Douglas College

EFFECTIVE: JANUARY 2003

CURRICULUM GUIDELINES

A: Division: **Instructional**

B: Department/ Program Area: **Science and Technology**

Date: **15 May 2002**

New Course [ ] Revision [X]

If Revision, Section(s) Revised: **M,P,Q**

Date Last Revised: **27 April 1999**

C:	**D:**	**E:**
Phys 110	**Mechanics & Heat**	**5**
Subject & Course No.	Descriptive Title	Semester Credits

F: Calendar Description: This is a calculus-based course in mechanics and heat. Topics include vectors; particle kinematics and dynamics; momentum; work & energy; motion of systems; rotational motion; statics; oscillatory motion; wave motion; sound; temperature, thermal properties of matter, elements of thermodynamics.

G: Allocation of Contact Hours to Types of Instruction/Learning Settings:

Primary Methods of Instructional Delivery and/or Learning Settings:

Lecture/Laboratory

Number of Contact Hours: (per week / semester for each descriptor)
7

Number of Weeks per Semester:
14

H: Course Prerequisites: Physics 12 (C or higher) & BC Principles of Math 12 (C or higher)

I. Course Corequisites: Math 120

J. Course for which this Course is a Prerequisite: Phys 210

K. Maximum Class Size: 36

L: PLEASE INDICATE:

[ ] Non-Credit

[ ] College Credit Non-Transfer

[X] College Credit Transfer: Requested [ ] Granted [X]

SEE BC TRANSFER GUIDE FOR TRANSFER DETAILS (www.bccat.bc.ca)

SFU:	SFU PHYS 120 (3) & SFU PHYS (2)
UBC	UBC PHYS 101 (3); DOUG PHYS 110 & DOUG PHYS 210 = UBC PHYS 153 (6)
UVIC	UVIC PHYS 120 (1.5): DOUG PHYS 110 & DOUG PHYS 210 = UVIC PHYS 112 (3)

M: Course Objectives/Learning Outcomes: The student will be able to:

1) identify the following quantities and their appropriate units and dimensions; displacement; velocity; acceleration; force; mass; work; kinetic energy; potential energy; power; linear momentum; impulse; angular displacement, velocity, and acceleration; moment of inertia; rotational kinetic energy; angular momentum; torque; amplitude, period, and frequency of motion; wavelength; wave intensity; intensity level; temperature; pressure; heat.
2) demonstrate an understanding of the following concepts, procedures, and principles of mechanics and heat through the solution of problems: vector algebra via components and unit vector notation; average velocity and instantaneous velocity; average acceleration and instantaneous acceleration; uniformly accelerated motion; free-fall motion; Newton's laws of motion; friction and coefficient of friction; conditions for equilibrium; work-energy theorem; conservation of mechanical energy; conservation of energy; centre of mass motion; conservation of linear momentum; centripetal acceleration and force; universal law of gravitation; rotational motion; rolling motion; conservation of angular momentum; statics; Hooke's law; simple harmonic motion; wave parameters; superposition principle; resonance; intensity level versus intensity of sound; Doppler effect; thermal expansion of solids and liquids; calorimetry; First Law of Thermodynamics.
3) perform laboratory experiments and analyse the data obtained using appropriate graphing techniques, scientific notation, significant figures, and experimental uncertainty consideration;
4) write a laboratory report in a conventional format required of submissions to scientific journals.

N: Course Content

1. Mechanics

Kinematics of a Particle: one dimension
- Velocity and acceleration
- Rectilinear motion with constant acceleration

Vectors:
- Vector versus scalar
- Vector addition
- Unit vector notation
- Multiplication of vectors

Kinematics of a Particle: two dimensions
- Projectile motion
- Uniform circular motion
- Relative velocity

Dynamics of a Particle:
- Newton's laws of motion
- Friction
- Centripetal force

Work and Energy:
- Work done by constant and variable forces
- Kinetic energy
- Gravitational potential energy
- Elastic potential energy
- Conservative and non-conservative forces
- Power
- Work-energy theorem
- Conservation of energy
- Relative mass and energy

System of Particles:
- Centre of mass determination
- Centre of mass motion
- Conservation of linear momentum
- Impulse
- Collisions

Rotational Motion:
- Kinematics of pure rotation
- Torque and moment of inertia
- Dynamics of pure rotation
- Angular momentum

Statics:
- Conditions for equilibrium
- Equilibrium of a rigid body

Oscillatory Motion:
- Simple harmonic motion
- Pendulum motion

Gravitation:
- Law of gravitation

Wave motion:
- Mechanical waves
- Wave speed
- Harmonic waves
- Superposition Principle
- Interference of waves
- Standing waves
- Resonance in air columns
- Doppler effect

2. Heat

Thermometry
Thermal expansion of solids and liquids
Specific heat
Heat of transformation
Calorimetry
First Law of Thermodynamics

3. Laboratory Experiments:

One-dimensional Motion Kinematics
Projectile Motion
Friction Coefficients
Simple Pendulum
Collisions
Rotational Motion Dynamics
Orbital Motion and Centripetal Force
Static Equilibrium
Hooke's Law and Simple Harmonic Motion
Standing Waves/Resonance
Thermal Expansion of Solids/First Law of Thermodynamics
Heat Capacity/Conservation of Energy

O: Methods of Instruction

Classroom time will be divided between the presentation and discussion of concepts on the one hand and the application of these concepts in problem solving on the other, with the majority of time devoted to the latter. The laboratory program will involve weekly, three hour sessions during which students will perform a set number of experiments. This course may involve some group work.

P: Textbooks and Materials to be Purchased by Students

Halliday, D., R. Resnick, & Walker, G. **Fundamentals of Physics**, Sixth Edition, Wiley, 2001

Douglas College, **Physics 110 Laboratory Experiments**

Q: Means of Assessment

The final grade assigned for the course will be based upon the following components:

a) final examination - minimum of 30% / maximum of 40%
b) at least two tests administered during the semester - minimum 40% / maximum of 50%; and
c) submitted laboratory reports - 20%

R: Prior Learning Assessment and Recognition: specify whether course is open for PLAR

Not open for PLAR

Course Designer(s)

Education Council/Curriculum Committee Representative

Dean/Director

Registrar