

ENPH 432 Microelectronic Circuit Fabrication

Department: Mathematics, Physics and Engineering

Credit Hours: 3

Current Catalog Description:

Fundamentals of MOS and bipolar microelectronic circuit fabrication; theory and practice of diffusion, oxidation, ion implantation, photolithography, etch; yield and reliability considerations; statistical process control; integrated process design, simulation, and characterization.

Course Schedule:

3 lecture hr/wk, 0 lab hr/wk

Coordinator:

Dr. Daniel K. Marble

Prerequisites by Topic:

ENPH 345 – Electronics (co requisite)

ENPH 436 – Solid State Physics (co requisite)

ENGR 223 – Principles of Engineering III

Program Outcome and Course Learning Goals Map:

The Program Outcomes for Engineering Physics are:

- A. an ability to apply knowledge of math, engineering & science
- B. an ability to design and conduct experiments, as well as to analyze and interpret data
- C. an ability to design system, component or process to meet needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- D. an ability to function on multi-disciplinary teams
- E. an ability to identify, formulate, and solve engineering problems
- F. an understanding of professional and ethical responsibility
- G. an ability to communicate effectively
- H. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- I. a recognition of need for, and ability to engage in life-long learning
- J. a knowledge of contemporary issues
- K. an ability to use techniques, skills, and modern engineering tools necessary for engineering practice.
- L. a depth and breadth of knowledge in engineering and physics necessary to work in a multidisciplinary environment

Course Goals	Program Outcome(s):
Upon completion of this course with a C or better, students will	
1. be able describe the various steps required for wafer manufacturing including both Czochralski and float zone growth methods.	A, L
2. be able to describe and contrast different deposition techniques and equipment.	A, L
3. be able to list the three major uses of SiO ₂ in silicon based devices and be able to describe and contrast various oxidation processes.	A, L
4. be able to identify the three major effects of contamination on semiconductor devices and the major sources of contamination.	A, L
5. be able to describe the basic steps in photolithography.	A, L
6. be able to describe ion implantation and diffusion doping process and equipment.	A, L

7. be able to describe various device isolation methods.	A, L
8. be able to describe the major steps required in construction of capacitors, resistors, diodes, MOS and BJT transistors.	A, L
9. be able to list the major cost factors that influence fabrication costs.	A, L
10. be able to describe both the physics principle behinds and the applications of the major electrical and physical characterization techniques used in microelectronic manufacturing.	A, L

Academic Honesty:

Cheating, plagiarism (submitting another person's materials or ideas as one's own), or doing work for another person who will receive academic credit are all-impermissible. This includes the use of unauthorized books, notebooks, or other sources in order to secure or give help during an examination, the unauthorized copying of examinations, assignments, reports, or term papers, or the presentation of unacknowledged material as if it were the student's own work. Disciplinary action may be taken beyond the academic discipline administered by the faculty member who teaches the course in which the cheating took place.

Students with Disabilities Policy:

It is the policy of Tarleton State University to comply with the Americans with Disabilities Act (ADA) and other federal, state, and local laws relative to the provision of disability services. Students with disabilities attending Tarleton State University may contact the Office of Disability Services at (254) 968-9478 to request appropriate accommodation. Furthermore, formal accommodation requests cannot be made until the student has been officially admitted to Tarleton State University.

Contribution of Course to Meeting the Professional Requirement:

Math/Science Topics: 100%

Status of Continuous Improvement Review of this Course:

Prepared by: *Daniel K. Marble*

Date: *May 5, 2005*

Reviewed by: *Jim McCoy, Denise Martinez*

Date: *May 9, 2005*

Review Notes:

05/09/05 – This course also has some (E) – identify and solve engineering problems and some (J) – knowledge of contemporary issues (due to the rapidly changing nature of this field). – DMM