PHZ-5355 Semester Papers

Instead of having a final exam in this course, each of you will be required to write a paper on a subject in high energy physics. You may choose your own topicm but you must then get it approved by one of the course instructors. please choose the instructor who has covered material most relevant to your topic. Please do not chose a topic on which you are already doing research. Also, please do not choose the topic that you wrote about in HEP I! Each paper should include references to the current literature. You should clearly explain the topic you are discussing and give enough details so that someone not familiar with the topic can, nevertheless, follow your presentation. Do not simply quote material from a selection of papers. Discuss the experimental results and present enough of the theory that the reader can see the significance of the equations you quote.

In order to research the literature, I suggest that you visit the archives at arXiv.org (see especially hep-ph and hep-ex) and at inspirehep.net. A selection of typical topics is given below, but please do not limit yourself to these topics.

These papers are to be done independently, although I encourage you to discuss your topics with others (faculty or students) in order to get broader viewpoints.

Possible topics:

1. $\sin^2\theta_w$: Its value, how it has been measured, and the significance of the new results from NuTev (see hep-ex/0110059 and references therein, hep-ph/0112302, hep-ph/0209200, hep-ex/0504049).

2. ν oscillations: give a brief overview of the key experimental results which indicate that neutrinos may have mass (discuss both the solar and atmospheric neutrino problems). See hep-ex/0106089, for example. Here is a more recent review: T. Kajita, Int.J.Mod.Phys.A24:3437-3446,2009.

3. Parton distributions: what are the latest key experimental results and how have they affected our knowledge of parton distributions? See hep-ph/0303013, hep-ph/0702159, and arXiv:0911.2254[hep-ph] to get started.

4. Precision mass measurement for the W boson: its status and the significance of the results. See hep-ex/0106018, hep-ex/0104047, and hep-ex/0007044 to get started. Here is a recent review: Ann Rev Nucl Part Sci 58: 147 (2008).

5. CP violation: briefly review the experimental situation and discuss future facilities under construction. Show how the results fit into the Standard Model. See hep-ex/0110019, hep-ex/0001042, hep-ex/0107061, and hep-ex/0107013 to get started.Here are some more recent reviews: arXiv:0808.1336[hep-ph] and arXiv:0705.2008[hep-ph]. This last one is an article from Reviews of Modern Physics.

6. High-p_T jet production: theory and experiment. Briefly summarize the experimental results and how they are described by theory. Here are some sample references: hep-ex/0011036, hep-ex/0008072, hep-ph/0102074, hep-ex/0012013, and hep-ex/0012046. See also arXiv:0905.2727[hep-ex].

7. Single top production - what is it, why is it considered important, and what are the experimental results obtained so far? See arXiv:1002.4167[hep-ex] and arXiv:1001.4577[hep-ex].

8. The Higgs boson in the Standard Model - what is it and why is it important? Summarize the discovery of a "Higgs-like" boson at the LHC. See arXiv:1211.4828 [hep-ph]

The papers are to be turned in to the appropriate instructor no later than 5:00 PM on Monday, November 30, 2015.