

NOC: Soft Nano Technology - Video course

COURSE OUTLINE

The fabrication of large area polymer structures with feature sizes ranging from few microns down to the molecular level is key to various technologically important areas, examples of which include molecular electronics, flexible display screens, optical sensors, structural colour, reusable super adhesives, super hydrophobic and self-cleaning surfaces, scaffolds for tissue engineering etc. The meso scale, which ranges from a few nm to few microns, interfaces the molecular and the macroscopic worlds. Thus, it becomes possible to observe simultaneous signatures of molecular interactions as well as macroscopic effects at these length scales, often giving rise to exciting new phenomena. The success of the desired applications, harvesting the extraordinary scientific phenomena occurring at these length scales, depends strongly on the availability of suitable, easy to implement patterning techniques that can create defect-free structures over large areas followed by their accurate characterization.

In this course we will learn how to create nano patterns on Soft Surfaces, particularly on Polymer films by various techniques. We will start out discussion with certain general concepts related to nano patterning, understand various issues related to **Surface Tension** and look into some applications of Nano Patterned surfaces (Module 1). Subsequently we will talk about **Photolithography** (Module 2) and various **Soft Lithography** techniques (Module 3) that allow creating nano pattern. Finally we will learn the basic working principle and functioning of a very important instrument that is widely utilized in Nanotechnology research: the **Atomic Force Microscope** (Module 4).

COURSE DETAIL

Week	Topics
1	Introduction to Patterning of Thin Films Application of Nano Patterned Films and Surfaces Basic Concepts of Wetting: Cassie and Wenzel Regimes Basic Concepts of Surface Tension.
2	Different Nano Fabrication Regimes including self assembly Micelle formation Introduction to Photo Lithography.
3	Discussion on Photo Lithography: Photo Resists Spin Coating Exposure



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Chemical Engineering

Pre-requisites:

Basic Knowledge of Fluid Mechanics will be helpful

Coordinators:

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	Development.
4	Nano Imprint Lithography.
5	Soft Lithography: Introduction Different Techniques.
6	Soft Lithography Techniques.
7	Basic Concepts of Atomic Force Microscopy.
8	Different Imaging Modes of Atomic Force Microscopy.

References:

1. "Alternative Lithography", C. M. Sotomayor Torres (Ed.), Kluwer Academic Press, 2003.
2. "Creating Micro and Nano Patterns on Polymeric Materials", A del Campo and E. Arzt (Ed), Wiley, 2011.
3. "Micro Fluidics and Micro Scale Transport Process", Suman Chakraborty (Ed), CRC Press, 2013