



COURSE BROCHURE

GLAN

(GLOBAL INITIATIVE OF ACADEMIC NETWORKS)

COURSE 2018

ON

**Extremozymes for Carving Better Tomorrow
(December 17 – December 28, 2018)**

COURSE COORDINATORS:

**Prof. Tamal Mandal
Dr. Gopinath Halder
Dr. Dalia Dasgupta Mandal
Dr. Jaya Adhikari (Sikder)
Dr. R. Navanietha Krishnaraj**

**DEPARTMENT OF CHEMICAL ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY
DURGAPUR, MAHATMA GANDHI AVENUE,
DURGAPUR, WEST BENGAL, INDIA, 713209**



ABOUT GIAN:

Overview:

Global Initiative for Academic Network (GIAN) programme approved by Union Cabinet in Higher Education aimed at tapping the talent pool of Scientist and Entrepreneur 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. In order to (i) gather the best international experience into our systems of education, (ii) enable interaction of students and faculty with the best academic and industry experts from all over the world, (iii) share their experiences and expertise to motivate people to work on Indian problems, there is a need for a Scheme of International Summer and Winter Term.

Objectives:

The proposed GIAN is envisaged to achieve the following objectives:

1. To increase the footfalls of reputed international faculty in the Indian academic institutes.
2. Provide opportunity to our faculty to learn and share knowledge and teaching skills in cutting edge areas.
3. To provide opportunity to our students to seek knowledge and experience from reputed International faculty.
4. To create avenue for possible collaborative research with the international faculty.
5. To increase participation and presence of international students in the academic Institutes.

6. Opportunity for the students of different Institutes/Universities to interact and learn subjects in niche areas through collaborative learning process.
7. Provide opportunity for the technical persons from Indian Industry to improve understandings and update their knowledge in relevant areas.
8. Motivate the best international experts in the world to work on problems related to India.
9. Develop high quality course material in niche areas, both through video and print that can be used by a larger body of students and teachers.
10. To document and develop new pedagogic methods in emerging topics of national and international interest.

ABOUT THE INSTITUTE:

The National Institute of Technology, Durgapur (formerly Regional Engineering College, Durgapur), was established by an Act of Parliament in 1960 as one of the eight such colleges aimed to function as a pace setter for engineering education in the country and to foster national integration. It is a fully-funded premier Technological Institution of the Government of India and is administered by an autonomous Board of Governors. The Institute is a University which awards B.Tech., M.C.A., M.Sc., M.B.A., M.Tech. and Ph.D. degrees to students after their successful completion of the specified courses. The Institute imparts education in the disciplines of Chemical Engineering, Civil Engineering, Computer Science and Engineering, Electrical Engineering, Electronics and Communication Engineering, Mechanical Engineering, Metallurgical and Materials Engineering, Information Technology, Biotechnology, Physics, Chemistry, Mathematics, Environmental science, Materials Science and Management Studies. As decided by the Ministry of Human Resource Development, Government of India. In addition to the normal intake, a few seats are reserved for Foreign Students who are nominated by the Ministry of External Affairs, Government of

India, and the Indian Council for Cultural Relations, Government of India.

ABOUT THE DEPARTMENT:

The Department of Chemical Engineering of National Institute of Technology, Durgapur, was established with active support of UNESCO. The department was built up by a team of dedicated faculty members with the help of a host of visiting professors deputed by UNESCO to NIT Durgapur. Some of the faculty members were trained abroad under UNESCO programme, and a number of equipment and instruments were donated by UNESCO to the department. The B.E. course in Chemical Engineering was started in 1964, and the first batch of students were awarded the degree in 1969. The Post-graduate programme with the specialisation 'Production Fertilisers' was introduced in 1968, along with the doctoral programme in Chemical Engineering. The department has a sanctioned intake of 30 students for the B.E. course per year. For admission to the M. Tech. course, 10 seats are available in regular full-time course with duration of 1.5 years, while 10 seats are reserved for part-time students from industries with a course duration of 3 years. Curriculum and syllabi of the courses offered were continuously updated over the years to keep pace with rapidly changing technological developments. Since 1999 new curricula and syllabi were implemented in the college for undergraduate studies.

ABOUT THE PROGRAMME:

Overview

Biochemical processes have been realized as the ideal option for replacing physicochemical processes in an efficient, eco-friendly, and economical manner. The understanding of the enzymes, their catalysis, and their applications are mandate for the scientists and engineers working in the industry. Today most industries, which were making use of microbial processes, have replaced most of their processes with processes with enzymes. Different enzymes have been explored for real time applications in various industries such as biofuel, detergent, brewing, culinary, dairy, paper industry, food processing, starch, molecular biology research, as well as biosensor development. Enzymes, in general, are fragile and get denatured easily. However, with the findings of new way for exploiting enzymes that can operate in severe operating conditions from extremophilic organisms, the scope of using enzymes for industrial applications has improved tremendously.

The extremophilic enzymes can operate at lower or higher pH conditions, different range of temperatures, and different pressures etc. The idea of exploring the enzymes from extremophiles is not new. For example, Taq polymerase, a thermostable enzyme with a half-life of greater than 2 hours at 92.5°C and can function at around 70-80°C, was isolated from a thermophilic bacteria *Thermus aquaticus* in 1976. The Taq polymerase is being used for amplification of DNA in polymerase chain reaction for over decades. Extremozymes are promising candidates for carrying out operations in adverse conditions such as space (microgravity), mining (biomining/bioleaching), deep sea (high pressure), and toxic environments (metals, radionuclides, drugs, antibiotics etc.).

The knowledge of extremophilic enzymes is essential for chemists, biochemists, chemical/biochemical/bioprocess engineers, biotechnologists, molecular biologists, genetic engineers, as well as computational biologists. The research activities are going on rapid speed in identifying the sources and applications of extremophilic enzymes. There are a few extremozymes which have been taken up for real time applications while hundreds of extremozymes will be used for industrial applications in the near future.

Existing enzymatic technologies (e.g. hydrolysis of lignocellulose into sugars) have several limitations including very slow enzymatic hydrolysis rates, low yields of products (often incomplete hydrolysis), require high dosages of enzymes, and sensitive to microbial contamination problems. These limitations could be overcome using extremophilic enzymes. This course introduces fundamentals of enzymatic processes and in-depth review of extremophilic enzymes which can be used in several industrial processes. In addition, the course provides the knowledge on how to engineer extremozymes for enhanced catalytic activities. This course will be useful for academia, research, and industry.

OBJECTIVES OF THE PROGRAM, EXPECTATIONS AND STUDENT LEARNING OUTCOMES:

The primary objectives of the course are to teach the following concepts to participants:

- Fundamentals of Enzymatic Processes
- Introduction to Extremozymes: Types, Advantages, and Applications
- Metagenomics for the Discovery of Extremozymes
- Mechanisms of Extremozymes: Sequences and Structural Biology

- Engineering of Enzymes for Improved Catalytic Rates under Harsh Conditions
- Hands-on Experiences on Catalytic Processes using Thermozyms in Laboratories
- Recognize current trends in extremozymes in response to current demands from various sectors of industry

FEES DETAILS:

Participants from abroad: US \$200

Industry/Research Organizations: Rs. 6,000/-

Academic Institutions: Rs. 4,000/-

Students/Scholars: Rs. 2,000/-

The above fee includes all instructional materials and computer use for tutorials. Tea & working lunch will be served. Participants are requested to arrange for their own accommodations. The participants may be provided with budget accommodation on payment basis upon advance request in the university premises subject to availability.

ELIGIBILITY:

- Student students at all levels (BTech/MSc/MTech/PhD) or Faculty from reputed academic institutions and technical institutions.
- Executives, engineers and researchers from manufacturing, service and government organizations including R&D laboratories.

REACHING NIT DURGAPUR:

The Institute is located about 160 KMs north-west of Kolkata on the Howrah-Delhi Main Railway-Route and overlooking the National Highway No. 2 (the great Grand- Trunk Road) and 8 KMs from Durgapur Railway station via City Centre near Gandhi More. For more information you may please visit our institute website:

<http://www.nitdgp.ac.in>

REGISTRATION PROCESS:

Registration for GIAN course is not automatic because of the constraints on maximum number of participants allowed to register for a course. In order to register for one or multiple non-overlapping courses, you have to apply online using the following steps:

1. Create login and password at www.gian.iitkgp.ac.in
2. Login and complete the registration form.
3. Select courses
4. Confirm your application and payment information.
5. **Pay Rs.500 through online payment gateway.**

The course coordinator of the course will go through your application and confirm your selection as a participant one month before the starting date of the course. Once you are selected you will be informed and requested to pay the full fees through online gateway service. The bank details are given below:

Account name: GIAN COURSE 2018

Account Number: 8569101003200

Name of bank: CANARA Bank

IFSC Code: CNRB0008569

MICR Code: 713015203

Address: NIT Durgapur, M G Avenue, Durgapur - 713209

MODULES:

Module A: Fundamentals: December 17– December 28, 2018

Module B : Applications: December , 2018

Number of participants for the course will be limited to fifty.

THE FACULTY:

Dr. Rajesh Sani is a Professor in the Departments of Chemical and Biological Engineering and Applied Biological Sciences at South Dakota School of Mines and Technology, South Dakota. His research expertise includes Extremophilic Bioprocessing, Biocatalysis, Biomaterials, Gas to Liquid Fuels, Genome Editing of Extremophiles, Homo/Heterologous

Expression of Genes, Metabolic Engineering and Bioelectrochemical Systems. Over the past 11.5 years, he has been the PI or co-PI on over \$18.39 million in funded research. Several of my accomplishments in research and advising include: i) Postdocs supervised (8); ii) Graduate students supervised (MS students, 10 and PhD, 11), and iii) Undergraduate students and K12 teachers supervised (over 60). He has one patent, five invention disclosures, and published over 65 peer-reviewed articles in high impact factor journals and have contributed in over 15 book chapters. He has edited four books and one proceedings for Springer International Publishing AG. In addition, Dr. Sani has been in proposal panel for the Federal Agencies i) National Science Foundation, ii) U.S. Army Research Office, iii) Department of Energy, and iv) U.S. Geological Survey. He also serves the Industrial Microbiology profession as “Biocatalysis Program Committee Member” of the Society for Industrial Microbiology and Biotechnology (SIMB), technical session chair at the Annual American Institute of Chemical Engineers (AIChE) and SIMB, and an associate editor.



Dr. Tamal Mandal- Professor of Chemical Engineering Department, NIT Durgapur. He expertises in subjects like Reaction Engineering, Advanced technologies for waste Management, Process development. His research focusses on Biodegradation, Environmental Biotechnology, Advance Oxidation process, Adsorption and Industrial wastewater Treatment for resource recovery and reuse.



Dr. Gopinath Halder-He is an Associate Prof in the Chemical Engineering Department, NIT Durgapur. He has several publications in National and International Peer reviewed journals and has authored a book on thermodynamics. His research interests are Pressure swing adsorption, chemical adsorption, bioremediation, biofuels and catalyst preparation.

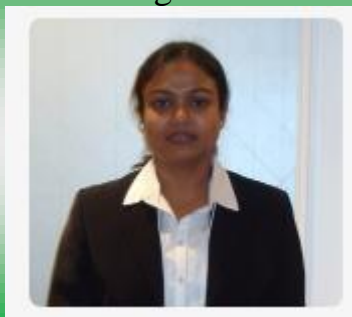


Dr. Dalia Dasgupta Mandal -She is presently the associate professor of Dept of Biotechnology, NIT Durgapur. Her expertises in Biotechnology/Cell Signaling in Infectious disease, Molecular Biology Tissue Culture. She has numerous publications and is supervising some heavy funded projects under DBT AND DST.



Dr. Jaya Adhikari (Sikder)-

She is currently Assistant Professor in the Chemical Engineering Department, NIT Durgapur. Her Research interest include Membrane synthesis for water/wastewater treatment, Photocatalytic nanoparticles, Biofuels/downstream purification using membrane.



FOR MORE DETAILS PLEASE CONTACT THE PERSONS :

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Weblinks :

- 1) [http:// www.nitdgp.ac.in](http://www.nitdgp.ac.in)
- 2) www.gian.iitkgp.ac.in

VENUE:

**Dept. of Chemical Engineering, NIT Durgapur, West
Bengal, India, 713209**
[http:// www.nitdgp.ac.in](http://www.nitdgp.ac.in)

The above fee includes all instructional materials and computer use for tutorials. Tea & working lunch will be served. Participants are requested to arrange for their own accommodations. The participants may be provided with budget accommodation on payment basis upon advance request in the university premises subject to availability.

SELECTION AND MODE OF PAYMENT

Selected candidates will be intimated through e-mail. They have to remit the necessary course fee to the bank as per the details given below.

Participants from abroad: US \$200
Industry/Research Organizations: Rs. 6000/-
Academic Institutions: Rs. 4000/-
Students/Scholars: Rs. 2000/-

Account Name: **GIAN CSE JULY 2017**
Account No: **8569101002865**
Bank: **CANARA BANK**
Branch: **REC DURGAPUR**
Branch Code: **8569**
IFSC: **CNRB0008569**
MICR Code: **713015203**
SWIFT Code: **CNRBINBBCFD**

Candidates registering early will be given preference in the short-listing process.

ABOUT THE COURSE

MHRD, Govt. of India has launched an innovative program titled "Global Initiative of Academic Networks (GIAN)" in higher education, in order to gather the best international experience. As part of this, internationally renowned academicians and scientists are invited to augment the country's academic resources accelerate the pace of quality reforms and elevate India's scientific and technological capacity to global excellence.

ABOUT THE INSTITUTE

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The Department of Chemical Engineering of National Institute of Technology, Durgapur, was established with active support of UNESCO. The department was built up by a team of dedicated faculty members with the help of a host of visiting professors deputed by UNESCO to NIT Durgapur. Some of the faculty members were trained abroad under UNESCO programme, and a number of equipment and instruments were donated by UNESCO to the department. The B.E. course in Chemical Engineering was started in 1964, and the first batch of students were awarded the degree in 1969. The Post-graduate programme with the specialisation 'Production Fertilisers' was introduced in 1968, along with the doctoral programme in Chemical Engineering. The department has a sanctioned intake of 30 students for the B.E. course per year. For admission to the M. Tech. course, 10 seats are available in regular full-time course with duration of 1.5 years, while 10 seats are reserved for part-time students from industries with a course duration of 3 years. Curriculum and syllabi of the courses offered were continuously updated over the years to keep pace with rapidly changing technological developments. Since 1999 new curricula and syllabi were implemented in the college for undergraduate studies.

Contact Details

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GIAN Course on

Extremozymes for Carving Better Tomorrow

December 17-28, 2018

Call for Registration and Participation

International Faculty

Dr. Rajesh Sani
Professor,
Department of Chemical and Biological
Engineering & Chemistry and Applied Biological
Sciences,
South Dakota School of Mines and Technology
(SDSMT)

Course Co-ordinators
Prof. Tamal Mandal/ Dr. R. Navanietha Krishnaraj
Department of Chemical Engineering
National Institute of Technology, Durgapur.

Organised by
Department of Chemical Engineering

National Institute of Technology, Durgapur.
Mahatma Gandhi Avenue,
Durgapur, West Bengal, India
Pin: 713209
www.nitdgp.ac.in

OVERVIEW OF THE COURSE

Biochemical processes have been realized as the ideal option for replacing physicochemical processes in an efficient, eco-friendly, and economical manner. The understanding of the enzymes, their catalysis, and their applications are mandate for the scientists and engineers working in the industry. The extremophilic enzymes can operate at lower or higher pH conditions, different range of temperatures, and different pressures etc. The idea of exploring the enzymes from extremophiles is not new. For example, Taq polymerase, a thermostable enzyme with a half-life of greater than 2 hours at 92.5°C and can function at around 70-80°C, was isolated from a thermophilic bacteria *Thermusaquaticus* in 1976. The Taq polymerase is being used for amplification of DNA in polymerase chain reaction for over decades. Extremozymes are promising candidates for carrying out operations in adverse conditions such as space (microgravity), mining (biomining/bioleaching), deep sea (high pressure), and toxic environments (metals, radionuclides, drugs, antibiotics etc.).

The knowledge of extremophilic enzymes is essential for chemists, biochemists, chemical/biochemical/bioprocess engineers, biotechnologists, molecular biologists, genetic engineers, as well as computational biologists. Existing enzymatic technologies (e.g. hydrolysis of lignocellulose into sugars) have several limitations including very slow enzymatic hydrolysis rates, low yields of products (often incomplete hydrolysis), require high dosages of enzymes, and sensitive to microbial contamination problems. These limitations could be overcome using extremophilic enzymes. This course introduces fundamentals of enzymatic processes and in-depth review of extremophilic enzymes which can be used in several industrial processes. In addition, the course provides the knowledge on how to engineer extremozymes for enhanced catalytic activities. This course will be useful for academia, research, and industry.

COURSE CONTENT

Fundamentals of Enzymatic Processes
Introduction to Extremozymes: Types, Advantages, and Applications
Metagenomics for the Discovery Of Extremozymes
Mechanisms of Extremozymes: Sequences and Structural Biology
Engineering of Enzymes for Improved Catalytic Rates under Harsh Conditions
Hands-on Experiences on Catalytic Processes using Thermozyms in Laboratories
Recognize current trends in extremozymes in response to current demands from various sectors of industry

COURSE FACULTY



Dr. Rajesh Sani Professor, Department of Chemical and Biological Engineering & Chemistry and Applied Biological Sciences, South Dakota School of Mines and Technology (SDSMT). His research includes extremophilic bioprocessing of lignocellulose-based renewables for biofuels and bioproducts and bioprospecting of extremophilic microorganisms for developing more efficient and cost-effective biofuel (bioenergy) production technologies. Over the past 11 years, he has been the PI or co-PI on over \$12 million in funded research. He has one patent, five invention disclosures, and published over 55 peer-reviewed articles in high impact factor journals, and has contributed in several book chapters. He also serve the Industrial Microbiology profession as “Biocatalysis Program Committee Member” of the Society for Industrial Microbiology and Biotechnology (SIMB), technical session chair at the Annual American Institute of Chemical Engineers (AIChE) and SIMB, an associate editor.

Dr. Tamal Mandal
Dr. Dalia Dasgupta Mandal
Dr. Jaya Sikder
Dr. Gopinath Halder

WHO CAN PARTICIPATE?

Student students at all levels
(BTech/MSc/MTech/PhD) or Faculty from reputed academic institutions and technical institutions.

Executives, engineers and researchers from manufacturing, service and government organizations including R&D laboratories

HOW TO REGISTER?

Step 1: Web Portal Registration:

Visit GIAN Website at the link: <http://www.gian.iitkgp.ac.in/GREGN/index> and create login User ID and Password. Fill up the blank registration form and do web registration by paying Rs.500/- online through Net **Banking/ Debit/ Credit Card** as per instructions given there in. This provides the user with life time registration to enroll in any number of GIAN courses offered. Skip this step, if already registered.

Step 2: Course Registration:

Login to the **GIAN portal** again with the user ID and password already created in Step1. Click on **course registration** option at the top of registration form. Select the course titled “**Extremozymes for Carving Better Tomorrow**” from the list and click on **Save** option. Confirm your registration by clicking on **Confirm Course**. **Also, send the filled-in registration form to the contact address by post/e-mail.**

IMPORTANT DATES

Last date for receiving the GIAN registration form: **05-December-2018**

Intimation to participants: **07-December-2018**

Course dates: **17th-28st December 2018**

Selection will be as per the eligibility, and on First-Come-First-Served basis. For more details Click:

[http://nitdgp.ac.in/all_pdf17/Brochure%20For mat_final.pdf](http://nitdgp.ac.in/all_pdf17/Brochure%20For%20mat_final.pdf)