Welcome to MSE 405 - Microstructure Determination

Syllabus as of 01/05/2023

https://canvas.illinois.edu/courses/33892

Instructor:
Prof. J.C. Stinville, jcstinv@illinois.edu. Office: 201C MSEB. Office hours: Virtual.

Teaching assistants:

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Online resources: Canvas: Course content, assessment, grades, and discussion.

Schedule: In-person Lectures held M and W, 1:00-1:50 pm in 218 Ceramics. Available on MediaSpace. In-person Lab sections M-F in 113A Ceramics. No lab session the first week of class (Week of Jan 16).

Textbook:

Y. Leng, Materials Characterization: Introduction to Microscopic and Spectroscopic Methods (Links to an external site.), 4th edition (you must be on IllinoisNet or Campus VPN to download).

Additional Texts:

C. Hammond, The Basics of Crystallography and Diffraction. C. Suryanarayana, X-Ray Diffraction: A Practical Approach. M. M. Woolfson, An Introduction to X-ray Crystallography.

Useful software and databases: VESTA -- Crystal structure visualization. ASM -- Phase Diagrams Database. Inorganic Crystal Structure Database (ICSD), SDBS Spectroscopy Database (organic), RRUFF Mineral Database (inorganic). ImageJ -- Quantitative image analysis. ISOTROPY -- Powder diffraction simulations. Paid software available in labs or EWS: Jade, Diamond, Matlab, Mathematica.

Learning objectives: Your goal as a student in this course is **to understand the fundamentals of crystallography, diffraction, spectroscopy, and microscopy.** You should **be able to choose and apply these methods to characterize the microstructure of materials.**

Exams: There will be one final examination. The final exam will be comprehensive, covering lecture and laboratory content. Last year was a take-home final with a 24h period during finals week.

Pre-lecture problems: You are expected to complete the reading and canvas-driven pre-lecture problems by noon before each class. Pre-lecture points are assigned per day, with two submission attempts and a 50% credit for incorrect responses. The lowest two days will be dropped for each student.

Homework: There are no standalone homework assignments in MSE 405. In-depth homework-style problems are included where they are most relevant: laboratory reports, and daily questions.

Laboratory: The laboratory experiments will give you hands-on experience in x-ray diffraction, optical microscopy, scanning electron microscopy, and Raman spectroscopy. **Your lab group will be assigned in the first week of class and will be the same for the whole semester.**

Prelab assignments: There are no standalone prelab assignments. Prelab-style questions are included as part of the previous week's lab report.

Lab reports: Reports are completed in question-and-answer format and are due on Canvas by 9:30 AM on the day of your next lab session. The final lab report will be due one week after your lab

session. You will work in groups of ~3. You will upload an individual report PDF each week. A penalty of 30% per day (including weekend days) will be taken for late lab reports.

Effort of lab group members: All members of each lab group should perform their fair share of the work involved. Data should be shared between group members. Figures and text should be prepared individually. If you are concerned that a member of your lab group is not contributing adequately, work as a team to divide responsibilities and deadlines fairly. If the problem persists, corrective actions can be taken in consultation with Prof. Stinville.

Attendance: Lecture: Icliker. Lab: The TAs will take attendance. If you need to be absent from a lab for a justified reason (sickness, family emergency) contact your TA and Prof. Stinville immediately. Your TA will arrange for you to make up the session. Non-emergency absences (e.g. conference attendance, job interviews) must be notified at least 7 days prior, since your makeup lab session may be before your normal time. Unexcused absences result in a 50% penalty for that report, and zero credit for any subsequent unexcused absences. Late arrival to lab is disruptive and disrespectful to your groupmates, and will be penalized by 30% per report. If you need to switch to Online Lab for any reason, it can be arranged by contacting instructors. Synchronous lab attendance is optional for online lab students.

Ethics: Plagiarism of text, data, figures, graphs, etc., is prohibited. Instances of plagiarism will result in at least a triple-zero grade for the assignment for all authors. Please read and understand the rules: https://studentcode.illinois.edu/
Instances in which answers are copied (from any source, including references, classmates, data from previous years, or old answer sets) will result in sanctions in accordance with the Illinois Student Code, which may include immediate failure in the course. Members of the same lab group turning in partially identical lab reports or prelabs is plagiarism. Pasting text from a source is plagiarism. Using someone else's plot is plagiarism. You are responsible for preparation of your own unique figures and text, although the underlying data may be the

same. All reports are checked automatically via SafeAssign against each other and web sources. Incidents are reported via the campus-wide FAIR system in accordance with the Student Code.

Safety is of paramount importance: You must complete 4 DRS trainings (Laboratory Safety, Analytical X-Ray Safety, Laser safety and Covid-19 Safety)Links to an external site. and submit the proof of completion via Canvas by 9:30 am of the second day of lecture. See lecture 1 slides for details. You must do this even if you are doing lab online. We will not tolerate unsafe operating procedures or behavior. Read the safety instructions at the start of each lab manual before beginning work. Always follow the TA's instructions and proper safety protocols. The laboratory contains high voltage, powerful lasers, chemical hazards, and high temperature equipment.

You are required to bring your own mask, safety glasses, closed-toe shoes, and long pants to every laboratory. No food or drink is allowed in 113A Ceramics. You are not considered present for lab until you are participating with safe attire.

Graphics and Plotting Software: Any software can be used to create effective graphs and figures, but some are more effective or efficient than others. Some suggestions: Data plotting: Matlab, Octave, Mathematica, Grace, Origin, R, gnuplot, matplotlib Graphics: GIMP (raster), Photoshop (raster), Inkscape (vector), Illustrator (vector).

Grading: The following weighting factors will be used to determine your final grade:

15% Pre-lecture questions, including other submissions on Canvas (polls, safety, etc.)

5% Attendance (Iclicker)

55% Lab reports (~11 or 12)

25% Final exam

Grades will be assigned using the following scale. Round to the nearest integer.

A+	(98–100)	B+	(88–90)	C+	(78–80)	D+	(68–70)
A	(94–97)	B	(84–87)	C	(74–77)	D	(64–67)
A–	(91–93)	B–	(81–83)	C–	(71–73)	D–	(61–63)

At my discretion, the minimum score needed to earn a certain letter grade may be lowered, but it will not be raised.

Thank you.

I look forward to an excellent semester together!