



# NANOTECHNOLOGY, SCIENCE AND APPLICATIONS

## **PROF. PRATHAP HARIDOSS**

Department of Metallurgical and Materials Engineering  
IIT Madras

**PRE-REQUISITES :** First two years of undergraduate course of Engineering (Introductory, undergraduate level Physics, Chemistry and Mathematics)

**INTENDED AUDIENCE :** Engineering and Science students at the UG and PG level

## **COURSE OUTLINE :**

This course will familiarize the student to the science related to various phenomena observed at the nanoscale. Following an introduction to the basic ideas of nanoscience and nanotechnology, several examples will be discussed which highlight the impact of nanoscale on various properties of technological interest. Technologies built on these phenomena will be discussed.

## **ABOUT INSTRUCTOR :**

Prof. Prathap Haridoss is a Professor in the Department of Metallurgical and Materials Engineering at IIT Madras. He works in the areas of Fuel Cell and Carbon nanomaterials. He has a B.Tech in Metallurgical Engineering from IIT Madras, and a PhD in Materials Science and Engineering from the University of Wisconsin-Madison, USA. Before he joined as a faculty at IIT Madras, he served as a Senior Scientist at Plug Power, a Fuel Cell company in New York. He has 3 US patents, several International Journal publications, and has published a book titled "Physics of Materials, Essential Concepts of Solid State Physics"

## **COURSE PLAN :**

**Week 1:** Introduction, History of nanomaterials Top down approach, bottom up approach to synthesize nanomaterials

**Week 2:** Thermodynamic considerations

**Week 3:** Inverse Hall Petch relationship

**Week 4:** Optical effects

**Week 5:** Superplasticity

**Week 6:** Magnetic effects, Ferroelectric effects at nanoscale

**Week 7:** Severe Plastic Deformation

**Week 8:** Nanocomposites, bulk nanoscale structures