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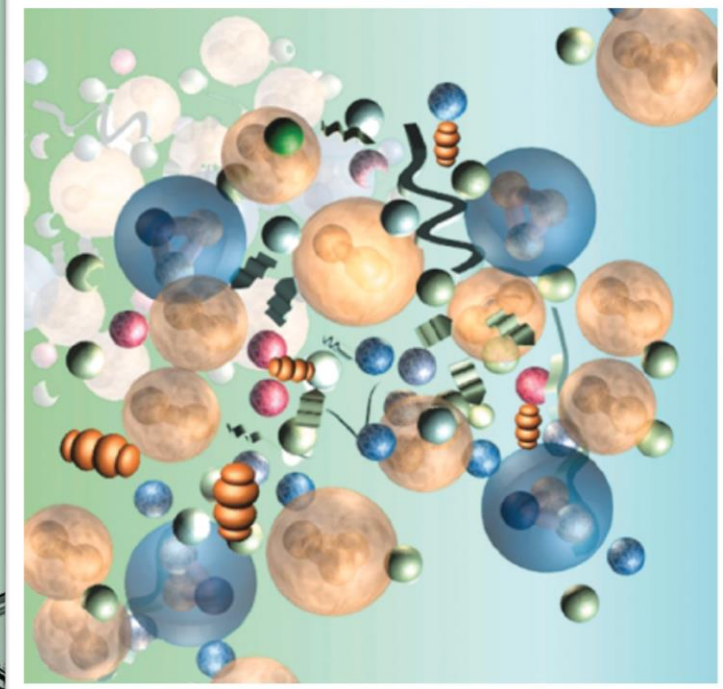
HTTP://WWW.HEP.LU.SE/COURSES/FYST17/



Modern Experimental Particle Physics

FYST17 - INTRODUCTORY NOTES - JANUARY 19, 2015

DIVISION OF PARTICLE PHYSICS (www.hep.lu.se)

teachers:

OXANA SMIRNOVA

VINCENT HEDBERG

and invited lecturers

Introductory meeting, 19.01.2015

1. Learning outcomes
2. Required knowledge
3. Course plan
4. Lecture schedule
5. Assessment
6. Projects (seminars)
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 give advanced knowledge on 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 and the Standard Model is also beneficial

3. Course plan

- 16 lectures covering
  - Quick summary of the Standard Model
  - Experimental methods
  - Modern-day challenges beyond the Standard Model
- Home work: problems
  - hand in either at the respective lecture or leave in the teachers' mail box in the corridor B3xx
  - Problems are explained during 3 problem solving sessions
- Students' projects: mini-seminars (~25 min)

4. Lecture schedule

- Will be available from the course home page
  - Check for updates
- Course start: **tomorrow** – Tuesday, January 20, 13:15 (H530)
- 3 times a week, in H530
  - Tuesdays: start at 13:15
  - Thursdays and Fridays: start at 15:15
  - **Exception**: week 5 (next week):
    - » **Monday Jan 26 - 13:15**, Tuesday Jan 27 - 13:15 and **Wednesday Jan 28 - 10:15**
  - Including problem solving
- Student project presentations in March
- Written examination: March 20 (tentative)
  - Other dates can be arranged, feel free to propose
  - One re-examination is possible

5. Assessment

- 7.5 ECTS credits (5 hp), requirements:
  - do homework (3 sets, 4-5 problems each)
  - present the project work on a selected topic at a dedicated mini-seminar (ca 25 min)
    - » no written report needed
  - pass written examination (4 hours)
- Scoring points for the final grade:
  - Exam: 6 complex questions, 60% of the final score.
    - » To pass, at least half of the questions must be answered
  - Exercises: 20% of the final score. Exercises are evaluated by the teachers.
  - Project work: 20% of the final score. Presentation is evaluated as *pass/no pass*.
  - HP and ECTS grades (A-E) are assigned according to the standard recommended distribution
  - IG or F is a failure to either pass the exam, do the project or submit exercises

6. Sample of project topics

- Students are asked to pick own subjects, some examples:
  - Discovery of the top quark
  - Discovery of neutrino oscillations
  - Discovery of CP violation
  - Discovery of the Higgs boson
  - Searches for supersymmetry
  - Dark matter
  - Dark energy
  - Pentaquarks
  - …
- Own (relevant) topics are most welcomed!

7. Course literature

- B.R. Martin & G. Shaw, ”Particle Physics” (3rd edition), 2008, publ. John Wiley & Sons Ltd
  - Certain chapters are extended with additional information
- Reviews and notes distributed/suggested by the lecturers
- Course homepage contains links to previous courses and (very old) video-recorded lectures, see http://www.hep.lu.se/courses/fyst17/
- 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 2015”
- 2-3 months of training at CERN: work in a research group, lectures, student sessions, visits to experiments, workshops,…
- Possibility to make a diploma project

8. CERN Summer Student program

- Applications deadline in 2015: January 28
- Eligibility:
  - Undergraduate students of physics, engineering or computing
  - CERN member state nationality
    - » Limited places for non-member states exist
  - At least 3 years of university studies
  - No previous work at CERN
  - Good knowledge of English
- Electronic application submission; 2 recommendation letters are required