NSE-842 Nanomaterials for Energy Applications

Prerequisite: Nil

Category: Elective Course

Existing Course Contents	Proposed Course Contents
• Nanomaterials for Energy Conversion: Light and Electricity, Light Emitting • Diodes and Carrier Multiplication: Giant Nanocrystal Quantum Dots for Light-Emission Applications • Multiple Exciton GenerationNanomaterials for Energy-Conversion: Electrochemical Energy Conversion and StorageElectrical Transport in Nanostructured Materials • Mesoscopic Transport, Nonionic: Size Effects on Ion Conduction and Storage, • Electronic Properties of Semiconductor Nanostructures Nanomaterials for Conversion of Chemical Energy • Nanostructured Catalysts for Conversion of Chemical Energy • Artificial Photosynthesis Nanomaterials for Photovoltaics and Solar Cells • Photoelectrochemistry & Theoretical aspects of doping nano-crystals • Nanostructures for Photovoltaics and Solar Energy Conversion • Nanostructured Solar CellsCharge Carriers in Doped Nanomaterials • Material design of p-type oxide semiconductors &From nano-powder to devices • A bottom-up approach for nanostructured thermoelectrics • Nanocomposites for Thermoelectrics, Nanostructured Thermoelectrics	• Quantum confinement and material properties such as surface area, surface charges, physio-chemical properties at the nanoscale. • Electronic properties of semiconductor nanostructures/nanomaterials for energy conversion. • Nanomaterials for solar energy conversion applications: Fuel cells, Dye sensitized solar cells (DSSCs), Organic photovoltaic's (OPVs), Quantum dots sensitized solar cells (QDSSC), Perovskite solar cells. • Multiple exciton generation in nanomaterials for energy conversion-transport in nanostructured materials • Artificial Photosynthesis-energy conversion in nature • Nanomaterials for energy storage applications: Li ion batteries, supercapacitors, hydrogen storage). • Nanostructured catalysts for conversion of chemical energy

Proposed Weekly Plan for the Concerned Faculty

Week /Lecture	Topic
1-3	Quantum confinement and material properties such as surface area, surface charges, physio-chemical properties at the nanoscale.
3,4	Electronic properties of semiconductor nanostructures/nanomaterials for

	energy conversion.
5-8	Nanomaterials for solar energy conversion applications: Fuel cells, Dye sensitized solar cells (DSSCs), Organic photovoltaic's (OPVs), Quantum dots sensitized solar cells (QDSSC), Perovskite solar cells.
9-11	Multiple exciton generation in nanomaterials for energy conversion-transport in nanostructured materials
12,13	Artificial Photosynthesis-energy conversion in nature
13-16	Nanomaterials for energy storage applications: Li ion batteries, supercapacitors, hydrogen storage).
16,17	Nanostructured catalysts for conversion of chemical energy