By completing the Crystal Viewer Lab in ABACUS - Assembly of Basic Applications for Coordinated Understanding of Semiconductors, users will be able to understand: a) crystals, b) crystal directions, and c) Miller indices.

The specific objectives of the Crystal Viewer Lab are:

- **Physical Model**
  - Introduce the concept of:
    - Crystal lattices
    - Crystal directions
    - Miller indices

- **Mathematical Model**
  - Apply mathematical techniques for calculating:
    - Distance between parallel crystal planes
    - Angle between crystal planes

- **Computational Model**
  - Validate crystal viewer by running the examples provided

**Recommended Reading**

Users who are new to crystal structures and Miller indices should consult the following materials:


**Demo**

Crystal Viewer Tool: First-Time User Guide

Crystal Viewer Tool Video Demonstration

**Theoretical descriptions**

* Crystal Structures

* Crystal Directions and Miller Indices

* Illinois ECE 440 Solid State Electronic Devices, Lecture 2: Crystal Lattices

* ECE 606 Lecture 2: Geometry of Periodic Crystals

**Tool Verification**

Crystal Viewer Tool Verification (V 2.3.4)

**Examples**

1. Crystal Viewer Demonstration: Bravais Lattices

2. Crystal Viewer Demonstration: Bravais Lattices 2

3. Crystal Viewer Demonstration: Various Crystal Systems

**Exercises and Homework Assignments**

1. Homework Exercise on Bravais Lattices, Crystal Structures, Miller Indices

2. Exercise: Crystal Lattices

3. Illinois ECE 440: Introduction to Crystal Properties Homework

4. ABACUS Exercise: Crystal Lattices and Miller Indices
Solutions to Exercises

Solutions are provided only to instructors!

Evaluation

This test will assess the users conceptual understanding of the physical, mathematical and computational knowledge related to the identification of crystal structures and the calculation of Miller indices.

ABACUS: Test for Crystal Viewer Tool

Challenge

Users are challenged to integrate what they have learned about crystal lattices.

Crystal Structures - Packing Efficiency Exercise