UNIVERSITY COLLEGE of the FRASER VALLEY

COURSE IMPLEMENTATION DATE:
COURSE REVISED IMPLEMENTATION DATE: January 1997
COURSE TO BE REVIEWED: January 2001
(Four years after implementation date) (MONTH YEAR)

OFFICIAL COURSE OUTLINE INFORMATION

Students are advised to keep course outlines in personal files for future use.
Shaded headings are subject to change at the discretion of the department and the material will vary - see course syllabus available from instructor

FACULTY/DEPARTMENT: **NATURAL SCIENCES**

PHYSICS 101		**4**
COURSE NAME/NUMBER	FORMER COURSE NUMBER	UCFV CREDITS

INTRODUCTORY GENERAL PHYSICS: MECHANICS AND FLUIDS
COURSE DESCRIPTIVE TITLE

CALENDAR DESCRIPTION:

This is an introductory non-calculus course for students with only Physics 11 or equivalent. The course covers Newtonian mechanics; motion, momentum, and energy of particles, rigid rotating bodies, and fluids. The object of the course is to develop both an understanding of physical laws and to develop logical problem solving skills. The course has lectures, tutorials, and laboratory experiments.

PREREQUISITES: **Physics 11 or PHYS 100 and MATH 12. Students with Physics 12 or those enrolling in MATH 11 might wish to enroll in PHYS 111.**
COREQUISITES: **None**

SYNONYMOUS COURSE(S)
(a) Replaces: _____ *(Course #)*
(b) Cannot take: _____ *(Course #)* for further credit.

SERVICE COURSE TO: _____ *(Department/Program)* _____ *(Department/Program)*

TOTAL HOURS PER TERM: **105**
STRUCTURE OF HOURS:

Lectures:	**60**	Hrs
Seminar:		Hrs
Laboratory:	**39**	Hrs
Field Experience:		Hrs
Student Directed Learning:		Hrs
Other (Specify): Exams	**6**	Hrs

TRAINING DAY-BASED INSTRUCTION
LENGTH OF COURSE:
HOURS PER DAY:

MAXIMUM ENROLLMENT: **35**
EXPECTED FREQUENCY OF COURSE OFFERINGS:
WILL TRANSFER CREDIT BE REQUESTED? (lower-level courses only) ☒ Yes ☐ No
WILL TRANSFER CREDIT BE REQUESTED? (upper-level requested by department) ☐ Yes ☐ No
TRANSFER CREDIT EXISTS IN BCCAT TRANSFER GUIDE: ☐ Yes ☐ No

AUTHORIZATION SIGNATURES:

Course Designer(s): Robert Woodside
Chairperson: *(Curriculum Committee)*
Department Head: Tim Cooper
Dean: J.D. Tunstall, Ph.D.
PAC Approval in Principle Date:
PAC Final Approval Date: October 29, 1997

LEARNING OBJECTIVES / GOALS / OUTCOMES / LEARNING OUTCOMES:

The students will be able to:
1. Understand the fundamental laws of mechanics and sound and learn how to apply the theory to solve related problems.
2. Apply physics to everyday situations and phenomena in biology and engineering.
3. Use and investigate modern apparatus, perform fundamental laboratory experiments, and interpret data obtained.
4. Develop a feeling for the order of magnitude of physical quantities in real experiments.
5. Write formal laboratory reports in the conventional format required for submissions to scientific journals.

METHODS:

This course will be presented using lecture, tutorial periods, and laboratory experiments. Films and other audio-visual aids will be used where appropriate. Problems will be assigned on a regular basis which are to be handed in and marked. At the tutorial period the marked assignments will be discussed and additional problems in the same general area will be given for the students to work on during the period. Close coordination will be maintianed between laboratory and classroom work whenever possible.

PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):

Credit can be awarded for this course through PLAR (Please check:) ☐ Yes ☐ No

METHODS OF OBTAINING PLAR:

TEXTBOOKS, REFERENCES, MATERIALS:

[Textbook selection varies by instructor. An example of texts for this course might be:]

TEXTS: Cutnoll & Johnson

REFERENCES: Beuche, Principles of Physics, 5th Ed., McGraw-Hill, 1988
Blatt, Principles of Physics, 3rd Ed., Allyn & Bacon (1989)
Serway, Physics for Scientists and Engineers, 2nd Ed., Saunders (1986)

SUPPLIES / MATERIALS:

STUDENT EVALUATION:

[An example of student evaluation for this course might be:]

Assignments		15%
Mid-term	25%	
Laboratory Work		20%
Final Exam		40%

COURSE CONTENT:

[Course content varies by instructor. An example of course content might be:]

WEEK 1 - 2 MATHEMATICS PRELIMINARIES
- Checking the units (Dimensional Analysis)
- Vectors
  - Mathematics of directed quantities or vectors is part of the language of physical science
  - Vector notation
  - Well known geometry revisited with displacement vectors
  - Force is a vector
  - Dot product (work) and cross product (torque vector) are introduced
  - Coordinate Systems are picked for convenience
  - Component notation and trigonometry

WEEK 3 - MOTION
- Rate of change or derivative of displacement vector is velocity
- Acceleration is the derivative of velocity
- One and two dimensional motion with constant acceleration

WEEK 4 - 5.5 NEWTON'S LAWS

- An isolated body has a constant velocity
- Inertia or mass is the resistance of a body to velocity changes
- The sum of the external forces on a body give the product of the mass and acceleration of the body
- Weight is a force (W - mg)
- Reaction is equal and opposite to action
- Contract forces and friction law
- Forces are analyzed with free body diagrams

WEEK 5.5 - 6 STATICS - VANISHING OF FORCES OR TORQUES

- A force directed through a body's centre of mass causes the body to accelerate.
- An equal force directed obliquely causes the same acceleration and a rotation about the centre of mass. Such a force produces a torque which causes rotation.
- With the aid of free body diagrams and the vanishing of forces and torques, 2 and 3 simultaneous equations are found and solved.

WEEK 7 - 8 WORK AND ENERGY

- Work is force through distance
- Kinetic Energy
- Gravitational Potential Energy
- Conservative forces and independence of path and potential energy
- Energy conservation
- Power is the rate at which work is done

WEEK 9 MOMENTUM AND IMPULSE

- Momentum - Impulse Conservation
- Collisions - elastic, inelastic, perfectly inelastic

WEEK 10 CIRCULAR MOTION

- Analogy between linear and circular motion with angular and tangential quantities
- Centripetal acceleration
- Newton's Law of Universal Gravitation
- Free body diagrams for circular motion

WEEK 11 - 12.5 ROTATIONAL MOTION IN A PLANE

- Analogy between linear and rotational dynamics: forces and torques, linear and angular momentum, mass and moment of inertia, translational and rotational kinetic energy

WEEK 12.5 - 13.5 SIMPLE HARMONIC MOTION AND WAVES

- Differential equation for uniform circular motion is simple harmonic motion equation
  - Solution by analogy for spring and pendulum
  - Integrating force to get potential energy
- Travelling wave solutions to wave equation

WEEK 13.5 - 14 FLUIDS: AS COMPRESSIONAL WAVES IN ELASTIC MEDIA

- Pressure
- Pascal's Principle
- Archimedes' Principle
- Continuity Equation
- Bernoulli's Equation

LABORATORY EXPERIMENTS:

1. Error Analysis
2. Graphical Analysis and Collecting of Data
3. Graphical Analysis and Collecting of Data
4. Acceleration Due to Gravity
5. Projectile Motion
6. Centripetal Force
7. Conservation of Momentum (ID)
8. Conservation of Energy (2D)
9. Conservation of Energy
10. Moment of Inertia