

Physics 123 Section 2
Course Outline – Winter 2003

INSTRUCTOR: Lawrence Rees, N-357 ESC, BYU 422-4307

OFFICE HOURS: MWF 2:00–3:00 p.m. and by appointment.

FAQs :

Q. Which section of Physics 221 should I be in?

A. If you are a physics major, you should be in this section. If you are a physics minor, it is better to be in this section. If you are neither a physics major nor minor, you must enroll in either Section 1 or Section 3. If you have problems registering for those sections, please inform me as soon as possible and I will do everything in power to get you in.

Q. What is different about the two sections?

A. In terms of content, this section does not cover quantum mechanics, as you will take that in Physics 222. In terms of approach to subject matter, we will treat you like physicists in this section. That means we will try to emphasize ideas and approaches that you will find useful in your later career in physics. We will approach topics with a greater emphasis on physical modeling and abstract analysis tools. Our treatment of relativity is much more advanced than in the other sections.

Q. Is this section harder than the other sections?

Yes! The content is not as easy, but the workload is still commensurate with the three credit hours given.

Q. Do I need to worry about my grade?

A. No, the average grade in this section is higher. You should receive about the same letter grade as if you were in the other sections.

EXPECTED OUTCOMES:

I have designed the course so that by the end of the semester you should be able to:

1. think more like a physicist.
2. have a greater appreciation of the beauty and symmetry of physical law.
3. explain a wide variety of natural phenomena and understand the models we use to describe these phenomena
4. gain skill in applying abstract models (differential equations, phasors, etc.) to physical phenomena.

TEXTS: The texts are Serway, *Physics for Scientists and Engineers*, 5th Edition and Rees, *A Kinematic Approach to Special Relativity*. The latter is available online rather than in the bookstore. The texts are the most important learning tools that you have. On the course schedule is a list of the sections which we will be covering each day. It is **essential** that you read the indicated sections **before** you come to class. A guide to reading and studying the text will be provided with each unit.

LECTURES: Class sections will usually be lectures. These are designated with an “L” prefix on the class schedule.

Lectures are intended to help you understand physics by

1. giving you a chance to see how nature behaves through demonstrations.
2. helping you sort out the important points from the mass of facts presented in the text.
3. giving you a chance to interact with other students to come to your own understanding of the concepts.
4. giving you a second approach to the same concepts found in the text.
5. helping you learn the mathematical tools you will need. If you have a good grasp of the fundamentals and the tools, working problems is usually straightforward. You will be expected to actively participate in the classroom.

DISCUSSION PERIODS: On many days, we will have a short discussion period in class. I will give you a multiple choice question, after which you will have two or three minutes to write down an initial answer. You will then break into groups of four to six students to discuss your answers. You will record your participation in these discussion on the unit summaries that are submitted online. The quizzes will be graded for completeness only. You may be excused from quizzes if you have a legitimate reason for being absent.

UNIT SUMMARIES: For each unit, a Unit Summary must be turned in following the exam. On the Unit Summaries you will record the time spent for all aspects of the course including reading, homework, taking exams, etc. The score for the Unit Summaries will not directly affect your grade, but will add bonus points to your exam scores. These bonus points may restore up to 1/3 of the points you lost on the comprehensive and written exams. The formula for determining the number of bonus points you will receive is:

$$\text{Bonus Points} = \frac{(100 - \text{Total Test Score}) \times \text{Unit Summary Score}}{300}$$

On each Unit Summary you receive points for:

1. Homework completed. To be considered completed, you must understand a problem well. Merely copying the answer without understanding it does not constitute completion. A penalty is assessed for homework completed late.
2. Hours of study spent.

Examples of work that can be included in total hours are:

- class attendance
- reading and studying the text
- doing homework
- discussing homework solutions with other students
- doing walk-in labs
- taking the take-home exams
- studying for exams
- taking the exam in the testing center (one hour maximum is allowed)

Examples of work that you may not count:

- work done for other courses
- work for which you are paid

If you feel that you are on top of the class, you may also do optional work. This includes:

- doing optional homework (homework groups 4-5)
- discussing optional homework solutions
- doing special research (library, experimental, etc.) related to the course work

As long as it relates directly to the course material, you may do most any optional project. You may simply do a "home lab" of your own design for fifteen minutes, or you may write a paper on nonlinear optics for twelve hours. Before beginning any major project (more than about three hours), please contact me so I can judge its suitability. These projects may be done individually or in groups.

3. Reading. If you have completed your reading before class you may receive credit for completed reading.
4. Quizzes. You will receive points for completed quizzes.
5. Walk-in Labs. Points are also given for completion of walk-in labs.

For each unit, a unit score will be tabulated and turned in on a "Unit Summary" form. Note that the various components of the unit score are weighted as follows:

- Homework – 25 points
- Hours – 70 points
- Reading – 10 points
- Quizzes – 10 points
- Walk-in labs – 15 points

WALK-IN LABS: Several short laboratory experiments will be set up in S415 ESC. Please carefully check the class schedule (prefix "W") to find the dates when each lab will be set up. A one page worksheet (handed out with the course materials) is due on the Monday following the lab.

TAKE-HOME TESTS: Five take-home tests will be given. I will give you a copy of the take-home test at the start of each unit. Take-home tests will be due at the **beginning** of each test review. The review dates are labeled with an "R" prefix on the class schedule. Late tests will be accepted at full credit only in the case of illness or university excused absence. Other late tests will receive a 20% penalty in your score you turn them in within two days of the due date. (After that time, you will need to come talk to me.) Take-home tests will **not** be returned before the exam. If you wish, you may copy your take-home test for review purposes. The tests will each consist of four "terminology questions,"

three “conceptual application” (multiple choice) questions, and four problems. It is **strongly** recommended that you work on the test during the course of each unit rather than waiting to the end to finish it.

Carefully note the following rules for the take-home tests:

- 1) There are no time limits.
- 2) You may use **only** the following helps:
 - any published materials
 - calculator
 - anything you have personally written
 - class handouts
- 3) You may **not** do the following
 - look at other students’ work
 - discuss take-home test questions with **anyone** else
 - look at take-home tests from previous semesters
 - share your take-home tests with other students after the semester is over

You may discuss general course material including homework problems, lectures, and the texts with other students or TAs; but you may not discuss specific test problems. If you have doubts about whether a question should be asked, then ask me the question.

UNIT TESTS: Five unit tests will be given during the semester. The dates for these tests are listed on the course schedule. Please note the following:

- 1) Unit Tests 1–4 will be administered in the testing center.
- 2) The Unit 5 Exam will be administered as part of the final exam session.
- 3) Each test will closely resemble the unit take-home exam.
- 4) No notes nor books will be allowed.
- 5) Calculators are allowed, however, you are **not** permitted to use any information stored in your calculators.
- 6) You are permitted to use scratch paper.
- 7) There will be no time limits on the Unit Tests. You should allow yourself approximately ninety minutes.
- 8) The tests will not be comprehensive.
- 9) Examinations may be made up or taken at a different time only in case of emergencies. Please contact the instructor prior to the exam date if possible.

FINAL EXAM: During the final exam period, you will take both the Unit 5 Exam and the Final Exam. The final exam will be comprehensive. It will consist of matching questions, short-answer questions, and short problems. This exam will be given in the classroom, C285 ESC at 2:30 p.m. – 5:30 p.m. on Wednesday, April 23.

TUTORIAL LAB: You are encouraged to use the Tutorial Lab in Room N-362 ESC to obtain individual help and to work with other students. Teaching Assistants will be available throughout most of each day.

DISTRIBUTION CENTER: The distribution center is located in the hallway near N-375 ESC. We place work being returned to you in the pigeon-holes labeled by the first two digits of your CID number. Walk-in Labs and Unit Summaries may be turned in during class or left in Physics 123 Section 2 slot (in the right-hand group of slots) in the distribution center.

GRADING: The final grade will be based on the following:

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|-----------------------------------|----------------|
| • Unit Test 1 (bonus included) | 10% |
| • Unit Tests 2–5 (bonus included) | 60% (15% each) |
| • Take-home tests | 20% |
| • Final Exam | 10% |

You will receive the following letter grades (or better, if I am merciful and conditions warrant) if your overall percentage is in the indicated range:

A	94 - 100%
A–	90 - 94%
B+	87 - 90%
B	84 - 87%
B–	80 - 84%
C+	77 - 80%

etc.

Appendix. My Educational Philosophy

I realize that most students really don't care about my philosophy of education. However, a few – perhaps because they are genuinely interested in education or perhaps because they think it may help them play the game of getting a better grade – might be interested in why the course is set up as it is.

Variety of methods: Different people learn things in different ways. To be maximally effective, the course must include a variety of learning resources. Not all may be of equal use to every student. Students need to have some flexibility to work in ways that are most productive to them individually. Concepts need to be presented in a unified manner both in written and verbal form. If the written text and lectures are similar, it helps reinforce the ideas.

Experiencing phenomena: To understand physics, it is very helpful to experience physical phenomena first-hand. Classroom demonstrations and walk-in labs help. Real-world examples help. Nothing can substitute for being curious about the world around you.

Why physics is hard: Many college students are only beginning to learn how to deal with the world in terms of abstract ideas. If it is of any comfort, most people never gain much proficiency in abstract thought. What makes physics particularly difficult is that abstract symbols represent physically measurable reality. The process of symbolically representing nature is very difficult for most students.

Concepts and problems: To understand physics, you must first understand basic ideas. Many students feel that physics is just learning a bunch of equations, but nothing can be farther from the truth. Professional physicists tend to create their own equations each time they approach a new problem. Equations are an outgrowth of fundamental understanding, not vice versa. Once a concept is learned and represented as an equation, the culminating act of solving problems can be performed. The working of problems refines and strengthens conceptual understanding. Concepts cannot be mastered until problems are worked.

Active learning: Most ideas can only be introduced by passive means. Active reinforcement is essential. Class discussions help fill this role. It can be very productive for students to work in study groups, but these groups often fail when they are formally structured. I encourage you to work together in groups, but I will leave it up to you to organize the groups yourselves. You are encouraged to use Blackboard 5 for this purpose. Homework can be active or passive, depending on how you use it. If you just analyze solutions, you will never be able to work problems yourself. Confronting problems head-on forces you to understand how ideas relate to the things that can be measured and observed in nature. Quizzes, tests, etc. are inherently active and play an essential role in learning.

Feedback: Immediate feedback strengthens learning. Multiple-choice quizzes and test questions, while not the best measure of actual understanding, can provide some prompt feedback. If you miss a multiple-choice question, you should analyze why you missed it. Many students are quick to blame the problem rather than to look for weak spots in their own understanding. You should take advantage of homework solutions to evaluate your own work as soon as you finish each assignment. Better methods of active feedback are presently being researched and implemented.

Grades: Grades should reflect mastery of core material. They should neither be a measure of how hard a student tries nor a measure of their potential to succeed. Evaluation instruments (such as exams) should primarily test concept mastery. Most of the problems should be applications that are familiar from class discussion, review sessions, homework, etc. Grades then should be based primarily on work done at the culmination of a learning cycle and should represent individual efforts. So that I can keep problems straightforward and results independent of the quality of notes, I do not allow notes, books, or other resources during exams. A good grade is the natural outcome of motivated learning. Paranoia over points often gets in the way of learning.

Incentive grades: Unfortunately, many students refuse to take assigned work seriously unless a definite grade is attached. I therefore give grades for quizzes and walk-in labs. Additionally, I provide incentive for students who are struggling to put more hours into their study rather than to give up in frustration.

LEGAL NOTICES:

The University suggests that the following statements be included in all course outlines. Please note that I fully endorse these policies.

Sexual Harassment

Title IX of the Education Amendments of 1972 prohibits discrimination on the basis of gender against any participant in an educational program or activity that receives federal funds. The act is intended to eliminate sex discrimination in education. Title IX covers discrimination in programs, admissions, activities, and student-to-student sexual harassment. BYU's policy against sexual harassment extends not only to employees of the university but to students as well. If you encounter unlawful sexual harassment or gender based discrimination, please talk to your professor; contact the Equal Employment Office at 378-5895 or 367-5689 (24-hours); or contact the Honor Code Office at 378-2847.

Students with Disabilities

Brigham Young University is committed to providing a working and learning atmosphere which reasonably accommodates qualified persons with disabilities. If you have any disability which may impair your ability to complete this course successfully, please contact the Services for Students with Disabilities Office (378-2767). Reasonable academic accommodations are reviewed for all students who have qualified documented disabilities. Services are coordinated with the student and instructor by the SSD Office. If you need assistance or feel you have been unlawfully discriminated against on the basis of disability, you may seek resolution through established grievance policy and procedures. You should contact the Equal Employment Office at 378-5895, D-282 ASB.