HONORS 135 - Ideas in Honors - Syllabus

The Higgs Boson and Other Discoveries: A Survey of Modern Particle Physics

Course information:

Instructor:	Aaron White
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Website:	`honors135.hg8i.com`
Location:	4481 Randall (268 Dennison on Sept 18)
Time:	Thurs 4:00-5:30pm

Course description: What happens when you smash protons together at 7 TeV? Why do physicists look for dark matter in tanks of liquid xenon? This HONORS 135 course will expose students to some of the most exciting discoveries of particle physics in a nearly math-free context. Starting with the discovery of the electron in 1897, we will discuss the evolution of particle physics and how discoveries are made up through the 2012 discovery of the Higgs boson and beyond. Classes will be a mixture of lecture and discussion. We will tour laboratories here at Michigan (PandaX, DAMIC, ATLAS), and we will visit high energy experiments at Fermi National Accelerator Laboratory in Chicago (SeaQuest, NuMI/MINOS) over Fall break (October 13-14).

Class structure: Each class will focus on a particular topic high energy physics. If there is a demo scheduled, class will start with the demo and discussion. Each class will have a lecture presented via slides that relate to the topic. If there is a tour scheduled, this will take place in the last half hour of the class.

Attendance: Attendance is mandatory for all class sessions, with the exception of the trip to Fermilab. If you absolutely must miss class, please notify me ahead of time. See the LSA guidelines for excused absences `http://www.lsa.umich.edu/facstaff/saa/studentclassattendance`.

Participation: Participation in discussions is expected. Depending on the level of participation, I may assign short questions based on readings to be completed and submitted on the class website.

Grading: Honors 135 classes are graded pass/fail. There are only two ways to avoid passing: 1) by failing to attend class and 2) by failing to complete and submit three of more assignments on time. I expect this class to be difficult to fail.

Course website: I will upload slides, optional readings, and other media to the class website. Assignments should also be submitted to `honors135.hg8i.com/assignments`. Please do not hack the course website, but if you do (without DoS) you will win some free coffee.

Trip to Fermi National Accelerator Laboratory:

Fermilab is a national laboratory located outside of Chicago, Illinois. It's the home of a variety of particle physics experiments, the Tevatron, and a lot of history. There will be an optional trip to visit the lab on Oct 13-14 (during fall study study break). We will visit several experiments and meet with staff scientists. Despite what the original course description said, this trip is supported by the Physics Department: transportation and housing are free.

Calendar:

- Week 1: Introduction
- Week 2: History of Particle Physics
- Week 3: Methods of Detection
- Week 4: Accelerator Technology
- Week 5: Modern Experiments
- Week 6: Fermilab
- Week 7: DAQ and Analysis

- Week 8: Theory and Future Experiments
- Week 9: Leftover Questions and Topics