Approved by Undergraduate Education 7/13/2011 Sharon Gill

General Education Course Submission Form

Date of Submission: May 5, 2010

1. **Check which area(s) this course applies to.**

Inquiry – Arts & Creativity		Composition & Communications - II	
Inquiry – Humanities		Quant Reasoning – Math	
Inquiry – Nat/Math/Phys Sci	X	Quant Reasoning – Stat	
Inquiry – Social Sciences		Citizenship – USA	
Composition & Communications - I		Citizenship - Global	

2. **Provide Course and Department Information.**

Department: Department of Physics and Astronomy

Course Prefix and Number: PHY231 + PHY241 Credit hours: 4+1

Course Title: PHY231-- General University Physics PHY241-- General University Physics Laboratory

Expected Number of Students per Section: 25 Course Required for Majors in your Program? Yes

Prerequisite(s) for Course? None

This request is for (check one): A New Course [ ] An Existing Course [X]

Departmental Contact Information

Name: Kwok-Wai Ng Email: kwng@uky.edu

Office Address: CP171 Phone: 257-1782

3. **In addition to this form, the following must be submitted for consideration:**

- A syllabus that conforms to the Senate Syllabi Guidelines, including listing of the Course Template Student Learning Outcomes.
- A narrative (2-3 pages max) that explains: 1) how the course will address the General Education and Course Template Learning outcomes; and 2) a description of the type(s) of course assignment(s) that could be used for Gen Ed assessment.
- If applicable, a major course change form for revision of an existing course, or a new course form for a new course.

4. **Signatures**

Department Chair: _____ Date: 5/13/10

Dean: Anna R. K. Bosch _____ Date: 8/5/10

College Deans: Submit all approved proposals electronically to:
Sharon Gill Sharon.Gill@uky.edu
Office of Undergraduate Education

Explanation:

PHY241 is the laboratory component of the PHY231 General University Physics. These two courses have to be paired together for GenEd compliance.

PHY231 + PHY241 "General University Physics": Learning Outcomes

1.Describe methods of inquiry that lead to scientific knowledge and distinguish scientific fact from pseudoscience.

For example, the importance of the contributions of Galileo, regarded as the father of modern science, is highlighted in this course. Prior to his innovative combination of experiment and mathematics, the natural philosophy of the time was qualitative and speculative and in many ways similar to pseudosciences like astrology and alchemy.

2. Explain fundamental principles in a branch of science.

A core goal of the course is to explain fundamental principles. For example, in this physics course a central role is played by Newton's laws which are the most fundamental laws of mechanics.

3. Apply fundamental principles to interpret and make predictions in a branch of science.

This is a highly-emphasized complementary goal to the exposition of the fundamental principles and is the most extensively tested on examinations. For example, Newton's laws are applied mathematically to solve trajectory problems such as determining where a baseball lands if thrown with a certain velocity.

4. Demonstrate an understanding of at least one scientific discovery that changed the way scientists understand the world.

Galileo's experiments suggested that, under idealized conditions, all bodies fall with the same acceleration. This discovery led to Newton's laws of motion which revolutionized natural philosophy. These laws were the first to give a mechanistic framework of how the universe works.

5. Give examples of how science interacts with society.

Our technological society would not be possible without physics. The mechanics taught in PHY 231 serves as the ultimate foundation of our technological-scientific world view.

6. Conduct a hands-on project using scientific methods to include design, data collection, analysis, summary of the results, conclusions, alternative approaches, and future studies.

This is the essence of the laboratory component of the PHY 231/PHY 241 pairing. During each of the five laboratories conducted each semester students will explore, compare and contrast different methodologies for gathering data on a particular phenomena such as the acceleration due to gravity. They will look at both automated and manual collection of the data required, analyzed the methodology and equipment used to determine the uncertainty in the initial measured parameters and then propagate these uncertainties to ascertain the precision and accuracy of a particular experimental method. They will conduct a detailed comparative analysis of the experimental methods applied and report on their findings, drawing relative conclusions and if needed applying alternate approaches and secondary analyses to obtain results more consistent with their initial hypotheses.

7. Recognize when information is needed and demonstrate the ability to find, evaluate and use effectively sources of scientific information.

Throughout the semester the students will find that information required to conduct the experiment and analyze the results will not be provided in the confines of the laboratory, in these cases the students will need to go to external sources such as the science library and various Internet sites to research and record critical informational elements needed to complete the experiment.

PHY231

University Senate Syllabi Guidelines

General Course Information

- [X] Full and accurate title of the course.
- [X] Departmental and college prefix.
- [X] Course prefix, number and section number.
- [X] Scheduled meeting day(s), time and place.

Instructor Contact Information (if specific details are unknown, "TBA" is acceptable for one or more fields)

- [X] Instructor name.
- [TBA] Contact information for teaching/graduate assistant, etc.
- [X] Preferred method for reaching instructor.
- [X] Office phone number.
- [X] Office address.
- [X] UK email address.
- [X] Times of regularly scheduled office hours and if prior appointment is required.

Course Description

- [X] Reasonably detailed overview of the course.
- [X] Student learning outcomes.
- [X] Course goals/objectives.
- [X] Required materials (textbook, lab materials, etc.).
- [X] Outline of the content, which must conform to the Bulletin description.
- [X] Summary description of the components that contribute to the determination of course grade.
- [X] Tentative course schedule that clarifies topics, specifies assignment due dates, examination date(s).
- [X] Final examination information: date, time, duration and location.
- [X] For 100-, 200-, 300-, 400-, 400G- and 500-level courses, numerical grading scale and relationship to letter grades for *undergraduate* students.
- [N/A] For 400G-, 500-, 600- and 700-level courses, numerical grading scale and relationship to letter grades for *graduate* students. (Graduate students cannot receive a "D" grade.)
- [X] Relative value given to each activity in the calculation of course grades (Midterm=30%; Term Project=20%, etc.).
- [X] Note that undergraduate students will be provided with a Midterm Evaluation (by the midterm date) of course performance based on criteria in syllabus.
- [X] Policy on academic accommodations due to disability. Standard language is below:

  If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours. In order to receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center (Room 2, Alumni Gym, 257-2754, email address jkarnes@email.uky.edu) for coordination of campus disability services available to students with disabilities.

Course Policies

- [X] Attendance.
- [X] Excused absences.
- [X] Make-up opportunities.
- [X] Verification of absences.
- [X] Submission of assignments.
- [X] Academic integrity, cheating & plagiarism.
- [X] Classroom behavior, decorum and civility.
- [X] Professional preparations.
- [X] Group work & student collaboration.

Physics 231
General University Physics
Fall 2011

Lecture Location:	Room 155, Chem-Phys Bldg.
Lecturer:	Prof. Terrence Draper
Office:	Room 389, Chem-Phys Bldg.
Office Hours:	MWF 11:05 AM – 11:55 AM
Telephone:	257-3413
E-mail:	draper@pa.uky.edu

Please read this entire syllabus carefully, and refer to it often. If you have any question about the structure or administration of the course, you are likely to find the answer here.

There are two different lectures (9AM for odd recitation section numbers, and 10AM for even) which are logically separated. Make sure that you attend the lecture in which you are registered and that you take the exams at your scheduled time (to get credit for them). Also, attend the recitation section to which you have been assigned. Since there are several recitation sections which are held simultaneously, learn your recitation section number, your meeting time and place (see the SCHEDULE OF CLASSES) and your recitation instructor's name.

Sections:	001, 003, 005, 007, 009	002, 004, 006, 008, 010
Lecture Times:	MWF 9:00 AM – 9:50 AM	MWF 10:00 AM – 10:50 AM

Course Description

PHY 231 is a general education compliant, introductory physics course for science and engineering students. In PHY 231, students will study the subject of *mechanics*. A primary aim of this course is to show you that physics can explain much of the natural universe from a few fundamental principles. You will learn how to apply some of these principles with the use of mathematics to interpret and make predictions about the motion of objects. The laws of physics as we know them today were developed over centuries by towering intellects who had brilliant insights. You will learn how Galileo was among the first to replace qualitative and sometimes untenable explanations (what we would now call "pseudoscience") with reasoning based on mathematics and experiment, and how his scientific discoveries contributed to Newton's grand paradigm which truly altered humankind's understanding of the universe, and which germinated today's technological society. Understanding and applying the basic laws of mechanics (using appropriate mathematics such as algebra, trigonometry, and calculus) will be the primary objective of this course, and a demonstration of one's understanding and proficiency at solving mechanics problems will be extensively tested in homework, in quizzes, and in examinations. To succeed, it is essential that you think analytically, and retain, organize and employ facts purposefully, critically, and effectively. Another goal is for you to strive to harness this way of thinking to help you understand, assess, appreciate and criticize modern science and technology.

A good scientist or engineer must possess knowledge of their discipline, *and* be able to communicate that knowledge effectively. You are expected to make *clear, coherent, and orderly* presentations of the physics principles involved in your solution to problems in exams, using not only equations and numbers, but also words and diagrams!

PHY 241 is the companion laboratory course. In it you will do several hands-on projects using scientific methods to verify some of the principles we discuss in PHY 231. In both courses you will need to find, evaluate, and use effectively information. Your laboratory reports will include a record of your data collection and analysis, and a summary of results from which you will draw conclusions. For logistical reasons, the laboratory PHY 241 is administered as a different course with a different instructor. You are strongly encouraged to take the lecture and laboratory concurrently.

Textbook and Ancillaries

The textbook for the course is **Physics for Scientists and Engineers**, *Eighth Edition*, by Serway & Jewett. One of the most important strategies for successfully learning the material (and getting a good grade) is for you to read the corresponding sections of the text **before** you come to class, as lectures will be spent expanding on the textbook's content.

The textbook is available bundled with a *PassCard* which contains an access code (for each of two semesters) for *WebAssign*, the on-line homework system we will use, and a rebate coupon to partially defray the cost of a "clicker" (described below) for the lecture response system. If you buy the textbook separately, make sure you also buy a WebAssign access code (which can be purchased on-line – see below), and a *TurningPoint* Radio Frequency (RF) clicker, which is available at the campus bookstores.

Web Site

Visit **http://www.pa.uky.edu/~draper/courses/phy231f11/**, the PHY 231 WEB SITE, which can also be reached from the departmental web site at **http://www.pa.uky.edu/**. Periodically, look for important announcements. Also, some of the notes presented in class will be available on the web site before and after lectures. Because of copyright considerations, some of the course material is password protected. To gain access, enter the user name and password which I will give to you in lecture. Please safeguard this information! Do not save it on any public computer. If you forget the password you will have to contact me in person. This information will not be sent by e-mail.

Class Meetings

PHY 231 meets formally for four hours per week. *You should expect to spend at least two hours studying physics outside of class for each hour you spend inside.* The entire class will meet three hours per week (MWF 9 AM or 10 AM) in the lecture/demonstration hall CP 155. The lectures will roughly follow the textbook, and will augment the reading assignments; I will assume that you have read the assignment **before** coming to class. Unless explicitly mentioned in class, students are responsible for **both** material assigned as reading *(even if we do not "cover it" in class)* and material presented in lecture. These lectures will be devoted to examining your current conceptions, demonstrating physical phenomena, describing quantitatively the characteristics of physical phenomena, and establishing relationships among them. These relationships are most easily expressed with calculus-based mathematics, which is why MA 113 is a concurrent requirement (and preferably a prerequisite) for the course.

Lecture time will also be devoted to teaching problem-solving skills needed to do the assigned homework. For one hour each Tuesday, smaller groups of students will meet with a recitation instructor in a recitation class (see your SCHEDULE OF CLASSES), where some of the problems from the homework set (based on the lectures of the previous few days) will be discussed and a weekly quiz given. Make sure that you take advantage of the opportunity to *ask for help* in recitation as well as in lecture, and be prepared to communicate your points of confusion to both the lecture and recitation instructors.

Examinations and Grading

Your course grade will be determined as follows:

In-class exam #1	15%
In-class exam #2	15%
In-class exam #3	15%
Final exam	30%
Lecture grade	10%
Homework grade	10%
Recitation grade	5%
Total	100%

You will receive a course grade of "A" if your total score at the end of the semester is 90% or above, a "B" for 75% or above, a "C" for 60% or above, and a "D" for 50% or above. However, these thresholds may be revised downward if the overall class average is low. After each exam, an estimate of your current letter grade will be given. A midterm grade will be sent to the registrar based on these criteria.

Lecture Grade: Physics is not a spectator sport! You will make best use of the lectures if you attempt to become actively engaged. Ask questions about what you have read and make predictions about the outcomes of real or imagined experiments. Often in lecture, we will go over several *"concept quizzes"* for credit; the purpose is to focus our attention on important concepts, and for the lecturer to receive feedback on how well the class is understanding a concept. You are likely to find some of these (or related) questions on exams. The quizzes will be administered as follows: A multiple-choice question on the lecture's material will be shown and you will given about one minute to select an answer on your own. This will be followed by a couple of minutes of open discussion with your fellow students. All students will then record their choices with the aid of a radio-frequency (RF) *"clicker"*. If the class response indicates that the concept is understood we will proceed. Each student will be awarded 3 points for entering an answer and an additional 2 points (for a total of 5) if the answer is correct.

Only a *TurningPoint* (TP) RF clicker is acceptable. This is now the campus standard, so you may already have one from another class. Otherwise, you may buy one at one of the campus bookstores, using the coupon packaged with the textbook. Older versions of clickers, such as the *Response Innovations* (RI) brand of RF, are unreliable. These and even older technologies, infrared (IR) and *Personal Response System* (PRS), are obsolete and forbidden. Once you have your clicker, it must be registered as soon as possible in order for your lecture grade answers to be accepted. See the PHY 231 WEB SITE for details.

At the end of the course, the "Lecture Grade" component of your overall course numerical score will not be affected if you miss (or otherwise do not answer) up to 20% of the quizzes (e.g. forgot clicker, clicker didn't work, absent due to illness, or absent for any other reason). This is very lenient and offers you flexibility in case you must miss lectures due to illness or university-sanctioned trips. Of course, by missing lecture you will miss information that I cannot convey in the printed lecture slides, so try to attend all lectures. If you miss a quiz because your clicker does not work, make every effort to resolve the problem as soon as possible, so you don't use up all of your eight excused absences.

Exams: There will be three fifty-minute exams and a two-hour final exam, which will be comprehensive. All exam dates are indicated on the READING ASSIGNMENT SCHEDULE. *Any student who cheats on an exam will be subject to severe disciplinary action by the university.*

If you anticipate missing an exam (for example, if you are a member of an inter-scholastic athletic team which will be out of town on the day of the exam), provide me with a written request and supporting documents (such as provided by your team) *at least one week in advance.* Notify me as soon as possible after unexpected emergencies in your immediate family. If you are physically unable to take an exam due to illness, contact me by e-mail before or very soon after the exam, and be prepared to provide documentation (a *contact phone number from a physician* or a *signed note from a university official*). *If you miss a exam without a valid excuse, you will receive a zero for the exam.*

If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours. In order to receive accommodations in this course, you must provide me with a *Letter of Accommodation* from the *Disability Resource Center* (Room 2, Alumni Gym, 257Ž0102754, email address jkarnes@email.uky.edu) for coordination of campus disability services available to students with disabilities.

If you miss a single exam with an excused absence, you will be given either a make-up exam (which will not be less demanding than the exam missed), or, at my discretion, a calculated replacement grade to restore the points lost on the missed exam. In the latter case, your grade for the missing exam will be calculated from your ranking on the other two fifty-minute exams.

If you miss the final examination or two fifty-minute exams, you may, at my discretion, get an *I*-grade *only* if you have a valid excuse and the average of your exam scores indicates a possibility of passing the course. You will have to complete the course at another time.

If you wish to submit an exam for re-grading, *first make sure that you understand how to do the problem correctly* (see the posted solutions, for example). Then, within a couple of days of receiving your exam back, provide an explanation of your request on a separate signed sheet of paper, and hand it to your recitation instructor who will forward it to the grader. Make no marks on the solution that you submit for re-grading, so that it can be compared with the photocopy on file. (Exams will be photocopied before they are returned.) *Any appeals concerning grades for exams* **must** *be resolved within two weeks of receiving your exam back. At semester's end, do* **not** *appeal to your recitation instructor for a reconsideration of a score assigned weeks previously.*

Homework Grade: Homework will be administered on-line through *WebAssign*. Go to the PHY 231 WEB SITE and follow links to register. All students will have the same generic numeric questions; however, each student has different parameters and hence different answers. Collaboration is encouraged, but rote copying of answers and random guessing will be fruitless. After the weekly homework submission deadline, you can view answers to the problems and your updated homework scores.

Please peruse the READING ASSIGNMENT SCHEDULE (RAS) for a list of topics to be covered each lecture, and for the due dates of the homework sets. About when a homework set is due, a new homework set will be available. The problems will be on material covered on a few (typically three) lectures; these are grouped between horizontal lines in the RAS. In order to keep current with the material, you should try working out the appropriate problems after each lecture and before the next. On the following Tuesday morning in recitation, the recitation instructor will discuss some of the problems pertaining to that week's homework assignment. (You are expected to participate and make this process interactive.) After recitation, continue to work out the problems off-line (some may take some time), then log back in and continue to submit answers (including retries) at your own pace (over several sessions if desired) until all of your questions are answered correctly, or until the **deadline at 5 PM, usually on either the Wednesday or Friday after recitation**, as indicated in the RAS. Answers to **all** problems should be entered, even those discussed in recitation.

To get started, you must set up and learn to use your computer homework account. You will not be able to log on unless your name appears on the UK registrar's official PHY 231 class roster. **Soon after the first lecture**, read and follow the instructions at **http://webassign.net/**. First, register yourself: click on "login" and it will ask you for your username (enter your UK "Active Directory ID"), institution (enter "uky"), and a password which I will announce in lecture. After you login, you should change your password (click on "My Options") to something convenient. After a grace period, you will need the access code from the *WebAssign PassCard* which comes packaged with your textbook. If you do not have one (because you bought the textbook elsewhere, without the code) you may purchase one on-line at your WebAssign home page. Once you're logged on, click on "Guide" to peruse the Student Instructions. Learn enough so that you can access the first homework assignment and how to submit answers. Work at least one (easy) question and submit your answer as soon as possible so that you are familiar with the technicalities of the homework service. Make sure you familiarize yourself with the scoring procedure.

Your lowest two weekly homework scores (out of a total of twelve) will be dropped before calculating the semester's homework score. You should print a copy of your scores weekly for your own records.

Our emphasis will be on an understanding of the underlying physics concepts as well as on problem-solving skills. In addition to being able to solve all of the assigned problems, you will also be expected on exams to be able to apply the concepts involved in these problems to somewhat different situations. Focus on gaining an understanding of the physical concepts involved rather than merely learning to memorize formulas and plug in numbers. This may involve qualitative and sometimes creative answers to questions or problems. It will thus be good practice for the exams if you attempt to do additional problems from the textbook. (Numerical answers to odd-numbered problems appear in the back of the textbook.)

Recitation Grade: To encourage you to keep up with the material and to motivate you to avoid postponing attempting the homework until after recitation, most of the recitation sessions will include a quiz to be taken for credit. The quiz will consist of a problem similar to one of that week's homework problems, or one which you will be able to do after having read the corresponding sections of the textbook

and having attended the recitation session.

Your lowest two weekly recitation quiz scores will be dropped before calculating the semester's recitation grade. You should make a copy of your scores weekly for your own records.

Course Evaluations

Course evaluations are an important component of our Department's instructional program. An on-line course evaluation system was developed to allow each student ample time to evaluate the course and instructor, thus providing the Department with meaningful numerical scores and detailed commentary. The evaluation window for Fall 2011 will be open for several days in November and December. To access the system during this time, simply go to **http://www.pa.uky.edu** and click on "Course Evaluation"; then follow the instructions. You will need to use your student ID number to log into the system, and this will also allow us to monitor who has filled out the evaluation. However, when you log-in you will be assigned a random number that will keep all your comments and scores anonymous.

Rights and Responsibilities

Please review the student code (http://www.uky.edu/StudentAffairs/Code/index.html) of rights and responsibilities, especially with regard to academic integrity (good), cheating and plagiarism (bad), and decorum and civility in the classroom (good).

Resources

PHY 231 is an intensive and demanding course. Consult often with your *lecturer* and *recitation instructor.* You are encouraged to ask both of them, or *any* of the other recitation instructors, questions during their posted office hours. (See the RECITATION SECTION page for a list of office hours.)

- PHY 231 WEB SITE at **http://www.pa.uky.edu/~draper/courses/phy231f11/**
  - Can be surfed from **http://www.pa.uky.edu/**, the Web Site of the DEPARTMENT OF PHYSICS & ASTRONOMY.
  - Contains important announcements you may have missed in class.
  - Contains an updated copy of this SYLLABUS, the READING ASSIGNMENT SCHEDULE, and the list of office hours for the instructors of each RECITATION SECTION.
  - Contains links to other useful sites.
  - Is a convenient place from which to e-mail your lecturer.
- TEXTBOOK WEB SITE at **http://thomsonedu.com/physics**
- HOMEWORK WEB SITE at **http://webassign.net/**
- RESOURCE ROOM in ML King Library, Room 310J
  - Is staffed several times throughout the week with teaching assistants *who are paid to answer your questions.*
- PHY 231 BULLETIN BOARD
  - Is where exam solutions and grades will be posted.
  - Is located on the third floor in the hallway closest to Rose street.
- UNIVERSITY COMPUTER ACCOUNTS
  - For assistance, contact UK INFORMATION TECHNOLOGY, Room 111 McVey Hall, 257-1300 (**http://www.uky.edu/UKIT**).

- Fellow students
  - You are encouraged to consult on in-class work and on homework problems.
  - For the homework, you must enter your own answers on-line. (The questions and answers will differ numerically from those of fellow students.) On exams and recitation quizzes, you must show only your own work, not consult with others, and not look at their papers.

PHY 231

READING ASSIGNMENT SCHEDULE

Fall 2011

#	Date	Topic	Reading	Homework
1	W 26 Aug.	Introduction		
2	F 28 Aug.	Measurement	App. B, 1.1-1.6	#1 due W 9/2
3	M 31 Aug.	One-Dimensional Motion	2.1-2.3	
4	W 2 Sep.	More 1D Motion	2.4-2.5	
5	F 4 Sep.	Constant Acceleration	2.6-2.8	#2 due W 9/9
	M 7 Sep.	**(Labor Day Holiday)**		
6	W 9 Sep.	Vectors	3.1-3.3	
7	F 11 Sep.	Vector Components	3.4	
8	M 14 Sep.	Projectile Motion	4.1-4.3	
9	W 16 Sep.	Relative Motion **(Drop Day)**	4.6	#3 due F 9/18
10	F 18 Sep.	Newton's I & II Laws	5.1-5.4	
11	M 21 Sep.	Weight; Newton's III Law	5.5-5.6	
12	W 23 Sep.	Applications of Newton's Laws	5.7	#4 due F 9/25
13	F 25 Sep.	Applications with Friction	5.8	
14	M 28 Sep.	Circular Motion	4.4-4.5,6.1	
15	W 30 Sep.	More Circular Motion	6.2	#5 due F 10/2
16	F 2 Oct.	Work	7.1-7.3	
	M 5 Oct.	**Test 1**		
17	W 7 Oct.	Work-Kinetic Energy Theorem	7.4-7.5	
18	F 9 Oct.	Potential Energy	7.6	#6 due W 10/14
19	M 12 Oct.	Force and Potential Energy	7.7-7.9	
20	W 14 Oct.	Conservation of Mechanical Energy	8.1-8.2	
21	F 16 Oct.	Non-Conservative Forces	8.3-8.5	#7 due W 10/21

- Before each lecture, read the corresponding assignment from the textbook.
- After each homework's deadline, print off the next homework assignment from the Web site (see the SYLLABUS for instructions). After each lecture, try the relevant homework problems (offline) *before* the next lecture.
- By each Tuesday recitation, you should have attempted to solve (offline) all of the problems assigned for that week, but not necessarily to have submitted answers. In recitation, you will see solutions presented to several of the problems. After recitation and before the deadline, complete your homework assignment on-line.

#	Date	Topic	Reading	Homework
22	M 19 Oct.	Conservation of Linear Momentum	9.1	
23	W 21 Oct.	Impulse & Momentum	9.2	
24	F 23 Oct.	Collisions	9.3-9.4	
25	M 26 Oct.	Center of Mass	9.5-9.7	#8 due W 10/28
26	W 28 Oct.	Kinematics of Rotation	10.1-10.3	
27	F 30 Oct.	Kinetic Energy; Moment of Inertia	10.4-10.5	
	M 2 Nov.	**Test 2**		
28	W 4 Nov.	Mechanical Energy; Rolling	10.9	#9 due F 11/6
29	F 6 Nov.	Torque **(Withdrawal Day)**	10.6-10.8	
30	M 9 Nov.	Angular Momentum	11.1-11.2,11.5	
31	W 11 Nov.	Conservation of Angular Momentum	11.3-11.4	#10 due F 11/13
32	F 13 Nov.	Newton's Law of Gravity	13.1-13.2	
33	M 16 Nov.	Motion of Planets: Kepler's Laws	13.3	
34	W 18 Nov.	Gravity: Field & Energy	13.4-13.5	
35	F 20 Nov.	Gravity: Conservation of Energy	13.6	#11 due M 11/30
36	M 23 Nov.	Oscillatory Motion	15.1,15.2,15.4	
	W 25 Nov.	**(Thanksgiving Holiday)**		
	F 27 Nov.	**(Thanksgiving Holiday)**		
37	M 30 Nov.	More on Oscillations	15.3,15.5-15.7	
	W 2 Dec.	**Test 3**		
38	F 4 Nov.	Waves	16.1,16.3,16.4	
39	M 7 Dec.	Sinusoidal Waves	16.2,16.6	
40	W 9 Dec.	Superposition & Interference	18.1,18.7	
41	F 11 Dec.	Standing Waves	18.2,18.3	#12 due F 12/11

- Through September 16, you may drop the course without it appearing on your transcript.
- Through November 6, you may withdraw from the course and receive a grade of W. After November 6, you may drop the course only for urgent *non-academic* reasons, and with the Dean's permission.
- There are two *different lectures* and thus two *different* final exams for PHY 231. You **must** go to the exam to which you are assigned.
    1. For the 9AM lecture of PHY 231 (recitation sections 001,003,005,007,009) the **final exam** is on Monday, December 14, from 10:30 AM to 12:30 PM in the lecture room (CP 155).
    2. For the 10AM lecture of PHY 231 (recitation sections 002,004,006,008,010) the **final exam** is on Monday, December 14, from 08:00 AM to 10:00 AM in the lecture room (CP 155).