Germantown High School
2020-2021 Syllabus

Course: **Physics**

Teacher: **Dr. Snigdha Roy**

Teacher Email: **roys@scsk12.org**

****THIS SYLLABUS IS SUBJECT TO CHANGE****

Course Description

Physics is a mathematical science. The underlying concepts and principles have a mathematical basis. Throughout the course of our study of physics, we will encounter a variety of concepts that have a mathematical basis associated with them. While our emphasis will often be upon the conceptual nature of physics, we will give considerable and persistent attention to its mathematical aspect.

Course Standards/Power Standards (2020-2021)

Quarter -1

UNIT1: One Dimensional Kinematics (3 weeks)

PHYS.PS2.2 Algebraically solve problems involving constant velocity and constant acceleration in one-dimension.
PHYS.PS2.1 Investigate and evaluate the graphical and mathematical relationship (using either manual graphing or computers) of one-dimensional kinematic parameters (distance, displacement, speed, velocity, acceleration) with respect to an object's position, direction of motion, and time.

UNIT 2: Two Dimensional Kinematics (2 weeks)

PHYS.PS2.13 Develop a model to predict the range of a two -dimensional projectile based upon its starting height, initial velocity, and angle at which it was launched.

UNIT 3: Forces, (4 weeks)

PHYS.PS2.4 Use free-body diagrams to illustrate the contact and non-contact forces acting on an object. Use the diagrams in combination with graphical or component based vector analysis and with Newton's first and second laws to predict the position of the object on which the forces act in a constant net force scenario.
PHYS.PS2.5 Gather evidence to defend the claim of Newton's first law of motion by explaining the effect that balanced forces have upon objects that are stationary or are moving at constant velocity.
PHYS.PS2.7 Plan, conduct, and analyze the results of a controlled investigation to explore the validity of Newton's second law of motion in a system subject to a net unbalanced force, $F_{net} = ma$ or $F_{net} = \Delta p/\Delta t$.
PHYS.PS2.8 Use examples of forces between pairs of objects involving gravitation, electrostatic, friction, and normal forces to explain Newton's third law. PHYS.PS2.12 Use experimental evidence to demonstrate that air resistance is a velocity dependent drag force that leads to terminal velocity.

Quarter -2

UNIT4: Work and Energy (3 weeks)

PHYS.PS3.1 Identify and calculate different types of energy and their transformations (thermal, kinetic, potential, including magnetic and electrical potential energies) from one form to another in a system.
PHYS.PS3.3 Use the principle of energy conservation and mathematical representations to quantify the change in energy of one component of a system when the energy that flows in and out of the system and the change in energy of the other components is known.
PHYS.PS3.6 Define power and solve problems involving the rate of energy production or consumption ($P = \Delta E/\Delta t$). Explain and predict changes in power consumption based on changes in energy demand or elapsed time. Investigate power consumption and power production systems in common use.
PHYS.PS3.15 Compare and contrast the process, design, and performance of numerous next - generation energy sources (hydropower, wind power, solar power, geothermal power, biomass power, etc.).

UNIT5: Momentum (3 weeks)

PHYS.PS3.4 Assess the validity of the law of conservation of linear momentum (p=mv) by planning and constructing a controlled scientific investigation involving two objects moving in one -dimension.
PHYS.PS2.11 Develop and apply the impulse -momentum theorem along with scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on an object during a collision (e.g., helmet, seatbelt, parachute).
PHYS.PS2.6 Using experimental evidence and investigations, determine that Newton's second law of motion defines force as a change in momentum, $F = \Delta p/\Delta t$.

UNIT6: Circular Motion and Gravitation (3 weeks)

PHYS.PS2.3 Algebraically solve problems involving arc length, angular velocity, and angular acceleration. Relate quantities to tangential magnitudes of translational motion.
PHYS.PS2.14 Plan and conduct an investigation to provide evidence that a constant force perpendicular to an object's motion is required for uniform circular motion ($F = m v^2 / r$).
PHYS.PS2.9 Use Newton's law of universal gravitation, to calculate the gravitational forces, mass, or distance separating two objects with mass, gave the information about the other quantities.
PHYS.PS3.8 Communicate scientific ideas to describe how forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space. Explain how energy is contained within the field and how the energy changes when the objects generating and interacting with the field change their relative positions.
PHYS.PS3.14 Recognize and communicate information about energy efficiency and/or inefficiency of machines used in everyday life.

Quarter -3

UNIT7: Heat Energy and Thermodynamics (2 weeks)

PHYS.PS3.2 Investigate conduction, convection, and radiation as a mechanism for the transfer of thermal energy.
PHYS.PS3.5 Construct an argument based on qualitative and quantitative evidence that relates the change in temperature of a substance to its mass and heat energy added or removed from a system.
PHYS.PS3.7 Investigate and evaluate the laws of thermodynamics and use them to describe internal energy, heat, and work.

UNIT8: Electric Forces, Fields and Energy (4 weeks)

PHYS.PS2.10 Describe and mathematically determine the electrostatic interaction between electrically charged particles using Coulomb's law. Compare and contrast Coulomb's law and gravitational force, notably with respect to distance.
PHYS.PS3.9 Describe, compare, and diagrammatically represent both electric and magnetic fields. Qualitatively predict the motion of a charged particle in each type of field, but avoid situations where the two types of fields are combined in the same region of space. Restrict magnetic fields to those that are parallel or perpendicular to the path of a charged particle.

UNIT9: Capacitors, Resistors and Circuits (3 weeks)

PHYS.PS3.13 Predict the energy stored by a capacitor and how charge flows among capacitors connected in series or parallel.
PHYS.PS3.11 Investigate Ohm's law (I=V/R) by conducting an experiment to determine the relationships between current and voltage, current and resistance, and voltage and resistance.
PHYS.PS3.10 Develop a model (sketch, CAD drawing, etc.) of a resistor circuit or capacitor circuit and use it to illustrate the behavior of electrons, electrical charge, and energy transfer.
PHYS.PS3.12 Apply the law of conservation of energy and charge to assess the validity of Kirchhoff's loop and junction rules when algebraically solving problems involving multi-loop circuits.

Quarter -4

UNIT10: Waves and Sound (3 weeks)

PHYS.PS4.1 Know wave parameters (i.e., velocity, period, amplitude, frequency, angular frequency) as well as how these quantities are defined in the cases of longitudinal and transverse waves
PHYS.PS4.2 Describe parameters of a medium that affect the propagation of a sound wave through it.
PHYS.PS4.4 Communicate scientific and technical information about how the principle of superposition explains the resonance and harmonic phenomena in air columns and on strings

UNIT11: Light and Light Behaviors (4 weeks)

PHYS.PS4.5 Evaluate the characteristics of the electromagnetic spectrum by communicating the similarities and differences among the different bands. Research and determine methods and devices used to measure these characteristics.
PHYS.PS4.6 Plan and conduct controlled scientific investigations to construct explanations of light's behavior (reflection, refraction, transmission, interference) including the use of ray diagrams.
PHYS.PS4.3 Understand that the reflection, refraction, and transmission of waves at an interface between two media can be modeled on the basis of characteristics of specific wave parameters and parameters of the medium.
PHYS.PS4.7 Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model.
PHYS.PS4.9 Investigate how information is carried in optical systems and use Snell's law to describe the properties of optical fibers.
PHYS.PS4.8 Obtain information to construct explanations on how waves are used to produce, transmit, and capture signals and store and interpret information.

UNIT12: Nuclear Physics (2 weeks)

PHYS.PS1.3 Investigate and evaluate the expression for calculating the percentage of a remaining atom ($N(t)=N0e^{-\lambda t}$) using simulated models, calculations, and/or graphical representations. Define the half-life ($t1/2$) and decay constant λ. Perform an investigation on probability and calculate half-life from acquired data (does not require use of actual radioactive samples).
PHYS.PS1.2 Recognize and communicate examples from everyday life that use radioactive decay processes.
PHYS.PS1.1 Develop models to illustrate the changes in the composition of the nucleus of an atom and the energy released during the processes of fission, fusion, and radioactive decay.

Over all Weekly Plan:

Day of the Week	Activity
Monday	Review day. Whatever we learned previous week, we review. Previous week's Lab-report is due on Monday.
Tuesday	Test day. 30 minutes test. 15 minutes review test.
Wednesday	New lesson start. Worksheet. Homework
Thrusday	Wednesday's homework is due. Continue the new lesson. Worksheet. Homework
Friday	Thursday's homework is due. Lab-day

Grouping:

Lecture Class: Maximum three and minimum two students will be grouped together.

Lab Class: Students will be grouped into small groups of four students.

Classroom Rules and Expectations

1. Conduct yourself in a respectful manner at all times.
2. Be on time and in your seat when the bell rings.
3. Come to class prepared, having all necessary materials to start class.
4. Stay in your seat. You must have permission to get up for any reason.
5. Attend to personal needs before coming to class.
6. All electronic devices must be turned OFF and stored in lockers at all times (cell phones, ipods, mp3 players, etc.).
7. NO food or drink in the classroom (this includes gum, candy, and water).

Procedures

1. When entering the classroom, get seated immediately and begin bellwork. **DO NOT WALK OUT FOR ANY REASON.** You will have 8 minutes to complete bellwork.
2. All assignments should have the student's name, date, and class period on the paper.
3. When turning in assignments, test, or quizzes place the papers in the designated basket (If a student does not write his or her name on the paper, there will be a delay in grading).
4. When the bell rings remain seated until the teacher dismisses you. The bell does not dismiss you.

Consequences:

Failure to follow any classroom rules/procedures will be handled accordingly:

1. 1st Offense – Verbal warning and written summary (by student) of offense.
2. 2nd Offense – Call parent.
3. 3rd Offense – Conference with Grade Level Administrator.
4. 4th Offense – Referral to office.

NOTE: Some offenses (such as inappropriate language, insubordination, and disrespect) may result in an automatic discipline referral.

Grade Scale

A	93 - 100
B	85 – 92
C	75 – 84
D	70 – 74
F	69 or below

Grade Weights

Homework	10%
Class Participation	5%
Classwork	35%
Projects/Laboratory Participation	10%
Assessments	40%

Notebook checks will count as a class participation grade. **Notebook checks can be announced or unannounced. Students are required to bring their notebook and book to class everyday. NO EXCUSES. NO EXCEPTIONS**.

Homework Policy

- **Homework** that is one day **late** will have 10% pts. deducted. **Homework** that is over one day late will not be accepted, and a grade of zero will be recorded.
- Students are responsible for getting missed work. I, as the teacher, will not hunt students down to give out missed work.
- Students may retest on most tests, except for six weeks tests and semester tests. Retests will only be available if students have no missing **homework** assignments; failure to complete even one assignment will forfeit the right to retest, so take homework seriously.

Grade Policy

Grades given at the end of each nine-week period will be determined by the average of daily work, oral and written assignments, and tests. A minimum of twelve grades for the nine-week period should be recorded for each subject. Fifty percent of the twelve grades should be earned and recorded by the interim of the nine-week term. This gives the teachers the basis for the grades at the end of the grading period. The teacher will assess all student assignments and weigh the value of grades given for various assignments within the nine-week term in computing the term grade. This procedure will enable the teacher to allow for individual student differences in the grading process. Grades for homework assignments should be given with care, since the student himself may not always complete homework. Homework assignments are of value in affording students needed practice, and such assignments should be made within practicable limits.

Late Work/Make Up Work Policy

- Late work is not accepted.

Make Up Work Following An Absence

Students are expected to make up work missed while they were absent, or in ISS. ***They will be given full credit for work done when they present a note from a parent or guardian within two (2) days of an absence. If a student accumulates ten (10) or more days from school, a note from a physician is required.***

The following is offered as a timeline for make-up work due to an absence:

- 1 day absence – day following return
- 2 day absence – 2 days after return to school
- 3 day absence – 3 days after return to school
- 4 day absence – 4 days after return to school
- 5 day absence – 5 days after return to school
    - Students absent more than five (5) days must make arrangements with their teachers for making up the work missed within one week (5 school days) after their return to school.
    - No make up work for students who are caught skipping class, or who receive an OSS assignment.
    - Students who skip class or who have previously received OSS during a school year **will** receive zeros for all missed class work unless the assignments are defined as those worth **15% or more** of the student's nine weeks average. Students receiving OSS for the first time in a school year can make up work after completing community service and have approval from administration.

Discipline Policy:

The following parameters are used to give quarterly conduct grades.

E – 0 offenses
S – 1 to 2 offenses
N – 3 to 4 offenses
U – 5 or more offenses

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Statement of Recognition and Agreement

As the parent of this student, I have read this document with my child, and he or she understands the syllabus for this teacher. I understand that my child is now bound to adhere to all rules and policies of this syllabus set forth by this teacher. Most importantly, I understand that if I have any questions or concerns that I can contact the teacher or have a conference with the teacher before or after school to address any academic or behavior issues.

_____ _____

Student Signature Date Parent Signature Date