PHYS 231: General University Physics I

Summer 2016

Northern Virginia Community College, Alexandria Campus

Class Information

Meeting Place:	Lectures**:** AA-441; Lab: AA-385 (Physics Lab)
Meeting Time:	Lectures**:** MWF: 10am – 1:30 pm; Lab TR:10 am – 1:00 pm;
Credit:	5 credit hours
Prerequisite:	basic calculus (MATH 173, or equivalent)
Required Materials: ***Vol. 1 (14th edition)***	***Sears and Zemansky's University Physics with Modern Physics,*** *by Young and Freedman* published by Pearson (Addison-Wesley) ISBN 9780134209586
Laboratory Manual:	Lab protocols will be posted on Blackboard.
MasteringPhysics:	MP Course ID: **MPMOSCATI98318**
Instructor:	Prof. Tony Moscati (amoscati@nvcc.edu, 703 845-6341 (Sec'y)
Office:	AA-483
Office Hours:	One-half hour MTWRF before and after class. Other times by appt.

Course Administration

We will use *Blackboard which* you can access if you are registered for the course. The website contains news and announcements, the course syllabus, lab information, lecture notes, and other useful information. Bookmark it and check it often.

Course Format

This course is conducted in a version of the **SCALE-UP** format, a **collaborative mode** of instruction, where students work together in groups on all classroom activities. The Scale Up format has been modified to suit the instructional parameters and physical layout of the Alexandria campus's classrooms. See later in this syllabus for a more detailed description.

Schedule of Lecture and Labs

Schedule of Lectures and Labs, Physics 231, Summer 2016
Lecture: MWF 10 am – 1:30 pm in AA-441; Lab: TR 10:00 am – 1:00 pm in AA-385

Monday, May 16	Tuesday, May 17	Wednesday, May 18	Thursday, May 19	Friday, May 20
Ch 1: Units, Phys Quantities & Vectors Ch 2: Motion along Straight Line	Lab 1: Virtual Lab on Vectors	Ch 2: Cont'd Ch. 3: Motion in 2 or 3 Dimensions	Lab 2: Velocity & Acceleration	Ch 4: Newton's Laws of Motion
May 23	**May 24**	**May 25**	**May 26**	**May 27**
Exam Ch. 1 – 3 Ch 5: Applying Newton's Laws	Lab 3: Addition of Forces **Last Day to Drop With Refund: May 24!**	Ch.5 Cont'd Ch. 6: Work & Kinetic Energy	Lab 4: Newton's 2nd Law	Ch 7: Potential Energy & Energy Conservation Ch 8: Momentum, Impulse & Collisions
May 30	**May 31**	**June 1**	**June 2**	**June 3**
Memorial Day Holiday No Class	Lab 5: Potential & Kinetic Energy	**Exam Ch. 4 – 6** Ch 8: Cont'd	Lab 6: Linear Momentum	Ch 9: Rotation of Rigid Bodies
June 6	**June 7**	**June 8**	**June 9**	**June 10**
Exam Ch. 7-9 Ch 10: Dynamics of Rotational Motion	Lab 7: Circular Motion	Ch 10: Cont'd Ch 11: Equilibrium & Elasticity	Lab 8: Equilibrium of Torques	Ch 12: Fluid Mechanics **Last Date to Drop with *W* June 10!**
June 13	**June 14**	**June 15**	**June 16**	**June 17**
Exam Ch. 10 - 12 Ch 13: Gravitation	Lab 9: Buoyancy	Ch 14: Periodic Motion	Lab 10: Simple Harmonic Motion	Ch 17: Temperature & Heat
June 20	**June 21**	**June 22**	**June 23**	**June 24**
Exam Ch. 13, 14, 17 Ch 18: Thermal Properties of Matter	Lab 11: Specific Heat	Ch 19: 1st Law of Thermodynamics Ch 20: 2nd Law of Thermodynamics	Lab 12: Gas Laws	**Exam Ch. 18 - 20**

Last day to drop with refund or audit (Census Date): May 24. Last day to withdraw without grade penalty: June 10.
This schedule of lectures and labs is approximate and subject to change without notice.

Course Description

Physics is the most basic of the sciences. It deals with the behavior and structure of matter in the natural world. The fundamentals of physics need to be understood by anyone who hopes to make a career in the sciences or technology: physicists, engineers, chemists, astronomers, geologists, biologists, to name a few. Even the non-science majors can benefit greatly from knowing basic physics in order to function well in an increasingly technologically-advanced society. The underlying premise of our approach to this course is that only a relatively few general physical principles are needed to understand a very broad array of physical phenomena. Upon completion of this course students should have a fundamental understanding of physical processes which may play a role in their own specific fields of study, as well as in their daily lives. A physical understanding of the world goes a long way.

This course is the 1st part of the basic physics sequence intended for physics and engineering majors. Physics 231 focuses on Classical Newtonian Mechanics, Energy, Fluids, and Thermal Physics. You don't have to be a 'genius' to do well in the course, but you have to have the desire to learn new physics concepts and the commitment to carry out the assigned tasks. You need some basic math skills, including calculus and differential

equations.

Course Learning Objectives

1) Acquiring a basic understanding of how and why things move and behave

2) Developing scientific problem-solving and critical thinking skills

3) Learning the connections between physical laws and modeling and understanding better the technology of the world in which we live

4) Being prepared to do well on standardized exams such as the GRE, MCAT LSAT and other exams used to determine admission to graduate and professional schools.

Group Work

Almost all of your in-class work will be conducted ideally in groups of 3. There is heavy emphasis on the group dynamics in this course, and therefore it is very important that all groups function well as a team. If for any reason, you are experiencing difficulties in your group, you should bring this to the attention of the instructor. The smooth operation of the group work is central to our collaborative effort. Groups may be reconfigured during the semester as needed to facilitate better learning experiences.

Classroom Activities

Research in physics education has demonstrated that lecturing is generally not an effective teaching method. Therefore, I will endeavor to keep lecturing at a minimum in class! We will not be spending time repeating what is presented in the textbook. That would not be a good use of our time since the material will be covered by your reading out of class – that is what the textbook is for! It is essential that you have read the material in each chapter in at least a preliminary manner ahead of time in order to get the most out of our in-class activities. Class time will be spent *practicing* the material to develop your problem-solving skills. This will involve interactive conceptual activities, in-class quizzes and demonstrations, and solving higher level problems. Class time is when we have the best opportunity for extensive interaction. You are strongly encouraged to ask questions and initiate discussions in class at all times.

We will more or less follow the class schedule provided in the schedule of lectures and labs. The nature of the collaborative section is such that it is critically important that you come to class prepared to work on the material each day. This preparation will be encouraged through in-class exercises that will be done generally at the front end of each class period. After you have read the textbook assignment for a given class, we will spend our class time supplementing the ideas in the textbook and applying them to well-defined problems that you will have to think about in class, which will help deepen your understanding of the basic underlying physics concepts. Our in-class activities will include questions on the reading material, concept questions, working out problems gradually escalating in difficulty, and, on Tuesdays and Thursdays, hands-on lab experiments.

Mathematics Background

Basic knowledge of basic differential and integral calculus, together with algebra, geometry, and trigonometry, is needed for this course. Therefore, a passing grade in Math 173 (or

the equivalent) is **required** and a facility with these mathematical techniques is **fully expected**. If you do not meet these criteria, you will not be allowed to take the course. If you are in doubt about this requirement, please talk with the instructor on the first day of class.

Warning: If your grade in Math 173 was lower than C, you probably have extra review work to do. See Appendix B of your textbook and the review posted online on Blackboard for a brief review. You should do this review ideally before the first class.

PHYS 231 Grading Policy and Weightings

The course will not be make-or-break based on one or two tests. Instead the work is spread out over many components accumulated over the entire semester, carefully monitored and graded along the way. The grading system used in this course is a tried and proven measure of the effort you put into the course AND your understanding of the physics. It is prompt, accurate, completely transparent, and most-importantly, fair. The detailed scale is:

90% – 100%:	A
80% - 89.9%:	B
70% - 79.9%:	C
60% - 69.9%:	D
<60%:	F

There are several components in the course, designed to maximize your learning and to assess that learning. Each component has its own weight in the overall grading scheme. The breakdown of these components is given below:

Course Element	Weighting
Collaborative Exam 1	10%
Collaborative Exam 2	10%
Collaborative Exam 3	10%
Collaborative Exam 4	10%
Collaborative Exam 5	10%
Collaborative Exam 6	10%
18 Homework Sets	15%
12 Labs	20%
Class Participation	5%

Total:	**100%**

Note that the exams count for 60% of your total grade and the combination of in-class and at-home aspects of the course count for the other 40% of your total grade. This means that you have a great deal of control over your own grade. If you make the effort to earn the non-exam points, you will build a safety net for yourself in the event that you stumble in the exams.

Collaborative Exams (60%)

There will be 6 exams worth 10% each for this course, roughly one per week for each of the 6 weeks. The exams are closed-book, but a formula sheet will be provided for each exam. The purpose in providing this information during the exams is to emphasize that formula memorization or plug-and-chug is not the main goal in this course. The focus is on understanding and problem-solving skills. The exams will consist of both conceptual problems as well as numerical ones (which are more quantitative, more like the homework). Calculators are allowed in exams.

The exams will be one and one-half hours long and given in 2-stages to encourage collaborative learning. The first hour of the exam (roughly) will be individualized; individual exams will be collected at the end of that period. The next half-hour of the exam will be collaborative with the exam (or portions, reworded problems, etc.) given back to the students to be worked on in small groups. Individual and collaborative scores will be combined in an 80 / 20 ratio (individual to collaborative) into a total score for the exam.

If an exam is missed due to a serious, unavoidable reason (e.g. personal illness), the student may be allowed to take a make-up exam. In such a case, the student must contact the instructor prior to the exam date. A claim of illness must be accompanied by a note from a medical doctor. Under no circumstances will there be make-up exams for students who have missed more than 5 regular classes (lecture or lab sessions)! No makeups *for exams* will be routinely given, so you should make every effort not to miss exams.

Homework (15%)

Homework worth 15% of grade will be assigned for each of the chapters to be covered. The homework assignments will be handled through the MasteringPhysics online system which is tied to the textbook. This system will give you immediate feedback as to whether or not your answer is correct and hints if it is not correct. You will have up to 10 tries for most problems. Most of the homework problems are taken from the end-of-chapter problems, which are both numerical and conceptual. Homework sets will be opened at the start of a chapter's lecture and will be due within 3 days of the last lecture on that chapter. Feel free to discuss the problems with other students; however, you are responsible for submitting your own answers. Since the homework answers can be submitted at any time while the set is active, from any location where you have Internet access, no extensions on homework are granted.

Students needing to purchase access to MasteringPhysics should go to www.masteringphysics.com and click to register. After identifying your country and textbook, you will be able to purchase MasteringPhysics either with or without the etext (your choice). The course ID is: MPMOSCATI43754. ***Students successfully completing 85% of the total points for homework will receive 100% of the points toward their overall grade. Extra homework points will not be given above the 15% contribution of homework toward the overall grade.***

Labs (20%)

There will be 12 labs integrated into the course worth a total of 80 points. Each of the 12 experiments is worth 5 points. Student presentations made at the start of each lab are worth up to 10 points each. There is no lab manual to purchase; instead, lab instructions (scripts) will be posted on Blackboard. You should read the instructions and print them out before going to the lab. Labs will be conducted as a group and ***one completed set of lab forms is to be brought by each group to the instructor at the end of the lab period for grading***. Each group member must be physically present and must have participated in the experiment to receive credit. There are no formal written lab reports required. Instead, before leaving the lab, you must meet with the instructor, satisfy his questions concerning your experiment, including making any preliminary calculations he may request to validate your findings before you leave the lab. If necessary, you may be asked to repeat some measurements. Labs will be graded promptly with each group member receiving a common grade. ***Any student missing 3 or more lab sessions will receive a grade of F for the entire course.*** If a student is late by more than 15 min for the lab, the student can still do the lab experiment but will receive diminished credit for that lab. *There will be no makeups for labs.* **Students without protective goggles or with open-toe shoes will not be allowed to stay in the laboratory.**

Class Participation (5%)

In order to encourage volunteering and cooperation between the instructor and the students, 5% of the overall grade will be awarded ***solely at the Instructor's discretion*** for the degree of participation demonstrated with the student's group in class in solving problems, responding to concept questions, demonstrating solutions, excelling in the lab and similar activities. This means that you do NOT earn the 5% grade contribution merely by showing up for class; active participation is required.

Triggers for Failing Grade

You will **automatically fail** the course if you completely **MISS** the activities specified in *any* of the following categories:

- 2 out of the 6 exams
- 12 out of the 18 homework assignments
- 3 out of the 12 labs

These triggers are minimum participation requirements, meant to keep you engaged in the course. They are independent of anything else you do in the course. Nobody should trigger them.

Other Matters

Student's Responsibility

Your attitude toward the course should be one of self-responsibility. You will get out of the course exactly as much as you put in to it. Your responsibilities include:

- Come to every class and participate actively in all of the collaborative work.
- Consult Appendix B of the textbook and the review posted on Blackboard to acquire the mathematical skills (algebra, vectors, and calculus) needed for the course.
- Read the textbook carefully and gain a reasonable familiarity with the day's material before you come to class. Come with questions in mind!
- Work on the homework problems early and finish them on time.
- Check the course website regularly for updates and course information.
- Participate fully in all of the classroom activities (I said this already, but it is important enough to mention twice!).

If you find that you are struggling with the coursework, seek assistance ***early*** so that you won't fall behind for even just one week.

Disability Support

Those seeking accommodations based on disabilities should provide a Disability Data Sheet obtained through the Counselor for Special Needs, located in the Bisdorf Building, Room 148 (tel. 845-6301)

Unexcused Absences

An un-excused absence will result in a grade of zero on that particular missed activity. Any excused absences (illness, religious holidays, athletic meets, etc) must be brought to the instructor's attention as soon as possible (not at the end of the semester). Valid documentation must be shown to support such claims. Any student missing 3 or more lab sessions will receive a grade of F for the entire course.

Academic Dishonesty

Cheating compromises the integrity of our course and is unfair to those students who earn their grade through honest hard work. I have a zero-tolerance policy regarding cheating. Any dishonest behavior, once discovered, will be penalized fullest. Copying and using someone else's work to obtain credit, as well as letting someone else copy your work, is considered cheating. Cheating on an exam will result in failing that exam. **A second offense will result in automatic failing of the class!** During an exam, if you leave the room for any reason, you will not be permitted to continue working afterwards.

Security

In the case of an emergency, if at all possible, the class should shelter in place. If the building that the class is in is affected, follow the evacuation procedures for the building. After evacuation, seek shelter at a predetermined rendezvous location.

Problem Solving Hint Sheet
(The 4-Point Strategy)

1. IDENTIFY the relevant concepts: Use the physical conditions stated in the problem to help you decide which physical concepts are relevant. Identify the target variables of the problem, i.e. the quantities whose values you are trying to find. Identify the known quantities, as stated or implied in the problem. This step is essential whether the problem asks for an algebraic expression or a numerical answer.

2. SET UP the problem: Choose the equations you'll use to solve the problem and decide how you'll use them. Draw a physical picture of the situation. This may start with a simple sketch, and later advance to a free-body diagram (or some other representation). It is frequently useful to draw multiple diagrams that represent the problem at different instances in time. As best you can, estimate what your results will be and predict what the physical behavior of the system will be.

3. EXECUTE the solution: This is where you "do the math".

4. EVALUATE your answer: Compare your answer with your estimates and reconsider things if there is a discrepancy.

Remember:

- All of these steps involve "translation" of information from one form into another. You need to translate the question text into diagrams, diagram information into physics formulas, formulas into numerical values, etc.

- When stuck, go back to the start of the list and check that you have accomplished everything that is needed. For example, when manipulating equations, you may find that additional facts need to be translated from the text into equation form. Or, you may find that you have neglected to include all of the forces in a force diagram, or that you need to draw multiple diagrams to represent different moments in time during the problem.

- You may find that you do not need to use all pieces of the problem-solving plan for a particular problem, especially if it is easy. However, more difficult problems are more likely to require an organized strategy like the one described above, so it is a good idea to get used to the 4-point plan.

What is SCALEUP?

The physics class that you are in is based on the SCALE-UP format (Student Centered Activities for Large Enrollment Undergraduate Physics) developed at NC State University modified to reflect the smaller enrollments and physical plant of NOVA. The approach to SCALE-UP is simple -- it is a highly collaborative environment in which lecture and lab components are fully integrated. The course will emphasize rigorous problem-solving in physics using interactive instruction, educational software and computer applications important for science and engineering students. All of the in-class activities will emphasize the cooperative learning aspects of the pedagogical process.

Each class meeting will require students to be responsive, to think, and to perform hands-on tasks (so get a good night's sleep before coming to class!). While key concepts of new material may be discussed in short lectures, you are responsible for all the readings outlined in the calendar, regardless of whether it is discussed in class. Specifically, you will be responsible for learning definitions from readings, going over example problems in the textbook, asking questions through the Discussion Forum on Blackboard or e-mail, and indicating when you want a topic discussed in more detail in class. A wide variety of activities and measurements will be interspersed with classroom discussion.

Collaborative Work

Scientists and engineers work in groups as well as alone. Social interactions are critical to their success. Most good ideas grow out of discussions with colleagues. This course encourages collaborative teamwork, a skill that is highly valued in all scientific endeavors (and also by many employers!). As you study together, you should help your partners get over confusions, ask each other questions, and critique your group work and lab write-ups. Teach each other! You will learn a great deal by teaching.

Of course, while collaboration is the rule in technical work, evaluations of individuals also play an important role in science and engineering. Tests and the final exam are to be done without help from others. So while you are working closely with your group on the various activities, make sure that you are personally understanding everything fully and that you are not relying too heavily on your team members to give you the answers.

Your role in this class is very likely to be very different from what you may have experienced in other courses. To help you see what is expected, take a look at the table below.

What Should You Expect?

Traditional Classroom	Collaborative Classroom
Listener, observer, and note taker	Active problem solver, contributor, and discussion participant
Low or moderate expectations of preparation for class	High expectations of preparation for class

Private presence in the classroom with few or no risks	Public presence with many risks
Attendance dictated by personal choice	Attendance dictated by community expectation
Competition with peers	Collaborative work with peers
Responsibilities and self-definition associated with learning independently	Responsibilities and self-definition associated with learning inter-dependently
Seeing teachers and texts as the sole sources of authority and knowledge	Seeing peers, self, and the community as additional and important sources of authority and knowledge

What Should You Be Doing?

This class meets almost 16 hours per week! Attendance (**both physical and mental**) is **required**. In addition to the 16 hours of lecture and lab per week, you are expected to spend about 20 additional hours studying outside class. If you typically do much less than that in outside study, you are unlikely to be able to learn the material. If you typically spend much more than 20 hours of outside study, you should consult with the instructor about ways to study more efficiently.

It is important to keep up with the class. Make sure you read, so that you are introduced to definitions and concepts before we use them in class. Each new concept introduced in this course builds on earlier ones, so mastering key ideas is critical. If you get behind, seek help right away! Talk to your teammates or the instructor. **Everyone wants you to succeed**, but it is up to you to take advantage of the assistance that is available.

Bring the textbook to class every day. If you must miss class, it is your responsibility to find out what you missed (get this information from your group members). Additionally, if you know that you're going to be absent, inform your group members so they are prepared to be short-handed that day. If a team member is absent without notification, contact them to let them know that they were missed.

Be a full participant during the in-class activities. You'll be amazed at how familiar the exam questions will be if you do this!

Studying the textbook

Review the course calendar carefully to see which textbook sections to study and what topics are being discussed during the upcoming week. Read the assigned textbook sections thoughtfully, before they are covered in class. Look through the example problems.

Get help with any definitions, concepts, or reasoning that was not clear to you from the reading. After studying the textbook sections, work through the *Discussion* questions in the back of teach chapter to check your understanding.

Hints from former students in the collaborative setting

Attend class and be prompt

You can miss many important announcements and concepts by skipping class -- your grade will benefit from good attendance.

Read ahead

Read the book before coming to class. The discussions in class will make more sense if you have seen the material before.

Come to class well rested

SCALEUP demands that you pay close attention and take good notes -- therefore you must be wide awake.

Ask questions

Don't sit in class and pretend that you understand when you really don't. Ask the instructors if you have a problem.

Take the homework seriously

This is your best chance to practice concepts learned in class and it can be helpful in preparing for the tests. Don't just try to get the right answers – make sure that you understand the concepts.

Take good notes

Not only may your notes be an actual part of your grade, but you need to be able to refer to them later.

Communicate with your group

Let them know up-front what you expect of them and tell them what you expect of yourself.

Work on labs as a team

Each member of your group will be responsible for skills learned in labs, so make sure everyone has a chance to do the work.

Help each other

If you understand a concept while others around you are confused, take the time to help them. Someday you might need help.

Tell the instructor immediately if there is a problem with your group

Don't wait until the end of the unit to decide that your group is irresponsible.