Course Outline
Scanning Electron Microscopy and X-ray Microanalysis
June 4-8, 2012

Day One **Sunday, June 3 (*evening*)**

5:00-8:00 Registration (Whitaker Lobby)
7:00-9:00 Lab 1: Basic SEM Imaging
7:00-9:00 Introduction to SEM Specimen Preparation for Images and X-ray Microanalysis

Day Two **Monday, June 4**

8:30-8:45 Welcome and Announcements
8:45-9:15 The SEM and Electron Probe Microanalyzer: An Introduction
9:15-9:30 Course Roadmap
9:30-10:30 SEM Imaging Modes
10:50-12:00 Electron Sources, Electron Lenses and Probe Formation
1:15-2:45 Electron Beam-Specimen Interactions
3:00-4:00 Generation of X-ray Signals
4:00-5:00 Elimination of Specimen Charging
7:00-9:45 Lab 2: SEM Imaging Modes

Day Three **Tuesday, June 5**

8:30-10:00 Image Formation
10:15-12:00 Image Contrast
1:15-1:25 Roadmap Update
1:25-2:45 X-ray Detectors (EDS)
3:00-4:00 X-ray Qualitative Analysis (EDS)
4:00-5:00 High Resolution SEM
7:00-9:45 Lab 3: Image Contrast and Quality

Day Four **Wednesday, June 6**

8:30-9:30 Digital Imaging and Compositional Imaging
9:30-10:00 How to Use the Lehigh CD-ROM
10:15-10:35 Roadmap Update
10:35-12:00 Quantitative X-ray Analysis: The Basics
1:15-2:00 Desktop Spectrum Analyzer
2:00-3:00 EDS Microanalysis: Qualitative and Quantitative
3:15-5:00 Lab 4: EDS Detectors and Characteristics of X-ray Spectra
6:30 Cocktail hour and banquet

Day Five **Thursday, June 7**

8:30-9:15 Variable Pressure and Environmental SEM
9:15-10:15 Low-Voltage SEM and Microanalysis
10:35-11:00 Live Demo: Variable-Pressure SEM
11:00-12:00 Choice:
1. SEM of Polymers and Fibers I
2. WDS Principles and Practice
3. Basic SEM Maintenance
4. Lab: Students on SEM, EPMA

1:15-2:30 Choice:
1. SEM of Forensic Samples
2. SEM of Polymers and Fibers II
3. Basic SEM Maintenance
4. Lab: Variable Pressure SEM
5. Lab: Students on SEM, EPMA

2:45-4:00 Choice
1. SEM of Electronic Materials
2. X-ray Analysis in Variable Pressure and Environmental SEM
3. Computer Lab: Monte Carlo Simulation and Thin Film Analysis
4. Basic SEM Maintenance
5. Lab: Students on SEM, EPMA

4:00-5:15 Choice:
1. Forensics: Imaging and X-ray Analysis
2. Image Analysis
3. Stereomicroscopy
4. Lab: Coating SEM Specimens
5. X-ray Ultramicroscopy
6. Lab: Students on SEM, EPMA

7:15-8:30 Choice:
1. X-ray Analysis of Particles and Supported Thin Films
2. Electron Backscatter Diffraction (EBSD)
3. ASTM Standards in Microscopy
4. Lab: SEM of Electronic Materials
5. Wavelength-Dispersive Spectrometry (WDS)
6. Lab: Coating SEM Specimens

8:30-8:45 Choice:
1. Electron Backscatter Diffraction (EBSD)
2. Image Analysis
3. Lab: WDS
4. Lab: Low-Voltage SEM
5. Coating SEM Specimens
6. Lab: Students on SEM, EPMA

Day Six **Friday, June 8**

8:30-9:30 Choice:
1. Reporting X-ray Results: Accuracy and Precision
2. SEM of Fracture Surfaces
3. Lab: EBSD
4. Lab: Forensic Applications
5. Lab: Digital Imaging
6. Lab: Students on SEM, EPMA

9:45-10:45 Choice:
1. Course Summary: Strategies for Practical Microscopy
2. Lab: Students on SEM, EPMA

11:00-12:00 Choice:
1. Course Summary: Strategies for Practical Microanalysis
2. Lab: Students on SEM, EPMA

1:15-2:15 Choice:
1. Failure Analysis in the SEM
2. Lab: EBSD
3. Lab: Students on SEM, EPMA
4. Lab: Forensic Applications

Note: All classes and labs will be held in Whitaker Lab. Disclaimer: The organizers reserve the right to change the instrumentation or sequence of lecture topics and to cancel Lectures or substitute lecturers if necessitated by circumstances beyond their control. Updated 9/7/11.