UNIVERSITY COLLEGE of the FRASER VALLEY

COURSE IMPLEMENTATION DATE: June 1993
COURSE REVISED IMPLEMENTATION DATE: September 2007
COURSE TO BE REVIEWED: May 2010
(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**

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

Advanced Mechanics
COURSE DESCRIPTIVE TITLE

CALENDAR DESCRIPTION:

The object of this course is to extend the concepts studied in PHYS 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: **PHYS 221**
COREQUISITES: **Pre- or co-requisite PHYS 381, PHYS 382 or 383 (Advanced Mechanics Group of experiments) s recommended**

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: May 26, 2006

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.

Students should be aware that, as per departmental policy: All instructors teaching physics courses will be expected to cover all of the material in the course content section in the official course outlines.

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:

Please see the Physics PLAR policy on the department's webpage.

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