

COURSE SYLLABUS: Physics 221 section A
 “Physics for Science and Engineering”
 (calculus-level physics with laboratory)

Course Title: Physics for Science and Engineering

Instructor: Keith Clay **Office:** SC 114 & KC 302c **Phone:** 833-9111, ext. 4248
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Course webpage: <http://www.instruction.greenriver.edu/physics/keith/221>

Office	MTThF	10:30 AM - 11:00 AM	SC 114 (Auburn)
Hours:	TTh	1:15 PM - 2:15 PM	KC 302c (Kent)
(If you can't find me you can also try checking with the buiding secretary.)			

Class Meetings:

Section A:	SC 117	“Daily”	9:00 AM – 10:20 AM
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Special announcements for Winter of 2013:

1. Notice that this class meets Monday, Tuesday, **Wednesday**, Thursday, and Friday. We will only meet on a few Wednesdays during the term. This change was made to minimize class time lost when instructor has important meetings out of town.
2. We will not have class on Monday January 7th, 8th, or 9th. We may miss additional days as well.
3. We will have class on the following Wednesdays: January 2nd, January 23rd, and February 6th, February 20th, March 6th.

Course Objectives: Successful students will develop skills in the following areas.

1. **Critical Thinking:** Understanding a physical problem requires construction of a mental model and identification of relevant and irrelevant details. It is necessary to consider both *what you think you know* and *how you think you know it*. This is what is meant by critical thinking. Manipulation of the facts associated with these details is often relatively easy, but we must also learn...
2. **Problem Solving:** To pass this course, it is not sufficient to merely learn *about* physics. It is also necessary to learn *to do* physics. This course will require refinement of problem solving techniques and the development of methods which new ones. Still, each method and technique is simply a tool to be used by a creative and practiced problem solver.
3. **Technical Writing:** Technical skill is of little use if it cannot be communicated. The clear and accurate written expression of ideas, using the combined languages of English and mathematics is an essential part of this course. Work will not be given full credit unless all steps can be understood!
4. **Laboratory Investigation:** Laboratory work will be a very large part of this course. Students will complete several laboratory exercises per week as well as designing and carrying out their own projects. All students will be tested on their abilities to design, carry out, and interpret experiments.
5. **Team work:** The laboratory work will be completed by teams working together. It will be the responsibility of each member of the team to see that all members work together, to see that all members participate, and to see that all members of the team understand all phases of the work.

Relationship to Campus-wide objectives:

Green River Community College has identified several educational objectives for all courses and all students on the campus. The objectives of this course include many of these campus-wide objectives which will be directly and indirectly monitored and assessed. These overlapping objectives include enhancement of proficiency in the following areas:

1. **Critical thinking and problem solving skills:** If there were only one objective to this course it would not be the retention of any fact that is associated with the subject matter called physics. It would be the development of skills needed to analyze any problem carefully, logically, analytically and creatively, with a hopeful eye toward the creation of a viable problem solving strategy.

Critical thinking and problem solving skills will be assessed using graded homework assignments, essays, quizzes, exams, laboratory exercises, and ungraded assessment tests.

2. **Mathematical and quantitative reasoning:** Successful completion of this course requires the mathematical modeling of many complicated situations, often using models which are not intuitively obvious. Students often comment that physics courses stretch their ability to translate from the real world to mathematical abstractions and back again more than any other.

Mathematical and quantitative reasoning skills will be assessed using graded homework assignments, quizzes, exams, laboratory exercises, and ungraded assessment tests.

3. **Clarity of communication and written expression:** Verbal exposition is often put to its most stringent test when technical material must be accurately and yet readably described. This course requires written discussion of highly technical subjects and precisely defined concepts, often blending the English language with the language of mathematics.

Communication and written expression skills will be assessed using graded homework assignments, essays, essay questions on exams, and presentations and written reports on laboratory exercises.

4. **Responsibility:** All students will be responsible for doing their own work *and seriously thinking about what they are doing!* Although it is tempting, especially in laboratory situations, to allow others to do our work for us, the successful students will be those who actively participate in all activities. Previous students have found it very difficult to make up for lost time in this class, so it is important for all students to work at least at the same pace as the rest of the class.

Students often believe that brain power alone determines performance in physics class. This is not the case! Before an anonymous in-class test, students were asked to estimate the fraction of the work that they had personally completed. Students who completed less than 80% of the course work averaged only 35% on the exam. Those who completed all of the course work averaged 80%.

5. **Aesthetic appreciation:** The teacher of this class freely pursued the study of physics when a career in engineering or any number of other fields would have been much more lucrative and required less formal education. The reason for this was simply a deep and abiding love for the astounding beauty of the subject matter. Your teacher sincerely hopes that some appreciation of this beauty will rub off on each and all of his students, although aesthetic appreciation will not be directly assessed.

Aesthetic appreciation of physics will be assessed in part through the work done in preparing and presenting an in-class work of the students choice and design.

Prerequisites:

Do you need High School Physics or equivalent? Yes. Students without some physics background find the level and pace of Physics 221 very difficult. Some very good students find it necessary to drop Physics 221, take Physics 114 first, and then return to do extremely well in Physics 221, 222, and 223.

Do you need Calculus, or concurrent enrollment in Math 151? Definitely. Students often ask if they can pass the course without calculus. Maybe some could, but Isaac Newton was one of the smartest men who ever lived, and he could not do physics without calculus. This is not a math course, but calculus will be an essential part of the language used to describe the physical world.

Textbooks:**1. *Smart Physics: Mechanics*, by Stelzer, Gladding, and Selen, **REQUIRED!****

The course textbook will be this small book and the online materials that accompany it. As of this writing it is the understanding of your teacher that **YOU MUST BUY THIS BOOK FROM OUR COLLEGE BOOKSTORE** in order to get all the materials. Fortunately, compared to other college textbooks this book is relatively inexpensive. If you are to continue with Physics 222 and 223 using the Smart Physics materials you will also need to buy *Smart Physics: Electricity and Magnetism* but you do not need to buy that book at this time (although it won't hurt you if you do).

You absolutely must have computer and Internet access to use and complete the materials within SmartPhysics. You may do all of this from computers on the GRCC campus if you like, but you should plan on needing a *minimum* of a couple of hours of Internet access at least a couple of times every week.

2. *Physics for Scientists and Engineers, 6th edition*, by Serway and Jewett, **Completely optional!!!**

Smart Physics has a lot going for it, but some students really want an old fashioned book to read. Any calculus-based physics book will do and this one is not substantially better than any other. Your teacher will make a few copies available to you and you can buy one for yourself if you want one. Note that this is NOT the current edition so used copies can be found online for the cost of a couple of lattes.

Supplemental Reading Material:

Students often request alternative reading material to supplement their general texts. However: students should be aware that there is little evidence that time spent *reading* another book is going to substantially increase your understanding or your grades. It is much better to spend extra time *doing* more physics problems, *discussing* the things that you find confusing, and *asking yourself* the kind of critical thinking questions modeled by the checkpoints in Smart Physics.

Copies of *Physics for Scientists and Engineers, 6th edition*, by Serway and Jewett, will be placed on reserve in the library. You may borrow them for short periods and/or share them with classmates.

Other additional physics texts can be found across from the Physics Store Room (SC 118) and students are encouraged to use them if they believe this will help. Several other calculus level physics texts are available for check out from our library. These include textbooks by Karen Cummings, Halliday and Resnick, Knight, and Walker.

There are very few *facts* that you need to learn for this class. It simply requires time and effort to really understand and use the facts that you will learn.

REQUIRED COURSEWORK:**Laboratory requirements:**

Most laboratory work will be based on the exercises in the *RealTime Physics* laboratory manual. These exercises are designed to illustrate and clarify the concepts of physics and not to test the laboratory skill of the students. Thus the laboratory grade will be based on participation and assessment of student understanding. Laboratory exercises will be collected periodically, and there will be at least one laboratory quiz. Students are **REQUIRED** to work together in groups during lab exercises.

Later in the term there will be many laboratory exercises that will *not* come from *RealTime Physics*. These will often require more thinking and writing on the part of the students and these labs will be impossible to make up late. These labs will be graded generously but they will be graded.

Attendance: Attendance is absolutely *required* for the laboratory component of this course. Students who miss a single lab may lose 10% of their lab grade. Students who must miss more than one lab may have difficulty passing the course!

Meeting times: There will be laboratory exercises almost every week. Some lab periods will appear in almost half of the class periods. Students in these classes are often confused about which classes are classes and which are labs. **THIS IS A GOOD THING!** You will learn the most by doing and thinking, not by sitting and taking notes (although you need to do that, too!)

Grades: Most of the lab grade will come from successful attendance and participation in lab exercises. Some lab work will be collected and graded, and there will also be one lab “quiz” in which students will need to demonstrate that they know how to use the equipment. (WARNING: If you allow your lab partners to do all of the “hands-on” work during lab, you will not pass this quiz!)

Homework (problem sets):

There will be ONE paper problem sets from your instructor assigned at the start of the term.

There will be TWELVE homework assignments from Smart Physics. This amounts to one homework assignment (and one Smart Physics unit) every third class day. These will be turned in online. (Note: You will need to do them on paper and save your work for later study, but you will turn in the answers online). These homework assignments will require the use of a computer either on this campus or at home. You will find the schedule of which assignments are due and when on the Smart Physics website. Your instructor will show you how to login. Your homework grade will depend only on whether you complete the assignments, not on your accuracy.

You are not required to do the homework individually! In fact you are encouraged to work together!

You will notice that the homework problems that you must solve will not be *exactly* the same as the homework problems of the student sitting next to you. This means that in order to collaborate on the homework you must discuss how a problem is to be solved and not just what the answer might be.

SmartPhysics assignments include homework, pre-lectures and checkpoints. Completion of pre-lectures and checkpoints will contribute to “participation” grades. Homework will be counted here.

Quizzes:

There will be approximately 8 quizzes given throughout the term. Each classroom quiz will contain one long or several short questions, intended to be finished in 30 minutes, however take-home quizzes may also be given and these will in general be longer and more involved.

Since it is the purpose of quizzes to assess what individuals have learned, each student must do his or her own work. Copying or cheating on classroom quizzes will result in failing the class and submission to the campus cheating policy.

Exams:

Exams may not be taken late. If you have a problem with the timing of a scheduled exam, contact your instructor *in advance*. There will be one midterm exam roughly five weeks into the quarter (the exact date will be announced well in advance). It will be 90 minutes long. Students are required to do their own work on exams. Failure to do so will result in *failed grades* and discipline under the policy on cheating. **The final exam for will be held on the date and time listed in the course schedule:**

Phys 221	Wednesday, March 20th	9:00 AM – 10:20 AM
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Class Participation:

Participation grades are influenced by class attendance and online assignments (prelecture, checkpoint, and homework). Participation in classroom discussions and laboratory exercises will also be taken into account. Most students attend regularly, participate in class, and complete their assignments. The overwhelming majority of students receive 100% of the possible attendance points.

You are expected to answer questions in class, speak to each other during class discussions, and work together cooperatively. **THE LANGUAGE OF PARTICIPATION IN THIS CLASS IS ENGLISH!** Students should expect to lose some or all of their participation points if they insist on relying on other languages. Feel free to ask for help with English or to use dictionaries and translators *during class time*. As with collaboration, you may not use dictionaries and translators during quizzes or exams.

Attendance and tardiness:

This class will not be graded on attendance, but students should be aware that due to the “hands-on” nature of what is done during class, it is very difficult to pass the class if attendance is lacking. Even students who do not believe they need to attend usually miss out on learning when they miss class. If you must arrive late to class, come in quietly, sit down, and shut up! Do not start conversations. Do not ask the people around you what is going on. This is very disturbing to those who are trying to learn.

Safety:

The safety of students and staff is of paramount importance to GRCC. Experiments and assignments in this course are not extremely dangerous but there will be scientific equipment all around us and some experiments involve objects moving with some speed. Reasonable precautions must be taken.

The big picture:

Follow directions and don't do anything foolish. If you aren't sure about a safe method to perform a laboratory task, ask your instructor. If you believe someone else is behaving in a way that threatens your safety, politely speak up right away. Communication is central to safety.

Wear eye protection when appropriate. In labs which involve the risk of objects flying through the air, some form of *safety glasses* or *goggles* must be worn. Students can use eye protection owned by the college or they may bring their own if they object to wearing shared equipment. If a student does not have personal eye protection when it is needed for a lab exercise, that student must borrow eye protection from the college or forfeit the exercise.

Failure to follow safety procedures may result in a lowering of the course grade or expulsion from the class (with a failing grade). Following instructions and using common sense will be enough to prevent this from happening. For the safety of all concerned, students **MUST** be able to follow spoken instructions in ordinary English.

Extra Credit Projects:

There will be NO EXTRA CREDIT PROJECTS THIS TERM!!! None will be accepted. Don't ask. Students who have extra time that could be devoted to an extra credit project should devote that time to learning the material in the course.

Grades:

Grades for this class will be computed numerically based on the fraction of a total of 100 possible points. Grades will be awarded for the following six components, with the indicated points for each:

Course component:	Fraction of grade:
Homework	20 points
Quizzes	20 points
Midterms	20 points
Laboratory exercises	10 points
Prelecture & Participation	10 points
Final Exam	20 points

Note that these point totals are subject to change if the instructor believes it would be to the benefit of the class as a whole.

So how many points do I need to get an A? To pass?

Numerical grades will be computed based on the following mathematical formula:

Take your total number of points. Subtract 56 points (ouch!). Divide by ten.

For quick reference, you may also look up grades in the following table:

Percent of Total Points	Numerical Grade		Percent of Total Points	Numerical Grade		Percent of Total Points	Numerical Grade
97-100	4.0		86	3.0		75	1.9
96	4.0		85	2.9		74	1.8
95	3.9		84	2.8		73	1.7
94	3.8		83	2.7		72	1.6
93	3.7		82	2.6		71	1.5
92	3.6		81	2.5		70	1.4
91	3.5		80	2.4		69	1.3
90	3.4		79	2.3		68	1.2
89	3.3		78	2.2		67	1.1
88	3.2		77	2.1		67	1.1
87	3.1		76	2.0		66	1.0
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Students are strongly encouraged to keep track of their own progress in this class. At any point in the course, students may compute their *average percentage* on completed material and use this table to estimate a grade. Students should note, however, that it is ultimately your instructor who makes the decision as to how many points each student actually has! Grading is a subjective exercise and the grade you receive may not be *exactly* the one that you calculate for your self.

Every attempt will be made to let you know what was and was not an acceptable score on the material that is handed back to you. Students should be forewarned that grades below 50% are not uncommon

on individual quizzes and taken by themselves are not disastrous (providing there are other grades to lift the overall average). An *estimate* of your current grade will be distributed after the midterm is returned. Please remember that this is only an *estimate*.

A grade of “I” will only be given in emergency situations and only if at least 75% of the work is completed satisfactorily. *Note that a grade of “I” cannot be given simply to save a grade point average! There must be a REASON for requesting an incomplete.*

A grade of “P” or “NC” can only be given if requested in writing at the registrar’s office before the deadline printed in the quarterly schedule. Students should know that completion of a course with a grade of “P” is usually *not* considered completion of a prerequisite for another class.

Students are NOT obligated to tell their instructors when a course is being taken for a P or NC grade!

Late homework, exams, etc.:

Exams and quizzes cannot be made up except in extraordinary circumstances. If a student knows that a forthcoming exam will compete with an urgent scheduling conflict, the student must notify the instructor *in advance!* In some cases it will be possible to make special arrangements for that student.

Homework will be accepted up to two days after it is due, but a deduction will be made of 10% of the total possible points (depending on the nature of the assignment).

Due to the nature of laboratory work, it will often be impossible to make up a late laboratory. Again, students who know of their inability to attend a specific lab should tell the instructor in advance.

Material Covered:

The schedule for material covered in this course will be roughly the following (SP = Smart Physics):

Time:	Subject:	Assignment(s)
WEEK 1:	Science, Measurement, Units, Coordinates	HW 1 (from Keith)
WEEK 2:	Position, Velocity, and Acceleration	SP unit #1 and start #2
WEEK 3:	2D motion and relative motion	SP units #2 and #3
WEEK 4:	Intro to Newton's Laws	SP unit #4
WEEK 5:	Forces in many dimensions	SP unit #5
WEEK 6:	Interactions with friction	SP unit #6
WEEK 7:	Work and Kinetic Energy	SP unit #7
WEEK 8:	Conservative forces	SP unit #8
WEEK 9:	Potential Energy	SP unit #9
WEEK 10:	Center of mass and momentum	SP units #10 and #11
WEEK 11:	Collisions and review	SP unit #12

Material may be added or removed from the schedule as time and interest allow.

“Guests” in the classroom:

Due to GRCC policy, no one who is not either registered for the class or an employee of GRCC will be allowed in the classroom during lecture or laboratory periods. This includes children, friends, visiting students, and prospective students. The only exceptions that will be made will be in the cases of students who require the assistance of others for the completion of essential classroom tasks or for students who are registered for another section of Physics 221 but have made arrangements with their teachers to attend at a special time.

Outside help:

Physics students are encouraged to make use of tutoring services should they find the need for outside help. As of this writing, GRCC has not chosen an official physics tutor but there are many talented

students available. Physics help may be found in the tutoring center on the second floor of the Holman Library. Students who have trouble with the mathematics associated with their physics work may find additional help in the Math Learning Center (SMT 355).

Again, you are strongly encouraged to use your classmates as sources of outside help. *There is ample evidence that talking to your classmates is the best source of clarification and understanding because it will force YOU to think through your own difficulties, often removing confusion and solving problems at the same time! When all else fails, remain calm, sit back, and THINK!*

Class breaks and interruptions:

Official class breaks are required for all class periods of length two hours or longer. Since our class meetings are between one and two hours long, class breaks are optional, *and official class breaks will usually not be scheduled!*

However, if you need to leave the classroom, stretch, take a break, please do so. This is much better than falling asleep during class and disturbing your neighbors with an annoying “thud” when your head hits the table. Try to take your breaks in a manner that disturbs your colleagues as little as possible.

Discipline:

The big picture:

1. If anything happens that you feel might require disciplinary action, **please talk about it!** Talk to each other. Talk to your teacher. We will all be better off if we can settle differences without official disciplinary procedures. This section of the syllabus is about what happens if that fails.
2. **Standard Procedure:** The standard course of discipline at GRCC begins with a student’s expulsion from the classroom for **three class periods**. If those class periods include exams, quizzes, or other assignments then the student will **receive a score of zero** on those assignments. A three-day dismissal from the classroom can result from violation of any rule of conduct at GRCC or any of the disciplinary rules below.
3. **These rules apply to you!** Having said that, very few students encounter disciplinary problems in their college physics classes. Most people are reasonable. If you have a complaint about somebody, refer to rule #1 above. And don't do anything to get yourself hit by rule #2 above.

Details:

The law: You should also know that due to changes in the law, students may be *legally liable in a court of law* for words or actions that might create an atmosphere viewed as hostile by other students.

Disruptions: In accordance with GRCC policy, students who disrupt the academic atmosphere of the class will be asked to leave and will be referred to an academic dean for further action. Disruptions of academic atmosphere include any behavior that interferes with the ability of faculty or other students to perform the work necessary for this class.

Inappropriate discussion: Discussions in the classroom should concern matters relevant to the class or topics of general interest that are not demeaning or insulting. Courts have ruled that explicitly sexual discussions lead to an academically hostile atmosphere (see paragraph beginning with “The law”, above). *Comments, discussions, or actions of a racist, sexist, or otherwise degrading nature will absolutely not be tolerated. Be careful about your use of words such as gay, black, white, etc.* Again, if you feel there are inappropriate discussions in our out of class, **please talk to each other.**

Cell phones, pagers, etc: GRCC policy is that all cell phones and pagers must be turned off during class. Your teacher recognizes that emergencies do happen. If you feel you need to answer your cell phone during class, please leave the room quietly and take the call outside. You do not need to ask

permission, just try not to disturb your fellow students. Exception: During an exam or quiz you will FAIL if the instructor sees your cell phone.

Computers: The computers in the classroom are to be used only for academic purposes. Students may use them to check schedules or register for classes *only during class breaks*. While class is in session they should be used only for physics (absolutely no games!). Violation of this policy will result in expulsion from the class for three days.

Cheating: Cheating and plagiarism can cause a wide range of disciplinary actions. *If you are caught cheating on any quiz or exam, you will fail the course!* Further discipline can range from academic probation or expulsion from GRCC. Many students cheat and most of them do not get caught. However, those that do get caught are in universal agreement: cheating is not worth the risk.

Please keep in mind that you are in college to learn, and if you are cheating you ultimately only cheat yourself out of learning and skills that you would otherwise get from this class. You don't need to cheat to pass the class. Don't do it.

SYLLABUS QUIZ (Due Thursday)

NAME: _____ (please print)

PHYSICS 221 Section:

Instructions: Read the syllabus, answer the questions below, and sign the form at the bottom indicating that you have read the syllabus. Return this to the teacher on Thursday.

When are Keith's office hours? Where is his office? (How many does he have?)

What is the minimum that will happen to students caught collaborating on a quiz?

What will happen to students who are caught collaborating on homework?

Are students in this class required to own a paper textbook? Explain.

Are students in this class required to have Internet access and work online more than once a week? Explain.

A physics 221 student walks up to Keith and says, "Hey, I'm sorry I didn't get the Smart Physics done when it was due this morning. Can I turn it in tomorrow?" What's the answer?

Another student walks up to Keith and says, "Hey, I'm sorry I didn't take the quiz yesterday. Can I do it tomorrow?" What's the answer?

When is the deadline for applying for a Pass/Fail grade? (Check the quarterly schedule.)

Would a grade of "Pass" help you toward your career goals? (Okay, you don't need to answer this here, but you should know the answer for purposes of your own educational planning. A grade of "Pass" will not allow you to advance to the next physics class, nor will it be accepted by many schools of science or engineering.)

I have read the syllabus for Physics 221.
Signed,

(Signature of student)

(Date)
