Course Title: Introduction to Semiconductor Technology
Course No: EE2304/PHYS2304
Credits: 4. Meeting Times: Tue + Thrs 2:00pm to 3:50pm

Course Description: This course is intended to instill a broad understanding of Semiconductor Technology and working knowledge of how semiconductor integrated circuits (IC) are designed and manufactured. Scientific and engineering principles required to study semiconductor technology are outlined. Students are also provided with an outline of the Semiconductor Technology Certificate program and a description of significant career options within the field and relevant elective courses available to them. Starting from its historical development and large socio-economic impact on our daily lives, the importance of the semiconductor industry for a post-networked society is emphasized, along with its current CMOS technological base and future challenges. Students are also introduced to the fundamental steps, tools, and processes used for the fabrication of CMOS devices and integrated circuits. The significance of the required high standards for fab cleanliness, production accuracy, manufacturing process yield, and chemical safety is emphasized. Distinguishing properties of important semiconductor materials and silicon CMOS devices are illustrated through examples from digital, analog, and photonic applications. The overall design hierarchy and abstract representation of circuit and process parameters for the design and simulation of integrated circuits are also explained. The course is supported by a suite of lab/demo activities that are aimed to illustrate electrical, optical, and microscopic properties of semiconductor wafers, fabrication tools used in the semiconductor industry as well as material processing steps that are key to a wholesome understanding of chip fabrication.

Learning Outcomes: Students will be able to
- demonstrate a broad understanding of Semiconductor Technology and working knowledge of IC fabrications steps.
- provide basic account of historical developments and socio-economic impact of semiconductor technology.
- identify the essential properties of semiconductor materials and their fundamental role in modern ICs.
- explain the significance of fab cleanliness, importance of yield, manufacturing accuracy and chemical safety for Semiconductor Technology.
- describe the basic structure and operation principles of CMOS technology and its design hierarchy.
- explore and present examples of recent developments in Semiconductor Industry and technology.

Lecture Topics List:	**Lab Demonstration List:**
- Historical Development of Solid-State Electronics and Semiconductor Technology - Socio-economic Impact of and markets for Semiconductor Industry - Significant Properties and Classes of Semiconductor Materials - Essential Physics for 2 Terminal Devices: Diodes - 3 Terminal Devices: Transistors and Amplification - Binary Logic Abstraction & CMOS Technology - Digital Design Hierarchy & CAD/Simulation Tools - CMOS Analog Logic Device Examples and Downscaling - Review of CMOS Fabrication Steps and Processing Tools - Challenges to CMOS Integration and Future of CMOS Technology - Student Presentations/Project: Semiconductor Industry in Post-Moore Era	- Cleanroom Protocols and Standards - Semiconductor Wafer Types and Handling - Electrical Conductivity in Intrinsic and Extrinsic Semiconductors - Response of Semiconductors to heat and light - Lithography & Patterning - Dry & Wet Etching. - PECVD & Thermal Oxide deposition - Metal Deposition and Sputtering

TEXT Readings: Lecture Notes and Presentation provided by EECS Faculty
Multiple Chapter combinations from several books including:
- Fundamentals of Modern VLSI Devices 3rd Edition, by Yuan Taur & Tak H. Ning (978-1108480024)
- Modern Semiconductor Devices for Integrated Circuits. Chemming Hu (Open Web Book)

Key Grade Factors:
Quizzes 25% Test 30%, Homework 15%, Lab Demos 15%, Summative Assessment/Project 15%