UNIVERSITY COLLEGE of the FRASER VALLEY

UPAC FORM #2 (Page 1)

COURSE IMPLEMENTATION DATE:	June 1993
COURSE REVISED IMPLEMENTATION DATE:	September 2006
COURSE TO BE REVIEWED: (Four years after UPAC final approval date)	November 2009 (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**

COURSE NAME/NUMBER	FORMER COURSE NUMBER	UCFV CREDITS
PHYSICS 321		**3**

Advanced Mechanics
COURSE DESCRIPTIVE TITLE

CALENDAR DESCRIPTION:

The object of this course is to extend the concepts studied in Physics 221. Topics to be covered include: Newtonian mechanics, oscillations, gravitation, central forces, motion in noninertial reference frames, Hamilton's Principle and Lagrange's equations, systems of particles, dynamics of rigid bodies. Although this course has no lab component, the emphasis will be shared equally between the theoretical and the applied aspects of the physics being studied.

PREREQUISITES: **Physics 221**
COREQUISITES: **Pre- or co-requisite Physics 381**

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: ***75***

STRUCTURE OF HOURS:

Lectures:	***75***	Hrs
Seminar:		Hrs
Laboratory:		Hrs
Field Experience:		Hrs
Student Directed Learning:		Hrs
Other (Specify):		Hrs

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

MAXIMUM ENROLLMENT:	**24**	
EXPECTED FREQUENCY OF COURSE OFFERINGS:	**Once every 2-3 yrs**	
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): Tim Cooper
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:

1. To increase the students' knowledge of Newtonian mechanics.
2. To increase the students' awareness of the important role Newtonian mechanics has played in the development of all the sciences.
3. To provide the knowledge and the discipline needed to continue a career in physics.
4. To provide an opportunity for the students to experience the joy of thinking.

METHODS:

This course will be taught using lectures, demonstrations, and computer simulations. Problems will be assigned and marked on a regular basis.

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:]

Text:
1. Marion & Thornton, Classical Dynamics, Harcourt Brace (1988)

References:
1. Norwood, J., Intermediate Classical Mechanics, Prentice-Hall, NJ

2. Goldstein, Classical Mechanics, 2nd edition, 1981, Addison Wesley

3. Baierlein, R., Newtonian Dynamics, McGraw-Hill, 1983

4. Symon, Mechanics, 3rd edition, Addison-Wesley, 1971

SUPPLIES / MATERIALS:

STUDENT EVALUATION:

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

The marks earned in this course will be calculated from the assignment grade, the midterm and final exams.

Assignments	25%
Midterm Exam	30%
Final Exam	45%

COURSE CONTENT:

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

1. Newtonian Mechanics (a review)
   Newton's Law, Conservation Theorems, Rocket motion, limitations of Newtonian mechanics
2. Oscillations (a review)
   damped and forced, sinusoidal driving forces, Fourier series, impulsive forces
3. Central Forces and Gravitation
   orbits in a central field, reduced mass, effective potential, orbital dynamics
4. Methods in the Calculus of Variations
   Euler's Equation, functions with several dependent variables

5. Hamilton's Principle and Lagrangian Dynamics
General coordinates, Lagrangian Dynamics, Hamiltonian Dynamics, phase space

6. Systems of Particles
Centre of Mass, Linear Momentum, Angular Momentum, Collisions

7. Non-inertial Reference Frames
Rotating Coordinate Systems

8. Dynamics of Rigid Bodies
Angular momentum, moments of inertia, Inertia Tensor, Eulerian Angles

9. Coupled Oscillators, Vibrating Strings

10. Group Velocity, Phase Velocity and Wave Packets