

**Note that this is a preliminary syllabus. Some of the contents, particularly dates of tests, etc. may change.**

**Phys 3071W: Laboratory-Based Physics for Teachers  
SPRING 2002**

**09:05am-12:05pm TTh, Tate Labs (Physics) 130**

**INSTRUCTORS**

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**GENERAL:**

This course is intended to provide a rich, hands-on experience in a selection of elementary physics material especially chosen to be useful for potential elementary teachers. The course is activity-based and discussion-oriented with four major goals: (1) to help you *construct a set of physics ideas* that you can apply to explain phenomena that are both intrinsically interesting and typically included in an elementary school science curriculum; (2) to help you *feel more comfortable* with science, (3) to help you learn the nature of science, so you will have more confidence in your ability to *do science*, and (4) to help you *become more aware of, and more in control of, your own learning*. During class you will spend most of your time performing experiments, working with computers (no skills initially required) and discussing ideas with your classmates. We hope you will find many of our teaching and learning strategies valuable and appropriate for you to use when you begin your teaching career. You will be given an opportunity to teach part of one of the units in an elementary school classroom.

During the semester we will be working on the **Light and Color** unit, the **Static Electricity** unit and the **Current Electricity** unit. A unit on magnets may be added if time allows.

**REQUIRED MATERIALS:**

1. Most classroom activity sheets, homework and notes will be distributed during class. You will also print out activity sheets from a computer. Because of the large demands on paper, we ask you to purchase one ream of paper (for laser printing) – in place of buying a textbook – and bring it to class during the first or second week of school. Write your name on it, and give it to one of the TA's. This will be used during the semester for printing.
2. A 3-ring loose-leaf notebook is required for keeping all activity sheets and content materials, homework assignments, exams, notes from classroom discussions, daily learning journals

and all other hand-outs. Include a package of lined paper. You will use this paper to keep a record of your individual predictions and ideas during laboratory activities.

### **LEARNING AND ATTENDANCE:**

You will be primarily responsible for your own learning in this class. The instructors will seldom, if ever, “lecture” in the traditional sense of the word. Instead, by engaging in meaningful discussions with your lab partner(s), by actively participating in whole class and small group discussions, and by performing interesting experiments you will develop and deepen your own understanding of some powerful ideas in physics. You will come to realize that these ideas can be used to explain a wide range of interesting scientific phenomena. Because you will play such an important role in your own learning and the learning of your classmates, your **attendance is essential**. Read our policies about “lates” and excused and unexcused absences below under “Requirements.”

You will be taking an active part in constructing the ideas that will be used to explain the phenomena explored during class. When a new phenomenon is being investigated, you will be expected to begin thinking about the phenomenon in terms of **your own ideas**; that is, ideas based on your own prior experience. As you perform experiments and observe how nature behaves, you may find that your initial ideas will be challenged. You may then find yourself motivated to change your initial ideas to ones that seem to you to be better able to explain the phenomenon you are investigating. Inspiration for these **new ideas** may come from your own invention or from those of your classmates.

There is no "textbook" for this course. Instead, the primary record of what is important for this class will be the comments your group writes on the computer-based activity sheets (which you will print out), and the comments you write on the individual activity sheets and in your own notebook.

While much of the work of the course will be accomplished during the class periods, you will be expected to complete your journal writing and some homework assignments out of class. **If you get behind in class assignments you will be expected to catch up in non-class time. You may use the lab at non-class times by arranging with the TAs or the instructors.**

### **DAILY JOURNAL REFLECTIONS ON YOUR LEARNING:**

Because many of you are prospective teachers, we believe it is particularly important for you to monitor your own learning. **You should be aware of how your own initial ideas are challenged and (perhaps) changed, and how you came to understand and to believe certain alternative ideas.** You should also be aware of what makes your learning easier or more difficult. Observe class activities which helps you learn or makes your learning more difficult. Observe what instructors do which helps you learn or makes your learning more difficult. Observe what classmates do. We believe that monitoring your own learning process will help you become more aware of the learning of your future students, and should therefore make you a more effective teacher.

To help you in this monitoring process you will keep a Daily Learning Journal. During the last ten minutes of most class periods (except during exam days) you will be asked to write a journal entry. Sometimes we will ask you to respond to a directed question. Other times, you should

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simply write down your reflections of your learning during that class period and during the period of time since the end of the previous class. (Thus, you might want to reflect on your homework or on discussions with other classmates. You are encouraged to write down these reflections at home and bring them with you to class. You would then add to these comments additional ones pertaining to your learning during that particular class.) For open-ended entries you should feel free to write anything that seems important to you. For example, you might discuss how you came to understand a particular idea (or ideas) that emerged during the class, relate something learned that day to a prior experience or to your future role as a teacher, discuss how you felt about a particular experiment or discussion, or raise concerns or ask questions.

You need to date and sign the Daily Learning Journal entry and turn it in before leaving class. (Occasionally we may ask you to work on your journal at home.) You will receive one point of credit for each daily journal entry, but only if it includes comments of substance. Writing “no comments today” or making only a few superficial remarks is not an appropriate Daily Learning Journal reflection. Your instructor will read all your comments and will try to respond to each concern you raise and each question you ask. (Your comments will provide your instructor with important feedback to get a sense of “how things are going” and, if necessary, to make appropriate changes.) Daily Learning Journals will be returned at the beginning of the following period. You should keep all your Daily Learning Journals together. They will be used as evidence to support the assertions you make in your Learning Commentary assignments that will be handed in three times during the semester (see below).

### **HOMEWORK:**

Homework assigned on Tuesday (Thursday) is due the following Thursday (Tuesday). Homework must be turned in during the first five minutes of the period in which it is due. Late written assignments will not be accepted unless special arrangements are made. You will be given an opportunity to correct errors in homework and turn it back in.

### **LEARNING COMMENTARIES:**

You will write three **Learning Commentaries**.

One of the possible formats is:

Each of these provides a detailed story about how an idea (or, at most two related ideas) has changed, from its initial form to one consistent with a Class Consensus idea, and how individual class activities, discussions and personal reflections promoted that change. You may include some descriptions on how your learning was promoted or discouraged by various components of the class and, as a future teacher, how you would avoid negative aspect(s) of the class.

The main narrative portion of a Learning Commentary should be three- or four-pages long (printed pages). Each should include extensive supporting documentation (here we are NOT talking about supporting evidence for physics ideas. See the underlined part below). A Learning Commentary should begin with a description of an initial physics idea (or ideas), then describe **in detail** how the various class laboratory and discussion activities (and homework) helped you **change** that idea to one closely aligned with a class consensus idea. For your Learning Commentary, your Daily Journals, your group's computer-based activity sheets, and your individual entries into your notebook should provide the primary evidence to support your

learning claims, and you should make specific references to them, and attach copies of relevant pages to your Commentary.

The evaluation of these Commentaries will be based both on the quality and quantity of your comments, and the degree to which you provide evidence to support your comments. In particular, we will be looking for a description of the initial idea (with supporting evidence), a substantive discussion of how various classroom activities promoted a change in the idea (with supporting evidence), and a brief description of the final, class consensus idea. Most credit will be assigned to the middle part (how the idea changed).

Alternatively, you can put heavy emphasis on aspects of class activities that promoted or discouraged any “learning” without focusing on a few physics “ideas.” It may also be about your own inner psychology, or interactions with teaching staff or other students. Describe how you would promote positive experiences or discourage negative experiences in your future class. In this option, much credit will be given to the thoughtfulness of the reflection of your own learning. When appropriate, you should attach supporting documents of the experiences you discuss.

The Learning Commentary must be turned in during the first five minutes of the period in which they are due. Late written assignments will not be accepted unless special arrangements are made in advance.

## REQUIREMENTS

You must complete the following items to pass this course:

0. Attendance- **You are expected to be in class and working for the full three hours, i.e.,** arriving late and leaving early will not be allowed (we will have a short 10-15 minute break in the middle of class). Roll will be taken five minutes after the start of class and five minutes prior to the end of class. If you are not present at either time, you will be counted “late” for the entire class period. After two “lates” or absences, you will receive a warning. Three or four “lates” will result in a 5% grade reduction; five (six) “lates” will result in an 8% (10%) reduction of your total final score for the course. **Three (five) unexcused absences or excused absences that are not made up in a timely manner will result in a 10% (20%) reduction of your total final score for the course.** More than 6 “lates” or five unexcused absences will result in “F” for the course.

1. You must write three Learning Commentaries (LC). They are due Feb. 14, March 14, and April 18. These must be typed and each counts the same as one quiz. For the supporting information needed in the LC you should keep a laboratory notebook containing
  - Records of your data and observations for each experiment,
  - Answers to questions asked in the unit,
  - Daily Journal notes about what you understand, what is confusing, and what is still to be learned.
2. There will be four quizzes during the quarter. The quizzes will be one hour long and given at the beginning of class on Feb. 12, March 7, April 4, and April 25.

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3. The final exam will be in two parts and each part will count the same as one quiz, i.e., the final counts as two quizzes. **Our final is scheduled at 8:30am on Sat. May 18, but most likely is will be moved to Thursday May 16 from 8:30-11:30am.** If you have any conflicts with either of these times, we must know by Jan. 31. After that date there will be no consideration given.
4. Homework (altogether counts as one quiz) assignments must be turned in at the beginning of the period in which they are due. Late written assignments (any assignment turned in five minutes or more after the start of class is late) will not be accepted unless special arrangements are made in advance. You are given an opportunity to correct errors on the homework and have it regraded.

### GRADING

Overall, 50% of the grade is based on your effort in learning and careful observation of your own learning as measured by Learning Commentaries, Daily Journals, peer and self evaluations, Idea Journals, and our observation of your participation in class. The remaining 50% comes from how well you learn physics as measured by tests, homework and the final examination. The three LC's account for 30% of the course grade. Daily Journals, Idea Journals, peer and self evaluations & class participation together account for 20%. Quizzes, homework and final exam make up the remaining 50%. Within this 50%, the grade will be calculated in two ways: Add percentage grades of the quizzes, all homework together and the final examination, or drop the worst quiz, double the final examination, and add the rest. Then whichever better will be your test grade. If you are absent on a quiz date that quiz will count as your dropped score (do not miss two). You are guaranteed the letter grade shown if you obtain the percentages given below.

	<b>A</b>	<b>A<sup>-</sup></b>	<b>B<sup>+</sup></b>	<b>B</b>	<b>B<sup>-</sup></b>	<b>C<sup>+</sup></b>	<b>C</b>	<b>C<sup>-</sup></b>	<b>D<sup>+</sup></b>	<b>D</b>
Your course grade	90	87	84	80	77	74	70	67	64	60