Spacetime and the Quantum World (PHYS 135) Fall 2010 v1.0

We should take comfort in two conjoined features of nature: first, that our world is incredibly strange and therefore supremely fascinating. . . second, that however bizarre and arcane our world might be, nature remains comprehensible to the human mind.
- Stephen Jay Gould

1. Introduction to Phys 135:

This semesters material is in two parts plus a little more: (1) Special Relativity (2) Quantum Theory (3) Reflections on the combination

Well set off on an exploration of these two foundational building blocks of the modern physical understanding of the world. Remarkably the subjects are conceptually rich and yet can be accurately studied without complex mathematical machinery. Whenever possible I will avoid a mathematical treatment. Nevertheless we will use diagrams, simple numerical calculations and some algebra during the course. A quick look at the two texts and the first three chapters of *Flat and Curved Space-times* will give you an idea of the level of math that we will be using. I will not assume that you have had any instruction in physics. As there is no set material that we have to get through I hope that your interests will help determine the path through the semester.

2. Instructor:

Seth Major (feel free to call me "Seth)
email : smajor@hamilton.edu
web : academics.hamilton.edu/physics/smajor/index.html
phone : x4919
office : Sci G052

3. Office Hours:

Wednesday 3:00 - 5:00 PM in the tutorial area outside my office (drop-in help sessions). Feel free to call or send an email about a homework problem, questions on the text, or any other issue youd like to chat about.

4. Texts:

Shop around for the best prices on these books.
- Mermin, *It's About Time*
- Styer, *The Strange World of Quantum Mechanics*

We'll also delve into the first three chapters of Ellis and Williams, *Flat and Curved Space-times*, 2nd edition, which will be available on course reserves.

5. On learning physics:

Learning occurs, and the seed of understanding is planted, when we think about a subject. This thinking happens when we actively confront a situation or a problem in a new way. Unfortunately, full understanding normally occurs only after iterating this process several times! Such active engagement with the material is especially beneficial to learning physics. As much as is possible, this course is structured to foster this active learning - hopefully giving you a chance to understand some of the complexity, beauty, and fun of working in physics. The work for the course will consist of reading,

attending classes, solving some problems or puzzles, a couple of quizzes and a final. If you all would like there will also be an optional paper.

6. Guides:

Normally on alternate weeks I will distribute a Guide which includes reading for up-coming classes, problems on material you have worked with before, and other aspects of the course. I strongly recommend that you look over the reading assignments before class. Guides normally will be posted on the 135 website Wednesday morning. When you have solutions due, the deadline will be Thursday morning at 9:00 AM. They will be graded out of 20 points. Solutions will be will be generally be available on the following Friday through electronic means.

During class I will demonstrate the different types of solutions before they are due so you know what to expect. When preparing your solutions, work in a logical, easy-to-read manner. If you have difficulty please plan on stopping by during office hours to ask questions. A common best practice is to copy over your solutions and hand in a readable final copy. Please do consult with your fellow students when you are solving these problems, but write up your own solutions. Whenever ideas are not 100 % yours please cite your sources, including discussions with friends and online materials. When writing up your work always follow the Hamilton Honor Code.

6.1. **Grades.** : Your semester grade will be determined by the following scheme:

(1) Participation 20%
(2) Solutions: 20%
(3) Quizzes: 30%
(4) Final exam: 30 %

6.2. **Exams and Quizzes.** : Well have a couple of in-class quizzes and a final. The final will be during the scheduled time: Thursday, December 16 at 7 PM (TR 10:30). The quizzes and exam include material in both the reading and the classes. The historical material will not be on any of the tests.

6.3. **Participation.** : This is graded on your level of participation during the scheduled class time, both in terms of contribution to the ongoing discussion and in terms of written questions handed in at the end of class.

Enjoy!

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