*Pascal's law*' and demonstrate an understanding of the law by applying it to examples presented in class.

2) Solve example problems as presented in class involving applications of *Pascal's law* to hydraulic presses, hydraulic jacks, hydraulic brakes, etc..

(h) Archimedes' principle

1) Demonstrate an understanding of the cause of the '*force of buoyancy*'. Do so by developing the relationship that exists between the *buoyant force* acting on an object, either submerged or floating, and the *weight of the displaced liquid*.

2) Write a verbal statement of *'Archimedes' principle'* and demonstrate an

understanding of the principle by applying it to examples as presented in class.

(i) <u>fluid flow</u>

1) Discuss what is meant by the terms *'laminar flow'* and *'turbulent flow'*.

2) Write the equations for *'volumetric flow rate'*, *'mass flow rate'* and *'weight flow rate'* and indicate clearly the meaning of each of the variables in each of the equations.

3) Write a verbal statement of the '*Continuity Principle*' and in your own words explain, in simple terms, the implications of this principle.

4) Write a mathematical statement (an equation) for the '*Continuity Principle*' and solve simple problems involving the flow of an *<u>incompressible</u> fluid* through a pipe having varying diameters along the path of flow.

5) Write a verbal statement for *'Bernoulli's principle'* and discuss several applications of Bernoulli's principle including the gasoline engine carburetor, an aircraft wing and a baseball pitcher's "curve ball".

6) Write a mathematical statement (an equation) for '*Bernoulli's principle*'. Indicate what each of the *quantities* in the equation represents; the proper units for each of the *terms* in the equation <u>and</u> the rational for each of the terms having these units.

7) Read chapter 12 of the reference text.

8) Answer the questions and solve the problems as assigned from chapter 12 of the reference text.

9) Solve the example and supplementary problems as presented in class dealing with the flow of an *incompressible fluid* through a pipe having varying diameters and changing elevations. The relationships between *pressure*, *velocity*, *elevation* and *frictional losses* are determined by applying *Bernoulli's energy equation*. See learning objective II - (i) - 6) above.

III) <u>TEMPERATURE, HEAT AND HEAT TRANSFER</u>

(a) <u>temperature</u>

1) Read the handout titled 'Historical Sketch on the Nature of Heat'.

2) Discuss what is meant by the term '*thermal energy*'.

3) Write 2 definitions for the concept of '*temperature*'.

(b) <u>temperature scales</u> and **(c) <u>absolute temperature scales</u>**

1) List the four most commonly used *temperature scales* along with the proper abbreviations for the '*units of temperature*' on each scale.

2) On each of the *temperature scales* above, recall the value of each of the following *temperatures*: the '*freezing point*' of water at standard atmospheric pressure; the '*boiling point*' of water at standard atmospheric pressure; and the temperature known as '*absolute zero*'.

3) State the mathematical relationships that exist between (i) the '*Celsius*' and the '*Fahrenheit*' temperature scales; (ii) the '*Celsius*' and the '*Kelvin*' temperature scales; and (iii) the '*Fahrenheit*' and the '*Rankine*' temperature scales.

4) Explain what is meant by the concept of '*absolute zero*' making reference to the terms '*temperature*' and '*thermal energy*' in your explanation.

5) Given a temperature on any one of the four temperature scales of learning activity III - (b) - 1) convert this temperature to an equivalent value on each of the remaining three temperature scales.

(d) <u>heat</u>

1) Explain the meaning of the concept of '*heat*'.

2) Distinguish clearly between the concept of '*heat*' and the concept of '*temperature*' as defined in learning activity III - (a) - 3) above.

(e) <u>methods of heat transfer</u>

1) Describe in detail the processes involved with each of the three methods of heat transfer, namely: '*conduction*', '*convection*' and '*radiation*'.

2) List the factors that determine the rate at which heat will flow by *conduction* through a surface.

3) Write the equation used to determine the amount of heat transferred by *conduction* through a surface of a known material, of given surface area and thickness, subjected to a specified temperature difference for a stated period of time.

4) Describe what is meant by the term '*R value*' and write the equation that

relates the *R value* to the '*thermal conductivity*' of a material.

(f) <u>specific heat capacity</u>

1) Explain the meaning of the term '*specific heat capacity*'.

2) Write an equation for the term '*specific heat capacity*'.

3) List the units of *specific heat capacity* in the *S.I. metric*, *C.G.S. metric*, *"old" M.K.S. metric* and *Imperial systems of measure.*

4) Write a definition for the concept of '*sensible heat*' and write the equation used to determine the '*quantity of sensible heat*' absorbed or released by a mass.

5) State the value for the *specific heat capacity* of water in each of the systems of measure listed in learning activity III -(f) - 3).

(g) <u>changes of state</u>

1) Explain clearly what is meant by a '*change of state*'.

2) Write the proper term for and discuss the processes that occur for each of the following *changes of state*: from *solid* to *liquid*; from *liquid* to *solid*; from *liquid* to *gas*; from *gas* to *liquid*; from *solid* to *gas*; from *gas* to *solid*.

(h) <u>specific latent heat of fusion</u>

1) Explain the meaning of the term '*specific latent heat of fusion*'.

2) Write an equation for the term '*specific latent heat of fusion*'.

3) List the units of *specific latent heat of fusion* in the *S.I. metric*, *C.G.S. metric*, *"old" M.K.S. metric* and *Imperial systems of measure*.

4) State the value of the *specific latent heat of fusion* for water in each of the systems of measure listed in learning activity III - (h) - 3) above.

(i) <u>specific latent heat of vapourization</u>

1) Explain the meaning of the term '*specific latent heat of vapourization*'.

2) Write an equation for the term '*specific latent heat of vapourization*'.

3) List the units of *specific latent heat of vapourization* in the *S.I. metric*, *C.G.S. metric*, *"old" M.K.S. metric* and *Imperial systems of measure*.

4) State the value of the *specific latent heat of vapourization* for water in each of the systems listed in learning activity III - (i) - 3) above.

(j) <u>method of mixtures</u>

1) Describe the procedure known as the '*method of mixtures*' that is used to experimentally determine values of: specific heat capacities, specific latent heats, unknown masses, unknown temperatures, etc.

2) Write the main equation used to solve problems involving the '*method of mixtures*'.

3) Solve the example problems as presented in class dealing with '*sensible heat*', '*latent heat of fusion*', '*latent heat of vapourization*' and '*heat loss/heat gain*'.

4) Read chapter 13 sections 13.1, 13.2, 13.3, 13.4, 13.5 and 13.8 and solve the problems as assigned from these sections of the text book.

(k) <u>linear expansion of solids</u>

1) List the 3 factors that determine the amount of '*linear expansion*' of a solid.

2) Explain clearly the meaning of the term '*coefficient of linear expansion*'.

3) Write the equation used to determine the amount of linear expansion for a solid subjected to a given temperature change.

4) Solve the example problems as presented in class dealing with *linear expansion* of solids.

(l) <u>area expansion of solids</u>

1) List the 3 factors that determine the amount of '*area expansion*' of a solid.

2) Explain clearly the meaning of the term '*coefficient of area expansion*'.

3) Write the equation used to determine the amount of area expansion for a solid subjected to a given change in temperature.

4) Discuss the relationship that exists between the '*coefficient of area expansion*' for a solid and the corresponding '*coefficient of linear expansion*'.

5) Solve the example problems as presented in class dealing with *area expansion of solids*.

(m) <u>volume expansion of solids</u>

1) List the three factors that determine the amount of '*volume expansion*' of a solid subjected to a temperature change.

2) Explain clearly the meaning of the term '*coefficient of volume expansion*'.

3) Discuss the relationship that exists between the '*coefficient of volume expansion*' for a solid and the corresponding '*coefficient of linear expansion*'.

4) Write the equation used to determine the amount of *volume expansion* for a solid subjected to a given change in temperature.

5) Solve the example problems as presented in class dealing with *volume expansion of solids*.

(n) <u>volume expansion of liquids</u>

1) Indicate how one would determine or where one would find the '*coefficients of volume expansion*' for *liquids*.

2) Discuss in detail the unusual behaviour of water with regard to it's volume and density as a function of temperature. Explain how it is that small northern lakes do not freeze solid during the winter months and, as a result, are able to support aquatic life both in the plant and animal form.

3) Read chapter 13 sections 13.6 and 13.7 of the reference text.

4) Answer the questions and solve the problems as assigned from chapter 13 of the reference text.

IV) <u>THE GAS LAWS</u>

(a) <u>Properties of Gases</u>

1) List the characteristics of the '*state of matter*' known as '*gases*' that distinguish them from the other '*states of matter*'.

(b) Boyle's gas law

1) Write a verbal statement of *'Boyle's gas law'*.

2) Write a mathematical statement (an equation) of *'Boyle's gas law'*.

3) Explain what is meant by the terms *'gauge pressure'* and *'absolute pressure'*.

4) Write the equation that interrelates the terms *'gauge pressure'*, *'absolute pressure'* and *'atmospheric pressure'*.

5) List at least a half dozen equivalent expressions for what is known as *'standard atmospheric pressure'*.

6) Solve the example problems as presented in class dealing with the relationship between the *volume* and the *absolute pressure* for a *given mass of a gas* maintained at a *constant temperature*.

(c) Charles' gas law

1) Write a verbal statement of *'Charles' gas law'.*

2) Write a mathematical statement (an equation) for *'Charles' gas law'*.

3) Recall from learning activities III-(c)-3)-(ii) and III-(c)-3)-(iii), the relationship that exists between the *Celsius* and the *Celsius absolute temperature scale* known as the *Kelvin scale* and the relationship that exists between the *Fahrenheit* and the *Fahrenheit absolute temperature scale* known as the *Rankine scale*.

4) Solve the example problems presented in class dealing with the relationships that exist between the *volume* and the *absolute temperature* for a *fixed mass* of gas held at a *constant pressure*.

(d) Gay-Lussac's gas law

1) Write a verbal statement of *'Gay-Lussac's gas law'*.

2) Write a mathematical statement (an equation) for *'Gay-Lussac's gas law'*.

3) Solve the example problems as presented in class dealing with the relationship that exists between the *absolute pressure* and the *absolute temperature* of a *fixed mass* of gas held at a *constant volume*.

(e) the general gas law

1) Write an equation for the *'general gas law'* indicating clearly the meaning of all variables.

2) Solve the example problems presented in class dealing with the relationships that exist between the *volume*, the *absolute temperature* and the *absolute pressure* for a gas of *constant mass*.

3) Read chapter 14 of the reference text. Answer the questions and solve the problems as assigned from the chapter.

V) THERMODYNAMICS

(a) heat and work

1) Recall from semester one physics, PHY100, the definition for the concept of '*work*'.

2) Recall from semester one physics, PHY100, the equation for the concept of '*work*'.

3) Explain how '*work*' may be converted into '*heat*'. Include practical examples of the conversion of *work* into *heat* that illustrate the explanation.

4) Explain how '*heat*' may be converted into '*work*'. Illustrate your explanation with practical examples of the conversion of *heat* into *work*.

5) Write a definition for a '*heat engine*' and list several examples of *heat engines*.

(b) the first law of thermodynamics

1) Write a verbal statement of the '*first law of thermodynamics*'.

2) Write an equation for the '*first law of thermodynamics*' indicating clearly the meaning of all terms.

(c) the second law of thermodynamics

1) Write a verbal statement of the '*second law of thermodynamics*'.

2) List and discuss several examples of the consequences of the *second law of thermodynamics*.

(d) <u>heat engines</u>

1) Discuss the consequences of the *first and second laws of thermodynamics* as they pertain to '*heat engines*'.

2) Write the equation for the '*efficiency*' of a *heat engine* in terms of the *quantities of heat absorbed and released* by a heat engine operating in a '*cyclic process'*.

3) Explain what is meant by an '*ideal heat engine*'.

4) Write the equation used to determine the *'efficiency'* of an '*ideal heat engine*' in terms of the *temperatures of the 'hot' and 'cold reservoirs'*.

5) Solve the example problems as presented in class dealing with heat engines.

(e) <u>refrigeration</u>

1) Discuss the consequences of the *first and second laws of thermodynamics* as they pertain to '*refrigeration units*'.

2) Write the equation for the '*coefficient of performance*' of a refrigeration unit in terms of the *quantities of heat absorbed and released* by the unit operating in a '*cyclic process*'.

3) Explain what is meant by an '*ideal refrigerator*'.

4) Write the equation used to determine the *'coefficient of performance'* of an '*ideal refrigerator*' in terms of the *temperatures of the 'hot' and 'cold reservoirs'*.

5) Solve the example problems as presented in class dealing with refrigeration units.

(f) <u>heat pumps</u>

1) Explain what a '*heat pump*' is and in ***<u>general</u> terms*** describe how it works.

2) Solve the example problems as presented in class dealing with '*heat pumps'*.

VI) STATIC ELECTRICITY

(a) electric charges

1) List the *three major components* of the '*atom*' and indicate the relative *mass* and the '*charge*' carried by each.

2) Describe the model of the *atom* known as the '*planetary model* '. Be certain to include in your description the terms '*nucleus*' and '*orbits*'.

3) Describe how it is possible to charge a *pith ball* with a '*positive charge*' by '*conduction*'.

4) Describe how it is possible to charge a *pith ball* with a '*negative charge*' by '*conduction*'.

(b) induction

1) Describe how it is possible to charge a '*gold leaf electroscope*' with a '*negative charge*' by the process known as '*induction*'.

2) Describe how it is possible to charge a '*gold leaf electroscope*' with a '*positive charge*' by the process known as '*induction*'.

3) Write the law describing the "*attraction*" and "*repulsion*" of "*like*" and "*unlike charges*".

4) Describe the operation of the "*van de Graaff generator*".

(c) Coulomb's law

1) Explain what is meant by the *unit of electrical charge* known as a '*coulomb*'.

2) Write a verbal statement of '*Coulomb's Law of Electrostatics*'.

3) Write a mathematical statement (an equation) of '*Coulomb's Law of Electrostatics*'.

(d) electric fields

1) Describe what is meant by and give several examples of '*electric fields*'.

2) Briefly explain some of the many practical applications of electric fields as used in electronics and elsewhere. Some examples might include, for example: an ink-jet printer, a television picture tube and a capacitor.

3) Read chapter 16 in the reference text.

4) Answer the questions and solve the problems as assigned from chapter 16 in

the reference text.

VII) DIRECT CURRENT ELECTRICITY

(a) simple circuits

1) Describe, in basic terms, what is meant by the term '*direct current*' as opposed to '*alternating current*'.

2) Explain what is meant by an '*electric circuit*'. Included in your explanation should be the terms '*source*', '*load*' and '*conductor*'.

3) Explain what is meant by the terms '*electric potential energy*' or '*difference in potential* ' or '*electromotive force*' or '*voltage*'.

4) List several examples of '*potential difference*'.

5) Write the equation for '*potential difference*' or '*emf* '.

6) State the unit of '*emf*' and describe what it is in terms of the unit of '*work*' (the '*joule*') and the unit of '*charge*' (the '*coulomb*').

7) Explain what is meant by the term '*electric current*'.

8) State the unit of '*electric current*' and describe what it is in terms of the unit of '*charge*' (the '*coulomb*') and the unit of '*time*' (the '*second*').

9) Explain what is meant by the term '*electrical resistance*'.

10) State the unit of '*electrical resistance*'.

11) Write a mathematical equation for the '*electrical resistance*' of a given conductor in terms of it's '*resistivity*', it's length and it's cross-sectional area.

(b) Ohm's Law

1) Write a verbal statement of '*Ohm's law*'.

2) Write a mathematical statement (an equation) for '*Ohm's law*'. Indicate the proper abbreviations for each of the quantities in the equation and the proper units for each of the quantities in the equation.

3) Solve problems as assigned in class dealing with *Ohm's law*.

(c) Series Circuits

1) Describe what is meant by a '*series circuit*'.

2) Write the equations which are used to determine (i) the '*current*', (ii) the '*emf*' and (iii) the '*total resistance*' for a simple '*series circuit*'.

3) Solve example problems as introduced in class dealing with simple *series circuits*.

(d) Parallel Circuits

1) Describe what is meant by a '*parallel circuit*'.

2) Write the equations which are used to determine (i) the '*total current*', (ii) the '*voltage*' across each resistor, (iii) the '*emf*' and (iv) the '*total resistance*' for a simple '*parallel circuit*'.

3) Solve the example problems as introduced in class dealing with simple *parallel circuits*.

(e) Series-Parallel Circuits

1) Solve the example problems as introduced in class dealing with '*series-parallel circuits*'.

2) Read chapter 17 in the reference text. Answer the questions and solve the problems as assigned from the chapter.

(f) Cells in Series and in Parallel

1) For a number of '*battery cells*' connected in '*series*' write the equations that indicate (i) the '*current*' in the circuit; (ii) the '*internal resistance*' of the '*battery*' in terms of the '*internal resistance*' of the '*cells*'; and (iii) the '*emf*' of the '*battery*' in terms of the '*emf*' of the '*cells*'.

2) For a number of '*battery cells*' connected in '*parallel* ', write the equations that indicate (i) the '*total current*' in the '*battery*' in terms of the '*individual currents*' in the '*cells*'; (ii) the '*internal resistance*' of the '*battery*' in terms of the '*internal resistance*' of one of the '*cells*'; and (iii) the '*emf*' of the '*battery*' in terms of the '*emf*' of the '*cells*'.

3) Solve the example problems as presented in class dealing with the '*total current*', the '*internal resistance*' and the *'emf'* of '*batteries*' of '*cells*'

connected in '*series*' and in '*parallel'* .

(g) <u>electrical power</u>

1) Recall from last semester's physics course, PHY100, the definition of '*power*'.

2) Recall from last semesters physics course, PHY100, the equation for '*power*'.

3) Recall from PHY100 the units of '*power*'.

4) Write the <u>three</u> equations for '*electrical power*' in terms of: '*voltage*' and '*current*'; '*voltage*' and '*resistance*'; and '*current*' and '*resistance*'.

5) Recall from PHY100 the definition of '*energy*'.

6) Write the unit most commonly used to express the amount of '*electrical energy*' consumed by a household or industry and billed by the power company.

7) Solve the example problems as introduced in class dealing with '*electrical power*' and '*electrical energy*' consumed.

8) Read chapter 18 in the reference text. Answer the questions and solve the problems as assigned from the chapter.

Method of Assessment:

Your final grade in PHY118 will be determined on the basis of four tests to be administered during the semester. Each test will examine your knowledge of a number of topics and will be administered within one week of completing those topics. The topics covered in each of the four unit tests are as follows:

Test #1 ------ Topic Number I

Test #2 ------ Topic Number II

Test #3 ------ Topic Number III
Topic Number IV
Topic Number V

Test #4 ------ Topic Number VI
Topic Number VII

The four tests are of equal weight.(i.e. ***Each of the four tests is worth 25% of your final grade.***) As a result, ***provided you have received a passing grade on each of the unit tests***, your final grade will simply be an average of your four test results. In order to obtain your letter grade the following percentage-letter grade equivalents will be used:

A^+ : 90% - 100% (*Consistently outstanding achievement*)
A : 80% - 89% (*Outstanding achievement*)
B : 70% - 79% (*Above average achievement*)
C : 60% - 69% (*Satisfactory or acceptable achievement*)
X or R: 0% - 59% (*Incomplete or Repeat*

If your final average is below 59%, or if you have received a failing grade in one or more of the unit tests, whether you receive an 'X' (Incomplete) or an 'R' (Repeat) grade is entirely at the teacher's discretion. The decision will be based upon *your final average* (e.g., A grade such as 32% ***would*** result in an 'R' grade while an average such as 54% ***might*** result in an 'X' grade.); *your attendance* during the semester; *your attitude* while in the classroom; your perceived *level of effort* during the semester; etc..

In any case, should you find yourself with an 'X' grade at the end of the semester, in order to upgrade your mark to a passing grade you will be required to write a *make-up* ***examination*** *covering the* ***entire course content***! Should you receive a passing grade on the make-up examination (60% or higher) your 'X' grade will be upgraded. The best you can do after receiving an 'X' grade as a result of a failing average is a 'C'. If you were required to write the make-up examination as a result of having failed or missed one test, you may substitute the exam result for this test result.

Prior to administering any test, you will be notified a full week in advance. Should you, for any reason (*within reason of course*), not be able to be in attendance on a day for which a test has been scheduled, it is **your responsibility** to notify the teacher *prior* to the test! *If your reasons are acceptable*, a date will be set during which you may write a *substitute* test for the one you

have missed.

Notes to Students:

a) **Attendance** and **participation** are **critical** to the student's success in this course.

b) The course outline as detailed on pages 3 to 17 and summarized on page 3 lists the sub-topics to be covered under each of the seven main topic headings. ***Your teacher reserves the right to modify the course as he/she deems necessary in order to meet the needs of the students. This may prove to be necessary to minimize the effects of any unforseen or unavoidable losses of class time that may occur during the semester. Also, certain topics may cause the class more difficulty than anticipated when the course outline was initially set up and, as a result, additional time may be required for their completion. As a result, some sub-topics may be deleted from the outline at the discretion of the teacher and/or others may be introduced.***

PRIMARY RESOURCES

Ewen, Nelson and Schurter, **PHYSICS FOR CAREER EDUCATION**, **Sixth edition.** Prentice Hall Publishing Company, 1999. ISBN 0-13-692823-4

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ADDITIONAL RESOURCE MATERIALS AVAILABLE IN THE COLLEGE LIBRARY

Book Section

You will find the college's collection of physics books on the second floor of the college library. They are located on the shelves under the Call Number QC.

PRIOR LEARNING ASSESSMENT:

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

SPECIAL NOTES:

Students with special needs (eg. physical limitations, visual impairments, hearing impairments, learning disabilities, etc.) are encouraged to discuss required accommodations confidentially with the teacher.