Carleton University Department of Physics
PHYS 6601 – Particle Physics Phenomenology (Fall 2016)
Course Outline (revised 2016/09/21)

Instructors:
Heather Logan *(coordinator)* (`logan@physics.carleton.ca`, 613-520-2600 x4319, 2450 HP)
Daniel Stolarski (`stolar@physics.carleton.ca`, 613-520-2600 x4179, 3320 HP)
Alain Bellerive (`alainb@physics.carleton.ca`, 613-520-2600 x1892, 3310 HP)

Lecture times: Wednesdays and Fridays, 4:00–5:30 p.m., 3349 Herzberg (Sunray Lab).
The first lecture will be on Wednesday September 14.

Course Description:

This course covers much of the required knowledge for research in particle physics from both the experimental and theoretical points of view. Topics may include: standard model, parton model, quark model, hadron spectroscopy, and experimental tests.

Course Content:

H. Logan: Electroweak Interactions and the Higgs [Sept 14, 16, 21, 23, 28 and 30]
These lectures will cover the electroweak sector of the Standard Model from the ground up: the gauge interactions, Higgs mechanism, and fermion masses. They will also cover Higgs physics and precision tests of the standard electroweak model.

D. Stolarski: Quarks and QCD [Oct 5, 7, 12, 14, 19, and 21]
These lectures will cover parton model calculations of hard scattering processes at colliders, and how QCD corrections can be systematically implemented in these calculations. They will show relevant data supporting the QCD-improved parton model, and specifically try to explain the QCD-improved parton model calculations underlying LHC analyses that many of our graduate students will be undertaking.

A. Bellerive: The Experimental Basis for the Standard Model [Nov 2, 4, **7***, **14***, 16, and 18]
Topics covered will include experimental evidence for the particle constituents of the Standard Model, precision electroweak tests from electron-positron colliders, and results from the Large Hadron Collider.

H. Logan: Flavour Physics and CP Violation [Nov 23, 25, 30, Dec 2, **5***, and 7]
These lectures will cover the flavour sector of the Standard Model: quark mixing, CKM matrix, CP violation, sequential decays, unitarity triangle, kaon/charm/beauty sectors meson-antimeson mixing.

***Monday lectures are marked with a star. They will be 4:00–5:30 p.m. in 3349 Herzberg.**

Assignments and Grade Distribution

Homework assignments ($4 \times 20\%$):
A set of homework problems will be assigned for each of the four course segments. The deadline for handing in assignments is two weeks after they have been given out.

Final seminar (20%):
Each student will be expected to give a 20-minute seminar on a topic in particle physics. Please discuss your choice of topic with the course coordinator (H. Logan) before Reading Week. You should take this opportunity to learn about a particle physics topic that is not directly related to your thesis research. The talks will be scheduled during the December exam period in consultation with the class.

Academic Policies

Please read and be familiar with the following Carleton University policies:
Privacy and freedom of information: `http://www6.carleton.ca/privacy/` .
Academic integrity: see item 18 of `http://calendar.carleton.ca/grad/gradregulations/` , in particular the sections on plagiarism and the unauthorized resubmission of work.

Academic Accommodation Policies

You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:

Academic accommodations for students with disabilities: The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or `pmc@carleton.ca` for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). Requests made within two weeks will be reviewed on a case-by-case basis. After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website (`www.carleton.ca/pmc`) for the deadline to request accommodations for the formally-scheduled exam (if applicable).

Religious obligation: write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the Equity Services website: `http://www2.carleton.ca/equity/` .

Parental obligation: write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the Equity Services website: `http://www2.carleton.ca/equity/` .