Indian Institute of Technology Kharagpur (WB) 721 302
Cryogenic Engineering Centre
Announces Training Programme on

Cryogenic Air Separation & Oxygen Safety
February 27 – March 04, 2017 (Monday to Saturday)

Cryogenic Engineering Centre of IIT Kharagpur is an academic establishment in India that offers M Tech and Ph. D. Degrees in Cryogenic Engineering. Over more than three decades, the faculty of this Centre have gained experience in teaching and research in different aspects of cryogenics like superconducting magnets, material properties at low temperature, simulation of cryogenic process plants, cryogenic equipment like turbo-expander and heat exchanger, technology for natural gases, cryogenic air separation, low temperature processes and phenomena and safe handling of oxygen gas etc. The Centre regularly provides training to industry and academia of India and abroad and takes up sponsored research and consultancy projects. More than 100 short courses and training programmes have been conducted from this Centre in the field of Cryogenics and allied technologies.

Course Outline:

1. Introduction to Air Separation,
2. Properties of solids and fluids at Cryogenic temperatures (with reference to Cryogenic safety, wherever applicable). Use of Tables and Charts,
3. Cryogenic Insulations, Storage and transport vessels & vacuum insulated piping,
4. Oxygen Cylinder filling calculations,
5. Psychrometric Processes: Water separation on compression, Moisture load on molecular sieves, Design and operation of WN2-water tower,
6. Fluid Flow and Pressure Drop: relationship with viscosity, velocity, diameter etc.,
8. Compression Process, Positive Displacement and Centrifugal Compressors and their characteristics,
9. Conventional Refrigeration Processes: Ammonia, R-134a,
10. Removal of CO2, moisture and hydrocarbons: Mol-Sieve Adsorption,
11. Cryogenic Liquefaction Cycles : Linde Cycle, Claude Cycle and their derivatives,
12. Cryogenic Distillation,
13. Air Separation Plant Configurations,
14. Intricacies of Argon separation,
15. Effect of excess liquid or excess gas draw on product purity, packed column versus sieve trays,
16. Mass Balance and Energy Balance in an Air Separation Plant,
17. Properties of Oxygen and Related Hazards,
18. General Concepts of ignition and combustion: Fire triangle,
19. Characterization of materials (metals and nonmetals): Oxygen Index, Heat of Combustion, Effects of pressure, temperature, humidity etc on OI and HoC,
20. Ignition Mechanisms:(Thermal) ignition mechanism and the mitigation,
21. Selection of Materials: Metals and Non-metals. System and Component Design based on the Critical Operating Parameters,
22. Analyses of Designs of special components: Valves, Pipelines, Bends, Filters and regulator,
23. International Codes and Safety Regulations,
24. Discussions of Fire incidents with photographs.

Faculty: Prof. Kanchan Chowdhury (Coordinator), Cryogenic Engineering Centre

Eligibility:
Engineers and scientists with degrees in any branch of science and engineering are eligible. Candidates without the background of science and engineering can apply only if they are professionally engaged in the relevant field.

Venue of Lectures:
Visveswaraya Guest House Lecture Room, Indian Institute of Technology, Kharagpur 721302

Timing: Classes will begin at 9 AM sharp. There will be breaks for lunch and coffee. Classes will end at 6 PM everyday.

Registration:
Registration Fee: INR 54,000 (US$ 900). Bank transfer is the only mode of payment for all participants. A scanned copy of the bank transfer document may be sent as proof of payment which is required for registration. Foreign companies will pay only in US Dollars mentioned above. Bank details: (a) Name of Bank : Syndicate Bank, (b) Address of Bank: IIT-SRIC Extension, Kharagpur 721302, India; (c)Account Name: CEP-STC, IIT Kharagpur; (c) Account of Beneficiary: Indian Institute of Technology, Kharagpur, PIN: 721 302, West Bengal, India; (d) Account Number: 9556 220 000 2955; (e) IFSC/RTGS Code : SYNB0009556 (f) Bank Swift Code: SYNBINBB120. All Bank charges are to be borne by the company. Charges for the boarding and lodging should...
be paid by the participants directly to Guest House. Course fee includes bound lecture notes and tea/coffee provided during the course.

**Accommodation:**
Accommodation has been booked for all the participants in advance at New Technology Guest House and Visveswaraya Guest House. Due to the fact that only a limited number of rooms have been made available for this course, participants may have to share rooms. 4 AC suits & 8 Double bedded rooms at NTGH and 4 Double bedded AC rooms & 1 Double bedded Non-AC room at VGH are all that we have for this course. Tariff can be seen at IIT Kharagpur website at [http://www.tgh.iitkgp.ac.in](http://www.tgh.iitkgp.ac.in).

**General Information:**
IIT is located about 6 km from the Kharagpur Railway Station. Kharagpur, 116 km from Kolkata by train, the capital city of the State of West Bengal in India, is conveniently connected to Howrah (Kolkata) by many local trains every hour and also by express trains. Kharagpur has direct rail links to most major cities in India. Those travelling by air may hire a taxi from Calcutta airport, which would bring you to IIT Campus at Kharagpur (150 km one way) within 2.5 hours. The minimum charge is about INR 3,000. Autorickshaws (INR 120) and Taxis (INR 160) are available to come from the Kharagpur Railway Station to IIT campus. Weather at Kharagpur would be pleasant requiring no winter-garment in February-March. Please contact Mr. Arjun Kumar Saha of J K Travels (+91 94341 93014, +91 99325 73310) or Damodar Maity of Saraj Travels (+91 94341 46359, +91 3222 277015) for travel-related help. You may request any one of them to send a vehicle to Kolkata airport to pick you up. Please mention Prof. Kanchan Chowdhury’s course for the reference of the travel agent.

**Sponsors may please note:**
a) Please inform the candidate that he/she should bring a scientific calculator to the classroom.
b) Please give a photocopy of this brochure to the prospective participant as soon as he/she is nominated by the company and please tell them to contact the coordinator directly via e-mail.

**Information Required for Registration for all participants:**
Name, Designation/Responsibility, Name and Address of Company, Phone (Off), Phone (Res), Phone (Mobile), E-mail, Date of Birth, Highest Academic Qualification, Nationality, Bank transfer details and Amount, Requirement for Guest House room and type.

**Additional Information Required for Registration of Participants holding Foreign Passports:**
Name, Fathers name, Nationality, Date of Birth, Place of birth, Number, Date and Place of Issue of Passport, Current Residential Address, Permanent Residential Address, Profession, Place of Employment, Academic Credentials. Please use separate pages for each participant.

**Please E-mail all information to:**
Professor Kanchan Chowdhury
Cryogenic Engineering Centre
Indian Institute of Technology
Kharagpur 721 302, West Bengal, India
Phone (Off) : (03222) 283582; Country Code for India: 91
Phone (Res) : (03222) 283583
Mobile : 94340 10442
e-mail : cryogenic.engineering.centre@gmail.com
Copy to: chowdhury.kanchan@gmail.com

Other courses offered by Cryogenic Engineering Centre during this time:

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<tr>
<th>Sl. No.</th>
<th>Name of Course</th>
<th>From</th>
<th>To</th>
<th>Duration</th>
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<tbody>
<tr>
<td>1.</td>
<td>Basic Cryogenics*</td>
<td>February 20, 2017 Monday</td>
<td>February 24, 2017 Friday</td>
<td>5 days</td>
<td>INR 24,000*</td>
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<td>2.</td>
<td>Liquefied Natural Gas: Transportation &amp; Regasification</td>
<td>March 06, 2017 Monday</td>
<td>March 08, 2017 Wednesday</td>
<td>3 days</td>
<td>INR 18,000</td>
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<td>3.</td>
<td>Hospital Fires: Root causes and their Prevention</td>
<td>March 10, 2017 Friday</td>
<td>March 11, 2017 Saturday</td>
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*20 TEQIP-II engineering college teachers can attend this course without any course fee.

**LAST DATE OF APPLICATION for ALL:** January 31, 2017