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

PHY 201 (Fall 2015) and PHY 202 (Spring 2016)
Instructor: Mr. Vinh Hoang

Contact info: Bowling Green Office 804-758-6788
Email: vhoang@cbgs.k12.va.us
Text: 434-284-0342

Office Hours: I am generally available weekdays from 11 am to 3:00 pm at Bowling Green in the Physics Classroom and by appointment.

Course Description: This is a 2 semester college level laboratory Physics course taken senior year covering fundamental Physics principles and their qualitative/quantitative applications. The semesters are split between Mechanics first and Electricity and Magnetism second. Topics covered 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, you must handle independent reading and study to be successful in the course. Pre-Calculus is a prerequisite for this course. Calculus is a core-co-requisite, taken during this year and may help with quantitative conceptualization.

Course Credit: RCC PHYS 201/202 4 credits/semester (total 8 credits)

Text: *COLLEGE PHYSICS, 5th ed. (Wilson and Buffa) Prentice Hall, 2003.*
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, pencil, notebook, and scientific calculator

Grading:
+**Letter Grade:**
A = 90 -100 B = 80 - 89 C = 70 - 79 D = 60 - 69 F < 60 (with incomplete work)
+Quarter Grades: Unit Tests 40%, Labs 30%, Weekly Quizzes 10%
Homework 10%, Participation 10%

+Semester Grades: Quarter 1 40%, Quarter 2 40%, Final 20%[1]
Attendance:
Class attendance is required. Be reminded of the CBGS policy you signed at orientation! Absences and tardies will be reported daily to your home school and will result in parent notification and conferences where necessary. You may also text or email me.

Individual and Group work: Unless specifically indicated, all work is to be done individually and each student must turn in their own assignment. When group work is assigned, one assignment per group is to be turned in unless otherwise specified.

Turning in work: Unless otherwise noted, class work and tests are due at the end of the class period in which they were assigned. Homework (including papers, labs, and other projects) are due at the beginning of class on the due date. In general, most assignments can be emailed to me, but when specified, hard copies must be brought in. If you do not have email access, bring it in on a USB drive, but make sure it is on my computer before class starts. When submitting assignments electronically, all files must be labeled as lastname_firstname_assignment and the subject line of emails must include the assignment name. Attachments or emails that do not fit these criteria will not be read, assignments can be resubmitted, but will be considered late. As always, please come to me with any issues you have.

Late & Make-Up Work: All assignments are expected to be turned in on the day they are due. Assignments turned in late will receive a 10% deduction of the earned grade for every day that they are late; however, homework and daily work that are vital to that day's class participation will not be accepted late (pre-labs, readings for class discussion, etc.). **After 1 week, assignments will not be accepted.** Exceptions for extenuating circumstances can be made, but you MUST talk to me first.

It is the student's responsibility to collect any missing work while absent. Check the website for any assignments, secure any missed notes from a friend, and be sure to get any handouts and assignments from me. Assignments, tests, and projects due on the date of the absence are due upon return to school. If an assignment was due via email or other electronic format, it is still due if you aren't present. Work assigned while absent is due within two days of returning to school. Again, exceptions for extenuating circumstances can be made, but you MUST talk to me first.

[1] It is important to note that your semester grade may be higher or lower than your average quarter grade!

Honor Code: Students are expected to follow the rules and procedures as outlined in the Student Honor Code. Refer to the Student Handbook if you need guidelines. Failure to do so may result in zero credit for assignments. Extreme cases may result in a dismissal from the program. All quizzes, tests, lab write-ups and written assignments 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. This indicates 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.

If a classroom does not have an evacuation plan posted, the student or instructor should notify the academic dean.

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 and inform CBGS faculty for appropriate academic adjustments or accommodations.

Course Topics / Sequence:
PHYS 201 (Mechanics)

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 and Dynamics

- One-Dimensional Distance, Displacement, Speed, Velocity, and Acceleration
- Freefall and Gravitational Acceleration
- Two-dimensional Motion
- Vector Addition and Subtraction
- Projectile Motion
- Newton's Laws (inertia, force, action-reaction)
- Free-body Diagrams
- Friction

Unit 3: 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 4: Circular Motion

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

Unit 5: Solids and Fluids

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

Unit 6: Temperature, Heat, and Thermodynamics

- Heat Transfer and the 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
- Thermodynamic Systems, States & Processes
- First Law of Thermodynamics (Conservation of Energy)

Unit 7: Vibrations and Waves[2]

- 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 8: 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 9: Circuits

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

Unit 10: Magnetism

- Magnets, Magnetic Poles (Domains, Ferromagnetism)
- Magnetic Field & Earth's Magnetic Field
- Magnetic Force
- Electromagnetism

---

[2] This may get moved to unit 11 if time dictates.

- Magnetic Force on Currents (Right Hand Rule)
- Applications of Magnetism (Motors, Generators, CRTs)

Fourth Quarter

Unit 11: 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 12: 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 13: Relativity
- Classical (Newtonian Relativity)
- Special Relativity (Length Contraction and Time Dilation)
- Relativistic Energy and Momentum
- Mass-Energy Equivalence (Radioactivity)
- General Theory of Relativity

Unit 14: Modern Physics Concepts
- Wave/Particle Duality
- Wave Properties of Matter
- Quantum Mechanics and Uncertainty
- Nuclear Physics (Solar Fusion, Fission)
- Solid State Physics