KAP Physics 140 / AP Physics C Mr. Herring Course Description & Syallabus 2012-2013

Course Goals: Physics is the study of the physical world. We will be exploring the fundamental laws that govern natural phenomena and use those laws to develop theories that can predict the results of future experiments. Using these laws to solve everyday problems is a major goal of this course. This course is designed to be the equivalent of a college-level first semester Physics class. Students can earn college credit by scoring well on the AP Physics Exams which take place in May. Students can also earn college credit through the Kenyon Academic Program (KAP).

Requirements: Success in previous college preparatory science and math classes (B or better) indicates the academic maturity necessary for this course. A thorough understanding of Algebra, Geometry, and Trigonometry is essential to solving many problems. It is strongly recommended that students be concurrently enrolled in Calculus.

Text:

<u>Physics for Scientists and Engineers</u>, 6th edition, by Raymond A. Serway & John W. Jewett Bring this book with you to every class unless otherwise directed.

Additional Requirements:

- 1. Scientific calculator (graphing calculator will prove most helpful)
- 2. Pencil, pen, notebook paper
- 3. A four color pen or four separate colored pens (black, green, red, blue)

Student Expectations:

- 1. Be ready to begin class when the bell rings.
- 2. Participate, this is <u>not</u> a course you can sit back and expect to grasp concepts just by watching me.
- 3. Do homework practice problems. Practice is essential to understanding Physics.
- 4. Ask questions. One of the most important ways to learn is from asking questions.
- 5. Work together in groups. Collaborate with each other specifically on homework.
- 6. Do your own work on quizzes and tests. Be responsible and ready.

About attendance:

You are responsible for obtaining any missed assignments and for making them up. This includes getting the class notes, completing homework, and making up any tests, quizzes, or labs. According to school policies, you will have as many days to make up assignments as you have missed; after that they are considered late. You must arrange time with the teacher to make up missed work.

Grading: Your grade will be determined <u>approximately</u> as follows:

Quizzes	50%
Labs	30%
Tests	10%
Homework	10%

Quizzes: Quizzes are given to determine how successful you are at mastering the material in class. They will cover homework problems and concepts presented in class. Expect one quiz a week most often on Fridays.

Tests: Tests will consist of problems similar to the ones in the quizzes and homework covering <u>all</u> the material in the nine weeks. Expect one test at the end of each nine weeks. The 4th nine weeks test will be a practice AP Physics Exam which all students will take.

Labs: Labs are an excellent method to learn and reinforce Physics concepts. Expect one lab per week. Labs are conducted on double blocks days giving ample time to complete the lab. Students will typically work in student selected groups of three. Tests may include a lab practical component. Each individual student is responsible for understanding how to execute the labs conducted during the year. Each student will keep a lab notebook. The lab book will be collected and graded randomly during the year.

Homework: Problems will be assigned every week. There will be challenging problems that we need to go over in class; however, I expect you to make an honest effort before class or before asking for assistance. Struggling is natural, expected, and part of the process to learn Physics. Work in groups to help each other solve challenging problems.

Extra Help: I want to help each student be successful. Often, only a few minutes of small group or 1:1 help with me will greatly improve student understanding. I am often available before and after school and during some periods during the day. The best method is to schedule a time with me during class to meet later. Also, you can email me (rusty_herring@hboe.org)

Course Outline:

1st Semester – Mechanics

Dimensional Analysis Motion (1D, 2D, projectile, and circular) Newton's Laws Friction Work, Energy, Power Impulse, Momentum, Collisions Rotation Gravitation and planetary motion Simple Harmonic Motion

2nd Semester – Electricity and Magnetism

Charged Particles and Electric Fields Electric Potential Capacitance Current and Resistance Circuits Magnetic Fields Inductance

Mechanics Outline

Mechanics is covered during the fall semester. Each subject is covered in the same order as in Serway and Jewett and other standard texts. Concepts and problem-solving techniques are introduced through a combination of lectures, demonstrations, lab experiments, question–answer sessions, assignments from the text and teacher-generated worksheets.

	~ Time	Text	
Торіс	(days)	Chapter	Labs and Demos
I. SI Units, Dimensional Analysis, Vectors	4	1	Lab: Vectors
II. Rectilinear Motion			Demo: Air Track cart - graph position, velocity, and
A. Kinematics with time-varying accel.	8		acceleration.
B. Kinematics with constant accel.		2	Lab: Intro to Motion - make x vs t, v vs t, a vs t
		2	graphs using sonic ranger motion detector.
			Lab: Reaction Time - students calculate their reaction
			time to catch a falling ruler.
III. Planar motion			Demo: Calculating freefall "g" in class
A. Kinematics of projectiles	8	3,4	Lab: Projectile Motion – calculate range of small ball
B. Kinematics of circular motion			from spring launcher.
IV. Introduction to Newton's Laws			Demo: Intro to Friction - find friction between a stool
A. Newton's three laws	10	5	and table top with a student sitting on the stool.
B. Free-body diagrams		5	Lab: Static and Kinetic Friction - measuring the
C. Intro to weight, normal, friction			coefficients of friction of various surfaces.
V. Applications of Newton's Laws			Demo: Intro to Circular Motion – DJ on a record
A. Pulley system	8		player with coins.
B. Uniform circular motion		6	Lab: Uniform Circular Motion – centripetal force of a
C. Non-uniform circular motion			rubber stopper on the end of string.
D. Non-constant friction force			Lab: Air resistance – falling coffee filters.
VI. Work, Energy, and Power			Lab: Power – determine power of a standing jump.
A. Work by constant force	5		
B. Work by position-varying force		7	Demo: Bowling Ball – bowling ball pendulum
C. Work–energy theorem			dropped from a fixed height.
D. Power			
VII. Conservation of Energy			Lab: Bulleyes Pendulum - predict where a ball will
A. Energy conservation	8		land after a razor blade cuts the string of a swinging
B. Work by nonconservative forces		8	pendulum.
C. Potential energy functions			Lab: Conservation of Energy Springs - measuring
D. Potential energy vs. position graphs			velocity of a mass on a spring.
IX. Impulse, Momentum, and Collisions			Demo: Linear momentum on air track.
A. Impulse–momentum relationship	8		Lab: Impulse and Momentum - a cart rolls downhill
B. Conservation of linear momentum		9	and collides with a force sensor.
C. Elastic and inelastic collisions			Demo: Ballistic Pendulum
D. Position and velocity of center of mass			
X. Rotational Kinematics			Demo: Race Day – a hoop vs. solid cylinder race
A. Kinematics with time-varying angular			down an incline.
acceleration	5	10	Lab: Torque Feeler – moment arm with ruler and
B. Kinematics with constant angular accel.			weights.
C. Introduction to torque and angular accel.			
XI. Rotational Dynamics			Lab: Moment of Inertia – student spinning on stool
A. Moment of inertia			with barbell weights.
B. Newton's laws for rotation	6	10,11	Demo: Conservation of angular momentum - student
C. Conservation of energy with rotation			on stool with rotating bicycle wheel.
D. Conservation of angular momentum			
XII. Translational and Rotational Equilib.	2	12	
XIII. Gravitation			
A. Newton's law of gravitation	4	13	
B. Energy and angular momentum			
XIV. Simple Harmonic Motion SHM		15	Demo: Spring swing.
A. Kinetics and Dynamics of SHM	3	15	

Electricity and Magnetism (E & M) Outline Electricity and Magnetism is covered between the first of January and the administration of the AP Exam. Concepts and problem-solving techniques are introduced through a combination of lectures, demonstrations, lab experiments, questionanswer sessions, assignments from the text and teacher-generated worksheets.

Topic(days)ChapterLabs and Demos1. Charged Particles and Electric FieldsDemos: Electroscope overhead.A. Review of the field concept and the definition of the electric field1023Lab: Electroscope - electroscope is charged by contact and induction is explained in terms of electron flow.1. Electrosticatic Fields and Gauss's Law C. Using Gauss's law to determine the clectric fields of various charge023Demo: Van de Graff Generator - static charge.1. Electrosticatic Fields and Gauss's Law clectric fields of various charge6233Demo: Van de Graff Generator - static charge.1. Electrosticatic Fields and surfaces clectric fields of various charge24Demo: Van de Graff Generator - static charge.1. Electric Foltatial B. Calculating the electric potential rusious charge distributions1225Electric Field and Equipotential Lines - map equipotential lines and surfaces b. Electric fields as the derivative of the potential241. Capacitors and Diedectrics A. The concept of capacitance D. Effects of dielectrics in capacitors6262. Capacitors and Diedectrics A. Resistivity and resistance D. Effects of dielectrics in capacitors6263. Ohm's Law and Direct Current Circuits b. Dot invis Law and Direct Struct D. Redivalent capacitance27Demo: Qualitative effects of capacitors on circuits various RC circuits - light board with switches. Lab: Resistors / Ohm's Law and Direct Current Circuits b. Determine the internal resistance273. Charged particles in magnetic fields mas spectrometer5294. The field co		~ Time	Text	
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