### 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

<table>
<thead>
<tr>
<th>FACULTY/DEPARTMENT:</th>
<th>PHYSICS 221</th>
</tr>
</thead>
<tbody>
<tr>
<td>COURSE NAME/NUMBER</td>
<td>MECHANICS (INTERMEDIATE)</td>
</tr>
<tr>
<td>FORMER COURSE NUMBER</td>
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<tr>
<td>UCFV CREDITS</td>
<td>4</td>
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<tr>
<td>COURSE DESCRIPTIVE TITLE</td>
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#### CALENDAR DESCRIPTION:

The object of this course is to extend the concepts studied in Physics 101 and 111. Topics covered in this course include: kinematics; orthogonal curvilinear coordinate systems; mathematical physics; dynamics; energy; momentum; free, forced, coupled and damped oscillations; gravitation; and special relativity. The course will be presented using lectures and laboratory experiments. Emphasis will be equally shared between applied and theoretical physics. Students indicating specific interests will be assigned problems relevant to those interests.

#### PREREQUISITES:

PHYS 101/102, B+ or better; or PHYS 111/112

#### COREQUISITES:

MATH 211 and MATH 221

#### SYNONYMOUS COURSE(S)

(a) Replaces: (Course #) (Department/Program)

(b) Cannot take: (Course #) (Department/Program)

#### SERVICE COURSE TO:

- (Course #) (Department/Program)

#### TOTAL HOURS PER TERM:

<table>
<thead>
<tr>
<th>STRUCTURE OF HOURS:</th>
<th>TRAINING DAY-BASED INSTRUCTION</th>
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<tbody>
<tr>
<td>Lectures: 60 Hrs</td>
<td>LENGTH OF COURSE:</td>
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<tr>
<td>Seminar:</td>
<td>HOURS PER DAY:</td>
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<tr>
<td>Laboratory: 30 Hrs</td>
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<td>Field Experience:</td>
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<tr>
<td>Student Directed Learning: 12 Hrs</td>
<td>(done in lab periods)</td>
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<tr>
<td>Other (Specify): Exams: 3 Hrs</td>
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#### MAXIMUM ENROLLMENT:

- 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: (Curriculum Committee)

Department Head: Tim Cooper

Dean: J.D. Tunstall, Ph.D.

PAC Approval in Principle Date:  PAC Final Approval Date: November 24, 1993
LEARNING OBJECTIVES / GOALS / OUTCOMES / LEARNING OUTCOMES:

If successful in this course, students should be able to:
1. Understand the fundamental concepts and laws involved in classical mechanics and relativity. To demonstrate this understanding by solving a wide variety of problems.
2. Have some knowledge and understanding of the basic principles as applied to instruments and apparatus.
3. Apply the classroom learning in the laboratory.
4. Feel confident about continuing their career in a science-related field.

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:

TEXTBOOKS, REFERENCES, MATERIALS:

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


REFERENCES:

1. Alonso & Finn, Fundamental University Physics, Vol. I
2. A.P. French, Newtonian Mechanics
3. Halliday & Resnick, Physics, Part I, J. Wiley

SUPPLIES / MATERIALS:

STUDENT EVALUATION:

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

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

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

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

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

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

LABORATORY EXPERIMENTS:

Graphical Analysis and Theory of Errors
Graphical Analysis of Vectors (Acceleration Due to Gravity from Projectile Motion)
Dissipative Forces (F V)
Dissipative Forces (F V2)
Anharmonic Motion
Damped Harmonic Motion
Coupled Harmonic Motion
Forced Oscillations
Compound Pendulum
Moment of Inertia