SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. **MARIE, ON**

cmmsEmoiuiE

COURSE TITLE: PHYSICS

CODE NO.: PHY 125-4 SEMESTER: ONE

PROGRAM: AVIATION TECHNOLOGY - FLIGHT

AUTHOR: G, DISANO

DATE: JUNE 1994 PREVIOUS OUTLINE DATED: JUNE 1989

APPROVED: MiM^dL 1^/../^^^

DEAN J DATE

PHYSICS PHY 125-4
COURSE NAME CODE NO.

TOTAL CREDITS 4

PREREQUiS!TE(S):

I. PHILOSOPHY/GOALS: This course will provide both a review of, and a more in depth study of many of the concepts of applied physics introduced in secondary school physics courses. An attempt will be made to limit the topics to those which should be relevant to the flight student.

II. STUDENT PERFORMANCE OBJECTIVES (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 presentg^^:

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'.

III. TOPICS TO BE COVERED:

		Approximate Time Frames (Optional)
1)	INTRODUCTION	8 hours
2)	MECHANICS - STATICS & DYNAMICS	28 hours
3)	PROPERTIES OF SOLIDS, LIQUIDS & GASES	14 hours
4)	TEMPERATURE & HEAT	14 hours
5)	WAVE MOTION & SOUND (See IX - Special Notes)	

IV. LgARWING ACTIVITIES

I INTRODUCTION

a) mathematics of basic physics

1) Read chapter 1 of reference A,

2) Review the mathematical concepts as presented in chapter 1 of reference A.

3) Answer the questions and solve the problems as presented in chapter 1 of reference A.

4) Read chapter 2 of reference A.

5) Answer the questions and solve the problems assigned from chapter 2 of reference A.

b) units of measurement

1) List the three most commonly used systems of units in use in science and engineering:
i) the S.I. metric system;
ii) the old C.G.S, metric system;
iii) the Imperial system of units (the British Engineering system & the United States Custumary system).

c) ^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 abbreviation for the 3 most common base quantities in each of the three systems of units of b-1 above.

4) Define 'derived' quantities and list at least a dozen examples of derived quantities,

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.

Continued .

IV. LEARWIMG ACTIVITIES (continued from page 3)

e) 'derived' quantities and 'derived' units

1) Recall the definition of derived quantities from I-c-4 above.

2) List at least a dozen examples of derived quantities as in I-c-4 above. For each of these examples write the proper units along with proper abbreviations in both the S.I, metric system and the Imperial system.

f) 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 that involves multiplying by ratios equal to 1.

g) significant figures and h) '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.

Continued ,..-

PHYSICS PHY125-4

IV, 1 FARMIMG ACTIVITIES (continued from page 4)

i) 'vector' and 'scalar' quantities

1) Recall the definition of 'scalar' quantities.

2) List at least 10 examples of scalar quantities.

3) Recall the definition of 'vector' quantities.

4) List 6 examples of vector quantities.

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

6) Recall that force is a vector quantity.

7) Write a definition for 'resultant force*.

8) By means of the 'parallelogram method' of vector addition determine the resultant of two vectors using both a graphical and a mathematical approach.

9) By means of the 'polygon method' of vector addition determine the resultant of two or more vectors.

10) By means of the 'method of components' calculate the resultant of two or more vector quantities.

11) Read chapter 3 of reference A and chapter 1 of reference B.

12) Answer the questions and solve the problems as presented from chapter 3 of reference A and chapter 1 of reference B.

II MECHANICS - STATICS & DYNAMICS

a) forces

1) Recall the definition of 'force' from I-i-5 above.

2) State the units of force in each of the S.I. metric, CG.S. metric and Imperial systems and write the proper abbreviations for each.

b) 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. LEARMIMG ACTIVITiES (continued from page 5)

c) 'distance' and 'displacement'

1) Write a definition for the term 'distance'.

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

3) Recall that 'distance' is an example of a scalar quantity while 'displacement' is an example of a vector quantity.

d) 'speed' and 'velocity'

1) Write a definition for the term 'speed'.

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

3) Recall that 'speed' is an example of a scalar quantity while *velocity' is an example of a vector quantity.

4) Solve problems that illustrate the distinction between the terms 'distance' and 'displacement' and the terms 'speed' and 'velocity'.

5) Explain what is meant by the term 'uniform motion'.

6) Explain what is meant by the term 'non-uniform motion'.

7) Write the equations for 'average speed' and 'average velocity'- Illustrate how each may be determined given a 'displacement versus time' curve.

e) acceleration

1) Write a definition for the term 'accleration'.

2) For 'uniform accleration' indicate how the acceleration may be determined from a given 'velocity versus time' curve.

f) equations for uniformly acclerated motion

1) List the 4 equations for 'uniformly accelerated motion'.

2) Solve sample problems dealing with uniformly accelerated motion as introduced in class.

E) the acceleration due to gravity - 'free fall'

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.

Continued ..

IV. LgARMIWG ACTIVITIES (continued from page 6)

2) State the values for the acceleration due to gravity in the absence of air resistance in each of the S.I, metric, C.G^S, metric and Imperial systems of measure.

3) Solve example problems as presented in class dealing with the acceleration due to gravity.

4) Describe what is meant by the term 'projectile' and cite the difference or differences between a 'projectile' and a 'missile*.

5) Using the equations of uniformly accelerated motion of II-f-1 above develop the 6 equations of projectile motion.

6) Solve example problems as presented in class dealing with projectile motion.

7) Read chapter 4 of reference A and chapter 4 of reference B.

8) Answer the questions and solve the problems as presented from chapter 4 of reference A and chapter 4 of reference B.

h) Newton's first law of motion - the law of inertia

1) Write a verbal statement of Newton's first law of motion and demonstrate an understanding of the law by applying it to examples presented in class

i) Newton's second law of motion

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

2) Write a mathematical statement (an equation) of Newton's second law of motion. Indicate the proper units for each of the variables involved in each of the S.I. metric, C.G.S. metric and Imperial systems of measure.

j) Newton's third law of motion

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

2) Read chapter 5 of reference A and chapter 5 of reference B.

3) Answer the questions and solve the problems as presented from chapter 5 of reference A and chapter 5 of reference B.

Continued .-•.

IV. LEARNING ACTIVITIES (continued from page 7)

k) work

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

2) Recall the equation for 'work' in its most general form.

3) Write a definition for the concept of 'energy',

4) List the proper units of work and energy in each of the S.I- metric, C.G-S. metric and Imperial systems of measure.

1) kinetic energy

1) Write a definition for the concept of 'kinetic energy'.

2) Recall the equation for 'kinetic energy',

m) gravitational potential energy

1) Write a definition for the term 'gravitational potential energy'.

2) Recall the two equations for 'gravitational potential energy'•

n) conservation of energy

1) Write verbal statements for each of the 'law of conservation of energy' and the 'law of conservation of mechanical energy'.

2} Solve example problems as presented in class dealing with work, kinetic energy, gravitational potential energy and the law of conservation of mechanical energy.

3) Answer the questions and solve the problems as presented from chapter 6 of reference A and chapter 6 of reference B.

o) power

1) Write a definition for the term 'power*.

2) Recall two equations for calculating 'power'.

3) List the proper units of power in each of the S.I. metric and Imperial systems of measure,

4) State the relationship between the unit known as the 'horsepower' and the Imperial unit of power.

5) State the relationship between the unit known as the 'horsepower' and the 'watt' and the 'kilowatt'

Continued....

IV. \PARMIMG ACTIVITIES (continued from page 8)

6) Solve example problems as presented in class dealing with 'power',

7) Answer the questions and solve the problems as assigned from chapter 6 of reference A and chapter 6 of reference B,

p) efficiency

1) Explain with the aid of a diagram what is meant by the term 'efficiency'.

2) Write an equation for the term 'efficiency',

q) mechanical advantage (actual)

1) Explain with the aid of a diagram what is meant by the concept of a 'simple machine*.

2) Write a definition for the term '(actual) mechanical advantage'.

3) Write the equation for '(actual) mechanical advantage'.

r) velocity ratio (ideal mechanical advantage)

1) Write a definition for the term 'velocity ratio' or 'ideal mechanical advantage'.

2) Write the equation for 'velocity ratio' or 'ideal mechanical advantage'.

s) some simple machines

1) Apply the concepts of learning activities II-p, Il-q and Il-r above to problems involving 'simple machines' such as: the 'lever', the 'inclined plane', the 'screw', the 'wheel & axle', 'pulleys and pulley systems', 'gears and gear systems' and the 'hydraulic jack'.

2) Answer the questions and solve the problems as assigned from chapter 7 of reference A and chapter 7 of reference B.

t) angular measurement

1) Recall, with the aid of a diagram, the meaning of and the relationship between the various units of angular measure: the 'revolution', the 'degree', 'minute' & 'second' and the 'radian*.

2) Write the definition for the concept of 'angular displacement'.

3) Develop the mathematical relationship between 'angular displacement' and 'linear displacement' for a point on a rotating body.

Continued ....

IV. LEARNING ACTIVITIES **(continued from page 9)**

u) angular velocity

1) Write the definition for the term 'angular velocity'.

2) Develop the mathematical relationship between 'angular velocity' and 'linear velocity' for a point on a rotating body.

v) angular acceleration and centripetal acceleration

1) Develop the mathematical relationship between 'angular acceleration' and 'linear acceleration' for a point on a rotating body which has a change of angular velocity with respect to time.

2) Distinguish between 'angular acceleration' and 'centripetal acceleration'.

3) Write the definition for the term 'centripetal acceleration' or 'normal acceleration'.

4) State the equations used to calculate 'centripetal or 'normal' acceleration for a body rotating with a constant angular velocity.

w) centripetal and centrifugal forces

1) Explain what is meant by the terms 'centripetal force' and 'centrifugal force' and discuss the the relationship between the two in terms of Newton's third law of motion from learning activity II-j-1.

2) Answer the questions and solve the problems as assigned from chapter 8 of reference A and chapter 9 of reference B,

x) momentum , y) impulse and z) conservation of momentum

1) Read and be held responsible for the contents of chapter 6 of reference A dealing with 'momentum', 'impulse' and the 'conservation of momentum'.

2) Write a definition for the concept of 'momentum'.

3) Write an equation for the concept of 'momentum'.

4) Write a definition for the concept of 'impulse'.

5) Write an equation for the concept of 'impulse'.

6) Explain the relationship between 'impulse' and 'momentum'.

7) Write a verbal statement of the 'law of conservation of momentum'-

Continued ....

IV, I PARMIMG ACTIVITIES (continued from page 10)

8) Solve the example problems as presented in class involving the principles of 'impulse* and 'momentum'. Apply the equation relating 'thrust', the 'velocity of the exhaust gases relative to the rocket motor' and the 'time rate of change of fuel mass' to a simplified analysis of rocket propulsion problems.

9) Answer the questions and solve the problems as assigned from chapter 6 of reference A and chapter 8 of reference B,

III MECHANICAL PROPERTIES OF SOLIDS, LIQUIDS & GASES

a) mass density

1) Write the 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 systems of units.

b) weight density

1) Write the 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 'mass density' and 'weight density*.

c) specific gravity

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

2) Write the equation for the term 'specific gravity' •

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

d) pressure

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

Continued ....

IV. LEARWIMG ACTIVITIES (continued from page 11)

e) units of pressure measurement

1) List the units used to measure pressure in the S.I- metric and the Imperial system of measure.

2) Identify the relationships that exist among the various units of pressure measurement including: lb/in?, kPa, N/m*, atmosphere, mb, in. of Hg, cm of Hg, mm of Hg, ft of water and m 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.

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.

h) the hydraulic press

1) Recall from learning activity II-s-1 that a hydraulic jack is an example of a 'simple machine'.

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

i) 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 fluid.

2) Write a verbal statement of Archimedes' principle and demonstrate an understanding of the principle by applying it to examples presented in class.

Continued ..

IV. LEARNING ACTIVITIES (continued from page 12)

j) absolute pressure and gauge pressure

1) List at least 8 equivalent values for standard atmospheric pressure.

2) Describe what is meant by the term 'vacuum' paying particular attention to the distinction between 'partial vacuum' and 'total vacuum'.

3) Write a definition for the term 'gauge pressure',

4) Write a definition for the term 'absolute pressure'•

5) Write the equation that relates 'absolute pressure', 'gauge pressure' and 'atmospheric pressure' -

tt) atmospheric pressure

1) Refer to learning activities III-j-1,2,5.

2) Solve the problems as presented on problem sheets 2, 3 and 4 dealing with hydrostatic pressure, problem sheet 6 dealing with Pascal's law and the problem sheet dealing with Archimedes' principle,

2) Answer the questions and solve the problems as assigned from chapters 10, 11 and 12 of reference A and chapters 12 and 13 of reference B,

IV TEMPERATURE AND HEAT

a) temperature

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) temperature scales and c) 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 scale.

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. LEARNING ACTIVITIES (continued from page 13)

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 IV-b-1, convert this temperature to an equivalent value on each of the remaining three temperature scales.

d) heat

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 IV-a-3.

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.

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 solidj and the corresponding 'coefficient of linear expansion'.

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

Continued ....

IV. LEARMiNG ACTIVITIES (continued from page 14)

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) Solve the problems and answer the questions as assigned from chapter 14 of reference A and chapter 15 of reference B.

3) 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.

i) Boyles' gas law

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

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

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

j) Charles' gas 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 presented in class dealing with the relationships between volume and temperature for a gas at constant pressure.

Continued ....

IV. LEARWIWG ACTIVITIES (continued rrom page \D)

k) 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 law.

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

1) the general gas law

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

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

3) Answer the questions and solve the problems as assigned from chapter 13 of reference A and chapter 16 of reference B.

m) units of heat measurement

1) List the various units used to measure heat content and for each unit explain clearly its meaning or definition.

2) State the relationships that exist between the units of heat content including: the calorie, the kilocalorie, the joule, the B.T.U. and the therm.

n) 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 IV-n-3.

Continued ....

IV. t gARWIMG ACTIVITIES (continued from page 16)

o) changes of state

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.

3) Explain what is meant by the state known as a 'plasma'.

p) specific 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 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 IV-p-3 above•

q) specific 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'.

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 of measure listed in learning activity IV-q-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) Answer the questions and solve the problems as assigned from chapters 14 and 15 of reference A and chapter 18 of reference B.

Continued ....

IV. LEARNING ACTIVITIES (continued from page 17)

r) methods of heat transfer

1) Read chapter 16 in reference A and be responsible for its contents.

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

3) List the factors that determine the rate at which heat will flow by conduction through a surface,

4) Write the equation used to calculate the amount of heat transfered by conduction through a surface of given surface area and thickness, subjected to a given temperature difference for a given period of time.

5) Solve the example problems as presented in class dealing with the equation of learning activity IV-r-4.

6) 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.

7) Describe the means by which the 'thermal conductivity' of a material may be determined.

8) Explain what is meant by the concept of an 'ideal blackbody'.

9) Write a verbal statement for the 'Stefan-Boltzmann law of radiation'.

10) Write a mathematical statement (an equation) for the 'Stefan-Boltzmann law of radiation' and use the equation to solve example problems as presented in class.

11) Describe several applications that either use heat transfer methods to advantage or try to limit the transfer of heat by these methods.

12) Answer the questions and solve the problems as assigned from chapter 16 of reference A.

Continued

IV. I EARMIWG ACTIVlTiES (continued from page 18)

V WAVE MOTION AND SOUND

3) periodic motion

1) Describe clearly and give examples of 'periodic motion'.

b) Hooke's law

1) Write a verbal statement of 'Hooke's law',

2) Write a mathematical statement (an equation) for 'Hooke's law'.

3) Solve example problems as introduced in class dealing with Hooke's law.

c) simple harmonic motion

1) Explain the meaning of the term 'simple harmonic motion'.

2) Distinguish between the terms 'periodic motion' and 'simple harmonic motion*.

3) Write the equation describing the relationship between the 'acceleration' and the 'displacement from the equilibrium position' for a point 'mass' undergoing 'simple harmonic motion'.

d) period, frequency and amplitude

1) Explain clearly the meaning of the term 'period' of a simple harmonic motion.

2) Explain clearly the meaning of the term 'frequency' of a simple harmonic motion.

3) Write the equation that describes the relationship between the 'period' and the 'frequency' of a simple harmonic motion.

4) Explain clearly the meaning of the term 'amplitude' of a simple harmonic motion.

5) Write the equation that relates the 'period' of a simple harmonic motion of a mass oscillating on the end of a vertical spring to the values of the mass and the spring constant of the spring.

6) List the various units that may be used to express the frequency of a simple harmonic motion

7) Explain clearly what is meant by the terms 'resonance' and 'resonant frequency'.

Continued ...

IV. I pARffiMG ACTIVITIES (continued from page 19)

e) types of waves

1) Describe clearly what is meant by and give several examples of * transverse waves'.

2) Describe clearly what is meant by and give several examples of 'longitudinal waves'.

3) Explain, the meaning of the terms ^compression' or 'condensation' pulse and 'rarefaction' pulse with reference to several examples of longitudinal waves, including longitudinal waves in a spring and sound waves.

3) Explain with the aid of a diagram how waves on the surface of water may be described as a combination of 'transverse' and * longitudinal' motions.

f) speed of waves

1) Write the two equations that may be used to determine the 'speed' of waves through a medium- One equation is in terms of 'speed', 'frequency' and 'wavelength'. The other is in terms of 'speed', 'period' and 'wavelength'.

2) Describe clearly with the aid of a diagram the meaning of the term 'wavelength'.

3} Answer.the questions and solve the problems as assigned from chapter 19 of reference A.

g) sound

1) Write a definition for the physical phenomenon known as 'sound'.

2) List the requirements necessary for the generation and propagation of sound.

h) speed of sound

1} Write the equation used to determine the speed of sound in air given the air temperature in degrees Celsius.

2) Write the equation used to determine the speed of sound in air given the air temperature in degrees Fahrenheit -

3) Given the temperature of the air in either '*C or °F calculate the speed of sound in the air using the equations of learning activities V-h-1 and V-h-2 above.

Continued

IV. I FAPM'MG ACTIVITIES (continued from page 20)

i) loudness and Intensity of sound

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

2) Write the equation that may be used to determine the 'intensity' of a sound.

3) Explain what is meant by and give the value of the intensity known as the 'threshold of hearing'

4) Explain what is meant by and give the value of the intensity known as the 'threshold of pain',

5) Explain what is meant by the term 'loudness' of a sound.

6) State the meaning of the unit used to measure the loudness of a sound, the 'decibel'.

7) Write the equation that expresses the Weber-Fechner law which is used to express the loudness of a sound, in decibels, given its intensity in W/m^'.

j) audible frequencies

1) State the range of frequencies which are audible to the human ear.

2) Explain what is meant by the term 'infrasonic frequencies'.

3) Explain what is meant by the term 'ultrasonic frequencies'•

4) Answer the questions and solve the problems as assigned from chapter 20 of reference A.

EVALUATION METHODS: (INCLUDES ASSIGNMENTS, ATTENDANCE REQUIREMENTS, ETC.)

See attached sheet titled: GRADE REQUIREMENTS

Page 22

Continued .

GRADE REQUIREMENTS

PHY125

PHYSICS

(Aviation Technology - Flight)

Your final grade in PHY125 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 11(1)
Test #2	Topic Number 11(2)
Test #3	Topic Number III
Test #4	Topic Number IV

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 in each of the four tests, your final grade will simply be an average of your four test results. In order to obtain your letter grade t e following percentage-letter grade equivalents will be used;

A+	90% - 100%	(Consistently outstanding achievement)
A	80% - 89%	(Outstanding achievement)
B	70% - 79%	(Consistently above average achievement)
C	55% - 69%	(Satisfactory or acceptable achievement)
X or R	0% - 54%	('Incomplete' or 'Repeat')

If your final average is below 55%, 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 instructor's discretion. The decision will be based upon your final average (e.g. 32% 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 supplemental examination as a result of having failed 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, June 1994

VI. 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 conripletion of the following:

VII. REQUIRED STUDENT RESOURCES

Harris, Hemmerling and Mallmann, PHYSICS Principles and Applications, Fifth edition. McGraw-Hill Publishing Company Toronto- T?90. ISBN 0-07-026851-7

*NOTE: This is the revised edition of: Harris & Hemmerling, INTRODUCTORY APPLIED PHYSICS, Fourth edition. McGraw-Hill Book Company. Toronto. 1980.

Bueche, Frederick J., Schaum's Outline Series - Theory and Problems of COLLEGE PHYSICS, Eighth edition, McGraw-Hill Publishing Company. Toronto- 1989.

VIIK ADDITIONAL RESOURCE MATERIALS AVAILABLE IN THE COLLEGE LIBRARY:

Book Stctton

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 Saction

Continued

IX. SPECIAL NOTES

Students with special needs (e.g. physical limitations, visual impairments, hearing impairments, learning disabilities, etc.) are encouraged to discuss required accommodations confidentially with the instructor. This of course will not affect Aviation - Flight students due to the nature of the entrance requirements for the program. It may however affect students from outside the Aviation program who may be taking this course for a credit in another area of study.

The course outline as detailed on pages 3 to 21 and summarized on pages 25 and 26 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.

** Topic V is optional; however, time permitting it will be covered. This creates the possibility for some latitude in the grading scheme as detailed on page 22.

COURSE ANALYSIS SHEET (*see attached*)

COURSE OUTLINE
(Summarized)

PHY125

PHYSICS
(Aviation Technology - Flight)

Reference Texts: A - PHYSICS Principles & Applications, Fifth edition
B - Schaum's Outline Series, COLLEGE PHYSICS, Eighth edition

TOPIC NO.	PERIODS	TOPIC DESCRIPTION	REFERENCE
		INTRODUCTION	A-Chapters 1,2,3 B-Chapter 1
		a) mathematics of basic physics	
		b) units of measurement	
		c) 'base' quantities and 'base' units	
		d) S-I. prefixes & their abbreviations	
		e) 'derived' quantities & 'derived' units	
		f) conversion of units of measure	
		g) significant figures	
		h) 'accuracy' and 'precision'	
		i) 'vector' and 'scalar' quantities	
II		MECHANICS - STATICS & DYNAMICS	A-Chapters 4,5,6,7,8 B-Chapters 4,5,6,7,8,9
		forces	
		the distinction between mass & weight	
		'distance' and 'displacement'	
		'speed' and 'velocity'	
		acceleration	
		equations of uniformly accelerated motion	
		the acceleration of gravity - free fall	
		Newton's first law of motion	
		Newton's second law of motion	
		Newton's third law of motion	
		work	
		kinetic energy	
		gravitational potential energy	
		conservation of energy	
		power	
		efficiency	
		mechanical advantage (actual)	
		velocity ratio (ideal mechanical advantage)	
		some simple machines	
		angular measurement	
		angular velocity	
		angular acceleration & centripetal acceleration	
		centripetal and centrifugal forces	
		momentum	
		impulse	
		conservation of momentum	

Continued .

III MECHANICAL PROPERTIES OF SOLIDS, LIQUIDS and GASES — A-Chaoters 10,11,12,13; B-Chapters 12,13

a) mass density
b) weight density
c) specific gravity
d) pressure
e) units of pressure measurement
f) pressure at a depth in a liquid
g) Pascal's law
h) the hydraulic press
i) Archimedes' principle
j) absolute pressure and gauge pressure
k) atmospheric pressure

IV TEMPERATURE and HEAT — A-Chapters 13,,14,15.16; B-Chapters 15,,16,18.19

a) temperature
b) temperature scales
c) absolute temperature scales
d) heat
e) linear expansion of solids
f) area expansion of solids
g) volume expansion of solids
h) volume expansion of liquids
i) Boyle's gas law
j) Charles' gas law
k) Gay-Lussac's gas law
1) the general gas law
m) units of heat measurement
n) specific heat capacity
o) changes of state
p) specific latent heat of fusion
q) specific latent heat of vapourization
r) methods of heat transfer

WAVE MOTION and SOUND — A-Chapters 19,.20; B-Chapters 11,,22,23

a) periodic motion
b) Hooke's law
c) simple harmonic motion
d) period, frequency and amplitude
e) types of waves
f) speed of waves
g) sound
h) speed of sound
i) loudness and intensity of sound
j) audible frequencies

G. Disano, June 1994

Course Analysis Form

Course Title and No.:

PHYSICS PHY 12 5-4

Learning Outcomes	Broad Areas of Content	Indicator of Importniire (U applicable)	Indicators of Success
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'-	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 125. I INTRODUCTION II MECHANICS - STATICS & DYNAMICS III PROPERTIES OF SOLIDS, LIQUIDS & GASES IV TEMPERATURE & HEAT V WAVE MOTION & SOUND		

7^i essmeat Process

Your final grade in PHY125 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 rnose 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

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 22 (grade requirements) will be used.

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

SIGNATURES:

IWcssor *jh* .- \ l^rogniui Cuordiiulor or M^^ /

Xo

Oile **(04/01/94)**