

Columbia University

EE 4944 Principles of Device Fabrication

Instructor: James T. Yardley.
Course time: Wednesday, 4:10 - 6:40 pm.
Location: 1127 Seeley W. Mudd Hall.

Office: 1020 CEPS.
Office Hours: Fridays, 12:30-2:00 pm.
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Course web page:

<https://www1.columbia.edu/sec/itc/ee/yardley/>.

EE 4944X Principles of Device Fabrication

Class Type:

- Lecture/discussion.
- Descriptive/limited quantitative.
- Base: Powerpoint presentations with html equivalents.
- Handouts for use in class and note taking.
- Powerpoint presentations available in web page format from course web site.
- Video course format and technology.

Course goals:

- Basic understanding of commercial silicon device fabrication today. Why?.....
- Overview for fabrication of non-silicon devices.
- General understanding of semiconductor fabrication industry and structure.
- Exploration of future directions in semiconductor fabrication. Why?.....

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Student information card:

Name

Type of enrollment (e.g. regular, audit, other).

Major or major field of interest.

Year or educational level (e.g. senior, first year grad student, etc.).

Goals for course or interest in course:

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Textbooks:

Required:

- ***The Science and Engineering of Microelectronic Fabrication (second edition)***, Stephen A. Campbell. (Oxford University Press, 2001).

Reference texts:

- ***Introduction to Microelectronic Fabrication***, Richard C. Jaeger. (Modular Series on Solid State Devices, Vol V, Gerold Neudeck and Robert Pierret, Editors. Addison Wesley, 1988).
- ***Microelectronic Processing***. W. Scott Ruska (McGraw Hill, 1987).
- ***Silicon Processing for the VLSI Era, Volume I – Process Technology***. S. Wolf and R. N. Tauber (Lattice Press, 2000).
- ***VLSI Technology***, Second edition. S. M. Sze. (McGraw Hill, 1988).
- ***Modern Semiconductor Device Physics***. S. M. Sze, editor (Wiley, 1988).
- ***ULSI Technology***. C. Y. Chang and S. M. Sze. McGraw Hill, 1996).

Computational tools:

- ***Mathcad, Mathematica***, or conventional spreadsheet (significant expertise with ***Excel*** for example).
- Access to world wide web and graphics browser with Java capability (***Internet Explorer 5.1*** is good).

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Course grade:

Homework: 10%

October 24

Midterm: 40%. Open textbook, open notes, 2 hour.

As scheduled:

Final: 50%. Open textbook, open notes, 2 hour.

Field trip:

IBM Fishkill – details not yet worked out....

**Electrical
Engineering
4944.
Fall, 2001
James T. Yardley**

Introduction to silicon processing.
Silicon basics.
Device architecture summary.
Deposition processes – general.
Chemical vapor deposition (CVD).
Epitaxial deposition.
Etch processes.
Transformation processes.
Ion Implantation.
Lithography Part I.
Lithography Part II.
Lithography Part III.
Clean Room Technology.
Assembly and packaging Part I.
Assembly and packaging Part II.
Assembly and packaging Part III.
Fabrication of GaAs devices.
Fabrication of Si:Ge devices.
Chemical mechanical planarization (CMP).
Semiconductor roadmap.