UNIVERSITY COLLEGE OF THE FRASER VALLEY

COURSE INFORMATION

Revised: December 1996

DEPARTMENT: NATURAL SCIENCE **DATE: 1992-5-26**

PHYSICS 093	PRE-COLLEGE	3
NAME & NUMBER OF COURSE	DESCRIPTIVE TITLE	UCFV CREDIT

CATALOGUE DESCRIPTION:

This course is designed as a continuation of Physics 083. The prerequisites for this course are Physics 083 or its equivalent, Algebra 11 or its equivalent. Students who have taken Algebra 12 or its equivalent will have a much better chance of successfully completing this course. Students who do not have these prerequisites must obtain the instructor's permission before enrolling.

The purpose of this course is to permit the students to review the introductory physics taken in Physics 083, and broaden their knowledge of physics. This course is also designed to permit students to take a College based physics course. The course is probably too demanding to be used for a general interest course.

The students should learn and gain insight into the basic concepts of physics in the classroom and in the laboratory. The student will be introduced to and expected to acquire skills in: problem solving techniques, laboratory design and writing, data handling and graphing, graphing analysis, formal lab write-up procedures, and real world applications of the concepts being studied.

COURSE PREREQUISITES: Algebra 11, Physics 083 or permission of the instructor, or Physics 100.

COURSE COREQUISITES:

HOURS PER TERM FOR EACH STUDENT			STUDENT DIRECTED LEARNING - HRS
	LECTURE	45 HRS	
	LABORATORY	45 HRS	
	SEMINAR	HRS	OTHER - specify:
			TOTAL 90 HRS

UCFV CREDIT TRANSFER	UCFV CREDIT NON-TRANSFER	NON-CREDIT
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TRANSFER STATUS (Equivalent, Unassigned, Other Details)

UBC

SFU

UVIC

GEORGE MCGUIRE	DON TUNSTALL, Ph.D.
COURSE DESIGNER	DEAN OF ACADEMIC STUDIES

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COURSES FOR WHICH THIS IS A PREREQUISITE:	**RELATED COURSES**

ASSIGNMENTS:

Students will be expected to hand in one problem assignment each week. The problems will be graded, the marks recorded, and a final percentage of the term mark will be earned from this work. Each assignment will consist of 10 problems.

TEXTBOOKS, REFERENCES, MATERIALS (List reading resources elsewhere)

Hirsh, *Physics for a Modern World*, Wiley, 1986.

OBJECTIVES:

After successfully completing this course the students should be able to:
1. Discuss the basic ideas of physics;
2. Apply those basic ideas of physics to increase their understanding of the physical world;
3. Gather and analyze data;
4. Apply the concepts learned to other subjects;
5. Discuss the scientific methods of physics;
6. More realistically assess their chance for a successful career in a science related field, or some branch of the technologies;

TEACHING METHODS:

1. The course will be presented using a variety of techniques: classroom lectures; laboratory experiments; activities; computer programs using simulations, CAL, CAI, and other interactive audio-visual computer programs; films; and demonstrations.
2. Close coordination will be maintained between the theoretical and laboratory work.
3. Assignments will be used to evaluate the rate of learning and the depth of the students' comprehension.
4. At least half of the classroom time will be spent on laboratory related activities.
5. The experiments will be used to interact with the students on a more personal and intimate level. This time can be used to give individual help.
6. The periods are 3.0 hours long and one break of twenty minutes is given after the instructional time. In this way many students will begin their labs at different intervals and this makes individual help much easier to obtain.

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STUDENT EVALUATION PROCEDURE:

1. Assignments 20%
2. Experiments and Activities 10%
3. Quizzes 10%
4. Midterm Exam 20%
5. Final Exam 40%

COURSE CONTENT

1. Measurement
   a. The fundamental quantities of physics (mass, time, distance) and their units in the SI system.
   b. Changing from one unit system to another.
   c. Dimensional analysis. Checking equations to see if the units give the desired quantity. Deriving equations knowing only the units for the answer.
   d. Methods of recording data (symbol, units, accuracy, and precision).

2. Vectors
   a. Review graphical methods of adding and subtracting vectors. Special emphasis should be paid to the subtraction process because of its importance in physics and strangeness to the students.
   b. Introduction of unit vectors î, ̄, and k.
   c. Adding and subtracting vectors using components.
   d. Unit vectors.
   e. Relative velocities.
   f. Dot product and cross product. (optional)

3. Kinematics 1-D Review from Physics 083.
   a. Use of the three kinematic equations which relate constant acceleration, initial speed, displacement and time.
   b. Vertical motion above the earth's surface.
   c. Relative motion.
   d. Analysis of kinematic graphs to find the quantities of distance, speed and acceleration.
   e. Problems which use the kinematic equations in more depth; two step solutions.

4. Kinematics 2-D
   a. Vector representation of motion in 2-D.
   b. Projectile motion.
   c. Centripetal acceleration.
   d. Plane polar motion. (optional)
   e. Relative velocities.
   f. The vector nature of the kinematic equations.
   g. Determining the accelerations from a strobe photograph of 2-D motion.

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COURSE CONTENT (Cont'd)

5. Dynamics
   a. Newton's three laws.
   b. Force, mass and acceleration.
   c. Free body diagrams.
   d. Using with the 1-D kinematic equations.
   e. Specific Forces
      i. centripetal force
      ii. force of friction
      iii. force of gravity (close to the earth)
   f. The vector nature of forces should be emphasized.
   g. Motion of objects that experience more than one force.

6. Conservation Laws (Emphasis 2D)
   a. Momentum.
   b. Collisions and momentum.
   c. The momentum of an object is changed by applying a force.
   d. The time rate change of a mass's momentum is equal to the net force acting on the mass.
   e. That the impulse applied to a mass equal a mass's change in momentum.
   f. Potential and kinetic energy.
   g. Conservation of energy.
   h. Elastic and inelastic collisions.
   i. Applications.

7. The Fundamental Forces (inverse square laws)
   a. Universal Gravitation.
   b. Coulomb's Law.
   c. Magnetic poles.
   d. Differences and similarities between these forces.
   e. Action at a distance.
   f. The fundamental forces and the universal constants.
   g. Gravitational potential energy.
   h. Conservative forces.
   i. Escape velocity.
   j. Circular orbits, energy total, etc.

8. Force Fields
   a. Gravitational.
   b. Electrical.
   c. Magnetic.
   d. Difference, similarities, uses, etc.
   e. Action at a distance.

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COURSE CONTENT (Cont'd)

9. Circuits and Currents.
   a. Ohm's Law V=iR.
   b. Kirchhoff's laws and circuits with multiple power sources.
   c. Resistances in series and parallel.
   d. Solving for the unknown currents in circuits containing more than one power source and/or contain resistors in non-parallel or series combinations.
   e. Non-linear circuit devices
      i. light bulbs
      ii. diodes
      iii. transistors (optional)
   f. Electrical work and power.

10. Magnetic Field (optional)
   a. Sources and the shapes of the fields.
      i. common magnets
      ii. straight wires
      iii. coils and solenoids
   b. Currents and electrical charges in magnetic fields.
   c. Induction and Lenz's Law (Qualitatively).
   d. Motional emf.
   e. Generators and motors. (optional)

SCHEDULING THE COURSE

Legend:

1.0 period	=	1.5 hours
3.0 hours	=	1 night
2.0 nights	=	1 week
15.0 weeks	=	1 semester

Totals:

60 periods (54 teaching; 6 for testing)
90 hours
30 nights
15 weeks

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POSSIBLE LABORATORY EXPERIMENTS

Between ten and twenty experiments will be attempted in the Physics 093 course, In this curriculum guide there are suggestions for experiments, lab activities and home projects for some or all of the topics listed below.

Unit 1 - Measurement

Unit 2 - Vectors

Unit 3 - Kinematics 1D

Unit 4 - Motion in 2D

Unit 5 - Dynamics

Unit 6 - Energy, Work, Momentum

Unit 7 - Fundamental Forces

Unit 8 - Fields

Unit 9 - Circuits

Unit 10 - Magnetic Fields