Lecture No.	*Course content to be covered*
1-2	Basics of renewable and non-renewable energy sources. Various form and conversion of energy. Need for energy storage for sustainability.
2-6	Introduction and revision of basic semiconductors, origin of Brillouin zone, band diagram. Solar cell generations and types – From silicon to perovskites. Performance characteristics of solar cells, Solar cell construction.
7-11	Brief history of wind power, Coriolis force, flow of ideal fluids, Continuity equation, Bernoulli's equation. Extraction of wind power by a turbine, action of wind turbine blades. Materials aspects, installation and operation.
12-15	The hydroelectric power, plant and its principles of operation. Wave power. Water waves, wave energy converters.
15-20	Energy Storage. Types – chemical, biological, hydrogen, thermal, mechanical, pumped hydroelectric, electrical, compressed air and flywheel energy storage. Superconducting magnetic storage, rechargeable batteries and fuel cells.
21-25	Fuel cells - Hydrogen fuel cells – Basic principles, limit of current, connection cell in series, bipolar plate. Fuel cell types. Figures used to compare systems. Gas supply and cooling. Use of nanomaterials in electrodes, electrode surfaces. Advantages and applications.
25-30	Electrical energy storage - Capacitors and supercapacitors. Types of capacitors, supercapacitors and batteries. Similarities and differences between supercapacitors and batteries. Distinguishable systems. Cell design and equivalent circuits. Modes of electrical energy storage by capacitors and batteries. Faradaic and non-Faradaic processes. Intercalation electrodes and separators used.
31-35	Electrostatics involved in double layer formation at the electrode interfaces. Electric potential and field, and significance of the dielectric constant. Poisson ratio: Charges in a 3 –dimensional medium. The double layer in pores of porous capacitors.
36-40	Materials used in supercapacitors and batteries, Common preparatory routes, Characterization techniques – BET, XRD, Structure refinement, DLS, CV, CD, etc.

Tutorials	
#1-2	Numerical problems on chapters 1-2
#3-4	Numerical problems on chapters 3-4
#5-6	Numerical problems on chapters 5-6
#7-8	Numerical problems on chapters 7-8