

# INTERNATIONAL COURSE

Under

GLOBAL INITIATIVE OF ACADEMIC NETWORKS (GIAN)



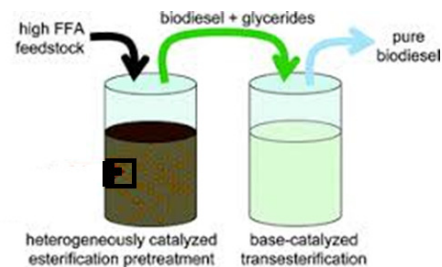
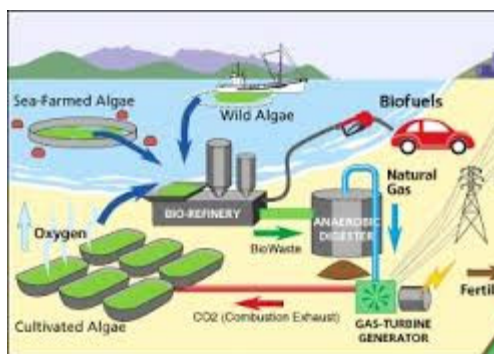
Ministry of Human Resource  
Development

## Sustainable Fuels and Chemical Production using Novel Catalysts

August 20-24, 2018

Course Coordinators

Dr. Kailash Singh, Dr. Madhu Agarwal, Prof. S.P. Chaurasia



DEPARTMENT OF CHEMICAL ENGINEERING  
MALAVIYA NATIONAL INSTITUTE OF TECHNOLOGY  
J.L.N. Marg, Jaipur-302017, Rajasthan, India

## **GIAN (An Initiative of Government of India)**

Union Cabinet has approved a program titled Global Initiative of Academic Networks (GIAN) in Higher Education, aimed at tapping the talent pool of scientists and entrepreneurs, internationally to encourage their engagement with the institutes of Higher Education in India so as to augment the country's existing academic resources, accelerate the pace of quality reform, and elevate India's scientific and technological capacity to global excellence. GIAN is envisaged to catalyze higher education institutions in the country that will initially include all IITs, IIMs, Central Universities, IISc Bangalore, IISERs, NITs and IITs. Subsequently, good State Universities where the spinoff is vast, shall also be covered. GIAN is an evolving scheme which will initially include participation of foreign faculty in Institute as Distinguished/ Adjunct/ Visiting faculty/ Professor of practice. They will delivering their expertise in short or semester-long course. In addition, other activities shall also be included in due course of time.

GIAN is envisaged to achieve the following objectives:

- a) Provide opportunity to our faculty to learn and share knowledge and teaching skills in cutting edge areas.
- b) To provide opportunity to our students to seek knowledge and experience from reputed International faculty.
- c) To create avenue for possible collaborative research with the international faculty.
- d) To increase participation and presence of international students in the academic Institutes.
- e) Opportunity for the students of different Institutes/Universities to interact and learn subjects in niche areas through collaborative learning process.
- f) Provide opportunity for the technical persons from Indian Industry to improve understandings and update their knowledge in relevant areas.
- g) To motivate the best International experts in the world to work on problems related to India.

## **About The Course**

The research and technology development in the field of sustainable fuels has become one of the major priorities by the Government of India. The need for substitution of biomass derived fuels has been attributed to sustainable energy production, environment and human health protection. However, significant advancements in the production technologies have to be undertaken before an economically and environmentally feasible use of sustainable fuels and chemicals. The progress in process engineering can contribute to the development of new catalysts and catalytic processes to play a decisive role toward the production of sustainable fuels and chemicals. There is a need to understand the catalytic mechanism, dependence of activity/selectivity on catalyst's structure, porosity, acidity, basicity, morphology, hydrothermal stability and resistance to deactivation. The catalytic thermochemical routes including catalytic fast pyrolysis and downstream upgrading of pyrolysis oil and lignin as well as Fischer-Tropsch synthesis need to be discussed along with liquid phase biomass pretreatment and catalytic upgrading of carbohydrate to fuels and chemicals via

dehydration, dehydrogenation and condensation reaction. In agriculture and in forestry, a lot of waste biomass (mainly lignocellulosic material) is produced, which is now either burnt, thereby producing CO<sub>2</sub>, or decays into CH<sub>4</sub> and CO<sub>2</sub>. It is possible to make use of this biomass waste and convert it into transportation fuels and/or chemicals.

This course will cover important technical and engineering considerations in catalytic conversion of triglycerides (vegetable oils and fats) into biofuels, with emphasis on studies and processes available in the open literature. Increased attention will be given to the hydrotreatment of vegetable oils followed by a detailed analysis of the transformation of these oils into biofuels via the catalytic processes. The production of bio-hydrogen via catalytic reforming of bio-oil or glycerol will be part of the course. Attempt will be made to understand the need of life cycle analysis of sustainable fuels and chemicals and recovery of byproducts. The course will include case studies for facilitating the learning outcomes. This course is proposed to be delivered over a period of 5 days, with 15 lecture hours containing various aspects of Sustainable Fuels and Chemical Production using various catalysts and their effectiveness.

## Objectives

The primary objectives of the course are as follows:

- i) Catalyst synthesis, characterization and application
- ii) Synthesis of sustainable fuels and chemicals
- iii) Green diesel synthesis via Fischer-Tropsch and transesterification.
- iv) Hydrogen production from biomass conversion and glycerol pyrolysis.
- v) Ethanol production via enzymatic catalysis.
- vi) Storage of renewable fuel
- vii) CO<sub>2</sub> capture and storage techniques
- viii) Synthesis, characterization and applications of biolubricants

## Who Can Attend

- Executives, engineers and researchers from manufacturing, service and government organizations including R&D laboratories.
- Students at all levels (B.Tech/MSc/M.Tech/PhD).
- Faculty from reputed academic institutions and technical institutions.

## Modules Coverage

Day	Topics to be covered
Day 1	Lecture 1: Introduction to Catalysis, Catalyst Synthesis Methods, Novel Catalysts Lecture 2: Characterization of catalysts and nanomaterials Lecture 3: Need of Sustainable Fuels (Hydrogen, Biodiesel, Ethanol, Bio-oil, Synthetic transportation fuel)

<b>Day 2</b>	Lecture4: Green diesel production through Fischer-Tropsch synthesis using novel catalysts and characterization, and applications. Possible strategies for green diesel production. Lecture5: Green diesel/biodiesel production via transesterification of oils and fats using novel catalysts and characterization, and applications Lecture6: Hydrogen production by methane and glycerol reforming, methane pyrolysis
<b>Day 3</b>	Lecture7: Hydrogen production from biomass using novel catalysts and supercritical technology. Process evaluation and its merits and demerits. Lecture8: Ethanol production using lignocelluloses using enzyme catalysts. Its characterization and applications Lecture9: Analysis, storage and distribution of renewable fuels – Critical for the success of implementation of biofuels
<b>Day 4</b>	Lecture10: Biolubricants synthesis, characterization and applications. Its advantages over the petroleum based lubricants Lecture11: Glycerol production, purification and catalytic conversion to glycols, glycerol ethers and glycerol carbonates
<b>Day 5</b>	Lecture12: Carbon dioxide capture and storage Lecture13: Life cycle analysis of sustainable fuels and chemicals

### Important Dates

Registration Opens: February 12, 2018

Registration Closes: August 06, 2018

Accommodation Requests: Before August 06, 2018

### Venue: Malaviya National Institute of Technology Jaipur

#### About The Host Institute

The Institute was established in 1963 with the name as Malaviya Regional Engineering College, Jaipur. The campus spreads over 317 acres of lush green area in the central location of Jaipur city and is imaginatively laid-out with a picturesque landscape. On June 26, 2002 the college has given the status of National Institute of Technology by the Government of India under the aegis of Ministry of Human Resource Development, New Delhi and on 15<sup>th</sup> August, 2007 proclaimed 'Institute of National Importance' through act of Parliament-2007. The Institute is fully funded by Ministry of Human Resource Development (MHRD), Government of India. A large number of reputed Industrial houses in the country visit the Institute and select the final year students as Engineers/ Management Trainees and the Scientists. Malaviya National Institute of Technology is one of the premier NITs of India and has the responsibility of providing high quality education in engineering, technology and sciences to produce competent Technical and Scientific manpower. The Institute offers undergraduate and post graduate (B.Tech., B.Arch., M.Tech., M.Arch., M.Sc., MBA and PhD) programmes to about 4500 students in leading field of Engineering, Technology, Architecture, Management and Sciences. The institute is actively engaged in research, consultancy and developmental activities, besides imparting regular teaching.

## About The Host Department

The Department of Chemical Engineering was commenced in the year 1988 with 30 undergraduate students in the B.Tech. Chemical Engineering programme and has been doing its best to bring about excellence in academics achieved in the last 29 years. The PG Programmes of M.Tech. in Chemical Engineering and Ph.D. was started in year 2006 and 2004 respectively. The current sanctioned intake of the B.Tech. Chemical Engineering Program and M.Tech Chemical Engineering Program is 100 and 31, respectively for Full time Courses. The Department is well equipped with good undergraduate and research laboratories. The Department aims to provide students with a balance of intellectual and practical expertise that enables them to serve the worldwide chemical industry as well as the societal needs. The programmes offered by the department are accredited by NBA and has educational objectives that are consistent with the vision and mission of the department. The curriculum has been designed to meet the programme goals and objectives that lay more stress on learning under the guidance of a vibrant and highly qualified faculty.

## GIAN Portal Registration

### Step-1: One Time Web Portal Registration

Create login and password at <http://www.gian.iitkgp.ac.in/GREGN/index> login and complete the Registration Form and pay Rs. 500/- (non-refundable, GIAN Portal Registration Fee) through online payment gateway. After payment, select this course from the listed GIAN courses.

Download "pdf file" of the application form and forward to the course coordinator by email: [ksingh.chem@mnit.ac.in](mailto:ksingh.chem@mnit.ac.in).

### Step 2: Institute Registration

The registration form for this course can be found along with this brochure. The soft copy of brochure can be download from the institute website [www.mnit.ac.in](http://www.mnit.ac.in) (GIAN portal). Participants are requested to fill the registration form and send to the course coordinator along with course registration fee. The registration fee details are listed below:

### Course Registration Fee (exclusive of GIAN Portal Registration Fee)

Students (UG, PG, and PhD)	Rs. 1000
Academicians	Rs. 2500
Industry and Research	Rs.3000
Participants from Abroad	US \$ 100

The above fee includes all instructional materials, computer use for tutorials and lab, free Internet facility, refreshments between sessions and working lunch. The accommodation will be provided to the outstation participants on payment basis subject to availability.

## Mode of Payment

Participants are requested to send a Demand Draft in favor of “**REGISTRAR, MNIT Jaipur**” payable at Jaipur with a print out of the filled in Registration form, by **Courier/ Speed Post/ Registered Post** before 13th August 2018 to: **Dr. Kailash Singh, Associate Professor, Department of Chemical Engineering, J.L.N. Marg, MNIT, Jaipur-302017, Rajasthan, India**. Please label the envelop, "GIAN: Sustainable Fuels and Chemical Production using Novel Catalysts". Please email a scanned copy of the DD and the signed registration form by the deadline to Dr. Kailash Singh at [ksingh.chem@mnit.ac.in](mailto:ksingh.chem@mnit.ac.in)

## How To Reach Jaipur

Jaipur is well connected by Air, Rail and Road with all the major cities in India. It is about 280 kms from New Delhi. It has direct flights from New Delhi (45 min), Mumbai (1.5 hrs), Hyderabad (1.45 hrs), Chennai (2.15 hrs), Bangalore (2.00 hrs) and Kolkata (2.2 hrs). The Institute is prominently located on JLN Marg and is 3 km from the Airport. It is 10 km from the main Railway Station and Bus Stand.

## Local Accommodation

Accommodation at the Institute Guest houses will be available on payment basis. The details regarding boarding and lodging are as follows:

Rates:

**Guest House 1 (Limited capacity):** (Single occupancy, double-bedded a/c room): Rs. 900/- per day.

**Guest House 2:** (Single occupancy, double-bedded a/c room): Rs. 700/- per day.

**Aurobindo Boys Hostel:** (Single occupancy, double-bedded non a/c room): Rs. 100/- per day.

**Gargi Girls Hostel:** (Dormitory): Rs. 100/- per day There are many good fair price lodging facilities available nearby the campus.

TA/DA will not be paid to any participant.

## Places To Visit

Jaipur is famous for its hospitality, culture, gems and jewelry, blue pottery, hand printed organic textiles and magnificent forts and palaces. Most prominent places to visit are Hawa Mahal, Jantar Mantar, City Palace, Albert Hall Museum, Amber Fort–Heritage Palace, Nahargarh fort, Jaigarh fort, Jal Mahal, Kanak Varindavan Garden, Govind Dev Ji temple and many more. You may also visit Agra for a day to visit one of the wonders Taj Mahal and Fetehpur Sikari. 150 km distance from Jaipur to Pushkar and Ajmeer.



## Brief Profile of Resource Person



Dr. Ajay K. Dalai is working as a full professor in the Department of Chemical Engineering at the University of Saskatchewan. In 2001, he was awarded a Tier 2 Canada Research Chair in Bioenergy and Environmentally Friendly Chemical Processing, and Tier 1 in 2009. In 2009, Dalai accepted the position of associate dean of Research and Partnerships for the College of Engineering, in addition to his professorship and supervisory role. His research focus is the novel catalyst development for gas to liquid (GTL) technologies, biodiesel productions and applications, hydrogen/syngas production from waste materials, hydroprocessing of heavy gas oil, and value-added products from biomass. He is currently working on the production and applications of activated carbon and carbon nanotubes (CNTs). The worldwide impact of this research is tremendous in terms of combating pollution and finding alternate energy resources, and has generated much interest and collaborative projects with research institutes and universities around the world. Dalai has published over 300 research papers mostly in heterogeneous catalysis and catalytic processes in international journals and conference proceedings. He is an active board member, reviewer, and guest editor for several international journals. He is a life member of the Indian Institute of Engineers, the Indian Catalysis Society, the American Institute of Chemical Engineers, and an active member of the American Chemical Society and the Chemical Institute of Canada. He is a Fellow of CIC, CAE, EIC, AIChE and IChE.

## Course Coordinators



**Dr. Kailash Singh**  
Associate  
Professor  
Department of  
Chemical Engg.,

MNIT Jaipur  
Mobile : 7891005053  
Email Id:  
ksingh.chem@mnit.ac.in



**Dr. Madhu  
Agarwal**  
Assistant Professor  
Department of  
Chemical Engg.,

MNIT Jaipur  
Mobile : 9549654166  
Email Id:  
magarwal.chem@mnit.ac.in



**Dr. S.P.  
Chaurasia**  
Professor,  
Department of  
Chemical Engg.,

MNIT Jaipur  
Mobile : 9549658127  
Email Id:  
spchaurasia.chem@mnit.ac.in

## GIAN Local Coordinator



**Dr. Vijay Janyani**  
Associate Professor  
Department of Electronics and Communication Engineering  
Malaviya National Institute of Technology Jaipur,  
Jaipur-302017



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**Ministry of Human Resource Development**  
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**REGISTRATION FORM**

**Name (In Block Letters):** .....

**Designation:**.....

**Qualification:** .....

**Institution:** .....

**Address:** .....

.....

**Email address:** .....

**Mobile No:** .....

**Payment by DD in favor of “REGISTRAR, MNIT JAIPUR” payable at Jaipur.**

**Details of Demand Draft:**

**DD No:** ..... **Bank Name:**..... **Date:** ..... **Amount Rs:** .....

.....  
Signature of the Candidate

**Speed Post**

**Dr. Kailash Singh**

**Associate Professor**

**Department of Chemical Engineering,**

**J.L.N. Marg, MNIT, Jaipur-302017,**

**Rajasthan, India.**