

# Syllabus

## "Crystal Structure Analysis" (445.616) Spring 2019

**Professor Chan Park**

Location: **33-330**

Lecture time: **Monday & Wednesday 09:30-10:45**

Language of the class: **English**

Class web page: **ETL**

### Teaching staff:

Instructor: **Chan Park** Office: **33-320** Tel: **02-880-9324** Email: [pchan@snu.ac.kr](mailto:pchan@snu.ac.kr)

Office hours/place: **Monday & Wednesday 10:45-12:00 / 33-320**

Teaching assistant: TBD

### Prerequisite of this course:

- Need basic knowledge of crystallography.
- Need to have the license to use any XRD (can be one in Research Institute of Advanced Materials (RIAM, Sin-Gong-Yeon) or anywhere else). (this applies without any exception)
  - You need this for the experiment (see below).
  - Those who do not have the license have to get one before taking this course.
  - Those who do not have the license should take this course after getting one.

**Text: Lecture notes and additional reading materials. Information on the additional reading materials will be provided in each section.**

### Reference:

- V.K. Pecharsky & P.Y. Zavalij, Fundamentals of powder diffraction and structural characterization of materials
- C. Hammond, The Basics of Crystallography and Diffraction
- D. Sherwood & J Cooper, Crystals, X-rays, and Proteins
- M. Birkholz, Thin Film Analysis by X-ray Scattering
- B. D. Cullity, S. R. Stock, and S. Stock, Elements of X-ray Diffraction
- A. D. Krawitz, Introduction to Diffraction in Materials Science and Engineering,
- R. Jenkins & R. L. Snyder, Introduction to X-Ray Powder Diffractometry

- D. L. Post & J. E. Bish, Modern Powder Diffraction, Reviews in Mineralogy (Reviews in Mineralogy)
- R. A. Young, The Rietveld Method

### **Course Description:**

- The objective of this course is to provide students with a thorough grounding in the theory and applications of crystal structure analyses using diffraction and spectroscopy.
- Fundamentals of crystallography are first covered briefly, followed by advanced diffraction and scattering methods which include both theory and application.
- Modern instrumentation and automation techniques are addressed.
- The principles of crystal structure analyses emphasizing powder techniques are covered.

### **Lecture contents will include:**

- Fundamentals of crystallography
- Nature of X-rays (generation & detection)
- Interaction of X-rays with matter
- Diffraction theory and diffractometers
- Powder diffraction methods and calibration techniques
- Powder diffraction pattern and profile analysis
- Qualitative & quantitative phase analysis
- Residual stress analysis
- Size and strain analysis
- Texture analysis
- Rietveld method
- Structure of thin film

### **Components of Your Grade:**

**1) mid-term exam (25%)**

**2) final exam (25%)**

**3) experiment (25%)** ; Powder sample which consists of 4 different phases will be handed out, and you are expected to find out what they are and carry out the quantitative analysis of the 4 phases.

**4) term paper & presentation (25%)** ; Few subjects will be announced, and you are expected to choose one subject and prepare an in-depth term paper on that subject together with a 20 minute presentation in the class.

**Evaluation; absolute assessment (in case the number of students is larger than 21, relative assessment will be used)**