EEC 146A – Integrated Circuits Fabrication
Winter Quarter 2026

Instructor:
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Virtual Office Hours: Tuesday 3:00pm-4:00pm (Use recurring Zoom link on Canvas)

Teaching Assistants:
Lisa McPhillips (TA)
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Simulation Office Hours: Monday 10:00am-11:00am [ZOOM]

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Lecture Times:		**Location:**
Tue. and Thu.	1:10pm-2:00pm	Walker Hall, Room 1320

Lab Times*:		**Location:**
1. Tuesday	9:00-11:50am	Kemper Hall, Room 1224
2. Wednesday	1:10-4:00pm	Kemper Hall, Room 1224
3. Wednesday	5:10-8:00pm	Kemper Hall, Room 1224
4. Thursday	9:00-11:50am	Kemper Hall, Room 1224
5. Friday	9:00-11:50am	Kemper Hall, Room 1224

*These are the times for in-person sessions. The preceding number is the section number. See Lab/Simulation Timeline table at the end.

Catalog Description:
Integrated Circuits Fabrication: (4 units) Lecture 2 hours; Lab 3 hours.

Basic fabrication processes for metal oxide semiconductor (MOS) integrated circuits. Laboratory assignments covering oxidation, photolithography, impurity diffusion, metallization, wet chemical etching, and characterization work together in producing metal-gate PMOS test chips which will undergo parametric and functional testing.

Prerequisites:
EEC 140A

Technology Use:
The students will need to have access to computer and mobile device with audio/video capabilities and internet access for assignments and in-class Top Hat quizzes.

Textbook (Available on Equitable Access Bookshelf [Canvas]):
Required: *Introduction to Microelectronic Fabrication, 2nd Edition* by Richard C. Jaeger. Prentice Hall, McGraw Hill, 2002.

Suggested additional reading: *Silicon VLSI Technology – Fundamentals, Practice, Modeling* by James D. Plummer, Michael D. Deal, Peter B. Griffin. Prentice Hall, 2000.

Grading:
Homework: 5%
Weekly Labs: 40%
Midterm Exams: 25% (Better exam weighed at 15%)
Quizzes: 15%
Final Exam: 15%

Homework Sets:
There will be 7-8 homework sets which will typically be assigned a week before they are due. Homework will not be graded in detail but a full or no score will be administered for each question. However, it is essential to do the homework to prepare for the midterm and final exams.

Laboratory/Simulation Assignments:
There will be a combination of three in-person lab sessions and four remote simulation-based assignments. Each class section will be divided into three groups for managing the assignments. An industry-level process and device simulation tool, Silvaco ATHENA/ATLAS, will be used for simulation assignments. More information on the laboratory/simulation assignments will be provided in class.

Exams:
There will be two midterm exams, for which the better-scored exam will be weighed at 15%. **Final exam is scheduled for 1:00pm-3:00pm Wednesday March 18, 2026.** Final exam will be comprehensive. Further information will be given in-class prior to each exam.

Quizzes:
Short quizzes will be administered in class using Top Hat or other similar software. Students will need charged devices (e.g., tables, phones) with internet access for these quizzes. Additional information will be provided in class. There will be approximately 10 quizzes during the entire quarter and the lowest grade will be dropped. There will be no make-up quizzes or time extension for late starts.

Make-up Exams and Quizzes:
Make-up exams will not be given unless cases of extreme extenuating circumstances arise.

Regrading:
If you disagree with the grading on homework, exams, quiz, and lab reports with a good reason, attach a note and return it to the instructor. The instructor will review the grading and reassign points as necessary. Note that upon regrading the score may go up or down. All regrading requests need to be filed within a week of receiving the graded item.

Late Submission Policy:
Assignments will be submitted electronically on Canvas. Submissions after deadline up to 24 hours will have 20% deducted; between 24 hours and 48 will have an additional 20% deducted. Any submission later than 48 hours will not be accepted.

Note on Generative Artificial Intelligence (GenAI) Tools:
Unless otherwise noted during class activities, you may only use GenAI technologies to *aid* or *nuance* your thinking, communication, and learning; but not to *replace* or *subvert* it. See the table at the end of the syllabus for non-exhaustive examples of allowable and non-allowable uses.

Academic Integrity:
Cheating and plagiarism will absolutely not be tolerated. Professional integrity is an important aspect of all engineering disciplines and understanding the material in these courses is integral to becoming a proficient and productive engineer. As such, it is imperative that you spend the time and effort to fully understand the material and seek help when necessary. Please read the UC Davis "Code of Academic Conduct" at participate.ucdavis.edu .

Student Resources: https://ebeler.faculty.ucdavis.edu/resources/faq-student-resources/

Lecture Timeline

Week	Date	Lecture	Topic
1	1/6	1	Intro to cleanroom, rules & safety training
	1/8	2	MOSFET layout, cross-section, intro to process flow
2	1/13	3	Oxidation
	1/15	4	Oxidation & wet chemical etch
3	1/20	5	Dry etching, (an)isotropic etching
	1/22	6	Photolithography, pattern transfer
4	1/27	7	Advanced Photolithography
	1/29	8	Diffusion
5	2/3	9	Diffusion (cont.)
	2/5	10	Sheet resistance, junction depth
6	2/10	-	**MIDTERM 1**
	2/12	11	Ion implantation, annealing
7	2/17	12	Ion implantation, annealing (cont.)
	2/19	13	Physical vapor deposition (PVD)
8	2/24	14	Chemical vapor deposition (CVD)
	2/26	15	Semiconductor-metal interface
9	3/3	-	**MIDTERM 2**
	3/5	16	Packaging & yield
10	3/10	17	Characterization techniques
	3/12	18	Biological microsystems & nanotechnology

Laboratory/Simulation Timeline

Week	Date	Description	Group*	Location
1	1/6 – 1/9	Gowning & Cleanroom Safety	1	CNM2
		Gowning & Cleanroom Safety	2	CNM2
		Gowning & Cleanroom Safety	3	CNM2
2	1/13 – 1/16	Lithography	1	CNM2
		Intro to Silvaco & Oxidation	2	Simulation
		Intro to Silvaco & Oxidation	3	Simulation
3	1/20 – 10/13	Intro to Silvaco & Oxidation	1	Simulation
		Lithography	2	CNM2
		Etch & Deposit	3	Simulation
4	1/27 – 1/30	Etch & Deposit	1	Simulation
		Etch & Deposit	2	Simulation
		Lithography	3	CNM2
5	2/3 – 2/6	**MIDTERM 1 (NO LAB)**	1, 2, 3	Classroom
6	2/10 – 2/13	Device Characterization	1	CNM2
		Diffusion & Ion Implantation	2	Simulation
		Diffusion & Ion Implantation	3	Simulation
7	2/17 – 2/20	Diffusion & Ion Implantation	1	Simulation
		Device Characterization	2	CNM2
		Device Design & Characterize	3	Simulation
8	2/24 – 2/27	Device Design & Characterize	1	Simulation
		Device Design & Characterize	2	Simulation
		Device Characterization	3	CNM2
9	3/3 – 3/6	**MIDTERM 2 (NO LAB)**	1, 2, 3	Classroom
10	3/10 - 3/13	**NO LAB**	1, 2, 3	

Approximate Laboratory/Simulation Report Deadlines

Week	Section	In-person				Simulation	
		Lab Date	**Lab Date**	**Assigned** (12:01am)	**Due by** (11:59pm)	**Assigned** (12:01am)	**Due by** (11:59pm)
1	1	Tuesday	1/6	No Assignment			
	2	Wed. 1	1/7				
	3	Wed. 2	1/7				
	4	Thursday	1/8				
	5	Friday	1/9				
2	1	Tuesday	1/13	1/10	1/19	1/10	1/16
	2	Wed. 1	1/14	1/11	1/20		
	3	Wed. 2	1/14	1/11	1/20		
	4	Thursday	1/15	1/12	1/21		
	5	Friday	1/16	1/13	1/22		
3	1	Tuesday	1/20	1/17	1/26	1/17	1/23
	2	Wed. 1	1/21	1/18	1/27		
	3	Wed. 2	1/21	1/18	1/27		
	4	Thursday	1/22	1/19	1/28		
	5	Friday	1/23	1/20	1/29		
4	1	Tuesday	1/27	1/24	2/2	1/24	1/30
	2	Wed. 1	1/28	1/25	2/3		
	3	Wed. 2	1/28	1/25	2/3		
	4	Thursday	1/29	1/26	2/4		
	5	Friday	1/30	1/27	2/5		
5	**MIDTERM 1 (NO LAB)**						
6	1	Tuesday	2/10	2/7	2/16	2/7	2/14
	2	Wed. 1	2/11	2/8	2/17		
	3	Wed. 2	2/11	2/8	2/17		
	4	Thursday	2/12	2/9	2/18		
	5	Friday	2/13	2/10	2/19		
7	1	Tuesday	2/17	2/14	2/23	2/14	2/20
	2	Wed. 1	2/18	2/15	2/24		
	3	Wed. 2	2/18	2/15	2/24		
	4	Thursday	2/19	2/16	2/25		
	5	Friday	2/20	2/17	2/26		
8	1	Tuesday	2/24	2/21	3/2	2/21	2/27
	2	Wed. 1	2/25	2/22	3/3		
	3	Wed. 2	2/25	2/22	3/3		
	4	Thursday	2/26	2/23	3/4		
	5	Friday	2/27	2/24	3/5		
9	**MIDTERM 2 (NO LAB)**						
10	**NO LAB**						

Details on GenAI Use (Acknowledgement: Dr. Torrey Trust, University of Massachusetts, Amherst)

Example of an Allowable Use	**Why is this Allowed?**	**Things to Keep in Mind**
Prompting GenAI technologies to **generate ideas** for a class project.	This might enhance your creative thinking by **exposing you to different ideas** compared to what you might come up with on your own (GenAI technologies, like ChatGPT, draw from a massive dataset of billions of parameters, which means these tools can introduce you to ideas and concepts from various fields that you might not be familiar with). GenAI writing technologies are also helpful for **idea iteration** – you can prompt these technologies to give you 50 different iterations of the same idea in less than a few seconds.	It is important to start with **brainstorming your own ideas first** (to aid your creative thinking), rather than letting GenAI do that initial work for you. Also, beware that GenAI might introduce biases into the topic when prompted to generate ideas.
Using GenAI technologies for writing support (e.g., using Grammarly to **improve writing quality, clarity, and expression**).	GenAI writing technologies and AI-powered writing assistants (e.g., Grammarly) can provide ideas for how to revise a sentence, begin a paragraph, express your thinking more clearly, and identify grammar and spelling errors. Used in this way, GenAI technologies might allow you to focus more on expressing your thinking and demonstrating your learning through writing as opposed to focusing on how to write and spell properly (although it is important to learn the foundations of writing, too!).	Make sure to **get your thoughts written down first** rather than asking GenAI technologies to write the first draft. Writing and thinking are interconnected processes, if you prompt GenAI technologies to write the first draft for you, you are not actively engaging in thinking about the material. NOTE: We also have a wonderful Writing Center on campus! Use it!
Using GenAI technologies as a **study or assignment aid.**	GenAI technologies can offer study tips, provide example text/quiz practice questions, design a personalized study guide, design flashcards, give directions for how to complete an assignment, create learning simulations and interactive scenarios to help you develop your understanding of the class content, and it can even provide a rubric so you can self-assess your own work.	GenAI tools are known for making up information and presenting biased output. Make sure to double-check the accuracy, credibility, and reliability of any AI-generated information that you use to support your studying or assignment completion.
Prompting GenAI technologies to help **make information easier to understand** (e.g., explaining technical or academic jargon, providing concrete examples of an abstract idea).	GenAI technologies could potentially be used in ways that reduce cognitive load, such as breaking material into smaller chunks, summarizing and simplifying material, providing an outline of an article to support pre-reading, translating text into your native language, making content more accessible, scaffolding learning, and providing concrete examples.	If GenAI technologies are used in ways that reduce germane load (the cognitive effort required to build mental schema) it can negatively impact learning. For example, asking ChatGPT to summarize an article for you instead of reading the article reduces your germane load as well as your ability to learn from the reading. Start with doing the reading first, then if you are still struggling to understand the text, consider if AI might help you with a summary or podcast overview of the content.