X-ray analysis is one of the key tools in non-destructive way to analyze all kinds of matter ranging from liquids to solids, and is essential for material characterization and quality control in research, engineering and production line. In this course, starting from what X-rays are, you will learn the crystal system, Miller index, the principle and application of powder X-ray diffraction measurement, and general X-ray diffractometers (XRD) how to configure and use.

**Properties of X-rays**
- **(30 min.)**
- **X-ray generating** (20min)
- **Interaction of X-rays with matter** (25 min.)
- **Geometry of crystals, Miller indices, and direction indices** (30 min.)
- **Basic applications of X-ray powder diffractometry** (20 min.)

**X-ray diffractometer** (20 min.)

**Focusing Method** (20 min.)

**Parallel Beam Method** (15 min.)

**Diffraction Angle** (30 min.)

**Precautions on Handling the X-ray Diffractometer** (15 min.)

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**Appendix [XRD] X-ray detectors** (Required time: approx. 0.5 hr)

To detect X-rays, X-rays need to be converted into a quantifiable signal by using interactions between X-rays and selected materials. In this chapter, after reviewing various detectors that have been used up to now, You will learn the features of semiconductor detectors that have become common in recent years.

- X-ray detectors (0D, 1D, and 2D detector)
- 2D Hybrid Pixel Array Detector "HyPix-3000"

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*1: Please note: required time is estimated as minimum period by taking consecutive programs from the beginning to the end of the chapters without any repetition.