SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ON

COURSE QUIUHE

COURSE **TITLE:** PHYSICS

CODE NO.: PHY 105-3 **SEMESTER:** ONE

PROGRAM: CIVIL & ARCHITECTURAL TECHNICIAN/TECHNOLOGY

AUTHOR: G. DISANO

DATE: AUGUST 1994 **PREVIOUS OUTLINE DATED:** AUGUST 1986

APPROVED: _____ _____
DEAN **DATE**

PHYSICS — COURSE NAME

PHY 105-3 — CODE NO.

TOTAL CREDITS 3

PREREQUISITE(S):

I. PHILOSOPHY/GOALS: The objective of this course is to introduce the student to a number of fundamental concepts which should prove useful to the civil or architectural technician/technology student.

11. STUDENT PERFORMANCE OBJECTIVES (OUTCOMES):

Upon successful completion of this course the student will:

1) in his/her own words write definitions for the concepts introducec^^

2) answer questions requiring a knowledge of the concepts presented;

3j respond to questions requiring extrapolation of the course content;

4) solve problems requiring an understanding of the course theory;

5) apply the knowledge to other courses which are 'physics based^.

III. TOPICS TO BE COVERED: **Approximate Time Frames (Optional)**

1) UNITS OF MEASUREMENT

2) PROPERTIES OF MATTER

3) TEMPERATURE, HEAT AND THERMAL EXPANSION

4) THE GAS LAWS AND THERMODYNAMICS

5) WAVE MOTION AND SOUND

IV. LEARMING ACTIVITIES

I UNITS OF MEASUREMENT

a) three systems of units

1) List the three most commonly used systems of units in use in science and engineering.

b) ^ base' quantities and 'base' units

1) Define 'base' quantities and list the 7 base quantities.

2) List the 3 "most common" base quantities.

3) State the units and the proper abbreviations for each of the 3 most common base quantities in each of the three systems of units of a-1 above -

c) 'derived' quantities and 'derived' units

1) Define 'derived' quantities and list at least a dozen examples of derived quantities. For each of these examples write the proper units along with the proper abbreviations in both the S.I. metric system and the Imperial system.

d) S,I. prefixes and their abbreviations

1) List the S.I. metric prefixes along with their proper abbreviations and mathematical meanings in descending order from 'tera' to 'femto'.

2) Set up tables of metric length measurement, area measurement, "dry" volume measurement, "fluid" volume measurement, and mass measurement Each table will illustrate the unit, its abbreviation and meaning for the prefixes from 'kilo' to 'milli'.

3) State 2 conversion factors used to convert from "dry" volume measurement to "fluid" volume measurement in the S.I. metric system.

G) conversion of units of measure

1) Given access to the proper conversion factors convert units of measurement in the S.I. metric, C.G.S. metric and the Imperial systems of measurement. Recall the method of conversion of units that involves multiplying by ratios equal to 1•

Continued .

IV. LEARNING ACTIVITIES

f) significant digits and g) 'accuracy' and 'precision'

1) Explain what is meant by an 'exact' number.
2) Explain what is meant by an 'approximate' number.
3) Explain what is meant by the term 'accuracy' of a measurement.
4) Explain what is meant by the term 'precision' of a measurement.
5) Discuss the difference between the two terms 'precision' and 'accuracy' and give examples of measurements having various degrees and combinations of accuracy and precision.
6) List the 6 rules for determining whether a digit in a measurement is 'significant' or not.
7) Determine the accuracy and the precision of any given measurement.
8) State the rule used to determine the accuracy of the product or quotient of measurements which are multiplied or divided.
9) State the rule used to determine the precision of the sum or difference of measurements which are added or subtracted.

h) scientific notation

1) Review the rules used to express numbers and measurements given in 'standard' notation in 'scientific' notation.
2) Given a number or measurement in 'standard" notation express it in 'scientific' notation.
3) Given a number or measurement in 'scientific' notation express it in 'standard' notation'.

i) the distinction between 'mass' and 'weight'

1) Write a definition for the concept of 'mass'.
2) Write a definition for the concept of 'weight'.
3) Identify clearly the distinction between the two quantities 'mass' and 'weight'.

Continued ....

IV. LFARMIWG ACTIVITIES

j) standard gravitational acceleration

1) Explain how the acceleration due to gravity is dependent upon the size, mass and density of a body in the presence of air resistance and demonstrate how the 'terminal velocity' of a given body may be altered.

2) State the value for the acceleration due to gravity in the absence of air resistance in each of the S.I. metric and the Imperial system of measure.

3) Write the equation that relates the mass of a body to its weight-

4) Write consistent units for the equation I-j-3 above in each of the S.I. metric and Imperial systems of units.

5) Given the mass of a body in either the S.I. metric system or the Imperial system, calculate its weight.

6) Given the weight of a body in either the S.I. metric or the Imperial system, calculate its mass.

k) unit analysis

1) Write the two conditions an equation must satisfy in order to be Mimensionally' correct.

2) Given an equation and the meaning of each of its variables, determine whether or not the equation is 'dimensionally' correct.

3) Read chapter 1 of the reference text.

4) Answer the questions and solve the problems as assigned from chapter 1 of the reference text.

11 PROPERTIES OF MATTER

a) composition of matter

1) Explain what is meant by each of the following terms: matter, atom, molecule, proton, neutron and electron.

2) State the value of the mass, diameter and charge for each of the three components of the atom: protons, neutrons and electrons.

Continued .

IV. I FARMIMG ACTIVITIES

3) List and compare the relative characteristics of the three states of matter: solid, liquid and gas.

b) force

1) Write a definition for the term * scalar quantity'

2) List at least a dozen examples of scalar quantities.

3) Write a definition for the term * vector quantity*

4) List 4 examples of vector quantities-

5) Write a definition for the concept of 'force* incorporating Newton's first law of motion to expand upon the definition.

6) Recall that force is a vector quantity.

7) List the units along with their proper abbreviations for force in each of the S-I. metric, C.G.S. metric and Imperial systems of units.

8) Explain what is meant by a 'static force*.

9) Explain what is meant by a 'dynamic force'-

c) cohesion and adhesion

1) Explain what is meant by 'adhesion'.

2) Explain what is meant by 'cohesion'.

3) Explain how it is that certain liquids are able to "wet" certain surfaces,

4) Explain how it is that certain liquids are able to leave dry or not "wet" certain surfaces.

d) 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.

e) Hooke's 1aw

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

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

Continued

IV. I FARMIMG ACTIVITIES

f) stress and strain: Young's modulus

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

2) Explain what is meant by 'stress' in a general sence 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 sence.

5) For each of 'tensile strain', 'compressive strain' and 'shearing strain' write equations including diagrams showing the meaning of each of the terms.

6) Exlain 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 of Hooke's law in its most general form.

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.

g) shear modulus

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 terms.

h) bulk modulus

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

2) Write an equation for bulk modulus, for 'bulk stress' and for 'bulk strain'.

Continued

IV. I pARMIMG ACTIVITIES

i) other physical properties of metals

1) Write definitions for each of the following: i) hardness, ii) ductility, iii) malleability iv) conductivity.

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

3) Read chapter 11 of the reference text pages 243 to 254, sections 11.1 and 11.2.

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

Ill TEMPERATURE, HEAT AND THERMAL EXPANSION

a) temperature and thermal energy

1) Read the handout entitled "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) heat as a form of energy

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

2) Distinquish clearly between the concept of 'heat' and the concept of 'temperature' as defined in learning activity HI-a-3 above.

^^ the Fahrenheit and the Celsius temperature scales

6c

d) the absolute temperature scales

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

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

Continued -..

IV. I FARMIMG ACTIVITIES

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-c-1 and III-d-1 above, convert this temperature to an equivalent value on each of the remaining three temperature scales -

e) linear expansion of solids

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 change in temperature.

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

5) Explain the operation of and list several applications of the device known as the "bimetallic strip".

f) area expansion of solids

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 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.

Continued

IV. I FARMIMG ACTIVITIES

g) volume expansion of solids

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

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 change in temperature.

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

h) volume expansion of liquids

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 its 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 life.

3) Solve the example problems as presented in class dealing with volume expansion of liquids and differential expansion of liquids in solid containers.

i) the measurement of temperature

1) Read the handout titled "Temperature Measuring Devices" and describe the operation of several temperature measuring instruments,

j) units of heat

1) Write definitions for each of the units used to measure heat content and indicate the proper abbreviations for each. These include the calorie, the kilocalorie, the British thermal unit and the joule-

2) State the conversion factors that enable one to convert among the units of heat content listed in learning activity III-j-1 above.

Continued

PHYSICS PHY105-3

IV. 1 FARMIMG ACTIVITIES

k) specific heat capacity

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'.

5) Write the equation used to determine the 'quantity of sensible heat*.

6) State the value for the specific heat capacity of water in each of the systems of measure listed in learning activity III-k-3.

1) the three states of matter

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.

m) the latent heat of fusion

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

2) Write an equation for the term 'specific latent 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-m-3 above.

n) the latent heat of vapourization

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

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

Continued ____

IV. } FARMIMG ACTIVITIES

3) List the units of 'specific latent heat of vapourization' in the S-1. 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 of measure listed in learning activity III-n-3 above.

5) 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".

6) Read the handout titled "Quantity of Heat and Heat Transfer'*.

7) Read chapter 13 of the reference text.

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

o) heat of combustion

1) Explain the meaning of the term 'heat of combustion'.

2) Write an equation for the term 'heat of combustion'.

3) Solve the example problems as presented in class dealing with heat of combustion.

p) Newton's law of cooling

1) Write a verbal statement of 'Newton's law of cooling'.

2) Solve example problems as presented in class dealing with Newton's law of cooling.

q) heat transfer processes

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

2) Describe the types of surfaces which tend to be good emitters of radiant energy and the type that tend to be poor emitters.

3) Describe the types of surfaces which tend to be good absorbers of radiant energy and the type that tend to be good reflectors-

Continued

IV. I FARN'Mfi AfTIVITIES

IV THE GAS LAWS AND THERMODYNAMICS

a) Boyle's law

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

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

3) Solve the example problems as presented in class dealing with the relationships between volume and pressure for a gas at constant temperature.

4) Explain what is meant by the term 'gauge' pressure

5) Explain what is meant by the term 'absolute pressure'.

6) List a number of equivalent values for standard atmoshperic pressure.

7) Write the equation that relates 'absolute pressure', 'gauge pressure' and 'atmospheric pressure*.

b) Charles' law

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

2) Write a mathematical statement (an equation) for Charles' law-

3) Solve the example problems as presented in class dealing with the relationships between volume and temperature for a gas nt constant pressure.

c) Gay-Lussac's law

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

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

3) Solve the example problems as presented in class dealing with the relationships between pressure and temperature for a gas held at constant volume.

d) the general gas law

1) Write an equation for the 'general gas law' indicating cHearly the meaning of all terms.

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

3) Read chapter 14 of the reference text.

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

Continued ... -

PHYSICS PHY105-3

IV. I FARMING ACTIVITIES

e) heat and work

1) Write a definition for the concept of 'work'-

2) Write an equation for the concept of 'work'.

3) Explain how 'work' may be converted into 'heat'.

4) Explain how 'heat' may be converted into 'work'.

5) Write a definition for a 'heat engine' and list several exampl es of 'heat engines' *

f) 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.

g) the second law of thermodynamics

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

h) heat engines

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.

i) refrigeration

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.

Continued ....

IV. I FARMING ACTIVITIES

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

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

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

j) heat pumps

1) Explain what a 'heat pump' is and in general terms describe how it works.

2) Solve the example problems as presented in class dealing with heat pumps,

V WAVE MOTION AND SOUND

a) mechanical waves

1) Explain what is meant by a 'mechanical wave'.

2) List several examples of 'mechanical waves'.

b) transverse waves

1) Explain what is meant by a 'transverse mechanical wave'.

2) List several examples of transverse waves.

c) longitudinal waves

1) Explain what is meant by a 'longitudinal mechanical wave'.

2) List several examples of longitudinal waves.

d) wave speed

1) State the two factors that determine the speed of propagation of a mechanical wave.

2) Write the equation for 'linear density' of a rope or cable.

3) Write the equation to determine the speed of propagation of a transverse wave in a rope of given linear density subjected to a tension of given magnitude.

4) Solve the example problems as presented in class dealing with the speed of propagation of transverse waves in a stretched rope or cable.

Continued .

IV. I PARMIMG ACTIVITIES

e) wavelength, frequency and period of a wavemotion

1) Describe what is meant by the term 'in phase'.

2) Write a definition for the term 'wavelength'.

3) Write a definition for the term 'frequency'-

4) Write a definition for the term 'period'_

5) State the unit of 'frequency', its abbreviation and its meaning.

6) State the mathematical relationship that exists between the 'period' and the 'frequency' of a wave motion-

7) Write two equations used to calculate the speed of a wave motion in terms of wavelength, period and frequency,

8) Explain what is meant by the terms 'condensation' and 'rarefaction'.

9) Solve the example problems as presented in class dealing with wavelength, period, frequency and speed of a wave motion.

f) sound

1) Write a definition of 'sound' and describe what 'sound* actually is in a physical sence.

2) Write 2 equations used to determine the speed of sound in air as a function of temperature - one equation being used in the S.I, metric system and the other in the Imperial system.

g) audible sound

1) List the range of frequencies for each of the following types of "sounds": 'audible' sound, *infrasonic' sound, and 'ultrasonic' sound.

h) intensity and loudness of sound

1) Explain what is meant by the term 'intensity' of of a sound.

2) Explain what is meant by and state the value of the * hearing threshold' of sound.

3) Explain what is meant by and state the value of the 'pain threshold' of sound.

4) Write the equation used to determine the 'loudness of a given sound expressed in 'decibels'.

Continued ...•

PHYSICS PHY105-3

IV. ^ F^'^M'Mg **^^^TIVITIES**

5)-Solve the example problems as presented in class dealing with intensity and loudness of sound.

i) vibration and resonance

1) Explain what is meant by each of the following terms: 'natural frequency', 'forced vibration , and 'resonance'.

2) Describe a number of applications and design considerations (bridges, for example) involving the phenomenon of 'resonance'.

3) Read chapter 15 of the reference text.

4) Answer the questions and solve the problems as assigned from chapter 15 of the reference text.

^ **V. EVALUATION METHODS: (INCLUDES ASSIGNMENTS,**
W **ATTENDANCE REQUIREMENTS. ETC.)**

See attached sheet titled: GRADE REQUIREMENTS

VL PRIOR LEARNING ASSESSMENT:
Students who wish to apply for **advanced** credit in the course should consult the instructor. Credit for prior learning will be given upon successful completion of the following:

Continued

GRADE REQUIREMENTS

PHY105

PHYSICS

(Civil and Architectural Technician/Technology)

Your final grade in PHY105 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 tests are as follows:

Test #1	Topic Number I
	Topic Number II
Test #2	Topic Number III
Test #3	Topic Number IV
Test #4	Topic Number V

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	76% - 89%	(Outstanding achievement)
B	66% - 75%	(Consistently above average achievement)
C	55% - 65%	(Satisfactory or acceptable achievement)
X or R	0% - 54%	(Incomplete or Repeat)

If your final average is below 55%, 0£ 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 instructor's discretion. The decision will be based upon your final average (e.g. ^2^" would result in an R grade while 50% 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 (55% 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, not be able to be in attendance on a day for which a test has been scheduled it is your responsibility to notify the instructor 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.

G. Disano, August 1994

VII. REQUIRED STUDENT RESOURCES

Even, Nelson and Schurter, PHYSICS FOR CAREER EDUCATION, Fourth edition. Regents/Prentice Hall Publishing Company, 1993. ISBN 0-13-667064-4

VIII. 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.

Periodical Section

Audiovisual Section

IX. SPECIAL NOTES

Students with special needs (e.g. physical limitations, visual impairments, hearing impairments, learning disabilities, etc.) are encouraged to discuss required accomodations confidentially with the instructor.

The course outline as detailed on pages 3 to 17 and summarized on pages 20 and 21 lists the subtopics to be covered under each of the five main topic headings. Some subtopics may be deleted from the outline at the discretion of the instructor and/or others may be introduced. In other words the instructor reserves the right to modify the course as he/she deems necessary to meet the needs of the students.

X. COURSE ANALYSIS SHEET (see attached)

COURSE OUTLINE
(Summarized)

PHY105

PHYSICS
(Civil and Architectural Technician/Technology)

Reference Text: Physics for Career Education, 4th edition
by Ewen, Nelson and Schurter

Topic Number	Periods Lecture-Lab	Topic Description	Reference Chapters
I		**UNITS OF MEASUREMENT** a) three systems of units b) 'base* quantities and *base' units c) * derived* quantities and * derived* units d) S.I. prefixes & their abbreviations e) conversion of units of measure f) significant digits g) 'accuracy' and 'precision' h) scientific notation i) the distinction between 'mass' & 'weight' j) standard gravitational acceleration k) unit analysis	1
II		PROPERTIES OF MATTER a) composition of matter b) force c) cohesion and adhesion d) elasticity e) Hooke's law f) stress and strain: Young*s modulus g) shear modulus h) bulk modulus i) other physical properties of metals	11
III		TEMPERATURE. HEAT AND THERMAL EXPANSION a) temperature and thermal energy b) heat as a form of energy c) the Fahrenheit & the Celsius temperature scales d) the absolute temperature scales e) linear expansion fo solids f) area expansion of solids g) volume expansion of solids h) volume expansion of liquids i) the measurement of temperature j) units of heat k) specific heat capacity 1) the three states of matter m) the latent heat of fusion n) the latent heat of vapourization o) heat of combustion p) Newton*s law of cooling q) heat transfer processes	13

Continued ....

IV THE GAS LAWS AND THERMODYNAMICS 14

a) Boyle's law
b) Charles' law
c) Gay-Lussac's law
d) the general gas law
e) heat and work
f) the first law of thermodynamics
g) the second law of thermodynamics
h) heat engines
i) refrigeration
j) heat pumps

V WAVE MOTION AND SOUND 15

a) mechanical waves
b) transverse waves
c) longitudinal waves
d) wave speed
e) wavelength, frequency & period of a wave motion
f) sound
g) audible sound
h) intensity and loudness of sound
i) vibration and resonance

G. Disano, August 1994

Course Analysis Form

Course Title and No.: PHYSICS PHY 105-3

Learning Outcomes

Upon successful completion of this course the student will:

1) in his/her own words write definitions for the concepts introduced;

2) answer questions requiring a knowledge of the concepts presented;

3) respond to questions requiring extrapolation of the course content;

4) solve problems requiring an understanding of the course theory;

5) apply the knowledge to other courses which are 'physics' based.

Broad Areas of Content

The 5 learning outcomes listed to the left are each to be applied to the following five major topic headings which form the course outline for PHY 105.

I UNITS OF MEASUREMENT

II PROPERTIES OF MATTER

III TEMPERATURE, HEAT & THERMAL EXPANSION

IV THE GAS LAWS AND THERMODYNAMICS

V WAVE MOTION AND SOUND

Indicator of Importntice (if applicable)

Indicators of Success

The challenge process consists of writing & passing a three hour comprehensive examination- The challenge exam will consist of the following components:

1) the writing of definitions for course concepts;

2) answering questions requiring a knowledge of the course content;

3) responding to questions requiring extrapolation of the course content;

4) solving problems requiring an understanding of the course theory.

The exam will cover the 5 major topic headings which form the course outline for PHY105. Refer to pages 20 6e 21 for a breakdown of the topics listed to the left under Broad Areas of Content.

A successful challenge requires a minimum grade of 557o on the exam.

Assessment Process

Your final grade in PHY105 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 completinE those topics. ^

Assessment Tools

The four tests as outlined in the "assessment process" above are of equal weight. In other words, each of the four tests is worth 25% of your final grade-

Supports

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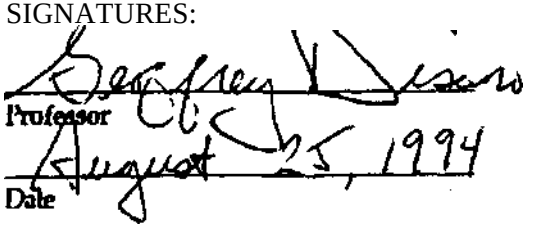
CM

Requirements for successful completion of course

Provided you have received a passing grade in each of the four tests, your final grade will simply be an average of the four test results. In order to obtain your letter grade the percentage-letter grade equivalents listed on page 18 (Grade Requirements) will be used.

A challenge process for this course can be made available lo learners within a reasonable period of lime following a learner's request

SIGNATURES:



Prugnuii Coordiiulor gjUuir

Dale

(04/01/94)