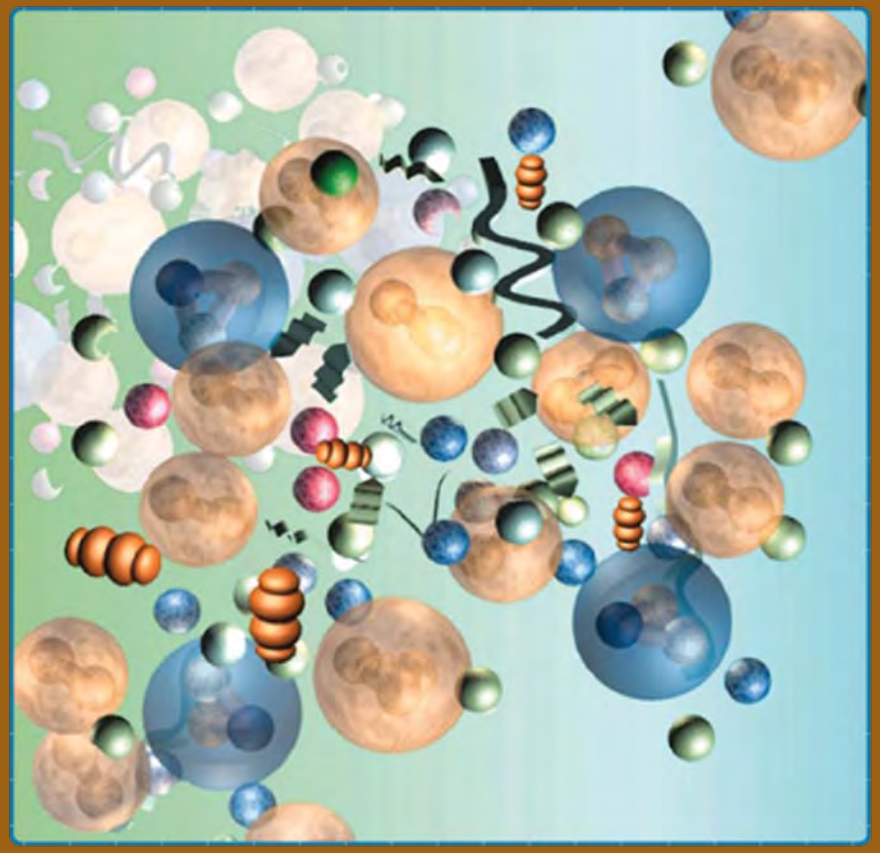
LUND UNIVERSITY

Modern Experimental Particle Physics

http://www.hep.lu.se/courses/fyst17-fkf050/



Introductory notes, January 19, 2009

FYST17
FKF050

Division of Experimental High Energy Physics (www.hep.lu.se)

Teachers:
Oxana Smirnova
Vincent Hedberg
Peter Christiansen
and invited lecturers

Introductory meeting, 19.01.2009

1. Learning outcomes
2. Required knowledge
3. Course plan
4. Lecture schedule
5. Assessment. FYST17 or FKF050?
6. Projects (seminars, only LU students)
7. Course literature
8. CERN summer student program

1. Learning outcomes

- Particle physics is the most fundamental of experimental natural sciences
- The purpose of this course is to introduce students to the current experimental particle physics aspects:
  - Current challenges
  - Experimental programs at world research centers, particularly at CERN
  - Future directions
- The student are also expected to learn how to:
  - Acquire scientific information, work with scientific publications in the area
  - Assess challenges in the area, solve problems
  - Communicate and discuss project results

2. Required knowledge

- Basic knowledge of four-vectors, relativistic kinematics, quantum mechanics
  - Check e.g. the “Notes on particle kinematics, cross-sections etc. ” at the course Web page
- Basic prior knowledge of particle physics is also beneficial

3. Course plan

- 16 lectures covering
  - Introduction to experimental methods
  - Basics of the Standard Model
  - Modern-day challenges
- Home work: problems
  - hand in either at the respective lecture or leave in Peter Christiansen's mail box in the corridor B3xx
  - Problems are explained during 3 problem solving sessions
- Few invited presentations about current research activities
- Students' seminars (LU)

4. Lecture schedule

- Will be available shortly from the course home page
- Course start: Monday, January 26, 14:15 (B113)
- 3 times a week, in B113:
  - Monday at 14:15
  - Wednesday at 10:15
  - Friday at 14:15
- Written examination: end-March

5. Assessment. FYST17 or FKF050?

- LU/N-faculty students: FYST17 7.5 ECTS credits
  - project work on a selected topic, presented at a dedicated seminar (ca 20 min).
- LTH students: FKF050 3p
  - NOTE THAT THERE IS A POSSIBILITY TO ENROLL IN FYST17 to make the 5p course
- All: written examination (4 hours) and exercises (problems)
- FYST17: points for the final grade:
  - Exam: 6 complex questions, 50% of the final points.
  - Exercises: 10% of the final points. Exercises are evaluated by the teacher and points are awarded accordingly.
  - Project work: 40% of the final points. The contents of the work will be evaluated based on the given presentations.
- FKF050: points for the final grade:
  - Exam: 6 complex questions, 85% of the final points
  - Exercises: 15% of the final points. Exercises are evaluated and points are awarded accordingly.

6. Suggested seminar topics

- Seminars are scheduled for February 25 and/or February 27 (preliminary)
- LU students are asked to pick own subjects, e.g:
  - Discovery of the top quark
  - Discovery of neutrino oscillations
  - Discovery of CP violation
  - Pentaquarks
  - Search for the Higgs boson
  - Searches for supersymmetry
  - Dark matter
  - Dark energy
  - *Own topics are most welcomed*

7. Course literature

- B.R. Martin & G. Shaw, "Particle Physics" (2nd edition), 1997, publ. John Wiley & Sons Ltd
  - Certain chapters are extended using additional literature
- Reviews and notes distributed/suggested by the lecturers
- Course homepage contains links to previous courses and video-recorded lectures, see http://www.hep.lu.se/courses/fyst17-fkf050/
- Other related information at the Division's homepage: http://www.hep.lu.se/education.html

8. CERN Summer Student program

- A unique opportunity to enjoy a summer in Switzerland, learning bleeding-edge science and technology and meeting new friends from all over the world
- Google "CERN Summer Student Program", or go directly to https://ert.cern.ch/browse_www/wd_pds?p_web_page_id=5836&p_no_apply=Y
- 2-3 months of training at CERN: work in a research group, lectures, student sessions, visits to experiments, workshops,…
- Possibility to make a diploma work

8. CERN Summer Student program

- Applications deadline in 2009: January 28
- Eligibility:
  - Undergraduate students of physics, engineering or computing
  - CERN member state nationality (also US, Japan and Israel)
  - At least 3 years of university studies
  - No previous work at CERN
  - Good knowledge of English
- Electronic application submission; 2 recommendation letters are required