PHYS 5396 – Lecture #1

Monday, Jan. 13, 2003
Dr. Jae Yu

1. Class time and location
2. Class specifications
3. Class plans
4. Semester projects

Class Time and Location

- Current: 11:00 – 12:20pm, Mon & Wed, SH 129
- Proposal: 1:00 – 2:20pm, Mon & Wed, SH 200

Class Specification

- Text Books
  - D. Griffiths, “Introduction to Elementary Particle Physics”
  - D. Perkins, “Introduction to High Energy Physics”
- Reading Assignments
  - Not just based on the books
  - Will have to rely on papers
  - Extra credit on presentations up to 5%
- Homework Assignments:
  - There will be homework problems randomly assigned throughout the semester
- Two Written Term Exams (20%+25%)
- Semester DØ Data Analysis Projects and Presentations (45%)
- Will be mixed theory + experimental techniques

Syllabus

- Neutrinos
  - Formalism
  - Neutrinos and proton structure functions
  - $\sin^2\theta_W$ measurements and its impact to Higgs
  - Neutrino Oscillation
- Electroweak Symmetry Breaking
  - Standard Model EWSB formalism & Higgs
  - Minimal Super-symmstric Extension of Standard Model
  - Other EWSB Theories (SUSY) & Other Types of Higgs
  - Strategy for Higgs search
- New Phenomena
  - SUSY Formalism and available models
  - Large Extra-dimension
  - Search strategy
- Will be mixed with appropriate experimental techniques
  - Detectors and Particle ID's, etc

Semester Projects

- DØ Data Analysis
  - Need to setup DØ Data Analysis systems
    - See http://www-d0.fnal.gov/computing/algorithms/howto/tutorial.html for tutorial
- Consists of
  - A >=10 page report (must become a UTA-HEP note)
  - A 30 minute presentation
- Topics
  - Number of events vs Number of jets for W and Z events

W/Z + Jets Events

- Most the signal events you are interested in involve
  - high P_T leptons (e, μ and τ)
  - Neutrinos → Missing E_T
  - Jets → especially jets from heavy quarks
- Requires
  - Knowing the trigger lists
  - Understanding the triggers
  - Understanding particle ID
  - Producing kinematic variable distributions
    - Electron and Muon E_T spectra
    - Missing E_T spectra
    - Construction of Masses (Transverse and Invariant masses of W and Z you collect)
    - Subtraction of backgrounds
    - Error estimate (stat. and syst.)