MSE 4330: Fundamentals of Nanomaterials and Nanostructures

Course Information

Instructor: Antonio Facchetti (afacchetti6@gatech.edu)
Course Prefix and Number: MSE 4330 AF
Term: Fall 2026

Course Description

Overview: This course covers the fundamentals of nanomaterials, nanostructures and nanoscopic films, as well as their unique properties for a broad spectrum of applications in science and technology. It emphasizes the interplay of engineering, chemistry, surface science, and physics to elucidate the multi-disciplinary nature of nanoscale science and engineering. The selected topics are appropriate for students in materials science and engineering, chemistry, physics, chemical engineering, mechanical engineering, environmental engineering, biomedical engineering, and electrical engineering.

Course Learning Outcomes

This course will enable the students to i) review fundamental concepts of bonding in chemistry; ii) familiarize with the physical chemistry and surface science to elucidate the fundamental aspects and unique properties of solid materials emerging at the nanoscale; iii) learn details of both "top-down" and "bottom-up" approaches to the fabrication and synthesis of nanostructures, nanomaterials and nanoscopic films; iv) familiarize with general and advanced tools for characterizing the physical and chemical properties of nanomaterials; iv) review recent developments of nanomaterials for applications in electronics, optoelectronics, and energy for understanding the societal impact of nanotechnology.

Required Course Materials

No textbooks or materials are required. Resources for research are determined in consultation with the instructor.

Grading Policy

The final grade in this course will be a weighted average of the following categories:

Exams	90% (Exam I, 30%; Exam II, 30%; Exam III, 30%)
Paper Review	10%

Below are the minimum weighted score grade ranges for the semester. Final weighted scores are rounded up from 0.5 to the nearest integer (i.e., a score of 69.5% would be rounded up to 70% and would be awarded a B grade).

A ≥85%
B 70-85%
C 60-69%
D 50-60%
F <50%

A homework or exam may be curved (i.e., extra points added to everyone's score) at the instructor's discretion. The curve for an exam or quiz will be announced both in class and on Canvas when the assessment is graded and returned to the class.

Attendance Policy

Attendance to class is not mandatory but strongly recoommended.

Academic and Research Honesty/Integrity Statement

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review the Student Code of Conduct and the Academic Honor Code, especially Appendix A: Graduate Addendum to the Academic Honor Code.

Students are expected to perform research in an ethical and responsible manner.

Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Allegations of scientific or scholarly misconduct are handled in accordance with the procedures outlined by the Policy for Responding to Allegations of Scientific or Other Scholarly Misconduct.

Core IMPACTS

Not applicable

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Student-Faculty Expectations

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. The Student-Faculty Expectations articulates some basic expectations that you can have of me and that I have of you. Additional information for research-related work is given in The Expectations of Advisors and Advisees. In the end, simple respect for knowledge,

hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

Campus Resources

The Undergraduate Research Opportunities Program (UROP) provides resources and support for undergraduate research students and their mentors. Visit https://undergradresearch.gatech.edu/ or contact UROP at urop@gatech.edu for more information.