SELECTION OF NANOMATERIALS FOR ENERGY HARVESTING AND STORAGE APPLICATIONS

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INTENDED AUDIENCE : UG & PG students of Metallurgy, Nano Science & Nanotechnology, Chemical Engg, Chemistry, Electronics, Electrical, Physics, and Material Science etc. R&D personnels from industries

INDUSTRIES APPLICABLE TO : Nanotech – Energy based industries: BHEL; NTPC;Eaton corporation plc; Tata power solar; Mega Engineer Infrastructure Ltd; Green Hydrogen company; etc.

COURSE OUTLINE :

Selection of nanomaterials for energy harvesting and storage applications is an interdisciplinary course which deals with selection of nanomaterials and key challenges to improve performance of the energy harvesting and storage devices/techniques. In this course we will be covering different energy harvesting and storage techniques and the parameters that are to be considered in selecting the nanomaterials for the same.

ABOUT INSTRUCTOR :

Prof. Kaushik Pal is Associate Professor in Department of Mechanical and Industrial Engineering, IIT Roorkee since 2012. He obtained his PhD Degree (2009) from IIT, Kharagpur and then joined Gyeongsang National University,South Korea for pursuing Post-Doc research. His fields of interests are surface modification of nano-materials and use of such materials in different energy harvesting
storage applications, sensors, Mechanical and bio-medical applications. Currently, he is acting as reviewer of several internationally known journals and is an active member of National Academy of Sciences, American Chemical Society (ACS) and Royal Society of Chemistry (RSC). He is also the recipient of Brain Korea (BK-21) fellowship award and DAAD fellowship award.

COURSE PLAN :

Week 1:
Introduction, Criteria for choosing the nanomaterials for energy harvesting and storage applications, Brief discussion about all types of energy harvesting and storage systems, Solar energy, Nanomaterials used for solar energy, Types of solar energy, Solar thermal and heat transfer fluids with example.

Week 2:
Hydrogen energy: Introduction, Nanomaterials used for hydrogen energy generation, Methods to produce hydrogen energy,Hydrogen production from fossil fuels and biomass, thermo-chemical process, electrolysis, solar and biological, Key Challenges for hydrogen energy generation.

Week 3:
Nanogenerators: Introduction, Types of Nanogenerators: Piezoelectric, Thermoelectric, Pyro-electric, Electromagnetic, and Triboelectric, Key challenges for choosing nanomaterials for nanogenerators, Other conventional energy generation techniques: Wind energy, Tidal, Thermal, hydro power generation, Nuclear and geothermal energy production.

Week 4:
Energy storage, Nanomaterials used for energy storage, key challenges for energy storage, Solution of key challenges, Type of energy storages: Electrochemical (Batteries), Supercapacitor, Hydrogen storage, Thermal energy storage.