

**MSE 8803F – Vapor Deposition of Thin Films: Processing Science & Technology– SP2024**  
**Georgia Tech School of Materials Science and Engineering**

**Time:** 8:00 – 9:15 am MW

**Location:** Rm 184, Love Building

**Instructor:** Prof. Losego (he, him, his) [losego@gatech.edu](mailto:losego@gatech.edu), Rm. 274 Love, 404-385-3630 (e-mail is best)

**Office Hours:** By request (email)

**Pre-requisites:** D or better in MSE 3002 or graduate standing. Please contact Dr. Losego with concerns.

**Required Text:**

D.L. Smith, *Thin Film Deposition: Principles & Practice*. McGraw Hill (1995). Available at the campus bookstores.

**Other References:**

M. Ohring, *The Materials Science of Thin Films: Deposition & Structure*. 2<sup>nd</sup> Ed. Academic Press (2002).

J. M. Lafferty, *Foundations of Vacuum Science and Technology*. (1998) Available as an E-Book from GT's library.

J. F. O'Hanlon, *A User's Guide to Vacuum Technology*, 2<sup>nd</sup> Ed. Wiley Interscience (1989).

V.V. Rao, T.B. Ghosh, and K.L. Chopra, *Vacuum Science & Technology*. Allied Publishers Ltd. (1998).

K. Jousten, *Handbook of Vacuum Technology*. 2<sup>nd</sup> Edition, Wiley (2016).

**Course Purpose**

To teach students the fundamentals of vacuum technology and vapor phase thin film processing science so that they may apply these concepts and quantitative approaches to their current research and/or future careers in vapor phase processing of materials.

**Topics Expected to be Covered in this Course**

- Kinetic Theory of Gases
- Gas Flow (Continuum Theory)
- Vacuum Technology (Pumping, Pressure Measurement, System Components)
  - Poster Session 1: Vacuum Technology – Creating, Measuring, and Manipulating Vacuum
- Evaporation: Theory and Kinetics
- Thin Film Deposition: Phenomenology and Kinetics
- Chemical Vapor Deposition: Thermodynamics & Kinetics
  - Poster Session 2: Thin Film Deposition Techniques and *in situ* Characterization

**Additional Topics That May Be Covered:**

- Plasmas & Ion Beams
- Epitaxy
- Mechanical Stresses in Thin Films

**Course Evaluation** (*All dates are tentative*)

- Group Homework / Take-Home Assignments (tentatively expect 2 to 4 assignments): 25%
- Posting of Notes for Assigned Lectures (3 out of 4): 5%
- Presentation 1 (Vacuum Technology): 15% (Estimate: **Sometime in February**)
- Presentation 2 (Deposition): 15% (Estimate: **between March 1 and April 15**)
- In-Class Quizzes on Posters: 20% (10% each)
- Final Project: 20% (**Due: Tuesday April 22, 5pm – Present During Final Exam: Fri. Apr. 26**)

**Course Grades**

<b>Score</b>	84.5% - 100%	69.5% - 84.4%	59.5% - 69.4%	49.5% - 59.4%	≤ 49.4%
<b>Grade</b>	A	B	C	D	F

**Academic Integrity:** Students should refer to the Institute's policy on academic integrity found in the code of conduct (<http://www.policylibrary.gatech.edu/student-affairs/code-conduct>). It is the instructor's understanding and expectation that the student neither gives nor receives any unauthorized aid on exams or quizzes, including the use of unauthorized notes or other information on an electronic device. All cases of academic misconduct will be submitted to Office of Student Integrity.

**Group Homework:** All take-home assignments will be group work and cannot be turned in individually. Groups must be composed of at least 2 students but no more than 4 students (or as otherwise indicated). Completed homework assignments must be turned in at the beginning of the class period in which it is due. **No late assignments will be accepted.**

**Posters:** Two poster presentations will be held during the semester. These sessions will be held in the evening, with dates TBD. Posters will be made by groups of nominally 2 students. Questions to be addressed for each poster topic will be provided beforehand. During the poster session, students will be expected to talk with other presenters to learn from each other. A Canvas discussion will also be setup to share this information. In-class quizzes will be given after the poster sessions based upon this information.

**Final Project:** The final project will also be completed in teams, likely of 2-3 students (TBD). This project will involve the design of a vapor phase deposition system and will include both a written report (Due Tuesday April 22 @ 5PM) and ~15 min presentations during the final exam period (Fri. Apr. 26 @ 8AM).

**Missed Tests:** If you miss an in class exam/quiz without either a certified medical excuse or prior instructor approval, **YOU WILL EARN ZERO CREDIT FOR THAT EXAM.** If a missed exam/quiz is approved, a re-test will be given or the final project score will substitute for that missed test.

**Instructor's Commitment:**

You can expect your instructor to be courteous, punctual, well-organized, and prepared for lecture and other class activities; to answer questions clearly; to be available during office hour or to notify you beforehand if he is unable to keep them; to provide a suitable guest lecturer if he is traveling; and to grade uniformly and objectively all tests and assignments.

**Expectation of Students:**

- **Students are expected to attend class regularly** and be involved with in-class activities.
- Most classes will involve active engagement; all students are expected to participate and will be actively called upon for discussions and responses. **During class, students are required to sit immediately adjacent to at least 1 other student to facilitate these learning activities.**
- Electronic devices (laptops, cell phones, etc.) are allowed as long as they do not audibly or visually disrupt the class and do not inhibit active involvement. (Policy subject to change.)

**Grading:** If you believe an error was made in grading homework, quizzes, or exams, you should write a short justification of your claim and attach it to the original assignment in question and then send a copy electronically ([losego@gatech.edu](mailto:losego@gatech.edu)) or in paper form to Dr. Losego. The "statute of limitations" for such claims is 1 week after the assignment/test is returned. All assignments/exams are copied before returning, so any "post-adjustments" will be caught and sent to the Office of Student Integrity.

**Online Resources:** The Canvas site will be used for grading, announcements, and distribution of supporting materials and assignments. A Piazza site will be made available to share technical information amongst students.

**Students with Disabilities:** The Office of Disability Services serves Georgia Tech students with documented qualifying disabilities and operates under the guidelines of Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act and its amendments (ADAAA). In accordance with Georgia Tech Policy, "Reasonable accommodations are provided to **self-identified students** with disabilities who meet the academic and technical standards requisite to admission or participation in the program of study. Consideration may be given to the substitution or modification of certain course requirements as long as such changes do not detract from the quality of the educational experience and the changes remain within the accreditation criteria for the degree program." More information can be found here: <http://www.adapts.gatech.edu>. Self-identified students with disability should speak with Dr. Losego during the first week of classes, so that suitable arrangements can be organized.