

# Modern Chemistry and Reactivity of the f-Block Elements

## Overview

The lanthanides La–Lu (Ln), also called ‘rare earth elements’ when grouped with Sc and Y, and actinide Ac–No (An) elements are critical in modern life and technology with applications ranging from medicine to smartphones, wind turbines to electric vehicles and space probes to nuclear power. Despite their critical and irreplaceable nature in many aspects of modern life, f-element chemistry often receives little or no mention in the modern chemistry curriculum.

This course will cover the modern fundamental and applied aspects of chemistry and reactivity of f-block elements, including the lanthanides (Ln) and actinides (An). Topics in the course will include their fundamental descriptive chemistries, electronic structures, physicochemical, magnetic and photophysical properties, geological sourcing, separations chemistry, supply problems, recycling and sustainability. The course will also focus on aspects related to ligand design for various applications including catalysis, magnetism, medical applications such as magnetic resonance and multi-modal imaging agents, luminescent bioprobes, sensing and chemistry related to nuclear fuel cycles. Underlying design principles and structures of lanthanide compounds for such applications will also be discussed.

At the completion of the course, participants will have gained an understanding of the unique chemical and physical characteristics of f-element compounds, the role of the elements in modern applications and state-of-the-art problems facing the field of f-element chemistry.

## Objectives

- This course is designed to prepare students to have a knowledge of the fundamental and applied chemistry of f-block elements (lanthanides and actinides).
- To understand why the global economy treats rare earth metals as ‘critical’ materials and the relationship between the chemistry of rare earths and their criticality.
- To understand and evaluate the opportunity of lanthanides in catalysis, bio-imaging probes, sensing, magnetic properties and specific catalytic applications.
- To provide a platform and academic network for a collaborative approach for exploring research in lanthanide chemistry and their diverse applications.

<b>Modules</b>	<b>November 8- November 17, 2018</b>
<b>Who can attend?</b>	<ul style="list-style-type: none"> <li>▪ Chemistry major student (B.S., M.Sc., Ph.D., B. Tech., M. Tech.) or research scientist, postdocs interested in Inorganic chemistry.</li> <li>▪ Engineers/scientists studying material science or chemical engineering interested to learn lanthanide /actinide based materials, catalysis or imaging application.</li> <li>▪ You are doing Ph.D. in Inorganic Chemistry or faculty from academic institution/ interested in the area of f-block chemistry for your research or teaching.</li> <li>▪ Faculties from academic and technical institutions or high school teachers.</li> </ul>
<b>Fees*</b>	<p>The participation fees for each taking the course is as follows:</p> <p><b>Participants from abroad : US \$500</b></p> <p><b>Industry/ Research Organizations: INR 10,000</b></p> <p><b>Academic Institutions: INR 1000</b></p> <p><b>UG/PG students &amp; school teachers: INR 500</b></p> <p>The above fee include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr free internet facility. The participants will be provided with accommodation on payment basis.</p>

## The Faculty



**Prof. Eric J. Schelter** is Professor at the Department of Chemistry, University of Pennsylvania since 2009. Ph.D. (2004): Texas A&M University. Postdoctoral fellow (2004-2009): Los Alamos National Laboratory. Recipient of US DOE Early Career Research Program Award, Cottrell Scholar Award, Research Corporation for Science Advancement, American Chemical Society

Harry Gray Award for Creative Work in Inorganic Chemistry by a Young Investigator, Member, Editorial Advisory Board, *Inorganic Chemistry*, published >120 peer-reviewed articles.

**Research Interests:** Unique electronic structure effects in f-element complexes and materials. Unique structures, bonding and reactivity in organo-f-element chemistry. f-element nanomagnetism and spin dynamics. Catalysis at Lewis acidic lanthanide and early actinide complexes.

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**Dr. Ashis K. Patra** is Assistant Professor at the Department of Chemistry, Indian Institute of Technology Kanpur since 2012. Ph.D. (2008): Indian Institute of Science, Bangalore. Postdoctoral research fellow: University of Georgia, Athens, GA, USA (2008-2010); Harvard University, Harvard-MIT Division of Health Sciences and

Technology (2010-2011).

**Research Interests:** Luminescent lanthanide complexes and biological imaging or sensing. Lanthanide functionalized hybrid nanomaterial and soft matters. Medicinal inorganic chemistry.

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### Venue

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INDIA

Visit GIAN registration portal:

<http://www.gian.iitkgp.ac.in/GREGN/index>

Course Co-ordinator  
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## Registration Procedure

Registration to this course is a two-step process.

Participants will have to first register to the GIAN portal. It is a onetime process. One time Non-refundable fee of Rs. 500/- is to be charged for this service. Please also note that mere registration to the portal will not ensure participation in the course. Please do not confuse GIAN portal registration with course registration. The course participation fee is separate. You are required to apply online using the following steps in the given link:

1. Apply online for registration.
2. Fill up the registration form.
3. Select the course "Moment Analysis for Contaminant Fate and Transport".
4. Pay Rs 500/- (non-refundable) through online payment Gateway The candidate has to pay course participation fee as per details given below.

<http://www.gian.iitkgp.ac.in/GREGN/index>

Once registered in the portal, an applicant will be able to apply for this GIAN course titled "Modern Chemistry and Reactivity of the f-Block Elements". The course coordinators will confirm your selection as a participant in due course of time. Once you are selected, you will be informed by email and will be requested to pay the full fees through Online Payment or Demand Draft in the name of "The Registrar IIT Kanpur" payable at IIT Kanpur.

### Online Payment

Account Name: Registrar, IIT Kanpur

Account No: 10426002126

Bank Name: SBI IIT Kanpur

IFDC Code: **SBIN0001161**