

## FUNCTIONAL MATERIAL AND HETEROGENEOUS CATALYSIS

<b>Overview</b>	<b>Objective</b>
<p>The course provides a broad introduction to the science and practice of catalysis. Modern principles of catalysis relevant to current industrial chemical processes as well as catalytic chemistry and technology to solve the pressing challenges with respect to climate change are introduced. In addition to a thorough introduction in the concept of catalysis, which has its foundations in chemistry, physics, and reactor engineering, the course discusses several technologies to highlight the conceptual intricacies of catalysis. The final case study relates to opportunities in materials chemistry for catalyst design.</p>	<p>Catalysis is simultaneously a very old and a very new subject that has not only provided an exciting platform for carrying out cutting-edge research of profound importance but also has played a great and crucial role in contributing to the growth of human civilization by facilitating many industrial processes with bearings on every aspect of human life, including such fundamental ones as hunger and health. It is difficult to comprehend what the nature of the modern world would have been without catalytic processes. With the ever-increasing demand for our natural resources and the constant need to innovate to meet new challenges, be it for energy, food, health, environment, or security, catalysis as a subject is becoming increasingly more important for our everyday life. Therefore, it is imperative that young students and researchers in science and technology be aware of the developments in this field and be inspired by its challenges and promises.</p>
<b>Course Schedule</b>	<b>December 11-15, 2023</b>
<b>Eligibility</b>	<ul style="list-style-type: none"> <li>❖ Ph.D. scholar or a student enrolled for one of the following M. Tech/ B. Tech/ MSc/ BSc or completed.</li> <li>❖ Faculty members, Scientists, and Industry representatives.</li> <li>❖ Number of participants are around 50.</li> </ul>
<b>Course Fee</b>	<ul style="list-style-type: none"> <li>❖ <b>One-time GIAN registration:</b> Please visit <a href="http://www.gian.iitkgp.ac.in/GREGN/index">http://www.gian.iitkgp.ac.in/GREGN/index</a> and register by paying Rs 500/- (those who have already been registered and paid need not again), then opt for the course under the course registration tab and save. After completing this process, please inform the course coordinator by e-mail.</li> <li>❖ Participants from abroad: US \$ 125</li> <li>❖ Industry/Research Organizations: Rs. 5000</li> <li>❖ Academic Institutions:</li> <li>❖ Faculty: Rs. 3000</li> <li>❖ Ph.D. Scholar: Rs. 2500</li> <li>❖ UG/PG Student: Rs. 1000</li> <li>❖ <b>The above fees include all instructional materials kit, certificate, use of computer facilities for tutorials and assignments, 24 hours free internet facility. The participants will be provided accommodation and food on a payment basis subject to availability. Guest house charges 1200 Rs + GST per night ; daily food expenses (Breakfast+ lunch + dinner 566 Rs per day). Hostel charges nominal. Both guest house and hostel fees are to paid spot by online transfer (Debit card/Credit Card/other online path/ cash is not acceptable</b></li> </ul>
<b>Payment Mode</b>	<p>Course registration fee can be paid either by NEFT preferably (<b>Account holder name: The Registrar, Indian Institute of Technology (ISM) Dhanbad: Account No. 0986101009746; IFSC Code: CNRB0000986; Bank: CANARA BANK; Branch Name: Saraidhela Dhanbad</b>) or by sending a <b>demand draft in favor of "Registrar, IIT(ISM) Dhanbad" payable at Dhanbad – 826004 on or before October 30, 2023.</b> The course fee is non-refundable. For further clarification, please contact the course coordinator.</p>

## Faculty Members



**Prof. Dr. Ir. Emiel Hensen** is a full Professor at the Eindhoven University of Technology, Netherlands in the Department of Chemical Engineering and Chemistry. The research of Prof. Hensen focuses on the fundamental and applied aspects of catalytic materials relevant to clean and sustainable processes to produce energy carriers and chemicals. The working approach is to apply advanced (in situ) characterization methods on as realistic as possible model systems combined with theoretical modeling (density functional theory, microkinetics) and performance testing (kinetics, high-throughput methods, transient techniques) to identify the active sites and their working mechanism. The materials explored include highly structured microporous and mesoporous materials containing reactive centers such as protons, metal ions, metal, metal oxide, and metal sulfide clusters and nanoparticles. These materials are used in a wide range of applications, including heterogeneous catalysis (methane activation, CO/CO<sub>2</sub> hydrogenation, biomass conversion), electrocatalysis (water electrolysis, CO/CO<sub>2</sub> electroreduction, electrochemical synthesis), and photocatalysis (water splitting, CO<sub>2</sub> reduction). For more details, one can go through the site <https://www.tue.nl/en/research/researchers/emiel-hensen>.



**Prof. Biswajit Chowdhury** working as a Professor in the Chemistry and Chemical Biology Department at the Indian Institute of Technology (ISM) Dhanbad. After graduating from Jadavpur University Kolkata in 1995, he obtained his Ph.D. degree in 2000 from Osmania University (Indian Institute of Chemical Technology; IICT) Hyderabad, under the supervision of Dr. B. M. Reddy. He performed his postdoctoral research in the group of Prof. Masatake Haruta at the National Institute of Advanced Industrial Science and Technology (AIST), Tsukuba, JAPAN, and Prof Kazumichi Yanagisawa at Kochi University, Japan. His research work is mainly focused on the synthesis of materials such as noble-metal nanoparticles, metal oxides, silicates, phosphates, carbon, etc., and their application in various industrially important gas-phase and liquid-phase reactions, such as alcohol oxidation, Suzuki–Miyaura coupling, dehydration, propylene epoxidation, ethanol to hydrocarbons, CO<sub>2</sub> fixation, biomass conversion, etc. He is currently

Fellow of the Royal Society of Chemistry (FRSC) and regular member of the American Chemical Society. For more, visit [https://www.iitism.ac.in/index.php/Faculty\\_members/profile](https://www.iitism.ac.in/index.php/Faculty_members/profile)

### Course Co-Ordinator Details

**Prof. Biswajit Chowdhury**  
Indian Institute of Technology (ISM) Dhanbad  
Dhanbad, Jharkhand, 826004  
Mobile: +91 9470194350; Email: [biswajit72@iitism.ac.in](mailto:biswajit72@iitism.ac.in)

### Course Details

Course ID: **171058B01**  
Course Credit: 2

## REGISTRATION FORM

### FUNCTIONAL MATERIAL AND HETEROGENEOUS CATALYSIS

COURSE ID (171058B01)

1. GIAN Registration/Application Number: \_\_\_\_\_
2. Full Name: \_\_\_\_\_
3. Date of Birth: \_\_\_\_\_ Gender (Male/Female): \_\_\_\_\_
4. Participation type (Industry/Academic/Student): \_\_\_\_\_
5. Qualification/Degree Program: \_\_\_\_\_
6. Organization: \_\_\_\_\_
7. Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
8. E-mail ID: \_\_\_\_\_ Mobile No.: \_\_\_\_\_
9. Fee Detail: Payable to "Registrar, IIT(ISM) Dhanbad", CANARA BANK, Saraidhela Branch, Dhanbad
  - i) Transaction No. (e-transfer/RTGS/NEFT): \_\_\_\_\_ Date: \_\_\_\_\_ Amount: \_\_\_\_\_
  - ii) Demand Draft No. (If paid by Demand Draft): \_\_\_\_\_ Date: \_\_\_\_\_ Amount: \_\_\_\_\_
10. Accommodation Required: Yes/No: \_\_\_\_\_ in Hostel/Guest House

Paste your soft copy of the recent photograph

(The participants will be provided accommodation and food on a payment basis subject to availability. Guest house charges 1200 Rs + GST per night (double bedroom)/sharing 600 Rs plus GST; daily food expenses (Breakfast+ lunch + dinner 566 Rs). Hostel charges nominal. Both guest house and hostel fees are to be paid on the spot by online transfer (Debit card/Credit Card/other online path/ cash is not acceptable)

Place: \_\_\_\_\_

Date: \_\_\_\_\_

Signature of the Applicant: \_\_\_\_\_

**Department of Chemistry and Chemical Biology**  
**Indian Institute of Technology (ISM), Dhanbad, India**