# Fundamentals of Electronics Devices

Unit-3

Lecture-4

# Carrier Injection

- From the discussion in the previous lecture, we expect the minority carrier concentration on each side of a p-n junction to vary with the applied bias because of variations in the diffusion of carriers across the junction.
- The equation uses the altered barrier $V_o$ - V to relate the steady state hole concentration on the two sides of the transition region with either forward or reverse bias (V positive or negative).

# Introduction

- From the study of diffusion of excess carriers in previous unit, we expect that injection leading to a steady concentration of $\Delta p$ excess holes at $x_o$ will produce a *distribution* of excess holes in the n material.
- As the holes diffuse deeper into the n region, they recombine with electrons in the n material, and the resulting excess hole distribution is obtained as a solution of the diffusion equation.

- The smallest unit cell that can be repeated to form the lattice is called a *primitive cell.*
- In many lattices, however, the primitive cell is not the most convenient to work with.
- The importance of the unit cell lies in the fact that we can analyze the crystal as a whole by investigating a representative volume.

- From the unit cell we can find the distances between nearest atoms and next nearest atoms for calculation of the forces holding the lattice together; we can look at the fraction of the unit cell volume filled by atoms and relate the density of the solid to the atomic arrangement.

- But even more important for our interest in electronic devices, the properties of the periodic crystal lattice determine the allowed energies of electrons that participate in the conduction process.
- Thus the lattice determines not only the mechanical properties of the crystal but also its electrical properties.