

EE 40446/EE60546
Integrated Circuit Fabrication

EE41446/EE61546
IC Fabrication Laboratory

Fall 2022

This lecture/laboratory course teaches the principles of semiconductor integrated circuit (IC) fabrication, with hands-on training in the Notre Dame Nanofabrication Facility (NDNF)[†]. Students learn the hardware side of microelectronics, starting from bare Si wafers, to transistors, and then to microelectronic circuits. This includes photolithography, oxidation, diffusion, ion implantation, vacuum evaporation, sputtering, chemical and plasma reactive ion etching, atomic layer deposition, plasma-enhanced chemical vapor deposition, and processes now being run in commercial foundries. Characterization methods are used in the lab for in process testing: ellipsometry, spectral reflectance, confocal optical microscopy, surface profilometry, and current-voltage measurements. On successful completion of the course students fabricate a chip that plays the Notre Dame fight song, and acquire the skills needed to work independently in the NDNF. The courses provides a hands-on appreciation of the technology which underpins modern life.

Instructor	Alan Seabaugh, 230A Fitzpatrick Hall, seabaugh.1@nd.edu Office (574) 631-4473, Mobile (574) 485-7816
Teaching Assistants	Muntasir Hossain, mhossai2@nd.edu , (574) 210-2053 Jon Cowart, jcowart2@nd.edu , (484) 800-6203, Weifeng Wu, wwu9@nd.edu
Prerequisites	Prior knowledge in semiconductors is useful, but not required. Science and engineering students across disciplines are welcome. The course is typically taken by seniors and graduate students; juniors can take the course.
Class	DeBartolo Hall, Room 319, 2-250 pm, MWF
Lab	Stinson-Remick cleanroom, Lab training sessions are held 9-12 am M, 3-6 pm Tu, or 3-6 pm W. Lab assignments are completed outside of these times.
Text	J. D. Plummer and P. B. Griffin, <i>Integrated Circuit Fabrication: Science and Technology</i> (Cambridge 2023)
Course Website	Canvas - Canvas support is available 24 hours a day, 7 days a week. Use Help button in Canvas, blue navigation panel, left side of screen
Lab Notebook	Cleanroom lab notebook will be supplied
Grading	Homework 10%, Midterm 15%, Final 20%, Lab 55% [Lab notebooks (10+10+15)% + midterm & final reports (10+10)%]
Seabaugh Meetings	By request to Heidi Deethardt, deethardt.1@nd.edu , or stop by or zoom.

[†] Stinson-Remick Hall of Engineering cleanroom, <https://www3.nd.edu/~ndnf/>