INSTRUCTOR: Clark G. Christensen, N482 ESC, 422-2207, cgc@byu.edu. Office hours, MWF 2:00-3:00 pm. Your grader is Tomo Baba, tomonoribaba@gmail.com. Your Walk-in Lab instructor is Nils Otterstrom, nils.otterstrom@gmail.com.

TEXT: Serway & Jewitt, Physics for Scientists and Engineers, 8th edition, Volume 1. Edition 7 is nearly identical to Edition 8 except that section 9.2 of Edition 7 has expanded to become sections 9.2 and 9.3 in Edition 8. Earlier editions and even other calculus-based mechanics texts are also fine in their treatment of the subject matter, but, if using an older edition or different text, you will need to exercise care to make sure you are reading about the same topic as the rest of the class. (There have been other modifications in section partitions, numbers and order in Serway & Jewitt editions.) The text is not the complete course. We will deal with some ideas which are either not in the text or are treated with different emphasis in the text. There are copies of the text in the tutorial lab. The text includes a "Student Tools CD-Rom" inside the back cover. This should be included if you sell the book back to the bookstore as a used book. However, it is not required for the course.

OPTIONAL BOOKS: Kleppner, Quick Calculus is a good math review, particularly for those who have been away from serious math for awhile. It is available in the reserve library (QA303 .K665 1985) and in the bookstore. The bookstore typically stocks other optional materials offered by the publisher which could be useful to you.

SPECIAL SITUATIONS: If you are repeating the course for any reason, or if you are on academic probation, or if your situation is unusual in any way, please see your instructor during the first week of the semester.

PHYSICS 121 ID NUMBERS: Your work in the course is recorded and published using a personal 'Physics 121 ID number' which you have probably received by e-mail. "Getting Started" tells you how to get one if you have not received it or if you do not remember it.

QUIZZES AND I-Clikcers: In every class period you will be quizzed electronically, sometimes more than once. To take these quizzes you will need to buy an i-clicker (available in the BYU Bookstore) and bring it to class every day. The quizzes will focus on the day's assigned reading material as listed in the class schedule and also material covered in class. Some quiz questions may require simple calculations, some will be conceptual. Since you might reasonably have to miss an occasional class, we adjust your quiz total to allow you up to three absences without any adverse effect on your grade. Since possible quiz points vary from class period to class period, we adjust your quiz total, not by dropping your three lowest scores, but by giving you the maximum possible scores, on the three quizzes on which you have lost the most points. This means that you can miss three class periods with minimal direct effect on your grade. Some quiz questions will be unscored. However there will always be one point given for participation, both on an otherwise unscored questions and on scored questions which you answer incorrectly. You will receive two points on scored questions which you answer correctly. Quizzes are intended to provide incentive to (1) attend class regularly and (2) on time, (3) stay current on reading assignments, and (4) keep engaged in the current day's lecture. There will be a longer, more heavily weighted than normal quiz, dealing primarily with the syllabus and course website, given on Friday, May 2.

LEARNING OUTCOMES: We shall study the ideas and structure of Newtonian mechanics. These provide the simplest entrance to modern science and technology. They are also perhaps the best example of rational thought in western civilization. The organized thought processes are as important to you as the details of mechanics. Most students in Physics 121 are beginning serious study in one of the technical disciplines in science or engineering. The career choices in these fields are quite diverse; this course will probably help you to learn more about yourself so that you can make a wise decision for future study. Specifically, after successfully completing this course you should be able to:

- Convert quantities from one set of units to another.
- Express numerical answers using a reasonable number of significant digits.
- Compute a particle's classical translational motion in one or two dimensions, including particles in circular motion, in response to simple forces.
- Use the ideas of energy, work and power to arrive at conclusions about the motion of a system.
- Use linear momentum to describe the motion of a system of particles.
- Compute the rotation of a rigid body about a fixed axis in response to simple torques.
- Relate the forces on objects in static equilibrium and in motion.
- Compute the motion of objects and planets moving in response to the gravitational force.
• Compute the motion of objects in simple harmonic motion.

**TIME:** Physics 121 is a time-intensive class. There will not be a time during the semester when you do not have something to do for Physics 121. Plan on about 30 hours per week. Some students will need much more and a few will need less. Plan for more if you have not had previous calculus and physics courses, if your math skills are rusty or weak, or if your physical intuition is not well-developed. Your best indicator may be how well you did on the 'story problems' in earlier math and science courses. We can help you develop your skills, but plan on more time. You should probably take the course another semester if you do not have this much time now. You will have more to do than many of your friends in other disciplines. Welcome to the real world of science and technology! This will be one of the least-demanding professional courses you will take–ask any upper-division student in your professional field. You probably should consider another career choice if the time requirements here seem onerous to you.

**MATH PREPARATION:** We presume that you can do algebra and trigonometry, at the level of Math 110, without undue effort and without significant errors. Almost all the items in Appendix B of the text should be familiar and usable. The appendix is in the form of a math review; it would be good for you to spend some time with it as we begin so that you know where to get some help if you need it later. You should have taken, or now be taking, a beginning calculus course (Math 112 or 119 or equivalent). We presume that you have taken an earlier calculus course. However you can do well if you are taking calculus concurrently if your algebra skills are quite good; otherwise you should postpone Physics 121 until you have completed introductory calculus. If you have not seen calculus and decide to stay, you'll have to request help. If you find that you must choose between physics and math this semester, it is always wise to do the math first.

**PHYSICS PREPARATION:** If you have not taken a high-school or college physics class, you are in a remedial mode and will have to work harder and longer than some other students. Many students without a previous physics course succeed every semester; some should take a preparatory course, perhaps Physics 105.

**CALCULATOR:** You will need a simple scientific hand calculator. An adequate one will not be expensive. It will be helpful if your calculator stores functions and plots curves, but you can easily get along without such amenities. We encourage you to use the most powerful calculator or computer available to you, but you need to explain what you have done when you use a stored program on homework and exams.

**LECTURES:** Lectures will not be a repetition of the text. We will presume that you have already studied the sections of the text indicated on the class schedule. Many important details will not be discussed in class; rather we will use the lecture time to organize, emphasize, and illustrate the most important ideas for you. Some classroom time will be devoted to experimental demonstrations. We will also outline some problem-solving strategies that we have found to be helpful. Most, perhaps all, classes will include short iclicker quizzes based on the scheduled preparation or class discussions.

**HOMEWORK:** Physics is 'learned' only by doing it; watching someone else, professor or classmate, has no lasting effect. Many, but not all, of the important techniques and ideas are the subject of the homework assignments. Most homework is submitted on-line, but a few problems require submission of some paper work. Papers are submitted in the Physics 121 slots in the box across the hallway from N373 ESC. Doing homework is the most time-consuming, but also the most effective activity we know for learning physics. The details of homework procedures and rules and the homework assignments are accessed by clicking on 'Homework' either here or on the course webpage.

**POSTED SOLUTIONS:** Solutions to some homework problems and exams will be posted in display cases in the hallway near N361 ESC. These are for your review or study and are not to be copied; photo-copying our posted solutions without permission is a violation of US copyright law. (You may make personal notes.)

**WALK-IN LABS:** Weekly experiments (2 experiments during most weeks) are to be done in the Walk-in Lab, S415 ESC. The equipment will be available anytime that the building is open. Go to the lab, do an experiment, and calculate your results. Then hand in the report to the slot just inside the door of the lab itself, according to the first digit of your CID number. The building is closed on university holidays and the lab will not be available. Come to the lab on or before the day designated for you on the schedule. Your report is due that evening. (To determine 'your day' read footnote #3 at the bottom of the Term Schedule. You may do the lab any day it is available if 'your day' falls on a holiday. The labs are scored on the basis of your experimental results and on the quality of your analysis, about half the credit for each.

Written instructions and lab report forms for each experiment are found by clicking on the Walk-In Laboratory Schedule on the course page, then clicking on the appropriate lab title on that schedule. You are allowed to collaborate (in groups of up to 3) in the collection of experimental data in the lab. Instructions found on some of the lab report forms suggest that you may also collaborate in writing your reports. This is not the case! You may discuss your results and all aspects of your experiment with your laboratory partners. However each of you should write his/her own report. Your data should be identical with that of your lab partners, but beyond that, your lab report
should be composed entirely and independently by you (after the allowed discussion). Please give the names and CIDs of your collaborators in your report.

You can get help with nonfunctioning equipment, during normal university office hours, by following the instructions in the lab, or contact Bro. Freeman Anderson at 422-5393 (or in room N490 ESC).

Late lab reports receive no credit since the equipment is taken down after the deadline. The only reason for doing a 'lab' is to apply the theory to real pieces of equipment. It is not the same as homework, which is always more abstract. Newton put Physics on a firm foundation of experiments - these are your experiments! (Don’t be surprised if you find that you enjoy the labs either much more, or much less, than the rest of the course. Such is the case with many professional physicists, many of whom focus almost entirely upon either theory or experimentation.)

Links to detailed descriptions of each lab assignment are found on the Walk-In Lab Schedule. (You will also find there a lab “Code” link. This link is for the people who set up the lab and you needn’t even visit it. However, a few of you may be interested in equipment lists and set-up instructions. If so, it is there for your perusal.)

TUTORIAL LAB: Teaching assistants (more advanced students) will be available in the Tutorial Laboratory, N304 ESC, to help you with physics-related questions. The room is open whenever the building is open, but TA's are only present during certain hours which we will post. The Tutorial Lab is not a study hall. It is a place you can come to get help on problems you have already worked on. It is not a place to do your homework, although there is some table space available to finish or write up problems to hand in. The Tutorial lab is open, with fewer TA's, during the reading days and will be closed during final exams.

COLLABORATION: You may study with other students; in fact, we encourage you to form study groups. However, you should not use or submit completed homework solutions simply provided by other students or some other source. Submitted work needs to be with your understanding and in your own writing in those cases where written work is to be submitted. You certainly should collaborate to get understanding.

Exams, of course, are not collaborative projects; you must do them without outside help. In general, we encourage students to engage in group discussion and collaborative learning. Students are encouraged to work together on homework, prepare for exams together, and learn from each other. Today's engineering efforts require teamwork and collaboration to achieve success, and employers will often want to see this in their job applicants. So start now, have fun, learn, and meet fellow students on a more personal basis.

MIDTERM and FINAL EXAMS: There are three 'midterm' exams administered in the Testing Center on dates given in the class schedule. Each midterm is available for three days, the third day of which is considered a "late" day and for which a penalty fee will be assessed. You can expect questions and problems covering a wide range of difficulty, some simpler than the homework problems, some similar to the most complex, and a few that will ask you to extend the ideas to new situations. The exam questions will often require strategies from several parts of the text; the homework problems are usually more limited.

These exams are closed book and notes except for an "Exam Formula Sheet" which you may examine and print by clicking here and on which you may put your own handwritten collection of information (whatever notes you wish!). This is a chance to summarize, for yourself, what you think is important. Photocopied information is not appropriate. To take your exam you will need to take to the Testing Center your Exam Formula Sheet, a calculator, paper and your choice of pencil or pen. Laptops are forbidden. There are no time limits. However, do check the hours of the Testing Center. They are generally shorter in the Spring and Summer than during Fall and Winter. Our objective is to allow each of you to do an honest exam under circumstances that allow you to do well.

The final exam will be given at the Testing Center on the days indicated in the schedule. No exams will be given outside of that date and time. It will be an 'answers only' multiple-choice format exam so that you can get early results. Instructions for the submitting your answers will be printed on the final exam. Please read them carefully.

EMERGENCIES and MAKEUP: Please contact your instructor as soon as you know of any emergency circumstance that keeps you from meeting the class schedule. We can work around approved difficulties, but please let us help you plan how to proceed once the normal flow of class work is interrupted.

APPEALS: Any appeals for homework or exams must be submitted in writing (or discussed with the instructor). For homework appeals, briefly describe the nature of the grievance: clerical errors, scoring disputes, etc. Appeals should be submitted within 7 days of the date that the homework or exams were turned back to the class.

INCOMPETES: If you find that you cannot complete the course before the end of the semester because of a non-academic emergency, you may want to petition for an "I" (incomplete). If you are considering this option, please click here and read the university policy on incompletes. The university regulations are quite stringent, and there are sometimes other ways to work around a problem. We encourage you to take an incomplete grade only as a last resort. Your instructor has observed that the majority of students who have taken the "I" grade in his classes have ended up failing rather than submitting the required work.

ANNOUNCEMENTS: On occasion, we will post announcements and instructions on the message board on the course title page. We will assume that you are informed of these announcements within two school days of their posting. We
reserve the right to make changes in any part of this document if they are advertised as stated on the bulletin board.

**WWW SCORES:** You may check your current scores on the web at [https://cas.byu.edu/cas/login?service=http%3A%2F%2Fgardner.byu.edu%2Fphp%2Fscores.php%3Fcourse%3D121sp](http://https://cas.byu.edu/cas/login?service=http%3A%2F%2Fgardner.byu.edu%2Fphp%2Fscores.php%3Fcourse%3D121sp) or by using the link below “Scores and Current Grade” on the course website title page. You should check them regularly—especially during the final exam period—to be sure that your scores are correctly recorded. The posted scores are updated every night. The computer-generated grade is merely an interim estimate.

**BYU STANDARDS:** Each of you has signed a pledge to maintain BYU standards including those of honesty, respectful treatment of others, and modesty and dignity in dress and grooming. Your instructor is also fully committed to those standards and expects, as a matter of honor, that the conduct of all class members will be in conformity with those standards. (In recent semesters the most common dress and grooming violations have involved unshaven facial hair on men and exposed cleavage on women. Thank you for not embarrassing us both by requiring me to address you concerning such a violation.) Academic honesty means, most fundamentally, that any work you present as your own must in fact be your own work and not that of another. Please call the Honor Code Office at 422-2847 if you have questions about these standards.

**SEXUAL HARASSMENT:** If you encounter sexual harassment or gender-based discrimination, please talk to your professor, contact the Equal Employment Office (422-5895), or contact the Honor Code Office (422-2847). BYU’s policy against such harassment extends to all members of the university community.

**STUDENTS WITH DISABILITIES:** Please contact the Services for Students with Disabilities office (422-2767) if you have any disability that may adversely affect your success in this course. BYU provides reasonable accommodation to qualified persons with disabilities. Services are coordinated through that office.

**A NOTE ON HONESTY:** We all know that there are several ways to receive an undeserved high grade in a course without doing assigned work and without knowing very much. Those who use these strategies will be punished by inexorable, irrevocable, and immutable laws of human intellectual development. Unless repented of, such habits invariably lead their victims to become professional and intellectual parasites. If you are caught in this trap, we invite you to repent now before the consequences become more obvious to everyone.

Please do not copy posted exams and solutions to homework problems and exams. Since these can only be obtained dishonestly, we presume that you would not use such material, if you were to encounter it. Copying and using such items is a very inefficient way to study the course material and to develop intellectually. Please let us help you design more effective strategies.

We sometimes use exam questions from previous semesters. If you encounter an exam problem you have seen before, go ahead and solve it, but indicate at the top of your solution that you have seen it before.

**GRADS:**

### GRADING WEIGHT SCALE

<table>
<thead>
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<th>Item Category</th>
<th>Number</th>
<th>Average Weight/Item</th>
<th>Total Weight</th>
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<tbody>
<tr>
<td>Homework</td>
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<tr>
<td>Quizzes*</td>
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<td>7%</td>
</tr>
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<td>Walk-In Labs</td>
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<td>8%</td>
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<td>Midterm Exams</td>
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<tr>
<td>Final Examination</td>
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<td>20%</td>
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*The scores for individual quizzes are variable. In this row the given value for the average weight/item is the average weight/class period, taking into account that the three lowest-score days are excluded from the total.*
LETTER-GRADE SCALE

<table>
<thead>
<tr>
<th>Guaranteed Grade Scale</th>
<th>if your numerical score (%) is at least</th>
<th>then you are guaranteed a letter grade of at least</th>
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<tbody>
<tr>
<td>A</td>
<td>86</td>
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<tr>
<td>A-</td>
<td>82</td>
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<tr>
<td>B+</td>
<td>78</td>
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<tr>
<td>B</td>
<td>74</td>
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<tr>
<td>B-</td>
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<tr>
<td>C+</td>
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<td>C</td>
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<td>C-</td>
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The grades are normally assigned on the basis of a class curve with grades of A and A- going to the top 20 to 25 per cent of students, grades of B+, B or B- going to the next 30 to 40 per cent, etc. The actual grade breaks are made where there are naturally occurring gaps in the score distribution so the percentages in each group are somewhat variable. After your grade is determined from the class curve, your grade will also be determined from the above guaranteed grade scale. You will be given the higher of these two grades. (Thus, in the unlikely event that everyone in the class earns more than 92 per cent of the possible points, everyone will be given an A grade regardless of position on the class curve.) Since the grading scale above is based on past class curves, you can expect that it will come close to predicting your grade, but often students fare a bit better than predicted by this scale.

Occasionally, by special request, we use weights other than those given above for students with special circumstances or unusual preparation. Such arrangements must be made with your instructor at the beginning of the term. Be sure to get a written agreement.