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## INTRODUCTION

IIT Kharagpur is the first of its kind in the country and has been providing trained manpower for different Industries/Research organizations through B.Tech, M.Tech and Ph.D programs. Specialized courses and workshops are also being organized under Continuing Education Programme (CEP) to train personnel from Industries/Universities. The institute has established a sophisticated **Vacuum Teaching Laboratory** in Cryogenic Engineering Centre under Indo-German Collaboration Programme, to train technicians, engineers, scientists and teachers working in the field of vacuum and its related areas. This laboratory houses several advanced vacuum equipment for production/measurement of vacuum and trouble shooting/application of vacuum systems. In addition, the institute has several high vacuum systems applied for metallurgical processes, MBE growth of thin films, microelectronic devices, Surface studies and Chemical analysis. Expertise/Facilities also exist on application of vacuum in chemical Engineering, food/pharmaceutical technology and biotechnology. These facilities are routinely used to solve technical problems faced by vacuum and related industries.

## OBJECTIVES

Vacuum Technology has diversified applications in different areas of science and Engineering. These include the major fields like Electronics, Metallurgical/ Chemical Processing, Food Processing, Space-Simulation, Nuclear Engineering, Electrical Engineering and Cryogenic systems. This has resulted in rapid development of many sophisticated vacuum instruments, pushing the range of vacuum to  $10^{-12}$  Torr. To keep pace with this advancement in vacuum technology, it is absolutely necessary for the engineers/scientists/teachers of our country to get a first hand exposure to these modern vacuum equipment and their applications. Keeping this objective in mind, present course on ***Vacuum Technology and Process Applications*** is undertaken. The uniqueness of this course is that, in addition to classroom lectures, emphasis is given to the *practical training* in designing, handling and trouble shooting of variety of modern vacuum pumps,

components, measuring systems, residual gas analyzers, leak detectors, vacuum furnaces, coating units, vacuum dryers and other applications.

## COURSE OUTLINE

- (1) Introduction to basic concepts of vacuum.
- (2) Application of vacuum in different processes. (Metallurgical, electronic, chemical, electrical, space, nuclear, pharmaceutical, food and cryogenics)
- (3) Production of medium and high vacuum by Rotary, Piston, Roots, Diffusion, steam jet ejectors, Water-ring, Dry membrane and Sorption pumps - their assembling and maintenance, pump-down characteristics.
- (4) Ultra-high vacuum pumps and their pumping characteristics, Handling and maintenance of Turbo-molecular, Ion and Cryopumps.
- (5) Pressure measurement in vacuum systems using different primary and secondary gauges. Calibration/maintenance of vacuum gauges.
- (6) Residual gas analysis in vacuum systems.
- (7) Design and Fabrication of vacuum chambers, flanges, couplings, and components for different applications.
- (8) Gas flow in vacuum systems, conductance calculations and measurements on vacuum piping networks. Design of vacuum piping in process industries.
- (9) Leak detection/trouble shooting/maintenance of vacuum systems, handling of mass spectrometric leak detectors, degassing procedures.
- (10) Handling of vacuum based furnaces/coating units/driers and other process-systems.

**Participants will also receive extensive practical training on above topics in the laboratories.**

## FACULTY

Professors and experts working in the field of vacuum technology and its related areas from different departments of the Institute will deliver the lectures and help in practical sessions.

## APPLICATION FORM

Online application form is available online at

[https://docs.google.com/forms/d/1RDikjtM0P4hHqsQiwMp-Oot8z61A2\\_gpuYMrV402qqA/viewform?sid=1e21753bb367849d&token=sxmH0zwBAAA.hAQ\\_OdZiUv1f13pZUeuDNQ.USlgMACGoZmQieMVf4\\_h9Q](https://docs.google.com/forms/d/1RDikjtM0P4hHqsQiwMp-Oot8z61A2_gpuYMrV402qqA/viewform?sid=1e21753bb367849d&token=sxmH0zwBAAA.hAQ_OdZiUv1f13pZUeuDNQ.USlgMACGoZmQieMVf4_h9Q)

### ***Guideline to fill the online form***

Please click on the above hyperlink or copy and paste it in the address bar then enter. Fill all the boxes in the form

Online Application Form

Name	<input type="text"/>
Date of Birth dd/mm/yy	<input type="text"/>
Designation	<input type="text"/>
Qualification	<input type="text"/>
Nature of Work R&D, Sales, Manager, Executive, Engineer etc	<input type="text"/>
Address	<input type="text"/>
Demand Draft details (Drawn in favour of CEP-STC IIT Kharagpur)	<input type="text"/>
Accommodation Single rooms are limited. First come first serve basis	<input type="text"/>
Room Type	<input type="text"/>
E-mail-ID	<input type="text"/>
Phone Number	<input type="text"/>

## CO-ORDINATOR ADDRESS

Prof. V. Vasudeva Rao  
Co-ordinator  
**Vacuum Technology Laboratory,**  
Cryogenic Engineering Centre,  
I.I.T, Kharagpur 721 302  
West Bengal.  
STC E-mail: [vacuum2k13@gmail.com](mailto:vacuum2k13@gmail.com)  
E-mail: [vvrao@hijli.iitkgp.ernet.in](mailto:vvrao@hijli.iitkgp.ernet.in)  
Phone: (03222) – 281445/283590 (Off)  
(03222) – 278577/283591 (Res)  
Mobile: 09933078577  
Fax: (03222) - 282258



**LAST DATE FOR APPLICATION**  
15<sup>th</sup> Nov. 2013

## ELIGIBILITY:

All practicing engineers/technicians working in private, public, government organizations/industries; scientists/engineers from R&D establishments, college teachers are eligible to apply for participation.

## REGISTRATION FEE/COURSE MATERIALS/CERTIFICATE:

Participants are required to pay Rs. 22,520/- (Course fees Rs. 20000/- including 12.6% service tax) per participant as the registration fee for this two-week course. The fee is to be paid in advance by a demand draft in favor of "CEP-STC, IIT, Kharagpur". Payable at Kharagpur.

Each registered participant will be provided with a detailed lecture notes on "VACUUM TECHNOLOGY & PROCESS APPLICATIONS" and registration materials/stationary. At the end of the course, the institute will issue a certificate.

## BOARDING AND LODGING:

Accommodation will be provided in our guest houses (TGH/VGH) on payment basis at the following rates.

Guest house	Non A/C	A/C
Single (per head/day) TGH	-	800/-
Twin Sharing (per head/day)TGH	-	600/-
Twin Sharing (per head/day)VGH	250/-	300/-
Dormitory(per head/day) VGH	100/-	N/A

Lunch and refreshments will be served by us during the session period. Breakfast/Dinner on payment is available in the guest house. Also there are several restaurants and cafeteria on campus. Accommodation will be provided on first come first serve basis and it will be finalized by the organizers.

# IIT Kharagpur Presents

A TWO-WEEK COURSE ON

## VACUUM TECHNOLOGY AND PROCESS APPLICATIONS

(18<sup>th</sup> Nov. – 27<sup>th</sup> Nov. 2013)



VACUUM TECHNOLOGY LABORATORY  
CRYOGENIC ENGINEERING CENTRE  
INDIAN INSTITUTE OF TECHNOLOGY  
KHARAGPUR - 721 302

**Co-ordinator**  
**Prof. V. Vasudeva Rao**