# *DE Physics 2023-2024*

## *Teacher Information*

Mr. Jay Stanley Email: wjstanley@lenoircityschools.net

## *Getting Help*

Help will be available every morning from 6:30 am to the start of school. Students can also seek help during ELT, and after school when I'm available. Students are able to retake unit tests in the morning before school, or ELT/Study Hall. Students can work with me on make up work, or spend time doing lab work in the mornings. The goal is long term understanding, and if you seek help, it will be provided!

## *Class Goals*

We currently live in a global environment, and today more than ever, our students are competing in the global marketplace. Thus, I want you to have the very best preparation in the areas of physics and physical science so that you can compete at a high level in that environment. I have set very high goals for you, and for myself as your teacher. I feel the content of this class offers a great platform to teach life-long skills that will be necessary in your future academics and in the work-place. At times, this class will be challenging, however, you will always have multiple opportunities to demonstrate growth and knowledge, and be successful with your final grade. If you want to be successful academically, the secret is persistence and determination. Nothing beats hard work, and in this class it is possible to EARN a wonderful grade regardless of your "academic talent." If you apply a great effort on a consistent basis, good things will happen to your grade and your learning! ***The greater goal is thorough and lasting understanding!***

## ***Goals - "Students of the 21st Century Must Have or Be Able To…."***

Students Will…

1. Have a safe environment in which to learn science. This includes general safety as well as safety in the laboratory and learning process.
2. Learn to apply discipline and a consistent work ethic to develop good study habits and techniques that will strengthen your ability to retain information, and to become a life-long learner.
3. Leave this class with an excellent conceptual understanding of physics concepts. Students will have an excellent foundation on which to learn higher level science concepts.
4. Learn to collect, organize, and analyze data using techniques and technology common to science through laboratory work and student-guided inquiry. Build a skill set that can be used in any scientific or academic setting, and in the work-place.
5. Improve your ability to read and comprehend technical and scientific information.
6. Improve your ability to write scientifically, and explain science concepts to others through both written work and verbal presentations.
7. Improve your ability to solve tough problems requiring analytical thought and critical thinking techniques as an individual and within small work groups. People get paid well to solve tough problems!
8. Learn to appreciate the world around you, and develop a curiosity about the scientific world.

## *CLASSROOM RULES*:

1. Be on Time, Be Prepared to Learn, and Do Your Very Best at ALL TIMES!
2. Be respectful of all people at all times.
3. When the teacher or presenter is talking, concentrate, listen and make every effort to understand what they are saying. Ask Questions! Talking or attempting to sleep during this time illustrates a conscious lack of effort to understand and is disrespectful to the person presenting, and will not be tolerated!
4. When something is presented on the board, overhead, or projector, write it down – it will be something you need to know! Engage yourself actively in the learning process!
5. Leave the world a better place each day. Clean up your area, even if it isn't your mess.
6. ***NO PHONES/Electronics IN CLASS UNLESS I ASSIGN YOU TO BRING THEM FOR A LAB!***

## *Attendance*

There are legitimate reasons for absences. ***When you are absent, it is vital that you take on the responsibility to get your missing work, and make up that work as quickly as possible***. Science is like math, in that it builds new concepts on previous ones. Failure to make up work in a timely manner means that you will be missing critical information needed for new learning. Find someone in the class that you can rely on to get assignments, notes, etc. If you can't find that person, then contact me directly. **Work for pre-excused absences, athletic absences, and co-curricular events should be made up ahead of time, not after!**

## *Tardy*

You are tardy if you are not in your seat, or not engaged in a learning activity or classroom routine when the bell rings. The school tardy policy will be followed to the letter.

## ***Materials You Will Need***

1. One 3 ring binder. A "two inch" binder or larger is recommended.
2. Loose leaf paper for doing assignments
3. Two 100-150 page spiral bound notebooks to be used for lab books. (I recommend a vinyl cover)
4. A scientific calculator (TI-82, 83, 84 are recommended but any scientific calculator is okay).
5. A blue or black pen for doing lab reports. Real lab work is done in non-erasable ink.
6. A green or red pen/marker for correcting work and self-analysis of work.
7. Pencil
8. Glue or Glue Stick

## *Learning and Grading: Philosophy and Practices*

I am a firm believer that every student can learn and perform at a very high level given time, support and guidance. Different people learn at different rates, and some concepts are more difficult than others. As I mentioned on page one, it is necessary to persist, have a positive attitude, and consistent work ethic. Every student can EARN the highest grade possible. ***Make ups must be done in a timely manner! i.e. immediately***

- Students can retake unit tests and quizzes at the discretion of the teacher. The test retake time will be 6:30 AM before school, within a week after the original assessment is returned to you. You may also make up tests and quizzes during resource time provided you schedule this with Mr. Stanley. ***Retake scores will be replace the original score for the final test grade!***
- Student lab notebooks represent a growth portfolio. Students who would like to make corrections can earn back points on their lab reports. You will have one opportunity to make corrections for each lab. You must make corrections within 3 school days of the return of your lab book.
- Daily assignments reflect problems and concepts we have already been through. ***These are re-doable if the original is turned in on time***. The daily work graded and handed in is very important, and represents review concepts that have been done before. Keep up to date on your work, and ask for help if you are falling behind.

My biggest concern is that each student is responsible for their own learning and students have demonstrated mastery and repeated retention of the content and key concepts within the class. This is done within a framework of a disciplined and consistent student effort. ***Work that is missing or not done on time may not be made up unless an excused absence or extenuating circumstances warrant another opportunity***. ***Confer with Mr. Stanley on this!***

## *LEARNING AND GRADE CHECKS*

***A grade report will be given to each student once per week (usually on Fridays).*** This is done for three reasons. First, I want to communicate the current grade to the student. Second, I want the student to be responsible for checking to see that entry errors into the grade-book are quickly corrected. ***Third, I want to involve the parents in the knowledge of their son or daughter's grade. Students who bring back their grade checks, signed by a parent, will receive a small stipend of extra credit. This is a responsibility and student assignment each week. Grade checks not returned will count as a missing assignment.***

### *Grading Scale*

The final grading breakdown will be by percentage of total points or points awarded by category %.

Homework = 15%
Lab Work & (AP - Learning Log Summaries) 30%
Quizzes = 5%
Tests = 50%

The Grading Scale is the standard 10 point system. i.e. 90% = A-, 80% = B-, 70% = C-, 60% = D-

## *LEARNING LOG (AP and DE Physics Only)*

The learning log is a system of self-review and self quizzing. You will write 3 "difficult" questions each day on your chrome book. Use these questions as a way to review by quizzing yourself over the past 10 days. It is vitally important, for long term retention that you process information on a daily basis, write your 3 questions per day, self-quiz as a means of review, elaborate, on previous and new material, and reflect often on connections between concepts. A lot of people learn and forget. You have one shot on the final exam to show what you know. Learning logs need to be up to date every day. ***At any time, I may ask you to up-load your learning log to Google Classroom/Canvas. This will be done one to two times per unit.***

## *HOMEWORK & PORTFOLIO*:

Every unit has several problem sets. It works out to about 1 problem set per day. The problem sets are due on the next day unless otherwise instructed. Many times, I will ask you to "start" the problem set on one day, and finish it the following day. In other words, two days to work all the problems. If it doesn't say, assume it is the next day. ***Your portfolio is the collective work that you keep in your 3-ring binder. This includes all assignments, quizzes, tests, notes, and handouts you receive. Keep this in order by unit and date.*** Put a date on every piece of paper in your binder. I will check the portfolio 3 to 4 times per semester. Keep yourself organized!

## *QUIZZES*:

We will have short 3 to 5 minute quizzes on a regular basis, usually every other day. While they only account for 5% of the overall grade, they are vital to promote long term understanding and retention. Take these quizzes seriously! If you are absent on the day of a quiz, you will receive a "NO COUNT" in the grade book. It doesn't hurt you, and it doesn't help you. There are no retakes on these quizzes.

## ***TESTS***:

There will be 7 to 12 unit tests in each semester, with a final exam during final exam times. The final exam in each semester is cumulative.

## *Specific Remediation Rules: What do I do on or for a redo?*

1. To Retake a Test
   a. **Retaking a test is not a right, it is a privilege and responsibility:**
      i. **You may not retake a test if you have work missing from the unit.**
      ii. **You may not retake a test if you do not initiate the retake process within the window offered. Once you start the retake process (within the window), you may retake it as many times as you want to get the best possible score.**
      iii. IT IS ALWAYS BEST TO SCORE WELL THE 1ST TIME!
      iv. Follow the guidelines posted in the classroom, and make the retake Window.
   b. YOU **MUST RETAKE** ANY TEST BELOW 70% IN THE RETAKE WINDOW.
   c. IT IS **YOUR RESPONSIBILITY** TO RETAKE TESTS ON TIME!
2. Lab Corrections – (1 per lab)
   a. Ask for clarification on anything you are unsure of – ask why points were taken if you do not understand. Labs MUST be neat and orderly to receive top grades. This is not redo-able.
   ***b.*** Correct mistakes made in the lab according to the notes made by the grader, and the lab rubric. Write a brief description of what mistakes were made and how they can be avoided in the future. ***Make your corrections at the end of the lab report.***
   c. **Discuss** your corrections with Mr. Stanley and explain what corrections where made and how they can be avoided in the future. Do not turn in the redo lab without talking with Mr. Stanley first!

d. Again – 2nd chances are not available to someone who did not use their first. Ask questions – you get only one chance to make corrections to a lab report.

3. Daily work and Assignments
   a. Daily assignments in this class are review problems, and re-doable. Change the numbers according to directions of the teacher. Staple the Redo to the front of the original! The original MUST BE DONE ON TIME. YOU CAN'T REDO THAT WHICH YOU DIDN'T INITIALLY DO!
   b. Portfolio's will be checked 3 to 6 times throughout the semester. Bring them with you at all times, and be prepared to show how organized you are. The portfolio checks are unannounced!
   c. Concept Maps of the Chapters will be due on the day we start a new unit. It is vitally important that you "pre-organize" information before we discuss it in class. These are not re-doable if they are not done on time.

## MISSING ASSIGNMENTS & LATE WORK POLICY

1) One day late – Max value = 75% of stated value or 25% off
2) Two days late – Max value = 50% of stated value or 50% off
3) **Three days late – WILL NOT BE ACCEPTED!** Perpetual Missing in the Grade book.

· Exceptions to this rule include absences where the school rule will be followed. If special circumstances apply you must speak with me about it before the assignment is graded.

***Organization***

In 33 years of teaching, I've found that there are ***two main things that cause a student to under-perform***. The first is not making the effort. The second is a lack of organizational skills. Write down your assignments every day in your "planner." A journey of a thousand miles begins with a single step. Physics can be difficult – you will struggle at times, but if you're willing to work, you will overcome challenges and learn a lot! Students who work consistently and take advantage of retake and redo opportunities will do very well!

My assignments will always be given on the white board or projector every day. ***WRITE DOWN THE WHITE BOARD INFORMATION EVERY SINGLE DAY IN YOUR PLANNER OR NOTEBOOK!***

Keep your notebook and binder organized, neat and up to date. If it's neat in your binder/notebook, it will be much more organized inside your head. **I recommend keeping things in order by date, unit by unit within the 3 ring binder. All homework, tests, quizzes, and labs should be kept throughout the term.** Put a date on everything as we do it, and place everything back into the 3-ring binder. You will be given all unit packets and lab materials on the first day of class – keep them in order!

**Cheating & Plagiarism**: A zero score will be issued for any assignment, lab or test where this occurs. For tests, a student will have ONE OPPORTUNITY for an immediate retake at 6:30 am the next morning that I am available. No other time will be offered!

***THE EXTRA HELP YOU NEED IS ALWAYS AVAILABLE! THE KEY IS COMMUNICATION AND RESPONSIBILITY TO SEEK THE HELP WHEN YOU NEED IT!***

***<u>YOU CANNOT REDO IF YOU DIDN'T DO IN THE FIRST PLACE!</u>***

# *Study Skills*

Physics is a science that builds on itself. It developed historically and logically over time as one theory was built upon the foundation of one or more previous concepts. This is NOT a class that you can cram for. It is not a subject that you can jump through one hoop to get to the next. Every unit builds upon the foundations of previous units, and all units are built upon relationships in the natural world, and mathematics.

In unit zero, we will review essential mathematics necessary for this course. I highly encourage you to have a scientific calculator with you every day. The more you use it, the better you will be able to apply math skills to the physics we learn.

Daily review is essential for creating lasting understanding of this content. Physics is a foundational science needed and used by every other science. The following strategy illustrates a technique I learned in a college course called "Educational Psychology" where learning theory and strategies were emphasized.

1. Be the Professor: Each day, write 3 questions (at a high level) from the content you learned. Write these questions as if you wanted to be the toughest teacher of all time. Really challenge yourself to actually write down (not on a computer), questions that will challenge your thinking.

2. Take 10 minutes each day to answer the questions you've written in the past 10 days. If you hit a road block, go back to your notes, and re-formulate and practice your answer.

3. One time each month, go over all the questions you have written during the semester.

4. When questions get easier, revise them to be either a) tougher, or b) integrated with other questions.

The skill outlined above will serve you well in college. In addition to this technique, I advise you to do the following:

1. Create a detailed concept map at the beginning of every unit. Add detail from class and other activities as you move through the unit. The concept map structure will help you organize content and understanding. ***(This is an assignment at the beginning of every unit!)***

2. Be an active and engaged learner in class. Studies show that if you verbalize your answers, you will learn content 7 to 10 times better. Passive learning simply doesn't work. Be actively engaged in what you are learning and doing. Ask questions!

3. Be organized. I ask you to keep all of your notes, homework, and returned tests, quizzes, and materials in a 3-ring binder. I would first organize the binder by content, then by unit, and then by date. Put a date on every piece of paper you keep in your binder. This is something that will serve you extremely well if you take physics in college.

4. Work with others, especially on problems. I highly encourage you to work with other people on your problem sets. The give and take in the discussions you have over problem solving will enhance everyone's understanding if and only if everyone is actively engaged in the process.

# *ADDENDUM TO SYLLABUS*
# *COVID-19 MITIGATION*

## ***CLEANING***

Any student who uses any piece of equipment that could be shared with, or common to, other students must immediately and properly clean the equipment after use. Students will clean the equipment in such a way as to not re-touch the item after it is cleaned.

Student desks and tables must be cleaned at the end of each period, and lab stations must be cleaned immediately after use. This is the primary duty of the teacher, but students will be asked to assist this process in accordance with expectations and rules set forth by the administration of the school district. When cleaning desks, students are expected to remain 6 feet apart.

Failure to abide by these expectations will result in documented insubordination as a disciplinary referral.

# ***IF YOU ARE QUARANTINED***

1. Weekly schedules of class content and assignments will be available to you by a) weekly emails, and b) on Google Classroom under the Lesson plans topic.
2. You are expected to keep up with assignments on quarantine. Please reference classroom notes, example problems etc on Google Classroom. Email me with any questions.

3. Email your assignments to me, or turn them in through available assignment portals on Google Classroom. It is certainly ok to take clear photos of your work, and upload them.
4. If you are gone for a test date on quarantine, then you will be sent a test to do within a time frame. Parameters will be given for time, and the use of notes during the testing period.
5. Labs are virtual during this year, and are mostly comprised of data analysis. These assignments can be done without in-class instruction. Reference the lab document itself, the data page given, and further instructions given. I will set up portals on Google Classroom for each lab to be turned in. You are expected to follow the lab report format, and can exclude the teacher and student discussions, and the procedure.

## ***If We "Go Virtual":***

If we take our classes online, you will be expected to show up for our virtual class at the appointed time, and attendance will be taken. You will be expected to turn in assignments on time, and take assessments at the scheduled times. You will be expected to participate in on-line discussions, answer questions, and be an active learner if we "go virtual".

## DE Physics – Unit Breakdown Outline

0. Foundations of Science and Problem Solving – Tools for Physics
    a. Be the "professor" – Expectation for retention in learning.
    b. Math skills needed for physics 1010
    c. Significant figures
    d. Lab Notebook Set Up and Formatting
    e. Graphical Analysis
1. Linear Motion - Kinematics
    a. Differentiate between kinematics and dynamics
    b. Understand the 3 ways to move (translate, rotate and vibrate)
    c. Work with the 6 descriptors, and 6 kinematic formulas to solve problems in one dimension.
    d. Explain and understand free-fall problems with gravity, with and without air resistance.
    e. Explain the difference between a vector quantity and a

scalar quantity.

f. Use vector concepts – resolve into components, add vectors, and convert vectors in unit vector notation to polar coordinates.

g. Use vector concepts to solve projectile problems in 2 dimensions.

2. Dynamics

a. Define a force as a push or a pull, and identify the 4 fundamental forces in nature, and several common forces.

b. Solve for values of a force.

c. Use free body diagrams to identify the forces acting on an object.

d. Identify, explain, and apply Newton's laws of motion.

i. 1st law: Inertia. The sum of all forces acting on an object add as vectors to be zero. This results in a zero value of acceleration, meaning that the object will continue in its state of motion.

ii. 2nd law: Acceleration. When the sum of all forces does not add up to zero as a vector, the object will accelerate in the direction of the net force, according to the formula F = ma. There are three indicators of acceleration – speeding up, slowing down, or turning a corner.

iii. 3rd Law: Interaction. When two or more objects interact, we refer to them as a system. The force of one object acting on another is equal and opposite. To solve problems with systems of objects, we must understand interaction forces, and we must use free body diagrams with "systems of equations" to solve for the interaction forces.

e. Be able to calculate weight, centripetal forces, friction forces, buoyant forces, electrical forces, restoring forces in springs, and gravitational forces.

3. Linear Momentum

a. Use a special version of Newton's 2nd law, to define and calculate impulses, and changes in momentum.

b. Differentiate between internal forces (within a system), and external forces (outside the system).

c. External forces change the momentum of a system
d. Internal forces do not change the momentum of a system. In such interactions, we say the momentum of the system is conserved.
e. Explain the different types of conservation of momentum problems (i.e. “gun-bullet”, inelastic collisions and elastic collisions.)
f. Solve problems using conservation of momentum.

4. Energy
   a. Define physical work as Work is the “dot product” of Force and displacement.
   b. Use the vector dot product with unit vectors or vectors in polar form.
   c. Explain and use equations for work and power.
   d. Explain that Energy is the central theme of all physics, and identify the $6^{+1}$ forms of energy.
   e. State the work-energy theorem, and show “proofs” for the development of energy equations.
   f. Use formulas for gravitational potential energy, kinetic energy, and elastic potential energy.
   g. Write conservation statements for energy given several different scenarios.
   h. Use conservation of energy to solve problems.
5. Rotation
   a. Define and identify angular quantities.
   b. Motion with constant angular acceleration.
   c. Convert translational motion to angular motion for a rolling object.
   d. Define, identify, and calculate torque. Use vectors to explain the 3 dimensional nature of torque using the vector cross product.
   e. Rotational inertia, and rotational dynamics.
   f. Rotational work, power, and kinetic energy
   g. Angular momentum and its conservation.
6. Solids, Elasticity & Statics
   a. Phases of matter – according to KMT (Kinetic Molecular Theory)
   b. Density
   c. Elasticity
      i. Hooke’s law
      ii. Stress, Strain, and Young’s Modulus
      iii. Poisson’s Ratio

d. Statics
    i. Static equilibrium
    ii. Conditions of equilibrium
    iii. Solving Statics problems in one plane

7. Vibrations and Waves
    a. Simple harmonic motion concepts (Period, Frequency, Amplitude)
    b. Using math to represent a vibration
        i. Analogous rotational motion to vibrational kinematics
        ii. Dynamics and Conservation of energy in a mass-spring system.
    c. Solve for kinematics and dynamics quantities in pendulum systems and mass-spring systems.
    d. Describe damped oscillations, forced oscillations, and resonance.
    e. Wave concepts – definition, and labeling transverse and longitudinal waves.
    f. Wave motion
        i. Types of waves (Mechanical vs. Electromagnetic).
        ii. Types of waves (Transverse vs. Longitudinal)
        iii. Use the wave speed formula
        iv. Speed of mechanical waves – dependent on elasticity and density of the medium.
    g. Energy and Intensity of Waves
        i. Related to Amplitude and/or frequency
        ii. Calculate Intensity of Sound waves and convert to decibels (dB).
    h. 4 wave interactions (reflection, refraction, diffraction and interference)
    i. Standing Waves and Resonance
        i. Calculate the speed of sound using standing waves.
    j. Traveling waves – representing a wave using a parametric equation.

## DE Physics – Lab List

| Lab # | Lab Book | Lab Title | Due Date (2022) |
|---|---|---|---|
| 1 | A | Hooke's Law – Graphing | 8-16-22 |
| 2 | B | Reaction Time – Precision | 8-22-22 |
| 3 | A | Acceleration of Gravity | 8-25-22 |

| | | | |
|---|---|---|---|
| 4 | B | Bulls Eye I | 8-29-22 |
| 5 | A | Force Exploration | 8-31-22 |
| 6 | B | Force, Mass and Acceleration (F = ma) | 9-6-22 |
| 7 | A | Centripetal Force | 9-8-22 |
| 8 | B | Frictional Force | 9-13-22 |
| 9 | A | Online Collisions Simulations | 9-16-22 |
| 10 | B | Bulls Eye II | 9-21-22 |
| 11 | A | Power Up – Human Body Power Lab | 9-28-22 |
| 12 | B | The Giant Slide – Work Energy Theorem | 9-30-22 |
| 13 | A | Spring Loaded – Wrap your energy in the bands | 10-5-22 |
| 14 | B | Simple Machines – The Inclined Plane | 10-7-22 |
| 15 | A | Disks, Hoops, and Balls (Rotation) | 10-20-22 |
| 16 | B | The Atwood's Machine | 10-28-22 |
| 17 | A | Density Lab | 11-4-22 |
| 18 | B | Shear Modulus Lab | 11-9-22 |
| 19 & 20 | A | Period of a Mass Spring System<br>The Simple Pendulum (2 separate reports in the same lab book) | 11-21-22 |
| 21 & 22 | B | The Mechanical Snake<br>Ripple While You Work (Same as above – 2 reports in the same lab book) | 12-2-22 |
| 23 | A | The Speed of Sound – Standing Waves | 12-6-22 |
| 24 | B | Sound Intensity – Sim Lab | 12-13-22 |

## Tower Building Project – Unit 6 (tested on 11-11-22)

Parameters: Build a tower that is a minimum of 16 inches tall, is open in the middle with a level base and top. It must be at least 4 inches by 4 inches on the bottom. Open in the middle means it must allow for a 1 cm diameter rod to pass from top to bottom through its center. This is a competition assignment, and may be individual, or with a partner. The tower can be made of any materials you desire, but read the directions below for how it will be scored.

How it will be scored.
(Height in cm) (Weight Held) / (mass in grams)

In other words, to get the best score:
1) you want it to be tall
2) you want it to hold a lot of weight
3) you want it to be very light