

Atoms, Molecules, and Materials

CHEM 1620/2620

Fall 2025

Instructor: Dr. Jill Millstone
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Lectures: 1:00-1:50 pm MWF; Location: CSC132

Textbooks and Readings:

I will use two books as primary source material for our course, as well as papers from the literature where appropriate. All books are available online, free of charge through Pitt, and any additional readings will be supplied and posted to Canvas. If you have trouble accessing the books via the links below, I suggest searching the titles in PittCat – this will ensure you have the proper permissions to download the books.

- *Materials Chemistry* by Fahlman
 - <https://link.springer.com/book/10.1007/978-3-031-18784-1>
- *Solid State Chemistry and Its Applications* by West
 - <https://ebookcentral.proquest.com/lib/pitt-ebooks/detail.action?pq-origsite=primo&docID=1584999>

Course Overview: This course is designed to enable senior-level undergraduates and graduate level students to understand the scope, tools, and scientific principles of materials chemistry with a special focus on solid state structure, material classes, and condensed phased chemical analysis.

Grading:

Homework: 100 pts

Exams: I, 100 pts, II, 100 pts.

Final Project: 100 pts

Office Hours: Fridays, 2-3:30 pm CSC 1003 or by individual appointment (*vide infra*)

Participation: Class participation entails both engagement in the class in the form of questions or on discussion forums in Canvas (asynchronously). In-class discussion and questions are encouraged. Asking questions is both a product of and a prelude to curiosity and understanding. Not only do I enjoy your questions, more importantly, they often encourage me and others to think differently about all topics.

Homework and In-Class Exercises: We will have a series of in-class and take-home assignments throughout the course. These assignments are designed to stimulate critical thinking about facts and concepts covered in class. These assignments will be evaluated on effort in addition to accuracy. Here, effort is characterized by thorough and thoughtful answers to each question, clear presentation, and acknowledgement of sources and co-workers should you use additional materials or AI tools, and/or decide to work in a group.

Exams and Projects: Exam 1, Oct. 17. Exam 2, Nov. 21. Final Project Due Date: Dec. 1. *All dates are tentative.*

Important University Policies:

**N. B. These are official statements from the university. In some cases, I've added my own words at the end of the official language.*

Academic Integrity: Students in this course will be expected to comply with the University of Pittsburgh's Policy on Academic Integrity. Any student suspected of violating this obligation for any reason during the semester will be required to participate in the procedural process, initiated at the instructor level, as outlined in the University Guidelines on Academic Integrity. This may include, but is not limited to, the confiscation of the examination of any individual suspected of violating University Policy. Furthermore, no student may bring any unauthorized materials to an exam, including dictionaries and programmable calculators. To learn more about Academic Integrity, visit the Academic Integrity Guide for an overview of the topic. For hands-on practice, complete the Understanding and Avoiding Plagiarism tutorial. Cheating on any assignment results in a 0 score for the assignment.

Disability Resources: If you have a disability for which you are or may be requesting an accommodation, please contact the Office of Disability Resources and Services, 216 William Pitt Union (412-624-7890) as early as possible in the term. *JEM: I'm here to help and to teach you. Please use these resources so that the DRS can work with us to deliver the most effective education for you. If you need help reaching out to DRS, please let me know.*

Health and Safety Statement: It is important that you abide by [public health regulations](#), the University of Pittsburgh's [health standards and guidelines](#), and [Pitt's Health Rules](#). These rules have been developed to protect the health and safety of all of us. These guidelines are fluid based on the community level spread of a given pathogen. When community levels dictate, personal protective equipment such as face coverings are required in all classrooms and in every building on campus, without exceptions, regardless of vaccination status. This means you must wear a face covering that properly covers your nose and mouth when you are in the classroom. If you do not comply, you will be asked to leave class. For the most up-to-date information and guidance, please check Pitt's official website.

Accessibility: The Canvas LMS platform was built using the most modern HTML and CSS technologies, and is committed to W3C's Web Accessibility Initiative and [Section 508](#) guidelines. Specific details regarding individual [feature compliance](#) are documented and updated regularly.

Equity, Diversity, and Inclusion: The University of Pittsburgh does not tolerate any form of discrimination, harassment, or retaliation based on disability, race, color, religion, national origin, ancestry, genetic information, marital status, familial status, sex, age, sexual orientation, veteran status or gender identity or other factors as stated in the University's Title IX policy. The University is committed to taking prompt action to end a hostile environment that interferes with the University's mission. For more information about policies, procedures, and practices, visit the [Civil Rights & Title IX Compliance web page](#). If there are instances of the aforementioned issues, please contact the Title IX Coordinator, by calling 412-648-7860, or e-mailing titleixcoordinator@pitt.edu. Reports can also be [filed online](#). You may also choose to report this to a faculty/staff member; they are required to communicate this to the University's Office of Diversity and Inclusion. If you wish to maintain complete confidentiality, you may also contact the University Counseling Center (412-648-7930). *JEM: I want to teach you and create an environment that works for all. If there's a problem with any aspect of course curriculum, dialogue, logistics, or attendees, I want to work with you to address it.*

Religious Observances: The observance of religious holidays (activities observed by a religious group of which a student is a member) and cultural practices are an important reflection of diversity. As your instructor, I am committed to providing equivalent educational opportunities to students of all belief systems. At the beginning of the semester, you should review the course requirements to identify foreseeable conflicts with assignments, exams, or other required attendance. Please contact me within the first two weeks of the first class meeting to allow time for us to discuss and make fair and reasonable adjustments to the schedule and/or tasks.

Statement on Classroom Recording: To ensure the free and open discussion of ideas, students may not record classroom lectures, discussion and/or activities without the advance written permission of the instructor. Any such recording properly approved in advance can be used solely for the student's own private use. JEM: I know there are lots of devices that now allow you to record audio discretely and translate the audio directly into transcripts and notes. I deeply understand the appeal of these devices, as I too value amplifying my accessible memory. However, I think it is still basic decency to ask anyone before they are recorded outside of a public space where there is a reasonable expectation of it, and that is not such a reasonable expectation in our classroom. Indeed, Pitt does not allow recording in any class without prior, written permission from the instructor.

Your Well-being Matters: College/Graduate school can be an exciting and challenging time for students. Taking time to maintain your well-being and seek appropriate support can help you achieve your goals and lead a fulfilling life. It can be helpful to remember that we all benefit from assistance and guidance at times, and there are many resources available to support your well-being while you are at Pitt. You are encouraged to visit [Thrive@Pitt](#) to learn more about well-being and the many campus resources available to help you thrive. If you or anyone you know experiences overwhelming academic stress, persistent difficult feelings and/or challenging life events, you are strongly encouraged to seek support. In addition to reaching out to friends and loved ones, consider connecting with a faculty member you trust for assistance connecting to helpful resources. The [University Counseling Center](#) is also here for you. You can call 412-648-7930 at any time to connect with a clinician. If you or someone you know is feeling suicidal, please call the University Counseling Center at any time at 412-648-7930. You can also contact Resolve Crisis Network at 888-796-8226. If the situation is life threatening, call Pitt Police at 412-624-2121 or dial 911. JEM: It is my genuine privilege to help each of you whenever and wherever possible. Please reach out to me.

Some personal notes on AI, small classes, etc.:

It is a joy every year that I get to teach 1620/2620. I see materials, the chemistry of how those materials form, and perform, as foundational to our lives as humans and citizens. It is my pleasure to be a guide for you as you see the incredible beauty, complexity, and opportunity afforded by materials chemistry. We won't get to cover even a tiny fraction of this universe, but I hope that what we do cover will inform and inspire you.

In that vein, even as covid wanes, there is always a new challenge ahead. This semester, because of scheduling conflicts at both the graduate and undergraduate levels, we'll have a small class. I see it as an opportunity to expand what's possible for us to experience and learn, and we will leverage it. That said, I don't expect that our pedagogical experiments will work all the time, that tech will always perform as expected, or that life hiccups are not coming - either for you, for me, or for the university. Instead, I expect that both you and I will have unexpected and unavoidable challenges. With a little grace for one another, we're going to be able to learn a lot and have a good time doing it.

One aspect that has become pervasive in our lives are AI tools. These tools are often awe-inspiring amplifiers for our personal productivity and learning. They can also create areas of significant ethical compromise and/or

ambiguity. On any assignment where you use AI, I ask you to acknowledge both the LLM name and the prompt(s) used. Frankly, I don't expect big problems on this topic, rather I expect another avenue of learning. I think prohibiting LLM use is not only unrealistic, I think it is counterproductive. While I do not encourage you to use LLMs for the majority of work in this class (chiefly because I have seen it used to ill effect here, because they often have errors the more niche a topic becomes), I think there are many uses beyond asking it to tell you the definition of surface energy. If or when you decide to engage these tools for our course, I ask you to report the details of your usage not only for reasons of academic integrity, but also because of its potential to positively impact how the class, your fellow students, and maybe the field at large, can productively engage those tools.

Overall, I conduct my course based on the idea that you are all senior students who want to be here and want to learn. Therefore, you will not make choices that undermine those goals, let alone your personal integrities. Instead, I hope we'll learn what AI can do for materials chemistry together, where and when appropriate.

A few additional notes:

1. This class will use Canvas, Zoom, and Panopto when needed. Lecture slides will be available at least 15 minutes before class starts, via Canvas, so that you may use them during class time for notes.
2. All course materials will be available via Canvas. These materials include all homeworks, extra readings, and in-class exercises. Exam formats will be determined, described, and announced prior to each individual exam.
3. Office hours will be held in my office unless otherwise noted. Office hours will be at the same time each week, unless my illness or absence requires temporary modification. When needed, I may hold virtual office hours in addition to or instead of the in-person hours, and you will be notified in advance of any change. I'll do my best to also accommodate individual meeting requests. Please make those requests via email with an agenda for what you'd like to cover. Without an agenda, it can be hard to make the meeting as productive as you want it to be.
4. Grades will be assigned as outlined in the syllabus unless otherwise noted.
5. Details of our final project will be discussed mid-October.
6. Any change in mode of instruction, or other course adjustments, will be posted on Canvas, via Canvas email, as well as mentioned in the nearest possible class period.

Week	Dates (Mon; Wed; Fri)	Topic Focus	Assignments/Assessments
Week 1	Aug 25; Aug 27; Aug 29	Introduction to Materials Chemistry	
Week 2	Sep 01 - No Class, Labor Day; Sep 03; Sep 05	Solid State Chemistry	HW 1 Assigned - 9/5/25
Week 3	Sep 08; Sep 10; Sep 12	Solid State Chemistry	HW 1 Due - 9/12/25
Week 4	Sep 15; Sep 17; Sep 19	Metals	HW 2 Assigned - 9/19/25
Week 5	Sep 22; Sep 24; Sep 26	Semiconductors	HW 2 Due - 9/26/25
Week 6	Sep 29; Oct 01; Oct 03	Polymeric Materials	HW 3 Assigned - 10/3/25
Week 7	Oct 06; Oct 08; Oct 10 - No Class, Fall Break	Nanomaterials	HW 3 Due - 10/8/25
Week 8	Oct 13; Oct 15; Oct 17	Nanomaterials	Exam 1 - 10/17/25
Week 9	Oct 20; Oct 22; Oct 24	Materials Characterization	HW 4 Assigned - 10/24/25
Week 10	Oct 27; Oct 29; Oct 31	Materials Characterization	HW 4 Due - 10/31/25
Week 11	Nov 03; Nov 05; Nov 07	Materials Characterization	HW 5 Assigned - 11/7/25
Week 12	Nov 10; Nov 12; Nov 14	Materials Characterization	HW 5 Due - 11/14/25
Week 13	Nov 17; Nov 19; Nov 21	Materials in Action	Exam 2 - 11/21/25
Week 14	Nov 24; Nov 26; Nov 28	<i>Thanksgiving - No Class</i>	
Week 15	Dec 01; Dec 03; Dec 05	Student Presentations	Student Presentations - <i>Details discussed mid-October</i>