



## **Global Initiative of Academic Networks (GIAN) Program**

### **Biotechnology and Biovalorisation of Extremophiles**

**February 20 to March 01, 2023**

**Department of Bio-Technology**

**Dr. B R Ambedkar National Institute of Technology, Jalandhar 144027, India**

### **About GIAN Program**

The Ministry of Education (then Ministry of Human Resource Development), Government of India launched a program titled Global Initiative of Academic Networks (GIAN) in Higher Education in the year 2016 aimed at tapping the talent pool of faculty, 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 program facilitates the participation of high-quality international academicians/researchers for delivering short-term courses and programs in Indian institutions. More details on various GIAN courses are available at <http://www.gian.iitkgp.ac.in/>

### **The Institute**

Dr. B. R. Ambedkar National Institute of Technology, Jalandhar (REC Jalandhar), was established in the year 1986, became the National Institute of Technology on October 17, 2002 and the status "Institute of National Importance" by Act of Parliament in 2007. The National Institute of Technology, the Institute has a responsibility of providing high-quality technical education in Engineering and Technology to produce competent technical manpower for the country. The Institute offers B Tech, M Tech, M Sc, MBA, and Ph.D. programs in several disciplines of Engineering, Science & Technology, and Management. The Institute has signed a Memorandum of Understanding (MoU) with many prestigious institutes such as the University of Florence, Italy, Ecole Centrale de Lille, France, University of Johannesburg, South Africa, University of Bolton, UK, University of South Alabama, USA, etc. for the mutual academic exchange and strengthening of the academics and research. The Institute ranked 52<sup>nd</sup> during the NIRF ranking in the year 2022 in Engineering.

### **The Department**

The Department of Biotechnology, NIT Jalandhar is one of the fifteen Departments of the Institute. The Department has an MOU with the University of Florence, Italy for collaborative research in "Biotechnology and Process Engineering in Biofuel Production". The Department organized GIAN international summer term course on May 16-25, 2016. Within a span of fifteen years of commencement of B.Tech, M. Tech, and Ph.D. programs, the Department has achieved results that reflect upon the growth pattern of the intellectual potential embedded with inter-disciplinary knowledge, human values, and professional ethics among the youth, aspirants of becoming Engineers and Technologists, so that they contribute to the field of Biotechnology in particular and to the society in general. The department has well-experienced and dedicated faculty with inter-disciplinary research activities.

## Overview

Owing to the rapid growth of population and industrial developments, wastes are being generated at rapid rates. These wastes create tremendous health, ecological, and social impacts, and global concerns for waste disposal are increasing in recent years. There is a constant lookout for an efficient, facile, eco-friendly, and economical strategy for the safe disposal of wastes. Most of the conventional methods suffer from several limitations. For example, chemical methods of treatment demand sophisticated facilities and are not environmentally benign because these methods often generate wastes that are more toxic than parental wastes. Conventional chemical methods also fail to treat the highly toxic waste materials such as nuclear wastes and emerging pollutants.

Biovalorisation is a promising alternative for treating wastes as well as converting these into value-added products. This approach helps in the safe disposal of wastes in an environmentally benign manner as well as cutting down the operational costs of the process. The use of extremophiles for biovalorisation will be added advantage. Extremophiles can survive in extreme environments; they help in developing robust processes with a wide range of operating conditions. In addition, extremozymes are very stable, have a longer shelf life, and greater activity thereby leading to a high rate of catalysis.

This course aims to cover different extremophilic biovalorisation technologies for the safe disposal of wastes such as cytotoxic biomedical wastes, recalcitrant agricultural biomass, food wastes, and hazardous nuclear wastes. The unique component of this course is that it includes practical case studies on i) Uranium Bioremediation project of the US-Department of Energy (US-DoE); ii) Crew Wastes Disposal project of the National Aeronautics and Space Administration (NASA); iii) Greenhouse gas (methane) conversion project of the National Science Foundation (NSF); and iv) Food Wastes to Biofuels project of the US-Department of Defence (DoD). Professor Sani, the speaker of this course, served or has been serving as a leader in these projects, and will share his expertise/experiences on process development, scaling up, and practical outcomes of these projects.

The main goal of the course is to introduce participants to current topics in extremophilic microbial processes, emphasizing the critical evaluation of published peer-reviewed scientific literature as well as hands-on experiences on the anaerobic and gas to liquid processes including extremophilic consolidated bioprocessing (in which pre-treatment, enzyme production, hydrolysis, and fermentation of solid wastes are carried out in a single reactor at the same temperature). To ensure optimal process sustainability and profitability, this course will also discuss the overall techno-economical and life cycle assessments for an integrated process.

## Objectives

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

- Basic concepts of extremophilic processes design and development
- Emerging contaminants: Health, Ecological, and Social Impacts
- Challenges in the safe disposal of hazardous nuclear wastes and emerging pollutants
- Biovalorisation of agricultural wastes and industrial effluents
- Fate and transport of emerging pollutants in biological systems
- Specify engineering principles to extremophilic processes for disposal of hazardous pollutants
- Microbial, Enzymatic, Chemical Processes, and their Scale-up study using Extremophiles
- Dark and Photo fermentative molecular biohydrogen production from secondary wastes
- Case studies on
  - Uranium Detoxification project of the US-DoE,
  - Crew Wastes Disposal project of NASA,
  - Greenhouse gas (methane) conversion project of the National Science Foundation (NSF),
  - Food Wastes to Biofuels project of the US-DoD
- Techno-economical and life cycle assessments for an integrated process

## Registration Process

### Step-1: One-time Web (Portal) Registration-

Visit GIAN Website at the link: <https://gian.iitkgp.ac.in/GREGN/index> and create a login User ID and Password. Fill up the blank registration form and do web registration by paying ₹500 online through Net Banking/Debit/Credit card. This provides him/her with lifetime registration to enrol in any number of the GIAN courses offered. **Those candidates, who have already enrolled at the GIAN portal, need not register again.**

### Step-2: Course Registration (Through GIAN Portal)-

Log in to the GIAN portal with the user ID and Password created. Click on the “Course Registration” option given at the top of the registration form. Select the Course titled “Biotechnology and Biovalorisation of Extremophiles” from the list and click on the ‘Save’ option. Confirm your registration by Clicking on ‘Confirm Course’.

### Step-3:

After GIAN Registration, the Course fee is to be deposited online in the institute account, as per the details given below. **The program fee covers the course materials and access to all the sessions.**

Participants should pay the registration fee through online mode (NEFT/IMPS), and fill up transaction ID/details in the google form with the link and the account details given below;

### Step-4:

After online payment of the registration fee, fill the google form Registration link given below:

[https://docs.google.com/forms/d/1bn\\_7sg1CY45oXePJ3m0T5rQybRepJ0wyp3b9TVcALQk/edit?ts=62f92bb7](https://docs.google.com/forms/d/1bn_7sg1CY45oXePJ3m0T5rQybRepJ0wyp3b9TVcALQk/edit?ts=62f92bb7)

The last date for registration is 18<sup>th</sup> February 2023 and submit their details in the google form.

<b>Modules</b>	<b>Biotechnology and Biovalorisation of Extremophiles</b> 20 <sup>th</sup> February to 01 <sup>st</sup> March, 2023 at Dr B R Ambedkar NIT Jalandhar
<b>You Should Attend If...</b>	<ul style="list-style-type: none"><li>• Biotechnologists &amp; Bioprocess Engineer</li><li>• Botanists, Agricultural scientists, Microbiologists</li><li>• Chemical Process Engineer, Material Scientists</li><li>• Students or Faculty from academic institutions</li><li>• Scientists and product developers from Industry/Research organization</li></ul>
<b>Fees</b>	The participation fee for taking the course would be: <b>Faculty from Academic Institutions: Rs. 3,000/-</b> <b>Students: Rs 1,000/-</b> <b>Industry/Research personnel: Rs.3,000/-</b> <b>Participants from abroad: US\$100</b> The above fee includes the instructional materials, internet facility and snacks. The Boarding and Lodging will be provided on a payment basis subject to availability.

### Account Detail for Payment of Registration Fee:

Bank Name	Canara Bank
Account Name	Global Initiative of Academic Networks (GIAN)
Account Number	2945101004688
IFSC Code	CNRB0002945
SWIFT	CNRBINBBBMC

## The Faculty



**Professor Rajesh Sani** is a Distinguished Professor ([rajesh.sani@sdsmt.edu](mailto:rajesh.sani@sdsmt.edu)), in the Departments of Chemical and Biological Engineering and Applied Biological Sciences at South Dakota School of Mines and Technology, South Dakota, USA. In the past 16 years, Dr. Sani has taught 15 different courses (e.g., Biochemical Engineering, Biochemistry, and Applied Biological Sciences courses) to undergraduate and graduate students at the South Dakota School of Mines and Technology and Washington State University, and integrated Engineering Sciences with Biological Sciences. His research expertise includes Extremophilic Bioprocessing, Rules of Life in Biofilms, OMICS, Biotechnology, Space Biology, Biogas to Liquid fuels, Biocatalysis, and Biomaterials/Biopolymers. Over the past 16 years, he has been the PI or co-PI on over \$54.8 million in funded research. Several of his accomplishments in research and advising include: i) Postdocs supervised (15); ii) Graduate students supervised (MS students, 14 and PhD, 18), and iii) Undergraduate students supervised (over 100). He has 2 patents, 12 invention disclosures, and published over 110 peer-reviewed articles in high-impact factor journals and has contributed to over 34 book chapters. He has edited 10 books and one proceeding for ACS, Wiley, Elsevier, and Springer. 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. Dr Sani has been leading a research consortium funded by the NSF with the aid of 48 scientists and engineers.



**Professor Subir Kundu** is a superannuated Senior Institute Professor ([skundu.bce@iitbhu.ac.in](mailto:skundu.bce@iitbhu.ac.in)) in the School of Biochemical Engineering, IIT BHU. He has published more than 100 research papers in international journals and is an expert in Bioprocess Engineering, Bioreactor design, Cell Processing Technologies and Bioprocess optimization. He is a fellow of the Institute of Engineers, India (FIE) and Association for the Advancement of Biodiversity Science (FABSc). He has foreign collaborations in UK and France. He has guided 18 Ph.D., 84 M.Tech students. He is the winner of the Millennium Gold Medal and 'Man of the Year-2007' by American Society.



**Dr. Nitai Basak** is an Associate Professor and Head ([basakn@nitj.ac.in](mailto:basakn@nitj.ac.in)) in the Department of Biotechnology at DR B R Ambedkar National Institute of Technology, Jalandhar, India. He has contributed more than 70 research papers in International & National journals and Conferences. His research area includes Bioprocess Engineering and Optimization, Enzyme and Protein Engineering, Biological Hydrogen production, Biomaterials, and Separation and Purification Technology. He is a fellow of the Institute of Engineers (FIE). Foreign Research Collaborator: Prof. Roberto De Phillippis, Dr. Alessandra Adessi, University of Florence, Italy; signed M.O.U. in the Institute level on 11th May 2018 for 5 years for Students exchange, Joint research, and organizing joint conferences.

## Biotechnology and Biovalorisation of Extremophiles

**20<sup>th</sup> February to  
01<sup>st</sup> March, 2023**

**Chief Patron**  
Sh S C Ralhan  
(Chairman, BoG)

**Patron**  
Prof. B K Kanaujia  
(Director, NITJ)

**Co-Patron**  
Prof. Asim Kumar  
Jana

**Local GIAN  
Coordinators:**  
Dr. Rajneesh Rani  
Dr. Shish Ram

**Course  
Coordinator:**  
**Dr. Nitai Basak**  
Associate Professor  
and Head,  
Department of  
Bio-Technology,  
Dr. B R Ambedkar  
NIT Jalandhar  
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