# 3.3- *Modeling the Diode Forward Characteristic*

How do we **analyze** circuits with junction diodes?

2 ways:

**A. Exact Solutions**

HO: Transcendental Solutions of Junction Diode Circuits

**B. Approximate Solutions**

To obtain a quick (but less accurate) solution, we replace all junction diodes with **approximate** circuit models.

3 kinds of models:

1.
2.
3.

HO:The Ideal Diode Model

HO: The Constant Voltage Drop Model

HO: The Piecewise Linear Model

HO: Constructing the PWL Model

Example: Constructing a PWL Model

Example: Constructing a Diode Small-Signal Model

Example: Junction Diode Models

Example: Another Junction Diode Model Example

## C. Small-Signal Analysis

We often find that currents/voltages consist of two components: **DC** and **small-signal**.

**HO: DC and Small-Signal Components**

**HO: DC and AC Impedance of Reactive Elements**

Note that for the ideal diode or CVD model, the fb small-signal diode voltage is always zero!

$$e.g.,\ v_D(t) = 0.7\,V \quad \therefore V_D = 0.7 \text{ and } \quad v_d(t) = 0.0$$

**HO: Small-Signal Circuit Analysis**

**HO: Steps for Small-Signal Circuit Analysis**

**Example: Junction Diode Small-Signal Analysis**