

**Syllabus**  
**ECE 571—Microelectronic Fabrication**  
ECE Department, UMass Amherst  
Spring 2018

**Course Instructor:** Prof. J. Joshua Yang, 201G Marcus Hall, [jjyang@umass.edu](mailto:jjyang@umass.edu)

**Lab Instructor:** Prof. Qiangfei Xia, 201D Marcus Hall, [qxia@umass.edu](mailto:qxia@umass.edu)

**Office Hours:** Yang: Tue./Thu.: 10:00-11:00 Am or by appointment

**Office Hours:** Xia: TBD

**TAs:** Wenhao Song [wsong@umass.edu](mailto:wsong@umass.edu)

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**First meeting:** 1/23/2017, Tuesday

**Organization:** *Lecture* – Tues/Thurs TuTh 8:30AM - 9:45AM, Marston Hall room 15

*Lab* – one session each week, Marcus Hall

**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, 4<sup>th</sup> edition.
- □ *Recommended:* Introduction to Microelectronic Fabrication, by Richard C. Jaeger, Prentice Hall, 2002. 2<sup>nd</sup> edition.
- □ *Recommended:* Microchip Fabrication: A Practical Guide to Semiconductor Processing, by Peter Van Zant, McGraw-Hill, 2014. 6<sup>th</sup> edition.
- □ *Recommended:* Silicon VLSI Technology: Fundamentals, Practice, and Modeling, by Pummer, Deal and Griffin, Prentice Hall, 2000, 1<sup>st</sup> edition.
- □ Lab manual, handouts, and lecture notes (Moodle).