Chapter 1

1.1 Outline of textbook

(Note: This outline was written for the previous course by K-F. Berggren and R. Riklund. Although the present course will follow approximately the same outline, some deviations are likely to occur.)

The textbook contains a lot of material. Although interesting you cannot read it all for the present course. Below we outline a reasonable path through the text.

- **Chapter 1:**
  This chapter gives an introductory overview and is meant for rapid reading (‘kursivt’). The chapter is elementary but is rewarding to read, e.g., Rutherford scattering and the corresponding cross-section are essential for later reference. Important concepts are introduced, e.g., isobaric spin, Yukawa exchange of pions and forces between nucleons (the field theoretic picture), and the quark-gluon plasma.

- **Chapter 2:**
  This chapter is about experimental techniques. Although the course is primarily theoretical one must recall that experiments constitute the empirical basis on which theory must rest. The chapter is for self-study.

- **Chapter 3:**
  Pages 109-113, parity, definition of isospin and statistics.

- **Chapter 4:**
  Note the Nilsson model (4.4). Magic numbers.

- **Chapter 5:**
  Section 5.2, pp 158-169, $\beta$-decay. This section is important for later reference but rapid reading should suffice. The chapter could be read at a later stage to get a better perspective on Chapter 11.

- **Chapter 7:**
  Important chapter, particle physics really starts here in the book.
  Particle data fig. 7.2. (Complete data are found in The European Physical Journal C, 3, No. 1-4, 1998).
  Definitions: baryon number, isospin, strangeness quantum numbers.
Hadrons as composite particles (p. 230).
Quarks (up, down, strange), Table 7.3.
Antiquarks.
Fundamental interactions; gauge bosons.
Feynman diagrams.

• **Chapter 8:**
  Symmetries, from 8.7.3 rapid reading.

• **Chapter 9:**
  Scattering theory 9.2.1 – 9.2.3.
  Examples of baryon resonances 9.2.4, only rapid reading.
  9.3 Fermi’s Golden Rule and Born scattering (supplementary notes) from
  Golden Rule (up to p. 308).

• **Chapter 10:**
  The quark model introduced in this chapter is, of course, of fundamental im-
  portance. Some sections, however, must be left for rapid reading due to the
  limited time we have at our disposal. Let the lecture notes guide your selection.

• **Chapter 11:**
  11.1 - 11.3 rapid reading.
  11.4 Relativistic quantum mechanics.
  11.5 - 11.10 are also important, but the rest of the chapter we have to leave
  because of lack of time.

• **Chapter 12:**
  12.1 Scattering theory.
  12.2 - 12.4 rapid reading.

• **Chapter 13:**
  This is a very important chapter about the standard model. Let the lecture
  notes guide you through this complicated text.

• **Chapter 14:**
  Be very selective and rapid. Of course, the chapter is important but we cannot
  include everything. Try to get an impression if theory is found to work well
  when confronted with experiments.

• **Chapter 15:**
  What a physicist should know something about.