ECE 4452 Microelectronics Processing Laboratory
Fall 2026

Time: Lecture Period, TH, 12:30-1:40 PM, Klaus 1447
Laboratory Session as assigned

Instructor: Professor Bruno Frazier
223 Pettit Building
Bruno.Frazier@ece.gatech.edu

Text: G. May & S. Sze, Fundamentals of Semiconductor Fabrication, ISBN: 0-471-23279-3
Reference: R. Jaeger, Introduction to Microelectronic Fabrication, 2nd edition, ISBN: 0-201-44494-7

Pre-requisites: (ECE3030 or ECE3040) and ECE2031

Laboratory Instructor: Dr. Seung-Joon Paik, 2nd Floor Marcus Building, spaik8@gatech.edu

Teaching Assistant: Evan Zhang
ezhang47@gatech.edu

Office Hours: Dr. Frazier, scheduled by appointment
TBD, H 11:00 AM-12:00 PM or by appt, The Hive top floor (TA OH Teams link)

Grading:
Your grade will be based on attendance (5%), exam 1 (15%), exam 2 (15%), final exam (design project) (20%), homework (15%), laboratory reports with updated model (20%), laboratory notebook (10%). The content of the laboratory notebook and laboratory reports is described in more detail per the additional handouts found on the course Canvas site.

The Examinations will be held per the canvas schedule. A grade of zero will be given for any missed exam for which there have been no arrangements made beforehand, unless you have a written medical excuse.

The Process Design Project is due ----, 11:59 PM.

Laboratory Notebooks are due on the last lecture day.

Laboratory Reports & Homeworks are due per the Assignment schedule on Canvas.

Class Rules and Regulations:
1. In the laboratory sessions, please note: safety is of the utmost concern in this class. Although all procedures in this laboratory are safe if done properly, improper procedures can result in severe injuries.
2. The laboratory reports and the computer modeling projects will be an individual effort (i.e., one laboratory report from each student). If you have any questions regarding when your fellow students can help you and when they can't, please ask the instructor.
3. Because we are on a tight schedule, and because independent work in the laboratory cannot be allowed due to safety reasons, it is extremely important that you attend EVERY laboratory session. If either you cannot attend a session, please notify me and Dr. Paik as soon as possible. In these cases, the laboratory instructor can be 'hired' to process your wafers for you, at a 'cost' of a 20 exam points for the course per occurrence.

Course Attendance Policy: Students are expected to attend ALL laboratory sessions and make a best effort attempt to make all the lecture sessions. Course credit is given for attendance.

Technology Requirements: Laptop with TEAMS, video, audio, and fully CANVAS capable

IMPORTANT NOTICE:

Assignments and/or project deliverables may be due during Final Instructional Class Days.

Academic Integrity:

Students are expected to behave in conformance with the Georgia Tech Honor Code (see http://honor.gatech.edu/). Students are encouraged to study together to prepare for exams and may discuss assignments, as detailed above. Additional assistance may be obtained from Dr. Frazier, or the ECE 4452 GTA. However, unless explicitly stated otherwise, all exams and assignments turned in for grading are to be the student's independent solutions. Incidents of academic dishonesty will be referred in writing to the Office of Student Integrity.

Student-Faculty Expectations Agreement:

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. See http://www.catalog.gatech.edu/rules/22/ for an articulation of some basic expectation that you can have of us and that we have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, we encourage you to remain committed to the ideals of Georgia Tech while in this class.

Accommodations for Students with Disabilities:

At Georgia Tech we strive to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, please contact Dr. Frazier to discuss options. If you have already established accommodations with the Offices of Disability Services, please communicate your approved accommodations at your earliest convenience so we can discuss your needs in this course. If you have not yet established services through Disability Services, you are welcome to contact that office at 404-894-2563, dsinfo@gatech.edu, or disabilityservices.gatech.edu.

Course Outcomes:

Upon successful completion of this course, students should be able to:

1. Understand the commonly used fabrication processes used to create integrated circuits
2. Understand the underlying theory behind semiconductor processes
3. Understand how to model semiconductor processes
4. Understand how to correlate theory, empirical data, and models of semiconductor processes
5. Design basic semiconductor processes and assess process flow

ECE 4452 LABORATORY SCHEDULE (Spring 2024)

	LAB SESSION TIME	TOPICS	LOCATION
		NO LAB SESSIONS	
2	**(No Lab on Monday)** M,W,F 12:30pm – 3:15pm T(K) 8:00am – 10:45am T,R 2:00pm – 4:45pm	**Lab Session 1:** Safety and introduction to laboratory sessions Wafer inspection, cleaning, and oxidation	Pettit Cleanroom
3	M,W,F 12:30pm – 3:15pm T(K) 8:00am – 10:45am T,R 2:00pm – 4:45pm	**Lab Session 2:** Photolithography (P-well) and oxide etch	Pettit Cleanroom
4	M,W,F 12:30pm – 3:15pm T(K) 8:00am – 10:45am T,R 2:00pm – 4:45pm	**Lab Session 3:** P-well diffusion	Pettit Cleanroom
5	M,W,F 12:30pm – 3:15pm T(K) 8:00am – 10:45am T,R 2:00pm – 4:45pm	**Lab Session 4:** Photolithography (P+) and oxide etch	Pettit Cleanroom
6	M,W,F 12:30pm – 3:15pm T(K) 8:00am – 10:45am T,R 2:00pm – 4:45pm	**Lab Session 5:** P+ diffusion and oxidation	Pettit Cleanroom
7	M,W,F 12:30pm – 3:15pm T(K) 8:00am – 10:45am T,R 2:00pm – 4:45pm	**Lab Session 6:** Photolithography (N+) and oxide etch	Pettit Cleanroom
8	M,W,F 12:30pm – 3:15pm T(K) 8:00am – 10:45am T,R 2:00pm – 4:45pm	**Lab Session 7:** N+ diffusion, photolithography (gate) and oxide etch	Pettit Cleanroom
9	M,W,F 12:30pm – 3:15pm T(K) 8:00am – 10:45am T,R 2:00pm – 4:45pm	**Lab Session 8:** Oxidation, photolithography (contact) and oxide etch	Pettit Cleanroom
10	M,W,F 12:30pm – 3:15pm T(K) 8:00am – 10:45am T,R 2:00pm – 4:45pm	**Lab Session 9:** Metallization and photolithography (metal)	Pettit Cleanroom
11		**NO LAB SESSIONS**	
12	M,W,F 12:30pm – 3:15pm T(K) 8:00am – 10:45am T,R 2:00pm – 4:45pm	**Lab Session 10:** Metal etch and annealing End of process	Pettit Cleanroom

13	M,W,F 12:30pm – 3:15pm T(K) 8:00am – 10:45am T,R 2:00pm – 4:45pm	**Lab Session 11:** Characterization and measurements	Pettit Room 230A