UNIVERSITY COLLEGE of the FRASER VALLEY

COURSE IMPLEMENTATION DATE: June 1993
COURSE REVISED IMPLEMENTATION DATE: September 2006
COURSE TO BE REVIEWED: November 2009
(Four years after UPAC final approval 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: **Faculty of Science, Health and Human Services/Physics**

PHYSICS 221		**4**
COURSE NAME/NUMBER	FORMER COURSE NUMBER	UCFV CREDITS

INTERMEDIATE MECHANICS
COURSE DESCRIPTIVE TITLE

CALENDAR DESCRIPTION:

This course extends the topics covered in Physics 111. Topics covered include kinematics, motion in polar coordinates, Newton's laws, momentum work, some mathematical aspects of physics and vector analysis (gradient, divergence, curl, Stokes' theorem and Gauss's law), angular momentum, forced and damped harmonic motion, central forces and Lagrangian mechanics. The laboratory portion of the course includes experiments designed to supplement the theory covered in class.

PREREQUISITES: (PHYS 111 and PHYS 112) or (PHYS 101 and PHYS 105 with a B+ or higher in each)

PRE- OR COREQUISITES: MATH 211

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

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

TOTAL HOURS PER TERM: **120**
STRUCTURE OF HOURS:

Lectures:	**75**	Hrs
Seminar:		Hrs
Laboratory:	**45**	Hrs
Field Experience:		Hrs
Student Directed Learning:		Hrs
Other (Specify): Exams (Done in lab period)		Hrs

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

MAXIMUM ENROLLMENT: **24**
EXPECTED FREQUENCY OF COURSE OFFERINGS: **once per year**

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): George McGuire
Chairperson: Gillian Mimmack *(Curriculum Committee)*
Department Head: Norm Taylor
Dean: Jackie Snodgrass
UPAC Approval in Principle Date:
UPAC Final Approval Date: December 14, 2005

LEARNING OBJECTIVES / GOALS / OUTCOMES / LEARNING OUTCOMES:

If successful in this course, students should be able to:

1. demonstrate their understanding of the physics they have studied by being able to solve related problems;
2. appreciate that the knowledge they have gained has provided them with the ability to better understand the world in which they live;
3. appreciate the fact that science demands that all theories be checked in a laboratory;
4. discuss and use the methods and techniques of theoretical and experimental physics;
5. enter and successfully complete more advanced physics courses.

METHODS:

This course will be presented using lectures and laboratory experiments. Audio-visual aids will be used whenever appropriate. Computer-assisted learning programs will be used to increase the understanding of the concepts being studied. Problem sets will be assigned and graded for each chapter studied.

PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):

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

METHODS OF OBTAINING PLAR:

Departmental Review and/or Course Challenge

TEXTBOOKS, REFERENCES, MATERIALS:

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

TEXTS: Fowles, Analytical Mechanics, 5th ed., HBJ, 1993

REFERENCES:

1. Alonso & Finn, Fundamental University Physics, Vol. I
2. A.P. French, Newtonian Mechanics
3. Halliday & Resnick, Physics, Part I, J. Wiley
4. Kleppner & Kolenkow, An Introduction to Mechanics, McGraw-Hill
5. A. Douglas Davis, Classical Mechanics, Academic Press, 1986

SUPPLIES / MATERIALS:

Fully-equipped physics lab

STUDENT EVALUATION:

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

Assignments	10%
Laboratory Work	10%
Mid-term	25%
Final Exam	45%
Quizzes	10%

COURSE CONTENT:

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

Kinematics: motion in one and two dimensions; dissipative forces; forces as function of time, position, and velocity

Harmonic Oscillator: simple harmonic oscillator, power series representation of an arbitrary function, anharmonic oscillators, damped and forced oscillators

Vectors: vector algebra, vector multiplication, coordinate systems, vector calculus, vector differential operators (gradient, divergence, and curl)

Coordinate Systems: plane polar coordinates, cylindrical coordinates, spherical coordinates, moving and rotating coordinate systems, vector differential operators in spherical and cylindrical coordinate systems

Central Forces: potential energy and central forces, angular momentum and central forces, inverse square law and ellipses, Kepler's laws

Lagrangian Mechanics: generalized coordinates, Lagrange's equations, elementary examples, applications, systems with constraints

Rigid Bodies: centre of mass, angular momentum, rotation about a fixed axis, moment of inertia, conservation of energy and momentum

Systems of Particles: momentum, momentum with variable mass (rockets), collisions, centre of mass

LABORATORY EXPERIMENTS:

1. Graphical Analysis of Vectors (Acceleration Due to Gravity from Projectile Motion)
2. Dissipative Forces (F V) (Two lab periods)
3. Anharmonic Motion (Two lab periods)
4. Damped Harmonic Motion
5. Coupled Harmonic Motion
6. Forced Oscillations
7. Compound Pendulum
8. Moment of Inertia