ELEN 270: Introduction to Integrated Circuit Materials

Instructor Name: Dr. Mahmud Rahman
Quarter and Year: Winter 2022
Class Time: (M) 5:10pm - 7:00 pm

Sales pitch/ course description:

Materials properties are at the core of and defines the ultimate limitations in the performance of semiconductor hardware ranging from ICs, sensors to MEMs. A comprehensive knowledge about IC materials is therefore key to the success of the present and future growth of IC industry. This course is a must for circuit designers and product developers of semiconductor hardware. The course provides useful insight for professionals involved in the entire semiconductor industry including managerial and marketing personnel who make decisions on equipment, processes and components working in the industry Silicon Valley and around the globe. It is an excellent course for any engineering professional including Mechanical Engineers and those pursuing Engineering Management Programs working in a team in the manufacturing and design environment to refresh their essential physical, chemical and mathematical background in general and to see their direct applications in real world situations in particular.

Course outline:

Introduction to Integrated Circuits: Materials Issues in IC, Classification of IC Materials
Electrical Properties of IC Substrates: Structures, Conductivity control, dielectric properties
Thin film Materials: Adhesion, Mechanical Stress, Thermal Conductivity, Electrical Properties
Processing Materials: Dopants – solid/liquid/gaseous, Chemicals/gases for Etching and Cleaning, Packaging Materials
Lithography Materials: Photo-, E-beam-, X-ray Resists, Resist Developers
IC Structures: Alloy junctions, planar structures, Homo/Hetero junctions, CMOS, Metal-Semiconductor Structures

Prerequisite skills / knowledge:

Chemistry, basic physical properties of elements and compounds
Fundamentals of solid, gaseous, and liquid materials
International system of Units and basic mathematics
Logarithmic Graphical representation of data