CHAPTER 1

The Structure of Mechanics

1.1 Introduction and some useful tips

This book is based on the first half of a year-long course that introduces you to all the major ideas in physics, starting from Galileo and Newton, right up to the big revolutions of the twentieth century: relativity and quantum mechanics. The target audience for this course and book is really very broad. In fact, I have always been surprised by the breadth of interests of my students. I don't know what you are going to do later in life, so I have picked the topics that all of us in physics find fascinating. Some may not be useful, but you just don't know. Some of you are probably going to be doctors, and you don't know why I'm going to cover special relativity or quantum mechanics. Well, if you're a doctor and you have a patient who's running away from you at the speed of light, you'll know what to do. Or, if you're a pediatrician, you will understand why your patient will not sit still: the laws of quantum mechanics don't allow a very small object to have a definite position and momentum. Whether or not you become a physicist, you should certainly learn about these great strides in the human attempt to understand the physical world.

Most textbooks are about 1,200 pages long, but when I learned physics they were around 400 pages long. When I look around, I don't see any student whose head is three times as big as mine, so I know that you cannot digest everything the books have. I take what I think are the really essential parts and cover them in these lectures. So you need the lectures to find out what's in the syllabus and what's not. If you don't do that,