

SAMPLE SYLLABUS

This syllabus is to be used as a guideline only. The information provided is a summary of topics to be covered in the class. Information contained in this document such as assignments, grading scales, due dates, office hours, required books and materials may be from a previous semester and are subject to change. Please refer to your instructor for the most recent version of the syllabus.

ABET Course Syllabus EEE435

1. **Course: EEE 435 Microelectronics**
2. **Credits and Contact Hours:** 3 Credit Hours (lab), Topics: Engineering
3. **Course Coordinator:** Dr. T.J. Thornton, Professor
4. **Textbook:** Campbell, *The Science and Engineering of Microelectronic Fabrication*, 2nd Edition 2000 Oxford UP, 1990 ISBN: 0195136055.
Supplemental materials: All of the course material including lecture notes and laboratory materials are available on-line.
5. **Specific course information**
 - a. **Catalog description:** Introduces basic CMOS and MEMS processing and fabrication tools. Covers the fundamentals of thermal oxidation, CVD, implantation, diffusion, and process integration.
 - b. **Prerequisites or co-requisites:** EEE 436.
 - c. **Required/elective/selected elective:** Elective
6. **Specific goals for the course**

Students understand the practical and theoretical aspects of basic CMOS and MEMS processing.

 - a. **Outcomes of instruction:**
 - Students understand the theoretical aspects of basic semiconductor processing and are exposed to the key practical steps in a clean-room laboratory environment.
 - b. **Outcomes of Criterion 3 addressed by the course:**
 - (1) Students use modern process simulation tools for laboratory projects and individual homework assignments.
 - (2) Students acquire hands-on experience of relevance to contemporary CMOS processing.
 - (6) Significant laboratory component with experiment design and conduct. The laboratory sessions yield data that the students use to extract process simulation parameters.
7. **Brief list of topics to be covered**
 - Introduction to CMOS processing
 - Wafer Cleaning
 - Defects in Semiconductors
 - Thermal oxidation
 - Chemical and Physical Vapor Deposition
 - Lithography
 - Etching
 - Diffusion
 - Ion implantation
 - CMOS Process Integration
 - MEMS Technology
 - Device measurement and parameter extraction

Computer Usage:

Students make use of an advanced process simulation tool called Athena. They use Athena for their laboratory work to simulate processes they actually perform in the cleanroom. Students also work with Athena for individual homework assignments. Students are also expected to use mathematical analysis software (e.g. Excel or MathCad) to analyze data they measure during the laboratory sessions.

Laboratory Experiments:

Students meet weekly for a three-hour laboratory under the guidance of a TA.

1. Wafer Cleaning
2. Thermal Oxidation
3. Photolithography
4. Reactive Ion Etching
5. Dopant Diffusion
6. MOSFET Characterization
7. MEMS Device Characterization

Course Contribution to Engineering Science and Design:

This course teaches Engineering Science through the application of advanced process modeling techniques to real world data measured during the laboratory sessions. For example, students adjust the process parameters in the Athena model to fit the measured data of oxide thickness grown at 1050° C for various times. Students are also exposed to Engineering Design problems by using the simulated and measured data to design MOS structures with certain characteristics. For example, they design a CMOS process flow to give a transistor with a threshold voltage of 0.7 V.

Person preparing this description and date of preparation: Trevor Thornton, K. Tsakalis, June, 2021.