Carbon Capture and Sequestration

……

Overview

The climate agreement reached in Paris last December establishes a global commitment to address climate change by reducing emissions of CO_2 and other greenhouse gasses in the coming decades. While long-term solutions to the challenge of sustainable energy generation rely on the direct or indirect conversion of solar energy, many of these solutions may be years from implementation. Meanwhile carbon emissions from existing fossil fuel infrastructure continue. Carbon Capture and Sequestration (CCS) employed on a global scale can mitigate the alarmingly high CO_2 levels in the atmosphere.

This course will introduce students in science and engineering disciplines to energy and climate considerations in general and to state-of-the art research in CCS specifically. The participants will be made aware of current energy consumption, understanding the role of CO_2 in the earth and its atmosphere as a system, the science and technology of capturing CO_2, the geological storage of CO_2, alternative approaches to reducing CO_2 in the atmosphere, and considerations of economics and policy related to carbon emissions.

Course participants will learn various topics through lectures and also case studies and assignments will be shared to stimulate research motivation of participants.

Modules	**Carbon Capture and Sequestration : Dec. 12 – 16, 2016** **12.12.2016**: **Energy, Electricity, Carbon** Counting carbon atoms. How many carbon atoms do we emit each year? How many of those can we capture? The questions are simple but the answers are enormous. How enormous? We will explore the complex relationship between energy generation and carbon emissions. The Atmosphere and Climate Modelling-What is the role of CO_2 in the atmosphere? How well do we understand this role and predict the future? **13.12.2016**: **The Carbon Cycle** We will review the biological, geological, and chemical mechanisms that control CO_2 levels in the atmosphere. The biological carbon cycle and the role of oceans in the carbon cycle. The inorganic carbon cycle, and the future carbon cycle. **14.12.2016**: **Introduction to Carbon Capture** We will review post- and pre-combustion capture of CO_2; the thermodynamics of gas separations, and the use of parasitic energy as a metric for successful carbon capture. Carbon capture by absorption, including solvent design, costs, and optimization. **15.12.2016 - Carbon Capture** Carbon capture by adsorption. Thermodynamics of adsorption, adsorption processes, optimization. The design of porous materials, including MOFS. Carbon capture by membranes. Membrane separations, microscopic analysis of adsorption and diffusion. Polymers and nano-porous materials for membranes. **16.12.2016 - Carbon Sequestration** CO_2 trapping mechanisms, selection of sites for geological storage. Examples of sequestration projects. Microscopic view of fluids in rocks. Field scale models of sequestration, health and safety, failure mechanisms. Geo-engineering for carbon capture, direct air capture. Course summary.

	Number of participants for the course will be limited to fifty.
You Should Attend If…	▪ you are a research scientist in Chemistry, Biology, Life Sciences interested in studying the role of carbon, CO_2 in the environment and how to reduce the carbon content in the environment. ▪ you are chemist or environmentalist or energy managers interested to learn role of carbon as energy source ▪ you are a student or faculty from academic institution or consultant interested in learning basics of CCS.
Fees	**The participation fees for taking the course is as follows:** **Participants from abroad : US $200** **Industry/ Research Organizations: Rs. 5000/-** **Academic Institutions:** **BSc Students: Rs. 500/-** **MSc Students: Rs. 1000/-** **PhD Students: Rs. 1500/-** **Faculty members: Rs. 2000/-** 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.

The Faculty

Prof. Jeffrey A. Reimer is presently the C. Judson King Endowed Professor and Warren and Katharine Schlinger Distinguished Professor and Chair of the Chemical and Biomolecular Engineering Department. Professor Reimer serves as a member of the Board of Trustees for Franklin University in Lugano, Switzerland and served as the Chair of the Governing Board for the Council for Chemical Research in 2015.

Professor Reimer has won several teaching awards, culminating with the UC Berkeley Distinguished Teaching Award, the highest award bestowed on faculty for their teaching. Professor Reimer's scholarship is in the fields of materials chemistry and engineering, with particular attention to the application of sophisticated NMR spectroscopic and physical measurements. He is recognized for these works by election as a Fellow of the American Association for the Advancement of Science, a Fellow of the American Physical Society in the Division of Materials Physics, and a Fellow of the International Society for Magnetic Resonance.

The goal of Professor Reimer's research is to provide a scientific basis for the systematic design of new materials and devices for technological development, with particular attention to those technologies aimed at energy and information systems. His is an experimentalist and uses many different tools for his research, yet retains special expertise and interest in magnetic resonance (MR) spectroscopy and imaging. In addition to his more than 170 research publications, Professor Reimer is co-author (with T.M. Duncan) of the introductory text *Chemical Engineering Design and Analysis* (Cambridge University Press, 1998), and the text *Carbon Capture and Sequestration* (with Berend Smit, Curt Oldenburg, Ian Bourg, World Scientific Press, 2013).

Prof. Dr. Palwinder Singh is the faculty of Organic Chemistry in the Department of Chemistry, Guru Nanak Dev University, Amritsar. His research interest is in the area of medicinal and bioorganic chemistry involving rational design, synthesis, characterization and evaluation of materials as enzyme models; development of anticancer, anti-inflammatory and anti-fungal agents, and studying their mode of action.

Dr Manpreet Singh Bhatti is working as Associate Professor in Department of Botanical & Environmental Sciences, Guru Nanak Dev University, Amritsar, Punjab (INDIA). Dr Bhatti is environmental engineer by profession and has 15 years of teaching experience. His research interests are water quality, industrial wastewater treatment, ambient air pollution through design of experiments (DOE), mathematical modeling and process optimization.

Course Coordinators

Prof. Palwinder Singh
Phone: 09876062406
E-mail:
palwinder_singh_2000@yahoo.com

Dr. M. S. Bhatti
Phone: 09417107598
E-mail: mbhatti.dobes@gndu.ac.in

REGISTRATION CUM ACCOMODATION REQUEST FORM

(To reach electronically by 12th Oct, 2016 and hard copy by 15th Nov, 2016)

INTERNATIONAL WORKSHOP on Carbon Capture and Sequestration

Dec. 12-16, 2016

Department of Chemistry, Guru Nanak Dev University

Amritsar, Punjab

Name (Block Letters): …… M/F: ……

Designation/ Professional Title: ……..

Organization: ……

Address: ……

……..

……

Tel.: …….. . Mobile: ……..

E- mail: ……

Accommodation Required (Yes/ No): ……..

The Registration fee of Rupees ……has been paid via Demand Draft No……..in favour of The Registrar, Guru Nanak Dev University, Amritsar Through online/offline banking bearing Transaction No. …….. to Punjab & Sind Bank, Guru Nanak Dev University Campus (RTGS/IFSC code: PSIB0000288) A/Ct No. 02881000007953 of Guru Nanak Dev University. Demand Draft/ Fee Receipt have been enclosed herewith.

Date: Signature