Instructor: Maxim Perelstein (mp325@cornell.edu)
When: Tuesdays and Thursdays, 2:55-4:25 pm
Where: Newman Lab 311 (live video available)
Web: http://www.lepp.cornell.edu/~maxim/P661

Experiments at high-energy particle colliders have long been an indispensable source of information about physics at subatomic scales. In the next few years, experiments at the Large Hadron Collider (LHC) will dramatically expand our knowledge in this field. However, extracting physical information from the experimental data is highly non-trivial. This course aims to prepare the students to confront this task. We will cover:

1. Theoretical basis: Review of theoretical ideas relevant for analysis of collider data. Topics include: Helicity and chirality, initial- and final-state radiation, infrared divergences, showering and fragmentation, jets, parton distribution functions.

2. Standard Model (SM) examples: Survey of a variety of reactions described by the SM, including results from recent and ongoing electron-positron and hadron collider experiments.

3. Searches for new physics: Survey of recent and ongoing searches for the Higgs boson and a variety of extensions of the SM, such as supersymmetry, extra dimensions, etc., as well as searches planned at the LHC.

4. Computational tools: Hands-on introduction to popular Monte Carlo tools used to simulate outcomes of collider experiments: MadGraph/MadEvent, PYTHIA, and PGS.

Prerequisites: Relativistic Quantum Field Theory I (Phys 7651 or equivalent), Standard Model of Particle Physics (Phys 7645). 2nd semester of QFT is useful but not essential. Students specializing in both theoretical and experimental HEP should be able to follow the course.