Syllabus and Schedule, Spring 2014

Introduction to X-Ray Powder Diffraction (EPS 400-001)

Overview of Course: The course is designed to be a practical introduction to X-ray powder diffraction and its use as a tool for identification of crystalline phases in natural and engineered materials. At the completion of the course, all students should have a fundamental understanding of the principles underlying the analytical methods, and some proficiency in the use of our Scintag PAD V diffractometer system and associated software to collect and analyze X-ray powder diffraction data.

Class Web Site: No published text is required for this course. The class web page is at http://epswww.unm.edu/xrd/xrd-course-info.htm. The web page is official syllabus with links to instructor-prepared materials that are the required text for the course. Material is in the form of printable Adobe Acrobat PDF documents for all topics, and some web-based PowerPoint presentations. Students must have access to an Internet-connected computer with Adobe Acrobat Reader (Free) installed, and a printer to print the course materials. Internet Explorer (preferably Ver. 6 or better) is required to view the PowerPoint presentations online; display of downloaded PowerPoint presentations may be enhanced by installation of Microsoft's Free PowerPoint Viewer.

Class Times: Wednesdays, 3:00 PM – 5:00 PM, Northrop Hall Rm 340. Some additional time in the laboratory will be required.

Instructor: Eric Peterson Office Farris Room 011. Cell 505-470-1076.

XRD Lab Northrop B25

Official Office hours by arrangement

Computer Accounts: Earth & Planetary Sciences department network accounts are required to use the laboratory. These will be created for students that need them within the first two weeks of class.

Grades and Exams: We will have two exams. The first is planned for the week after Spring Break and will cover the basic introductory material (through week 6). The second "take home" exam will cover the remainder of the course, and will be due during finals week.

Homework: All students will have several take-home exercises and problems that will comprise part of your grade.

Lab Exercises: There will be two laboratory exercises involving collection of XRD data and identification of unknown phases using Jade software.

Graduate Credit: E&PS graduate students ***must*** take this course for graduate credit. ***A "Graduate Credit Authorization" card must be completed, signed by your instructor and submitted to the Office of Graduate Studies as soon as possible after the start of class.*** For graduate students in other departments this is not required (since a 400-level course in another department is allowable for graduate credit). Award of graduate credit

requires students to propose and complete a research project (with report) involving XRD analysis in addition to the standard lab exercises.

Radiation Safety Requirements: ***All users of the laboratory must pass a basic examination about radiation safety and be monitored for exposure to radiation before they can use the laboratory.*** Radiation Safety Material presented January 28 will be helpful with the radiation safety exam. Additional materials are available on the XRD Lab website. Contact Larry Cleveland at 277-0317 to schedule the exam. ***The radiation safety exam must be completed before Spring Break starts.***

Class Schedule

This schedule is based on past experience. As with everything, it is subject to change if circumstances demand it. The class web page will be updated if changes are required.

January 21: Into and Lab Tour

January 29: Introduction to X-Ray Powder Diffraction /Radiation Safety for X-ray Diffraction Users

February 5: Generation of X-Rays

February 12: Crystallography Review

February 19: Introduction to Diffraction and the Reciprocal Lattice

February 26: Diffraction II: Intensities and Extinctions

March 4: Systematic Errors and Sample Preparation
(Radiation Safety Exam should be completed by this date)

March 12: Open Pre-Exam Q&A on first 6 weeks of class; Introduction to DataScan and Jade Software.

March 19: NO CLASS (Spring Break)

March 26: First Hour Exam (for first hour); Discussion of Lab Projects and Proposal Requirements.

April 2: Review of First Hour Exam (for first hour); Clay Mineralogy and XRD, Part 1 (Dr. Dewey Moore) (tentative)
(Round 1 of "Unknowns" for Lab Exercise distributed: Due on April 22)

April 9: Clay Mineralogy and XRD Part 2 (Dr. Connie Constan) (tentative)
(Round 2 of experimental "Unknowns" distributed: Due on April 29)

April 16: Q&A about Lab Exercises; Introduction to Quantitative Methods

April 23: Quantitative Methods Part 1 (Mr. Eric J. Peterson)

April 30: Quantitative Methods Part 2 (Mr. Eric J. Peterson)

May 7: Inexpensive and/or Free Software for XRD; Open Q&A Session; Take home "final" distributed at the end of class.

May 14: Finals Week – Take home "final" exam due no later than 4:00 PM on this day.