

Syllabus

Introduction to Nano-fabrication B: EE599

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Course summary: Nano-fabrication is one of the enabling technologies of nano-device nano-science researches. While it was mainly invented through the progresses of semiconductor industry, its applications have gone beyond semiconductor devices and circuits. In this course we will place emphasis on lithography, material deposition, pattern transfer and metrology. Several example applications will be given too. The goal of this course is to:

- 1) Survey the landscape of the stat-of-the-art nano-fabrication technologies.
- 2) Understand the fundamental sciences behind nano-fabrication.
- 3) Provide the starting point of nano-fabrication research.

Prerequisites: Graduate students with major in Engineering, Physics or Chemistry

Course text:

Handout on each class, and

“Fabrication Engineering at the Micro and Nanoscale”, by Stephen A. Campbell

Grading:

20% homework, 20% presentation, 30% mid-term exam, 30% final exam

Week by week:

1. Introduction and overview
2. Semiconductor substrates: Czochralski growth, Bridgman growth, float zone growth
3. Diffusion, implantation and process simulations software
4. oxidation, self-limiting oxidation, rapid thermal annealing
5. SOI technologies, thin film physical deposition: evaporation, sputtering,
6. PECVD, LPCVD, ALD
7. Epitaxy, plating, SAM, LB
8. Low dimensional nanostructures
9. Mid-term exam, Flexible substrates
10. Transfer printing (guest lecture), pattern transfer: fundamentals
11. Pattern transfer: wet etching, ion milling,
12. Pattern transfer: RIE, ICP,
13. Pattern transfer: deep RIE, CAIBE
14. CMP, Nano-informatics (guest lecture)
15. Student presentation

Statement for Students with Disabilities

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

Statement on Academic Integrity

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. *Scampus*, the Student Guidebook, contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A: <http://www.usc.edu/dept/publications/SCAMPUS/gov/>. Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: <http://www.usc.edu/student-affairs/SJACS/>.