Intensive Course on Computation for Experimental Particle Physics PY 482

1. *Instructor's Name, Date*
   - Prof. Arno Heister; contact info, etc. see http://physics.bu.edu/people/show/arno
   - Winter/Spring semester 2011

2. *Course Designator and Title*
   - CAS PY 482 Computational Methods for Statistical Analysis of Experimental Physics (LHC software course); Formal rubric: CAS PY 482 Seminar on Physics, 2 credits = 1/2 course; CAS = College of Arts and Sciences PY = Physics
   - Prerequisites: Familiarity with any imperative programming language, e.g. C, C++, Fortran, Java, Basic, Pascal. Laptop with EVO, ROOT, C++ Computer accounts on buphy and on CERN computers
   - Two Target Audiences:
     a)Students enrolled in the BU/CERN/UniGe Program
     b)Remote learning students from BU Physics, following the course by EVO video conferencing and by the posted lectures on the BU/CERN Internship web pages
   - Max Enrollment: 15 BU/GE students (2 credits awarded if student requests them)

3. *Course Overview* A day-to-day familiarity with the functional computational tools of modern experimental data handling is developed, with examples from ATLAS and CMS data workflow, event reconstruction and visualization. A framework for analysis using ROOT and C++ is taught, with an appreciation of the nuances involved, e.g. the interpretation of compiler errors.

4. Methodology
   - Tutorials and discussions, with extensive hands-on exercises in and after class on CERN computers and on personal laptops.
   - Assignments/Homework: At the end of each session, assigned computation problems, including examples from both ATLAS and CMS using Monte Carlo as well as real data.
   - Presentations to the class on the physics, on the detectors, and on solutions to problems
   - Take-home final exam project: A computing project determined by the instructor to develop a program for their subsequent Directed Research Course PY 492
   - Course material, most recent schedules, etc. can be found here: http://physics.bu.edu/sites/geneva-program/lhc-software-course/

5. *Required "reading"*
   - Extensive research on the web into coding techniques of C++ and ROOT.
   - Material can be found also from here: http://physics.bu.edu/sites/geneva-program/home/

6. *Grading Criteria*
   - homework (30%)
   - class participation and presentations: one presentation on the physics of the research, one presentation on the programming progress made on the project during the course (50%)
   - final computational project judged by the participation in class (20%)

7. *Chronology*
   - 2pm Tue and Thurs afternoons, 2 hr tutorial + discussion, > 20 total contact hours Period: Mid January to end of February/beginning of March, 5 weeks

- Structure: First two sessions: introduction to the LHC detectors and the computational challenges of calibrating, monitoring, simulating, and reconstructing events, histogramming data, bump searches, background fitting, etc.
- Subsequent sessions: start with ~1/2 hr interactive discussion of a computational problem. Continue with mini-computing task, with instructor available for consultation.

8. *Terms and Conditions*

Students are expected to attend all sessions and prepare all homework before classes. They must check their email each morning for updates on assignments, etc. If ill, they should attempt to follow the session by EVO video conferencing from their dorm room. Each day of late submission of work will decrease the grade by one point (e.g. A becomes A-).

9. *Plagiarism* All students are responsible for having read the Boston University statement on plagiarism, which is available in the Academic Conduct Code. Students are advised that the penalty against students on a Boston University program for cheating on examinations or for plagiarism may be "...expulsion from the program or the University or such other penalty as may be recommended by the Committee on Student Academic Conduct, subject to approval by the dean."