

Physics & Astronomy for Elementary Teachers

	SECTION 001	SECTION 002
INSTRUCTOR:	Professor Kwok-Wai Ng	Professor Joseph Brill
Office:	CP 385	CP 381
Telephone:	257-1782	257-4670
E-mail:	kwng@uky.edu	jwbrill@uky.edu
TEACHING ASST.:	Esmat Elhami	Chris Rucker
Office:	CP 250	CP 250
Telephone:	257-3941	257-3941
E-mail:	eelha2@uky.edu	erruck0@uky.edu

Required Text: <i>Physics by Inquiry, Vol. I and II</i> , by Lillian C. McDermott (Wiley)
--

PHY 160 is a 3-credit-hour laboratory course that meets for 6 hours each week - 2 hours on Mondays, Wednesdays, and Fridays for section 001 and 3 hours on Tuesday and Thursday for section 002.

This course will most likely be different from others that you have taken. In most university courses, students are exposed to the ideas of the subject in readings and lectures, and they then memorize and work with these ideas. Here, you will learn based on your own direct observations of physical phenomena and what you can infer and reason from these observations in collaboration with your fellow students and Instructors. (By “Instructors” here we mean Professors and T.A.s.) You will learn science as you *do* science. You will reinforce and apply your new ideas in homework and other in-class activities. You will realize that thinking scientifically is not mysterious and is a process that you can help your own students develop.

Most of the experiences, discussions, and other activities in this course must take place in group collaborations in the laboratory. Therefore, ***ATTENDANCE AND PUNCTUALITY ARE REQUIRED! CLASS ACTIVITIES THAT ARE MISSED BECAUSE OF EXCUSED ABSENCES MUST BE MADE UP OUTSIDE OF CLASS, SUCH AS DURING AN INSTRUCTOR’S OFFICE HOURS OR DURING CLASS TIMES OF THE OTHER SECTION.*** By missing activities, you will not only hurt your own performance on exams but you will impede your lab partners’ progress; in addition, missing activities will directly affect your course participation grade.

Laboratory hours will be spent working through the materials in your text, as described in its *Preface*. Your written discussion of experiments and exercises including **CHECKS** (described below) should be kept in your **Class Notebook**—a bound notebook. This is your record of what you have observed, inferred, and learned. In this course, we allow full use of Class Notebooks on the tests and Final Exam.

CHECKS (“✓”): Key experiments and exercises direct you to have your responses checked before proceeding to the next section. After discussing the relevant issues with classmates and staff members, each student prepares a written response. After review, staff members will either initial your response or will discuss the issues further with you and ask you to rewrite your response.

PARTNERS: Most work in PHY 160 will be done with partners in groups of four. It is important that partners engage in discussion of their experiences and ideas and avoid working in different sections in the text as isolated individuals. As in most courses using groups, we will change group members during the semester. If you feel strongly that you are in a group with which you are incompatible, please discuss this with an Instructor.

MATERIALS YOU WILL NEED: We will mostly be working with curriculum materials published by Lillian McDermott and the Physics Education Group at the University of Washington. The primary text will be *Physics by Inquiry: Volume 1 & Volume 2*. **You must use new, not used, copies of these.**

You must have a bound notebook that will be your Class Notebook. You will also need a clear plastic ruler with centimeter and inch scales and a clear plastic protractor; these are available at the Art Part of Kennedy’s bookstore, at Michaels, Office Depot, and elsewhere.

LISTSERV: All students must join and participate in the PHY160 e-mail listserv established by the university. Important announcements, including assignments, will be emailed to students through the listserv, so you should check your email frequently. You can also send messages and questions to your classmates and instructors through the listserv: send messages to PHY160-00x@lsv.uky.edu (where x = 1 or 2 depending on your section). *To access the listserv, it is necessary for you to use your official UK email address.* If you do not have a UK e-mail address, please contact one of the University Microcomputer Labs for procedures to obtain one. Complete instructions for use of listserv can be found at: http://www.uky.edu/IT/Customerservice/docs/class_listserv/

WEBSITE: Students are expected to read and use our course homepage on the Web. Important information, such as schedules, summary reviews before exams, and occasionally other notes, will be posted on the web page, which will also include links to websites around the world that are useful in teaching elementary students. One can access our Web site at <http://www.pa.uky.edu/~kwng/phy160/> or by going to the Department of Physics & Astronomy homepage at <http://www.pa.uky.edu/>, choosing Education and Outreach, then choosing Course Home Pages, and finally choosing PHY 160 . You can bookmark the final link for easy access.

TOPICS: The semester’s curriculum will be broken up into six units: **Electric Circuit, Magnets and Electromagnets, Light, Mirrors and Lenses, Motion and Sound, and Astronomy by Sight** (analyzing sky data that we’ll have taken all semester). All of these topics are included in the curriculum for K–4 as prescribed both by the National Academy of Sciences in the National Science Education Standards (NSES) and by the Kentucky Department of Education in the Core Content for Assessment. The inquiry-based approach of this course is consistent with National Science Education Standards and the Academic Expectations of the Kentucky Department of Education.

TESTS: There will be four 50-minute tests covering the first four topics listed above and a 2-hour Final Examination covering the last two topics. The tests are tentatively scheduled to be given within approximately one week after finishing each topic, as shown on the attached class schedules. If you are sick and cannot take a test as scheduled, try to call your Instructor BEFORE the test to arrange for a makeup. Excused absences are defined in the publication *Student Rights and Responsibilities* (Part II, §5.2.4.2) and do not include, for example, trips that are family vacations or taken with organizations that are not University-sponsored. **NO MAKEUP TESTS WILL BE GIVEN WITHOUT PRIOR ARRANGEMENT.**

HOMEWORK: Homework will be assigned in class on a regular basis. We recommend promptly working the problems on your own at home and then discussing your responses with classmates and staff before turning in the assignment. Homework will be collected at the *beginning* of our class periods. Most of your solutions will be graded on the following scale: A (excellent), B (good), C (adequate), D (marginal), and E (unacceptable). ***The most important part of homework is the explanation of why you believe your answer is correct.*** You should refer to your in-class work and your ideas should be presented in a clear and complete way. Sometimes we will not fully grade your solutions, but rather simply mark that you made a serious effort on the homework and turned it in. Homework not turned in will earn an E grade. Late homework will not be accepted because solutions are usually posted the day you turn yours in. All homework will be returned to you before the test on the corresponding subject. Test questions will often be similar to homework, so doing the homework helps you learn physics and helps you practice the test-like problems.

Course Evaluations are an important (and mandatory!) component of our Department's instructional program. An on-line course evaluation system was developed to allow each student ample time to evaluate each component of the course and instructor, thus providing the Department with meaningful numerical scores and detailed commentary while minimizing the loss of instructional time in the classroom. The evaluation window for Spring 2006 will be open for 2-3 weeks at the end of the semester. To access the system during this time, go the Department of Physics Web page at www.pa.uky.edu and click on the link for Course Evaluations; then follow the instructions. You will need to use your student ID# to log into the system, and this will also allow us to monitor who has filled out evaluations. However, when you log-in you will be assigned a random number that will keep all your comments and scores anonymous. As we all know, thoughtful evaluation is good for the evaluated and the evaluator, so we think we should give credit for doing it. In PHY 160 we will award one homework credit worth A for completing the course evaluations.

OFFICE HOURS: Tutoring and help with concept development, with homework, etc., is readily available. Many of the homework problems have subtle aspects that may not be immediately apparent. We *strongly recommend* that you use staff office hours, make phone calls, write e-mail, or logon to the Listserv to discuss homework and other issues with your classmates and the staff.

CLASSWORK: Your attendance, punctuality, cooperation, and participation in small-group and whole-class discussions are important to your learning and the learning of your group members. Your role as a group member is to attempt to answer questions, pay attention to detail, focus on understanding or mastering concepts, stay on task, and demonstrate personal commitment to learning. The writing and discussions associated with the **CHECKS** will be especially important. Be sure to take turns having **CHECKS** read and to have all group members fully join in the **CHECK** discussion.

PHYSICS 160 GRADE: Your final grade will be based on the following:

Class Exams: 4 x 100 pts.	= 400 pts.
Homework:	200 pts.
Class participation:	100 pts.
Final Exam:	<u>200 pts.</u>
Total:	900 pts.

Your “class participation” grade will be based on your completion of the assigned laboratory **Checks**. Letter grades including +’s and –’s will be assigned to tests and homework, etc. At the end of the semester, your grades will be averaged and whole grades (i.e., without +’s or –’s) will be assigned.

FRUSTRATION: Possible quote from a student of **Physics by Inquiry**:

“If you are not frustrated you are not learning physics!”

Learning based only on what you can infer and reason from direct observations is not easy and can be quite frustrating at times. Hang in there! Based on personal experience, we have found that these moments of frustration are usually where the seeds of understanding are planted. (Remember, frustration is proportional to your passion to understand and is an indication that you recognize what you don’t yet understand. Scientists have long recognized that knowledge of what we do not understand is often more important than those ideas we have already accepted as “true.”) We will make every possible effort to help you along this journey. Because we want you to learn how to perform this reasoning yourselves, referring to textbooks or science reference books is usually *not* helpful and is not encouraged. FACTS ARE NOT NEARLY AS IMPORTANT AS THINKING. The “accepted” scientific explanation for a phenomenon usually does not provide much insight into the evidence and reasoning required to support this explanation. Look inside yourselves and at Nature for your insights. Discussions with your peers are also an important part of this process. The following are some strategies for what to do when you feel you are becoming *too* frustrated (please add your own to this list):

- Take several deep breaths.
- Stretch.
- Meditate.
- Laugh.
- Get enough sleep.
- Talk with a peer or staff member.
- Know that you have the capabilities to understand all the material.
- Recognize that to understand a physics idea sometimes you have to work through the idea with several different applications.
- Go outside and lie down on the grass for a while.
- Get something to eat or drink.
- Remember that the Instructors intend never to directly answer a question or say whether students’ responses are correct or not, but rather to help the students develop and test their *own* ideas.
- Stand up and walk around the room or walk around the second floor of the CP building.
- Arrange some additional time to come into the lab and work slowly through a topic.
- Go back and repeat the experiments that you do not understand.
- Try to forget everything you ever learned, at least temporarily, and think afresh about what you’ve observed.