

Syllabus
ECE 571—Microelectronic Fabrication
ECE Department, UMass Amherst
Spring 2019

- Course Instructors:** Prof. Qiangfei Xia, 201D Marcus Hall, qxia@umass.edu
Prof. J. Joshua Yang, 201G Marcus Hall, jjyang@umass.edu
- Office Hours:** Xia: Tues: 10:00 am- noon or by appointment
Yang: Wed: 12:00-2:00 pm or by appointment
- TAs:** Shiva Asapu: sasapu@umass.edu
Rivu Midya: rmidya@umass.edu
Wenhao Song: wsong@umass.edu
- First meeting:** 1/22/2019, Tuesday
- Organization:** *Lecture* – Tues/Thurs 8:30 – 9:45 AM, E-Lab 306
Lab – one session each week, Marcus 15A
- Enrollment:** limited to 20 students
- Prerequisites:** ECE 344 or equivalent background
- Credits:** 4 (with lab) (**NO audit**)
- Grading:** 50% Laboratory (*If your chip fails and you have to get raw data from other people's chip, you should let the TA know and the analyses should be your own*); 20% Exam 1; 20% Exam 2; 10% Homework (5 highest scores out of 6 homeworks); 2 fastest ring oscillator awards (each gets a notch up in final grade, e.g., A- to A)

Course Goals

- To introduce basic technologies and knowledge of IC fabrication.
- To fabricate semiconductor devices and integrated circuits starting from bare silicon wafers.
- To test devices/circuits and analyze their performance using your knowledge in semiconductor physics and electronics.

Lecture Topics:

- Overview of IC fabrication
- Semiconductor Crystal Growth
- Substrate Preparation and Cleaning
- Thermal Oxidation and Gate Dielectrics
- Optical Lithography
- Dopant Diffusion and Ion Implantation
- Wet and Dry Etching
- Thin Film Deposition
- Metallization and Interconnection
- Bonding, Packaging and Yield

Course Materials:

- *Required:* Fabrication Engineering at the Micro-and Nanoscale, by Stephen A. Campbell, Oxford University Press, 4th edition.
- *Recommended:* Introduction to Microelectronic Fabrication, by Richard C. Jaeger, Prentice Hall, 2002. 2nd edition.
- *Recommended:* Microchip Fabrication: A Practical Guide to Semiconductor Processing, by Peter Van Zant, McGraw-Hill, 2014. 6th edition.
- *Recommended:* Silicon VLSI Technology: Fundamentals, Practice, and Modeling, by Pummer, Deal and Griffin, Prentice Hall, 2000, 1st edition.
- Lab manual, handouts, and lecture notes (Moodle).