# Contents

# Chapter 1

# Introduction

## 1.1 Introduction

Beyond simple knowledge and concepts, the various chapters in this lectures series introduce to the basic principles and formulas attached to accelerator, accelerator physics, beam dynamics, and other concepts which are discussed and manipulated, by means essentially of computer exercises.

In a general manner, deeper insight in the theory and technology of accelerators can be found in the brief series of refrences cited in each one of these chapters. The candidate to the computer exercises which follow is encouraged to first read these references.

In any case, for each type of accelerator addressed in these lectures, the bases will be learned from the practice of the computer exercises, from the priciples of magnet building bloks (magnets, radio-frequency accelerating systems), and their operation (pulsed or fixed-field magnets, frequency-modulated or fixed-frequency RF systems), to particle bunch dynamics (closed orbit, focussing, acceleration, magnet alignement and field defects, non-linear motion, etc.), to particle acceleration outcomes as synchrotron radiation, radiation damping, spin, depolarizing resonances, Siberian snakes and other Sokolov-Ternov equilibrium bunch polarization, relativistic life-time and in-flight decay, simple space charge models, etc.

## 1.2 Nomenclature

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|---|---|
| $c$ | velocity of light |
| $m$ | relativistic mass of a particle |
| $m_0$ | rest mass of a particle |