

Introduction to Energy Storage: Relevance and scenario. Perspective on development of Energy storage systems. Energy storage criteria, General concepts. Conventional batteries – fundamentals and applications. Grid connected and Off grid energy storage systems and requirements.

Thermal storage: Thermal properties of materials, Principle of operations, Efficiency factors, large scale and Medium scale operations, Pros and Cons. Advances in thermal storage.

Mechanical Storage: Types of systems, Principle of operations, Emerging advances and Technologies. case study : Flywheel

Electrochemical Storage: Materials, Principle of Operation, Challenges and research survey, Positive electrode materials, negative electrode materials, electrolytes.

Fuel Cells and Hydrogen storage: Principle of operation, challenges and Case studies

Magnetic storage: Principle of operation, emerging challenges, devices and technology review

Electro-optic and Optical storage: Principles of operation, device fabrication, emerging devices and upcoming technologies

Supercapacitors: Principle of operation, device fabrication, challenges and technical review

Text/Reference Book

- [1] Energy Storage 2010th Edition by Robert Huggins (Author)
- [2] Lithium-Ion Batteries: Fundamentals and Applications (Electrochemical Energy Storage and Conversion) by Yuping Wu (Editor)
- [3] Storing Energy: with Special Reference to Renewable Energy Sources by Trevor M. Letcher (Author)
- [4] Electrochemical Energy Storage for Renewable Sources and Grid Balancing by Patrick T. Moseley (Editor), Jürgen Garche (Editor)
- [5] Nanomaterials for Energy Conversion and Storage by Dunwei Wang (Editor), Guozhong Cao (Editor)

Preamble

This course is specifically designed for post graduate students of Energy Engineering coming from diverse background in order to provide them holistic, integrated overview of the various energy systems.

Overview of different energy storage systems in conventional and emerging technologies will be provided along with the principles of operation, energy efficiency and key challenges. Case studies and literature surveys will be discussed focusing on challenges of the current state of art and deliberating on the developing technologies.