ELEC211P An Introduction to Nanotechnology
Professor Richard B Jackman, 0.5CU

Objective

- To introduce Engineering students to the materials, methodology and applications for the topic known as 'nanotechnology', that is the application of nanometre scale material and devices for Engineering

Learning Outcomes
Understanding materials on the nanoscale***;*** Acquire an insight into nanoscale devices for electronic, photonic, magnetic, mechanical, chemical and biological uses
Be familiar with differing methodologies for building nanoscale devices
Consider different methods and techniques for characterising nanomaterials and nanoscale devices

Syllabus

What is nanotechnology?
Definitions ; History of nanotechnology; Context of nanotechnology ; atoms and molecules; crystal lattices and surfaces

Motivation for nanotechnology
Materials; Devices ; Systems; Issues in miniaturization; Moores Law for transistor technology

Scaling laws
Materials; Forces; Device performance; Design

Nanometrology
Imaging nanostructures; Non-imaging approaches; Metrology of self-assembly

Raw materials of nanotechnology
Nanoparticles; Nanofibres; Nanoplates; Nano-carbon and graphene-based materials.
Biological and environmental effects of nanoparticles

Nanodevices
Electronic devices; Magnetic devices; Photonic devices; Mechanical devices; Electro-Mechanical devices; Fluidic devices; Biomedical devices

Nano-manufacturing
Top-down methods; Molecular manufacturing; Bottom-up methods; Intermolecular interactions

Bionanotechnology
Biomolecules; Characteristics of biological molecules; Mechanism of biological machines; Biological motors; Biophotonic devices; DNA as construction material

New fields created by nanotechnology
Quantum computing and spintronics
Nanomedicine
Energy Devices

Laboratory Class
An introduction to Atomic Force Microscopy (AFM) and Scanning Tunnelling Microscopy (STM) – a practical class where you will image atoms!