2 Statics of Rigid Bodies

Statics is the study of materials at *rest*. The actions of all external forces acting on such materials are exactly counterbalanced and there is a zero net force effect on the material: such materials are said to be in a state of **static equilibrium**.

In much of this book (Chapters 6-8), **static elasticity** will be examined. This is the study of materials which, when loaded by external forces, deform by a small amount from some initial configuration, and which then take up the state of static equilibrium. An example might be that of floor boards deforming to take the weight of furniture. In this chapter, as an introduction to this subject, **rigid bodies** are considered. These are ideal materials which do not deform at all.

The chapter begins with the fundamental concepts and principles of mechanics – **Newton's laws of motion**. Then the mechanics of the **particle**, that is, of a very small amount of matter which is assumed to occupy a single point in space, is examined. Finally, an analysis is made of the mechanics of the rigid body.

The material in this chapter covers the essential material from a typical introductory course on statics. Although the concepts presented in this chapter serve mainly as an introduction for the later chapters, the ideas are very useful and important in themselves, for example in the design of machinery and in structural engineering.