## Fundamentals of Electronics Devices

Unit-1 Lecture-2

## Elemental and Compound Semiconductor Materials

- In studying solid state electronic devices we are interested primarily in the electrical behavior of solids.
- However, we shall see in later units that the transport of charge through a metal or a semiconductor depends not only on the properties of the electron but also on the arrangement of atoms in the solid.

## Introduction

- In the first unit we shall discuss some of the physical properties of semiconductors compared with other solids, the atomic arrangements of various materials, and some methods of growing semiconductor crystals.
- Topics such as crystal structure and crystal growth technology are often the subjects of books rather than introductory units.

## Silicon uses

- Silicon is now used for the majority of rectifiers transistors, and integrated circuits.
- However, the compounds are widely used in high-speed devices and devices requiring the emission or absorption of light.

- The two elemental (binary) III-IV compounds such as GaN, GaP and GaAs are common in light emitting diodes (LEDs).
- Three-elemental (ternary) compounds such as GaAsP and four-element (quaternary) compounds such as InGaAsP can be grown to provide added flexibility in choosing materials properties.

- An important microwave device, the Gunn diode, is usually made of GaAs or InP.
- Semiconductor lasers are made using GaAs, AlGaAs, and other ternary and quaternary compounds.

- The band gap of GaAs is about 1.43 electron volts (eV), which corresponds to light wavelengths in the near infrared.
- In contrast, GaP has a band gap of about 2.3 eV, corresponding to wavelenghts in the green portion of the spectrum.