THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Structure and Characterization Lab

MATSCEN 2331

Credit Hours:
2.00

Course Levels:
Undergraduate (1000-5000 level)

Course Components:
Lecture
Lab

Course Description:
Companion laboratory course to MatScEn 2241. Experiments on X-ray diffraction, scanning electron microscopy, optical microscopy, and stereology with applications. Statistical treatment of data and technical reporting.

Prerequisites and Co-requisites:
Prereq: 2010, Physics 1250 or 1260, Math 1151 or 1161, and Chem 1210 or 1250; and enrollment as MatScEn-BS student; or permission of instructor.

Course Goals / Objectives:
- Understanding basic operation and capabilities of the principal characterization methods used in materials science, namely XRD, optical microscopy and SEM
- Understanding the processing, evaluation and reporting of experimental data

Course Topics:

- X-ray Diffraction Lab: Diffractometer operation and sample preparation. Analytical treatment of data for simple unknown structures. Computer-based pattern matching for more complex unknown structures, including texture and particle size effects.
- Optical Microscopy Lab: Sample preparation. Grain size and volume fraction measurement. Use of image analysis/stereological software.
- Scanning Electron Microscopy Lab: Interpreting various imaging modes. Analysis of Al-Si microstructures and relationship to phase diagram. Energy dispersive spectroscopy (EDS) analysis of phase compositions.
- Orientation Imaging Microscopy Lab: Automated measurement of grain size and twin fraction. Determination of global and local textures.
- 3D Microscopy Lab: Stereomicroscopy on fracture surfaces/porous structures. Quantitative surface topography using 3D digital optical microscope. Comparison of 3D serial section datasets (to be provided to students) and 2D stereology.
- Statistical treatment of data including sources and types of error, weighted averaging, scatter, and regression.

Designation:
Required