

# Synthesis and Characterization of Materials for Energy Storage Devices

## Overview



This is an interdisciplinary, short-course that provides a treatment of the storage, conversion, and conservation of energy using advanced materials. The course is uniquely designed for one credit and it will be divided into three themes:

- Synthesis of Advanced Energy Materials
- Surface and Structural Characterization
- Assembly of Energy Storage Devices

The physical nature of energy materials will be developed from a 'bottom up' perspective, beginning with the manner in which such materials are synthesized. The synthesis topics will include detailed treatments of both dry (e.g., CVD) and wet chemical approaches. The content will also incorporate contemporary research directions, such as directed/patterned synthesis in situ. After synthesis, the technologist must know the quality of the materials that have been synthesized, and with this in mind, the course is aimed to cover a diverse range of surface characterization methods. Here, fundamental understanding of these methods will be developed as a foundation for those who work with energy storage materials but might not have a deep background in analytical methods. Finally, the course will focus on functional characteristics of assembled devices for a variety of energy-related purposes including storage, conversion, and conservation. Basic functional characterization techniques with reference to state-of-the-art technologies, as well as means of establishing objective comparisons of performances within and among the competing approaches to electrical energy storage, will be discussed.

<b>Registration</b>	<ul style="list-style-type: none"><li>• Number of participants for the course will be limited to 50.</li><li>• Registration fees includes course material.</li><li>• Accommodations are available at IITJ Guest House on first come first serve basis upon payment.</li></ul>
<b>You should attend if...</b>	<ul style="list-style-type: none"><li>• you are a graduate student or an engineer interested in gaining an understanding of the fundamental elements of energy materials.</li><li>• you are a researcher interested in developing skills to implement the synthesis and characterization of energy materials.</li><li>• you are a research scientist or a young faculty interested in applying energy materials to problems of contemporary importance ranging from energy storage to conservation to conversion.</li></ul>
<b>Fees</b>	<ul style="list-style-type: none"><li>• Academic Institutes and Government Aided Organizations: Rs. 1000</li><li>• Industry/ Private Organizations: Rs. 4000</li><li>• Participants from abroad : US \$200</li></ul>

## The Faculty



**Prof. Timothy S. Fisher** is James G. Dwyer Professor in Mechanical Engineering at Purdue University, USA. His research has included studies of nanoscale heat transfer, carbon nanomaterial synthesis, coupled electro-thermal effects in semiconductor and electron emission devices, energy conversion and storage materials and devices, microfluidic devices, biosensing and related computational methods ranging from atomistic to continuum scales. He is active in service to the American Society of Mechanical Engineers through a variety of responsibilities, and is a former Co-Editor of the journal *Energy Conversion & Management* and currently Specialty Chief Editor for Heat and Mass Transfer of the journal *Frontiers in Mechanical Engineering*. Prof. Fisher has taught a nanoHUB-U course on Thermal Energy at the Nanoscale (<https://nanohub.org/courses/TE>).



**Prof. Giridhar U. Kulkarni** is a Professor, Chemistry and Physics of Materials Unit, JNCASR and Director at CeNS, Bangalore, India. His present research interests are focused on new strategies in synthesis of nanomaterials, nanopatterning and nanodevice fabrication including molecular systems. His recipes emphasize the importance of simple design, near ambient working conditions, solution based processing as well as low cost instrumentation. His group strives to translate nanoresearch finding into affordable technology.



**Prof. Rakesh K Sharma** is currently Assistant Professor and Head of Chemistry Department at Indian Institute of Technology, Jodhpur. His present research interest include catalysis, new materials for energy harvesting and storage, and solar hydrogen production via water splitting.



**Dr. Ritu Gupta** is currently Assistant Professor at Indian Institute of Technology, Jodhpur. Her research interest includes flexible and transparent devices, as well as scalable synthesis of nanomaterials for application in energy devices.

## Course Coordinator

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