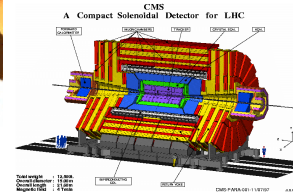
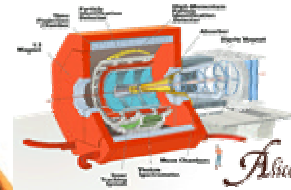
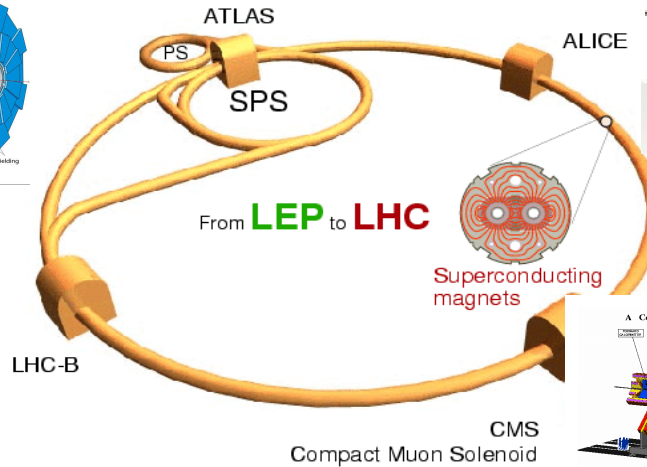
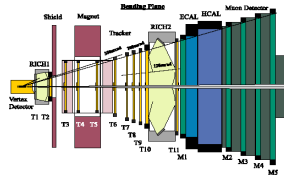
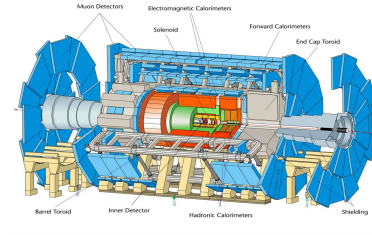


# Particle Physics Course

## FYS225 / FKF050

### The Large Hadron Collider (LHC)



|            | Beams | Energy   | Luminosity                             |
|------------|-------|----------|--|
| <b>LEP</b> | e+ e- | 200 GeV  | $10^{32} \text{ cm}^{-2}\text{s}^{-1}$ |
| <b>LHC</b> | p p   | 14 TeV   | $10^{34}$                              |
|            | Pb Pb | 1312 TeV | $10^{27}$                              |

Paula Eerola, Vincent Hedberg, Stefan Ask

Paula Eerola  
Lund University, 24.1.2005



**LUND**  
UNIVERSITY

# Introductory meeting 24.1.2005

1. Purpose of the course
2. Needed knowledge
3. Course plan
4. Lecture times
5. FYS225 or FKF050?
6. Seminars (only LU students)
7. Literature
8. CERN summer student programme



# 1. Purpose of the course

- The purpose of the course is to give basic knowledge about elementary particles and their interactions
- The course has an experimental perspective: which are the variables or quantities which can be experimentally measured, what kind of measurement devices are needed, which are the current experimental questions
- Elementary particles are experimentally investigated at experiments at particle accelerators, and also at cosmic ray experiments → therefore some material about astroparticle physics has been included.



## 2. Needed knowledge

- **Basics of quantum mechanics, relativistic kinematics**
- **N-faculty students: those who have taken FYS002/tankeverktyg contact me – we need some knowledge about four-vectors and relativistic kinematics**



# 3. Course plan

- Three 2-hour lectures a week (one per chapter), 2 astroparticle lectures.
- Weekly hand-in exercises: given on Mondays, return next Monday (either at the lecture or to a box in the cupboard at the end of corridor C300).
- Exercises are explained in 3 problem sessions.
- Few presentations about current research



# 4. Lecture times



[kurs05.htm](#)



# 5. FYS225 or FKF050?

- LU/N-faculty students: FYS225 5p
  - ❖ project work on a selected topic, presented orally (ca 20 min).
- LTH students: FKF050 3p
  - ❖ **NOTE THAT THERE IS A POSSIBILITY TO REGISTER IN FYS225 to make the 5p course**
- Examination (written, 4 hours)
- 5p course FYS225: points for the final grade:
  - ❖ Exam: 6 questions, 50% of the final points
  - ❖ Exercises: 10% of the final points. Exercises are corrected and points are given accordingly.
  - ❖ Project work: 40% of the final points. The contents of the work will be evaluated based on the oral presentations.
- 3p course FKF050: points for the final grade:
  - ❖ Exam: 6 questions, 85% of the final points
  - ❖ Exercises: 15% of the final points. Exercises are corrected and points are given accordingly, except for the astroparticle exercises which are demonstrations (attendance gives the points).



# 6. Seminar topics (ca 20 mins)

| <b>Topic</b>                 | <b>Name</b> | <b>Date</b> |
|------------------------------|-------------|-------------|
| Discovery of $J/\psi$        |             | <b>4.3.</b> |
| Discovery of top quark       |             | <b>4.3.</b> |
| Discovery of W- and Z-bosons |             | <b>4.3.</b> |





# Seminar topics (ca 20 mins)

| <b>Topic</b>                       | <b>Name</b> | <b>Date</b> |
|------------------------------------|-------------|-------------|
| Discovery of neutrino oscillations |             | <b>4.3.</b> |
| Discovery of CP violation          |             | <b>4.3</b>  |
| Discovery of pentaquarks           |             | <b>4.3</b>  |
| Search for the Higgs boson         |             | <b>4.3.</b> |
| Dark matter                        |             | <b>4.3.</b> |
| Dark energy                        |             | <b>4.3.</b> |
| Own topic                          |             |             |
|                                    |             |             |



# 7. Literature

- **B.R. Martin&G. Shaw, "Particle Physics" (2nd edition), 1997, publ. John Wiley&Sons Ltd**
- **Course homepage with slides:**  
**<http://www.hep.lu.se/staff/eerola/fys225.html>**
- **Course slides (spring 2002) on the web**  
**<http://www.hep.lu.se/education.html>**
- **Lecture videos (spring 2002) on the web**  
**<http://www.hep.lu.se/education.html>**



# 8. CERN summer student programme

- <http://humanresources.web.cern.ch/HumanResources/external/recruitment/Students/students.asp>
- Possibility for 2-3 months summer training at CERN: work in a research group, lectures, student sessions, visits to experiments, workshops,...
- Possibility to make a diploma work



[ss-info-2003.asp.html](http://ss-info-2003.asp.html)



[workshops03.asp.html](http://workshops03.asp.html)



- **More material: see paper copies**
- **Application deadline: 31 January 2005!**
- **How to apply: electronic registration and application via web. 2 recommendations are needed!**





**CERN in 2**  
**minutes**

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Paula Eerola  
Lund University, 24.1.2005

