Chesapeake Bay Governor's School
For Marine and Environmental Science
Bowling Green Campuses

College Physics
Phys 201 (Fall 2016) and **Phys 202 (Spring 2017)**
Instructor: Dr. Vinh Hoang

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Office Hours: After class from 10:45-3:00 most days and by appointment.

Course Description: This is a 2 semester, college level, laboratory Physics course taught in the senior year, covering fundamental Physics principles, and their qualitative and quantitative applications. Topics include: mechanics; Harmonic and wave motion; Sound; Optics; Electromagnetism; Thermodynamics; Nature of matter; Nuclear and quantum physics and relativity. Additional topics may be pursued depending upon time and interest.

In addition to qualitative and quantitative understanding of topics, students will be required to use them for problem solving in laboratory applications. Strong mathematical skills are essential, particularly in Algebra and Trigonometry. In addition to strong math skills, the ability to handle independent reading and study is crucial. Pre-Calculus is a prerequisite for this course. Calculus is a co-requisite, taken during this year, and may help with quantitative conceptualization.

Course Credit: 1 HS credit / RCC PHY 201/202 4 credits/semester (total 8 credits)

Text: *Physics 5th ed.* James S. Walker. Pearson, 2017.
Please cover this text and keep it covered throughout the year

Course Expectations:
1. Be prepared and on time
2. Be courteous and respectful
3. Follow all school rules (RCC, CBGS, and Base School)
4. Follow safety measures in the class
5. Be in class and participate every day

Required Materials: 3-ring binder with dividers, pencil and pens, notebook, folder, scientific calculator, scrap paper.

Grading: Grades are determined using a weighted system on a 10-point scale.

Semester grades:
Midterm/Final Exam 20% Quarter 1 40% Quarter 2 40%

Quarter grades:
Unit Tests 40% Labs 30% Weekly Quizzes 10% Homework/Participation 20%

A = 90 -100 B = 80 - 89 C = 70 - 79 D = 60 - 69 F < 60 (with incomplete work)
We use plus and minus scale for CBGS grade also, for example:
A+ = 97 – 100, A = 93 – 96, A- = 90 – 92.

Attendance:
Class attendance is required. Be reminded of the CBGS policy you signed at orientation! Absences and tardiness will be reported daily to your home school and will result in parent notification and conferences where necessary.

Make-up/Late Work Policy: If you miss a class:

- Look on Schoology for the assignments given for the day
- You are responsible to get all notes and missed assignments.
- You are allotted one day per excused absence to makeup work.
- Unexcused make-up work may be completed right upon return to class.
- A missed test/quiz may be taken right upon return to class.
- In-person lab makeup may be scheduled right or a substitute may be given.
- A deduction of one letter grade per day (10 %) may be assigned to all late work.
  - ❖ **Items are late if they come in after the beginning of the class they are due.**

Course Policies:

Tests: Tests will be given after each unit. Calculators may not be shared during a test or exam. A cell phone cannot be used as a calculator for tests and quizzes.

Students are allowed "test corrections" following tests to receive up to 50% or 25% (depending on the test) credit back on problems missed. This excludes exams as they are curved. Corrections must be on separate sheets of paper following the subsequent format:
(1) Explain your original thought process for the problem and why it is incorrect,
(2) Fully resolve of the problem, and
(3) Explain your new work and why it is now correct

Labs: Safety is of utmost importance students must follow the lab safety guidelines provided by the instructor during labs. Extreme misbehavior through breaking these rules is grounds for removal from lab, with potential grade deduction for missed work.

Each lab is distinguished as an activity or formal lab. Activities are turned in the same day. Formal labs have data collection in class with an out of class lab report. Formal lab grades are weighted three times as much as activity grades. Each lab format has a specific template.

Homework: Conceptual questions and calculating problems will be assigned through Mastering Physics as a weekly basic along with reading assignments. The late penalty of Mastering Physics is set as 10% deduction for individual late submitted problems.

Tutoring: I am here to help you succeed and will work with you diligently to help! I will announce particular dates and times to come to yours homeschool and you will

register for tutoring through Schoology. I will schedule some online sessions open to everyone before exams. However, you all are seniors and to help better prepare you for your college or careers you are expected to seek assistance on your own when needed.

Honor Code:
Students are expected to follow the rules and procedures outlined in the Student Honor Code outlined in the Student/Family Handbook. All tests and projects are pledged.

Emergency Evacuation Plan:
In each classroom, laboratory or other places where students are assembled for the purpose of instruction, a fire evacuation plan is posted indicating the direction of travel from the room in the event it becomes necessary to evacuate the building as a result of fire or other emergency. This plan will be posted in a conspicuous place near the exit from the room.

Whenever the fire alarm sounds, the building will be evacuated. The instructor will ensure the fire door is closed upon leaving the area (doors with automatic closures on them). Instructors are also responsible for assisting disabled students.

CBGS Statement on Safety
What to know and do to be prepared for emergencies at CBGS/RCC:
Sign up to receive RCC text messaging alerts. Keep your information up-to-date (https://alert.rappahannock.edu/index.php?CCheck=1)

Know the safe evacuation route from each of your classrooms. Emergency evacuation routes are posted in campus classrooms. Listen for and follow instructions from CBGS/RCC or other designated authorities. Know where to go for additional emergency information. Report suspicious activities and objects

Statement on Americans with Disabilities Act
Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 require Schools to provide an 'academic adjustment' and/or a 'reasonable accommodation' to any qualified individual with a physical or mental disability who self-identifies as having such. Students should contact inform CBGS faculty for appropriate academic adjustments or accommodations.

Course Topics / Sequence:
<u>PHYS 201 (Mechanics)</u>
First Quarter

Unit 1: Nature of Physics (Laboratory Skills)

- Laboratory Skills, Safety, and Procedure
- S.I. System of Measurement and Scientific Notation
- Dimensional Analysis
- Data Analysis

Unit 2: Kinematics

- One-Dimensional Distance, Displacement, Speed, Velocity, and Acceleration
- Freefall and Gravitational Acceleration
- Two-dimensional Motion
- Vector Addition and Subtraction
- Projectile Motion

Unit 3: Linear Dynamics

- Newton's Laws (inertia, force F=ma, action-reaction)
- Free-body Diagrams
- Friction

Unit 4: Work, Energy, and Momentum

- Work-Energy Theorem
- Kinetic and Potential Energy
- Conservation of Energy
- Power
- Momentum and Conservation of Momentum
- Elastic/Inelastic Collisions

Second Quarter

Unit 5: Circular Motion

- Angular Measurement and Polar Coordinates
- Angular Speed, Velocity, Acceleration, and energy (with centripetal acceleration)
- Newton's Law of Gravity
- Kepler's Laws
- Rotational Dynamics (Torque, Equilibrium, and Stability (Center of Mass))
- Angular Momentum and its Conservation

Unit 6: Solids and Fluids

- Solids and their Moduli
- Pascal's Principle (Fluid Pressure)
- Buoyancy and Archimedes' Principle
- Fluid Dynamics and Bernoulli's Equation

Unit 7: Temperature, Heat, and Thermodynamics

- Difference between Temperature and Heat
- Temperature Scales (Fahrenheit, Celsius, Kelvin)
- Gas Laws and Kinetic Theory of Gases
- Units of Heat (Joule, Calorie)
- Specific Heat, Phase Changes and Latent Heat
- Heat Transfer (Convection, Conduction, Radiation)
- Thermodynamic Systems, States & Processes (Engines and Efficiency)
- First Law of Thermodynamics (Conservation of Energy)

Unit 8: Vibrations and Waves

- Simple Harmonic Motion
- Equations of Motion
- Wave Motion and Properties
- Standing Waves and Resonance
- Sound Waves and their Speed
- Sound Intensity
- Sound Phenomena (Interference & Beats)
- Doppler Effect

PHYS 202 (Electricity and Magnetism)

Third Quarter

Unit 9: Electricity

- Electric Charge and Charging (Conductor, Insulator, Induced Charge)
- Electric Force (Coulomb's Law)
- Electric Field (Point Charges and Conductors)
- Electric Potential Energy and Potential Difference (Voltage)
- Capacitance (Series & Parallel, Dielectrics)
- Batteries (Series and Parallel)

Unit 10: Circuits

- Electrical Safety
- Direct Current and Simple Circuit Diagrams
- Current and Drift Velocity
- Use of Ammeters and Voltmeters
- Ohm's Law
- Resistance (Series & Parallel & Combination, Reading Resistors)
- Household Circuits and Household Electrical Safety
- Electric Power
- Multi-loop Circuits and Kirchhoff's Rules
- Superconductivity

Unit 11: Magnetism

- Magnets, Magnetic Poles (Domains, Ferromagnetism)
- Magnetic Field & Earth's Magnetic Field
- Magnetic Force
- Electromagnetism
- Magnetic Force on Currents (Right Hand Rule)

- Applications of Magnetism (Motors, Generators, CRTs)

Fourth Quarter

Unit 12: Electromagnetic Waves and Induction

- Induced EMF, Faraday's Law, and Lenz's Law
- Power Distribution and Transformers
- Electromagnetic Waves & EM Spectrum (Line and Continuous Spectra)

Unit 13: Geometric Optics

- Light Rays and Wave Fronts
- Reflection (Plane and Spherical Mirrors)
- Refraction (Dispersion)
- Total Internal Refraction (Fiberoptics and Brewster's Angle)
- Lenses (Lensmaker's Equation, lens Aberrations)

Unit 14: Relativity

- Classical (Newtonian Relativity)
- Special Relativity (Length Contraction and Time Dilation)
- Relativistic Energy and Momentum
- Mass-Energy Equivalence (Radioactivity)
- General Theory of Relativity

Unit 15: Modern Physics Concepts

- Wave/Particle Duality
- Wave Properties of Matter
- Quantum Mechanics and Uncertainty
- Nuclear Physics (Solar Fusion, Fission)
- Solid State Physics
- Astro-Physics