

<b>Course:</b>	PHY 112
<b>Instructor</b>	Dr. N. Christensen
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<b>Phone:</b>	(309)438-5502
<b>Office:</b>	MLT 312D
<b>Office Hours:</b>	MWF 2:00-2:30
<b>WebAssign:</b>	<a href="https://www.webassign.net">https://www.webassign.net</a> Course key: ilstu 2901 1164
<b>Lecture:</b>	MWF 1:00-1:50 in MLT 309
<b>Lab:</b>	R 1:00-3:50 Computer Labs in MLT 309 Experimental Labs in MLT 217
<b>Required Materials:</b>	WebAssign access with <i>included</i> textbook. Textbook: Physics for Scientists and Engineers, 9th Edition <b>including</b> the Modern Physics chapters through chapter 46.
<b>Homework:</b>	Mostly on WebAssign Some turned in to instructor Due at the beginning of class period as scheduled or communicated in class.
<b>Exams:</b>	2 Midterms and 1 Final, All are comprehensive.

## WebAssign

Both the textbook and much homework will be done on WebAssign. You will need access to WebAssign immediately. Many of you already have “lifetime of edition” access. When you go to the WebAssign website to register, you will click on the button that says “I have a class key” and enter “ilstu 2901 1164”. This will give you access to the course materials and assignments.

Doing homework online has certain benefits to the student. The homework software will give immediate feedback. This will include whether the question was answered correctly. In some cases, it will also give guidance for what you may have done wrong. Additionally, you will have multiple attempts to answer the problem, each time with different numerical values. Working on the homework until mastery is achieved is one of the best ways to prepare for the exams.

Your textbook will be accessible on WebAssign. You do **not** need to purchase a separate print copy of your textbook. An electronic version comes with WebAssign. (If you are registering for WebAssign for the first time, you should select the option to include the textbook.)

## Grading

Normally your grade will be based on exams, homework, quizzes and laboratories in the following proportions:

- 40% Exams
- 5% Quizzes
- 25% Homework
- 30% Labs

However, your scores will also be analyzed based on:

- 60% Exams
- 40% Labs

You will be given the better grade of the two. I highly recommend against skipping homework and quizzes as exam scores tend to be highly correlated with homework and quiz scores. Your letter grade will be determined according to the following percentages of the total possible scores:

- 90% A
- 80% B
- 70% C
- 60% D

You are required to complete all assignments and laboratories and to attend all exams. Only extremely good and documented excuses will be allowed for missing exams. You must discuss this with the instructor as soon as possible.

## Homework

A combination of continuously reading the textbook for understanding and doing a lot of homework problems is the best way to master the material in this course and therefore do well on the exams. For the first part of class, you will have one homework for each class period. At some point, this may be switched to one homework assignments per chapter. You will also have one optional review homework assignment per exam. Each will be due at the beginning of the class period when the next section or chapter begins or at the beginning of the exam.

Discussing homework problems with other students is ok, even good if you are stumped. But, remember that it is up to you to make sure you master each problem so that you will do well on the exams (since you can not get help on the exams). You can do each problem multiple times. Only your best score (before the due date) is used for your grade. So, if you don't feel confident in a problem, do it again with new numerical values. There is nothing to lose in doing the homework problems multiple times.

## Quizzes

Every lecture period will begin with a quiz. These quizzes will be based on the reading material. They will occur during exactly the first 3 minutes of class from **1:00-1:03**. It is on webassign. It is *already* scheduled to appear at 1:00 and disappear at 1:03. So, it is imperative that you read the sections of the book then arrive on time for class and log into webassign by 1:00 and take the quiz at the beginning of class. Since it is automated, I won't be able to extend the time. So, make sure to be on time. For example, if you come to class 2 minutes late, you will have 1 minutes to sit down, log in and take the quiz. If you arrive 3 minutes or more late, you will miss the quiz for that day. You can use your notes for the quiz. You can not use the book. In order to account for unforeseen emergencies, the lowest 3 quizzes will be dropped. Do not use these unwisely. You

can get credit for a missed quiz by attending colloquium, physics club, astronomy club, a weekly solar-car meeting or another class-organized event. Each is worth one quiz.

## Exams

All the exams will be comprehensive. The first exam will cover Chapters 19-22. The second exam will mainly cover Chapters 39-41 with a small number of questions from Chapters 19-22. The final exam will mainly cover Chapters 42-44 and 46 with a smaller number of questions from Chapters 19-22 and 39-41. There may also be some questions based on the laboratories.

## Laboratories

The first five laboratories will give an introduction to Mathematica. They are designed to teach the student, and help the student become comfortable with, the following Mathematica topics: functions, lists, plotting and basic programming techniques. These skills will be important to complete the later laboratories, so students are required to attend these laboratories, which will take place in MLT 309. If not finished by the end of lab time, the student may finish at home and pass off the lab to the TA during the week before the next laboratory. The format for these laboratories consists of a Mathematica notebook containing instructional text that must be read followed by a set of embedded “assignments” which must be completed to the satisfaction of the instructor or TA. The student’s score for these labs will be equal to the fraction of the embedded assignments that are completed. There will be no lab reports for these labs. They can be found at the website: <http://www.physics.byu.edu/courses/computational/230>. We will be doing Labs 1, 2, 3, 6 and 7. (Note that we skip 4 and 5.)

There will be six more computational laboratories as tentatively scheduled. They are available on WebAssign and, just as for the previous labs, you can download them ahead of time and begin working on them before you get to class. They are as follows:

- CL1: You will develop a better understanding of distributions and uncertainty as you practice your computational skills. You need to download reaction-time.nb, reaction-time.js and reaction-time.html for this lab.
- CL2: You will learn the Euler Method for solving a simple differential equation and use it to find the solution for a piston bouncing up and down in a straw. You need to download piston.nb for this lab.
- CL3: You will learn the Monte-Carlo technique and apply it to photons hitting a screen and building up an interference pattern. You need to download Lab-Double-Slit.nb for this lab.
- CL4: You will learn the Finite-Difference method and apply it to solving the radial part of Schrodinger’s Equation for the Hydrogen atom. You need to download Radial-Equation.nb for this lab.
- CL5: You will learn about creation and annihilation operators as well as the Hamiltonian in quantum mechanics. You will learn to code these and use them to study the Higgs boson. You need to download Higgs-Scalar-Hamiltonian.nb and Higgs-Scalar-Hamiltonian-Package.wl for this lab.
- CL6: To be decided.

As in the introductory labs, there will not be a lab report. You will be expected to complete all the sections of the lab to the satisfaction of the TA or instructor. If not finished during class, the student can finish at home before the next lab begins.

Additionally, there will be three experimental laboratories. The first will be combined with the first computational laboratory. The experimental part of it will be measuring your reaction time. However, the experimental focus is also on understanding random and systematic error. The second will measure the specific heat properties of air. The third will measure the atomic

spectrum of Hydrogen and compare it with the prediction of quantum mechanics. The second and last experimental labs must be finished during laboratory time.

The computational labs will be completed in MLT 309 while the second and third experimental labs will be completed in MLT 217. Students must attend laboratory. Only very good and documented excuses will be permitted for missing labs. You may not leave lab early without completing it, without special permission. If you would like to leave early, you must complete it early. All the computational labs are available from the beginning of class. So, it is up to you if you want to start it early.

## Department Computers

Each of you has or will receive an account on the department computers. This includes the computers in this room that you will use for laboratories as well as computers in a few other locations in the department. It is essential that you check that your account works, that you remember your username and your password. (Go ahead and try on these computers.) If you do not have an account yet, or if you can not remember your credentials, you need to find a time to talk to Dr. Bogue. He will set up an account for you or reset your password if you already have an account. It is up to you to do this before the next class so that you can take the quiz.

## Academic Integrity

Although it is ok to discuss certain aspects of this course with other students, the final work on all assignments and exams must be your own. Homework and laboratories can be done in groups according to class policies but the final homework input and submission using WebAssign and the final lab report must be the work of the student claiming credit for it. Additionally, exams and quizzes must be done by the student alone and with no help from anyone other than the instructor. Any violations will be dealt with according to university policy.

## Accessibility and Accommodation

Any student needing to arrange a reasonable accommodation should contact Student Access and Accommodation Services at 350 Fell Hall, (309)438-5853, on the web at [StudentAccess.IllinoisState.edu](http://StudentAccess.IllinoisState.edu).

## Counseling

Life at college can get very complicated. Students sometimes feel overwhelmed, lost, experience anxiety or depression, stumble with relationship difficulties or diminished self-esteem. However, many of these issues can be effectively addressed with a little help. Student Counseling Services (SCS) helps students cope with difficult emotions and life stressors. Student Counseling Services is staffed by experienced, professional psychologists and counselors, who are attuned to the needs of college students. The services are FREE and completely confidential. Find out more at [Counseling.IllinoisState.edu](http://Counseling.IllinoisState.edu) or by calling (309) 438-3655.

## Tentative Schedule

All dates are tentative. The Review dates are used to review for the exams. MI, CL and EL stand for Mathematica introduction laboratory, computational laboratory and experimental laboratory, respectively.

## Tentative Schedule

	<b>Monday 1:00-1:50</b>	<b>Wednesday 1:00-1:50</b>	<b>Thursday 1:00-3:50</b>	<b>Friday 1:00-1:50</b>
<b>Week 1</b> Jan 16-20	<b>MLKJ Day</b>	Ch. 19 Secs. 1,2	MI 1 Introduction	Ch. 19 Secs. 3,4
<b>Week 2</b> Jan 23-27	Ch. 19 Sec. 5	Ch. 20 Secs. 1,2	MI 2 Functions & Lists	Ch. 20 Secs. 3,4
<b>Week 3</b> Jan 30-Feb 3	Ch. 20 Secs. 5,6	Ch. 21 Sec. 1	MI 3 Plotting	Ch. 21 Secs. 2,3
<b>Week 4</b> Feb 6-10	Ch. 21 Secs. 4,5	Ch. 22 Secs. 1,2	MI 4 Programming 1	Ch. 22 Secs. 3,4
<b>Week 5</b> Feb 13-17	Ch. 22 Secs. 6,7,8	Review	<b>Exam 1:</b> Chs. 19-22	Ch. 39 Secs. 1,2
<b>Week 6</b> Feb 20-24	Ch. 39 Secs. 3,4	Ch. 39 Sec. 4	MI 5 Programming 2	Ch. 39 Secs. 5,6
<b>Week 7</b> Feb 27-Mar 3	Ch. 39 Secs. 7,8	Ch. 40 Sec. 1	EL&CL 1: RT Distributions & $\Delta$	Ch. 40 Sec. 2
<b>Week 8</b> Mar 6-10	Ch. 40 Secs. 3,4,5	Ch. 40 Secs. 6,7,8	CL 2: Damped V Euler's Method	Ch. 41 Secs. 1
Mar 13-17	<b>Spring Break</b>			
<b>Week 9</b> Mar 20-24	Ch. 41 Secs. 2,3	Ch. 41 Secs. 4	EL 2: Damped V $C_V/C_P$ : Piston	Ch. 41 Secs. 5,6
<b>Week 10</b> Mar 27-31	Ch. 41 Secs. 7	Review	<b>Exam 2:</b> Chs. 19-22, 39-41	Ch. 42 Secs. 1,2
<b>Week 11</b> Apr 3-7	Ch. 42 Secs. 3	Ch. 42 Secs. 4,5	CL 3: DS Photon Monte Carlo	Ch. 42 Secs. 6
<b>Week 12</b> Apr 10-14	Ch. 42 Secs. 7	Ch. 43 Secs. 1,2,3	CL 4: Radial $\psi_H$ Finite Diff. Method	Ch. 43 Sec. 4
<b>Week 13</b> Apr 17-21	Ch. 43 Secs. 5,6	Ch. 44 Secs. 1,2,3	EL 4: Radial $\psi_H$ H Spectra	Ch. 44 Secs. 4
<b>Week 14</b> Apr 24-28	Ch. 44 Secs. 5	Ch. 46 Secs. 1,2	CL 5: Higgs Hamiltonian Creation & Annihilation	Ch. 46 Secs. 3,4,5
<b>Week 15</b> May 1-5	Ch. 46 Secs. 5	Ch. 46 Secs. 6,7,8,9,10	CL 6: TBD	Review
May 8-12	<b>Final:</b> Chs. 19-22, 39-45			