Perris Union High School District
Course of Study

A. COURSE INFORMATION

1. Course Title:

AP Physics C

2. Transcript Title / Abbreviation:

AP Physics C

3. Transcript Course Code / Number:

4. Required for Graduation?

Yes **X** No

5. Meets UC/CSU Requirements?

X *Yes* *No*

Was this course <u>previously approved</u> by UC?

X Yes No

6. Meets "AP" Requirements?

X *Yes* *No*

7. Course Author/Contact:

First Name: Tony
Last Name: DiMauro
Position/Title: Teacher
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Date Submitted: OCTOBER 1, 2013

8a. Subject Area

History/Social Science
English
Mathematics
X Laboratory Science
Language other than English
Visual & Performing Arts
College Prep Elective
Other: Science

Is this course classified as a Career Technical Education: Yes **X** No

If CTE:
Name of Industry Sector: _____
Name of Career Pathway: _____

8b.Credential required to teach this course:

_____
(To be completed by H.R. only)

_____
Signature date

9. Grade Level(s)

11 - 12

10. Meets "Honors" Requirements?

X *Yes* *No*

11. Unit Value / Length of Course

0.5 (half year or semester equivalent)
X 1.0 (one year equivalent)
2.0 (two year equivalent)
Other: _____

12. APPROVALS

	Name/Signature	Date
Subject Area Council:	**Nick Hilton**	**11/7/13**
Educational Planning Council:	**Carrie Waeldin**	**11/7/13**
Board Approval:		

13. Pre-Requisites

Passed Algebra II with a B, or better and concurrent enrollment in PreCalculus or Calculus AB

14. Co-Requisites

Calculus AB or BC

15. Brief Description of the Course

The AP Physics C is a national calculus-based course in physics. This course is equivalent to the pre-engineering introductory physics course for the university students. The emphasis is on understanding of the concepts and skills and using the concepts and formulae to solve problems. Laboratory work is an integral part of this course. Physics C: Mechanics should provide instruction in each of the following six content areas: kinematics; Newton's laws of motion; work, energy and power; systems of particles and linear momentum; circular motion and rotation; and oscillations and gravitation. The course includes a laboratory component comparable to a semester-long, college-level physics laboratory. Students spend a minimum of 20% of instructional time engaged in laboratory work.

B. COURSE CONTENT

16. Course Purpose:

What is the purpose of this course? Please provide a brief description of the goals and expected outcomes. Note: More specificity than a simple recitation of the State Standards is needed.

Students will be exposed to

1. Read, understand, and interpret physical information — verbal, mathematical, and graphical
2. Describe and explain the sequence of steps in the analysis of a particular physical phenomenon or problem; that is,
   a. describe the idealized model to be used in the analysis, including simplifying assumptions where necessary;
   b. state the concepts or definitions that are applicable;
   c. specify relevant limitations on applications of these principles;
   d. carry out and describe the steps of the analysis, verbally, or mathematically; and
   e. interpret the results or conclusions, including discussion of particular cases of special interest
3. Use basic mathematical reasoning — arithmetic, algebraic, geometric, trigonometric, or calculus, where appropriate — in a physical situation or problem
4. Perform experiments and interpret the results of observations, including making an assessment of experimental uncertainties
5. The AP Physics Exams are designed to test student achievement in the AP Physics courses described in this book . These courses are intended to be representative of courses commonly offered in colleges and universities, but they do not necessarily correspond precisely to courses at any particular institution . The secondary school course in physics should be to develop the students' abilities to do the following

6. **Laboratory experience must be part of the education of AP Physics students and should be included in all AP Physics courses, just as it is in introductory college physics courses.** In textbooks and problems, most attention is paid to idealized situations: friction is often assumed to be constant or absent; meters read true values; heat insulators are perfect; gases follow the ideal gas equation . It is in the laboratory that the validity of these assumptions can be questioned, because there the student meets nature as it is rather than in idealized form . Consequently, AP students should be able to:

- design experiments;
- observe and measure real phenomena;
- organize, display and critically analyze data;
- analyze sources of error and determine uncertainties in measurement;
- draw inferences from observations and data; and
- communicate results, including suggested ways to improve experiments and proposed questions

17. Course Outline

Detailed description of topics covered. All historical knowledge is expected to be empirically based, give examples. Show examples of how the text is incorporated into the topics covered.

Physics Concepts

Physics as a Science
Units and Measurements
Powers of Ten
Significant Figures
Accuracy and Precision
Graphing
Unit Analysis
Order of Magnitude Problems

Kinematics
Motion in 1-D
Motion Equations
Motion Graphs
Derivatives and Slopes
Relative Motion
Scalars, Vectors and Trigonometry
Motion in 2-D - Projectiles

Dynamics / Newton's Laws of Motion
Force and Mass
Tension and Normal Reaction
Freebody Diagrams
Static Equilibrium
Uniform Circular Motion
Friction
Drag Force

Work, Energy, and Power
Work
Energy
Conservation of Energy
Work done by Conservative / Nonconservative Forces
Work Due by Variable Forces
Kinetic and Potential Energies
Conservation of Mechanical Energy
Power

Linear Momentum
Impulse and Linear Momentum
Law of Conservation of Linear Momentum
Two-Body Collisions in 1-D and 2-D
Systems of Particles

Rotational Kinematics / Dynamics
Constant Angular Speed
Constant Angular Acceleration
Relationships between Linear and Angular Variables
Translational - Rotational -Rolling Motion
Rigid Bodies
Moment of Inertia and Torque
Rotational Variables and Newton's Second Law
Angular Momentum
Conservation of Angular Momentum
Rotational Equilibrium
Mechanical Equilibrium

Gravitation
Newton's Law of Gravitation
Gravitational Potential Energy
Motion of Planets and Satellites
Kepler's Laws
Critical and Escape Velocities

Simple Harmonic Motion
Kinematics
Dynamics
Simple Pendulum
Spring Mass System
Physical Pendulum

18. Writing Assignments

Give examples of the writing assignments and the use of critical analysis within the writing assignments.

1. Students will be writing up 12 formal Labs. Each lab will require students to state a purpose, discuss the procedure, analyze the data and provide a conclusion that will incorporate error analysis and possible future experiments that can provide better data. Each of these components requires that the student use academic language to explain their answers.
2. Students will be required to choose a topic and write a research paper on this topic. This research paper will require students to explain their research using their newly acquired physic academic language.

19 (A) Textbook :

Title: Physics: Principles with Applications

Edition: 4th Publication Date: 2007

Publisher: Prentice-Hall (ISBN-10: 0132273586 | ISBN-13: 978-0132273589)

Author(s): Giancoli, D.

Usage: **X** Primary Text Read in entirety or near entirety

19 (B) Supplemental Instructional Materials (please describe)

Students will supply an AP Physics C prep book.
2013 Barron's AP Physics C, 3rd Edition [Paperback]

20. Key Assignments

- Problem Solving
- Formal Lab Write-ups
- Physics Notebooks (Chapter notes, Classic Problem Summaries, Worksheets, etc.)
- Physics Demo Project
- Test Prep Summaries
- Quizzes and Tests

21. Instructional Methods and/or Strategies

A number of active learning strategies would be used including but not limited to:

- Problem-based learning
- Applying Physical concepts to real-world situations
- Hands on activities
- Technology based activities
- Visual learning strategies - Animated Problem solving presentations
- Direct instruction
- Formal Labs and Lab write-ups

22. Assessment Methods and/or Tools

This course would be assessed using a number of tools that include (but are not limited to):

- Tests
- Quizzes
- Projects
- Classwork and homework
- Lab write-ups
- Notebook/journal work

23. Course Pacing Guide and Objectives:

Days	Key Topics	Standards	Chapters	Key Activities
10 days	**Physics as a Science** Units and Measurements Powers of Ten Significant Figures Accuracy and Precision Graphing Unit Analysis Order of Magnitude Problems	I & E all	1	1. Measurement Lab 2. Spreadsheets Exercises
20 days	**Kinematics** Motion in 1-D Motion Equations Motion Graphs Derivatives and Slopes Relative Motion Scalars, Vectors and Trigonometry Motion in 2-D - Projectiles	1A	2	3. Demonstrations of principles. Mousetrap Cars Vector/Coordinate Exercises Projectile Motion
20 days	**Dynamics / Newton's Laws of Motion** Force and Mass Tension and Normal Reaction Freebody Diagrams Static Equilibrium Uniform Circular Motion Friction Drag Force	1I, 1J, & I&E 1E	3	8. Atwood's machine—Verification of Newton's First Law 9. Relationships between Fc and r for uniform circular motion
15 days	**Work, Energy, and Power** Work Energy Conservation of Energy Work done by Conservative and Nonconservative Forces Work Due by Variable Forces Kinetic and Potential Energies Conservation of Mechanical Energy Power	1B-1D, & 1K	4	
15 days	**Linear Momentum** Impulse and Linear Momentum Law of Conservation of Linear Momentum Two-Body Collisions in 1-D and 2-D Systems of Particles	2A, 2B, 2C, 2H, & 5O	5	12. Conservation of linear momentum—The three kinds of collisions—air track
~80 Days- End of Semester 1				

20 days	**Rotational Kinematics / Dynamics** Constant Angular Speed Constant Angular Acceleration Relationships between Linear and Angular Variables Translational - Rotational -Rolling Motion Rigid Bodies Moment of Inertia and Torque	4A – 4F	6	10. Rotational Dynamics—Relationships among rotational variables
10 Days	**Rotational Variables and Newton's Second Law** Angular Momentum Conservation of Angular Momentum Rotational Equilibrium Mechanical Equilibrium	5E, 5J – 5M, 1M	7	
10 Days	**Gravitation** Newton's Law of Gravitation Gravitational Potential Energy Motion of Planets and Satellites Kepler's Laws Critical and Escape Velocities	5A, 5D	8	
10 Days	**Simple Harmonic Motion** Kinematics Dynamics Simple Pendulum Spring Mass System Physical Pendulum	5F - 5H, 5I, 5J, 5N	9	6. Hooke's Law: Finding the spring constant of different springs. 7. Elastic force in rubber bands—Nonlinear spring 13. Simple pendulum—Photogate and spring-mass system—Force sensor

C. HONORS COURSES ONLY

24. Indicate how this honors course is different from the standard course.

D. BACKGROUND INFORMATION

25. Context for Course (optional)

26. History of Course Development (optional)