PHYS115 Inquiry into Physics

MTuW 2–4pm in PHY 3316

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Office Hours: MWF 1–2pm and by appointment

Fall 2011

This course is designed to familiarize you with some of the basic physics principles that you might be called upon to teach in a elementary or middle school classroom. In particular we will focus on three units: Electricity, Heat and Energy, and Motion. Each unit will consist of a series of open-ended investigations that could be adapted for use in your future classroom. Additionally, you will be asked to reflect on your experience as a learner in these experiments and what implications that might have in teaching this kind of material to children.

Lab Manual

Each experiment that you do in this course will have a two page handout. This handout will list the materials which should be on your lab table when you come in (if you find something missing, please let me know immediately), some initial definitions, givens, instructions, and questions. The instructions and questions are deliberately vague or generic in places in order to give you more freedom to explore the phenomena you are studying.

You will need to maintain a 3-ring binder as a lab manual for this course. All of your handouts should go into this binder. Additionally you may need to add pages if you run out of room on the handouts. When you need to turn something in, scan the appropriate pages from your binder and then replace the originals back in the binder in the appropriate place.

Laboratory

You will be working in class in groups of 3 or 4 students. Every member of the group is expected to contribute to the group discussions, setup and performing of experiments, and recording and reporting results. You will work with the same group for an entire unit (barring exceptional circumstances) and the groups will be shuffled so that you work with different people for each unit.

Journal

Each activity in the Lab Manual has a journal page with 6 questions on it (front and back). Using these questions as a guideline, you are expected to spend at least 15 minutes on the same day after each class reflecting on your experience in the classroom as a learner. These reflections should be written up in your Lab Manual, but need not be in paragraph form. They will not be graded, but do count towards your

participation in the course. You must scan and upload these journal entries to ELMS the day after class. The journal entry for November 23rd (the day before Thanksgiving) is due November 28th (the Monday after Thanksgiving).

Teaching Implications

Each week you are to write a 1–3 page paper discussing how your experiences as a learner are relevant to teaching. You should reflect on how you could use or modify the activities done in class to promote those experiences which you would want your students to have and avoid those which you would want them to avoid. These papers need to be typed and and should be uploaded to ELMS in pdf format each Friday.

Taking Stock

Roughly half-way through and at the end of each unit we will have a class discussion of the physics that we have been exploring in class. You are encouraged to prepare for this discussion by writing down your understanding on the appropriate page in your Lab Manual ahead of time and then taking notes during class which clarify, amplify, or correct your understanding.

After the second Taking Stock Discussion for each unit you will have to write up a paper describing your understanding of the physics in that unit. Emphasis in this paper should be given to mechanistic explanations and conceptual relationships, not to mathematical formulas. This paper should be uploaded to ELMS in pdf format 1 week after the second Taking Stock Discussion for the first two units and by the final exam for the last unit.

Final Exam

The final exam for this course will be Monday, December 19th from 1:30–3:30pm (the slot reserved for MW classes which meet at 2pm). It will be cumulative and will cover the material in the Taking Stock Discussions and Papers.

Grading

With the exception of the Journal Entries, which are awarded points solely for completion, everything that you turn in will be graded and returned to you no more than 1 week after it is due. Points are assigned in the following manner:

Journal Entries	37 at 5 points each	185
Teaching Implications	13 at 20 points each	260
Taking Stock Papers	3 at 150 points each	450
Final Exam	1 at 150 points	150
	Total Points	1045

Your final grade will be calculated out of 1000 points, giving you a few extra points to play around with.

Attendance

Since this course consists primarily of labs which build on each other, attendance to every class meeting is essential. If you cannot attend class for a valid reason, as defined by the University attendance policy (http://www.testudo.umd.edu/soc/atedasse.html), then you will be given the option of an alternative assignment to make up for the ones you missed. Absences will never excuse you from the Taking Stock Papers, though alternative arrangements may be made for turning them in.

Honor Pledge

The University has a nationally recognized Honor Code, administered by the Student Honor Council. The Student Honor Council proposed and the University Senate approved an Honor Pledge. The University of Maryland Honor Pledge reads:

> *I pledge on my honor that I have not given or received any unauthorized assistance on this assignment/examination.*

Unless you are specifically advised to the contrary, the Pledge statement should be handwritten and signed on the front cover of all papers, projects, or other academic assignments submitted for evaluation in this course. Students who fail to write and sign the Pledge will be asked to confer with the instructor.

For more information on the Honor Pledge visit http://www.studenthonorcouncil.umd.edu/.

Students with Disabilities

If you have a disability which would interfere with your performance in this course and would like to request accommodations, you must consult with Disability Support Services and obtain an Accommodation Letter from them. Once you present me with this letter, I will make every effort to follow the requested accommodations where doing so can be done without compromising the learning experience of the course.

Semester Calendar

This calendar is subject to change and does not constitute a part of the syllabus proper.

Monday	Tuesday	Wednesday	Friday
Aug 29th	30th	31st **1** Introduction	Sep 2nd
5th **Labor Day** No Class	6th **2** E1: Batteries and Bulbs	7th **3** E2: What Materials are Conductors?	9th Teaching Implications Due
12th **4** E3: Batteries in Series	13th **5** E4: Bulbs in Series	14th **6** E5: Parallel Circuits	16th Teaching Implications Due
19th **7** E6: Size and Direction of Current I	20th **8** Taking Stock on Electricity Discussion I	21st **9** E7: Static Electricity	23rd Teaching Implications Due
26th **10** E8: Size and Direction of Current II	27th **11** E9: Power Supplies, Voltmeters, and Ammeters	28th **12** E10: Using Excel to Make Graphs	30th Teaching Implications Due
Oct 3rd **13** E11: Ohm's Law	4th **14** E12: Resistors	5th **15** E13: Magnets	7th Teaching Implications Due
10th **16** E14: Currents and Magnetism	11th **17** Taking Stock on Electricity Discussion II	12th **18** H1: Touch and Temperature	14th Teaching Implications Due
17th **19** H2: Equilibrium	18th **20** H3: Mixing Water at Different Temperatures Taking Stock on Electricity Paper Due	19th **21** H4: Mixing Un-like Materials	21st Teaching Implications Due
24th **22** Taking Stock on Heat and Energy Discussion I	25th **23** H5: Mixing Ice and Water I	26th **24** H6: Mixing Ice and Water II	28th Teaching Implications Due
31st **25** H7: Freezing Water I	Nov 1st **26** H8: Freezing Water II	2nd **27** H9: Condensing Steam	4th Teaching Implications Due

Monday	Tuesday	Wednesday	Friday
7th **28** H10: Temperature of Liquid Nitrogen	8th **29** Taking Stock on Heat and Energy Discussion II	9th **30** M1: Introduction to the Motion Detector	11th Teaching Implications Due
14th **31** M2: Practice Predicting What a Graph Will Look Like	15th **32** M3: Practice Reading a Graph, Making an Equation for a Graph Taking Stock on Heat and Energy Paper Due	16th **33** M4: Using Computer Tools to Understand your Graph	18th Teaching Implications Due
21st **34** M5: Introduction to Instantaneous Velocity and Acceleration	22nd **35** M6: Motion with a Constant Force	23rd **36** M7: Motion with "No" Force	25th Thanksgiving Recess No Class
28th **37** Taking Stock on Motion Discussion I	29th **38** M8: Test your Understanding I	30th **39** M9: Test your Understanding II	Dec 2nd Teaching Implications Due
5th **40** M10: Equation for Distance versus Time for Constant Force	6th **41** M11: Relation Between Force, Mass, and Acceleration	7th **42** M12: Gravity	9th Teaching Implications Due
12th **43** M13: Pendulum	13th **44** Taking Stock on Motion Discussion II	14th	16th
19th Taking Stock on Motion Paper Due Final Exam 1:30–3:30pm	20th	21st	23rd