

# UNIT 11

## RECENT DEVELOPMENTS IN PHYSICS

*'There's Plenty of Room at the Bottom: An Invitation to Enter a New Field of Physics'*

-Richard Feynman

### Learning Objectives

In this unit the students are exposed to

- Importance of physics for the development in all spheres
- Physics as the basic building block for engineering and technology
- Nanoscience and nanotechnology
- Physics in robotics
- Principles of physics in medical diagnosis and therapy
- Realise that the foundation to explore recent developments is covered in higher secondary physics
- Students are equipped to face challenges in higher education comfortably and confidently



### 11.1 Introduction

Physics is the basic building block for science, engineering and technology as depicted in Figure 11.1 (Refer XI Physics, 1.3). The fast developing fields like Nanoscience and Nanotechnology, Robotics and Medical diagnosis and therapy are briefly brought out for the students to appreciate the application of physics in these areas. This unit exposes the salient physics principles covered in the higher secondary physics as the foundation for technology break through. In addition, with the adequate exposure to basic physics at the school level, students are motivated to pursue higher education confidently in all fields related to science, engineering, technology and medicine.

Figure 11.1 Physics is the building block for science, engineering, technology and medicine  
(Not for examination)



## 11.2 Nanoscience and Nanotechnology

### 11.2.1

#### Nanoscience

Nanoscience is the study of structures and materials on the scale of nanometers. Nano means one-billionth of a meter that is  $10^{-9}$  m.

If matter is divided into such small objects the mechanical, electrical, optical, magnetic and other properties change.

#### Nanotechnology

Nanotechnology is a technology involving the design, production, characterization, and applications of nano structured materials.

#### Nanoparticles

The solids are made up of particles. Each of the particle has a definite number of atoms, which might differ from material to material. If the particle of a solid is of size less than 100 nm, it is said to be a 'nano solid'. When the particle size exceeds 100 nm, it is a 'bulk solid'. It is to be noted that nano and bulk solids may be of the same chemical composition. For example, ZnO can be both in bulk and nano form. Though chemical composition is the same, nano form of the material shows strikingly different properties when compared to its bulk counterpart.

In the nano scale dimensions (reduced dimensions), two important phenomena govern nano properties. They are quantum confinement effects and surface effects. Students can explore these effects in higher education and the explanation is avoided at school level.

### 11.2.2 Interdisciplinary nature of Nanotechnology

Nanoscience and technology is the interdisciplinary area covering its applications in various fields

