

NSE-961

Surface coating and thin films

Credit Hours: 3

Prerequisites: Nil

Course Objectives:

- This course introduces nano science and engineering students to the concepts that are central to the study of thin films, surfaces energy, interfaces and vacuum concept.
- Understand physical phenomena that can be exploited for the deposition of thin films.
- Demonstrate knowledge of different thin film deposition strategies
- Develop proficiency for experimental techniques used to deposit and characterize thin films

Course Contents:

- Elementary thermodynamic ideas of surfaces, Surface energies and the Wulff theorem
- Introduction to surface and adsorbate reconstructions
- Introduction to surface electronics
- Kinetic theory concepts, Vacuum concepts
- Surface preparation and cleaning procedures : *in situ* experiments
- Role of Thin films in Technology and Device
- Nucleation and Growth: Adsorption, Surface coalescence and depletion, grain structure and microstructure and its dependence on deposition parameters.
- Role of energy enhancement in nucleation; Self-assembly: mechanisms and controls for nanostructures of 0 and 1 D
- Thin film deposition procedures

Course Outcomes:

The student will obtain the deep understanding the concept of surfaces thermodynamic, electronics, kinetic, vacuum and how these concepts are important for thin films fabrication processes. The student will be able to use this knowledge in practical applications.

Recommended Books:

- Introduction to Surface and Thin Film Processes, JOHN A. VENABLES
Arizona State University and University of Sussex, John A. Venables 2000
- [Chemical Solution Deposition of Functional Oxide Thin Films](#), Theodor Schneller (auth.), Theodor Schneller, Rainer Waser, Marija Kosec, David Payne (eds.), Springer, 2013.
- [Characterization of Polymer Surfaces and Thin Films](#), K. Grundke, M. Stamm, H.-J. Adler, Springer, 2006.
- [Adhesion Aspects of Thin Films](#), Mittal K. L., VSP, 2007