☐ **Category 1:** Nil
(Enclose Certificate that your institute is approved by **TEQIP-II**)

☐ **Category 2:** ₹ 500 (for IIT Kharagpur Students)

☐ **Category 3:** ₹ 5000* (For Industry / Self Sponsored)

Payment should be made via demand draft drawn in favour of "**CEP-STC, IIT Kharagpur**", payable at Kharagpur

DEMAND DRAFT DETAILS	
Amount ₹	
Bank Name	
Place	
Branch Code	
DD No. & Date	

Declaration
The information provided is true to the best of my knowledge. If selected, I agree to abide by the rules and regulations of the course and shall attend the course for the entire duration without any failure.

Place _____

Date _____

_____
Signature of applicant

Please complete the details above and mail alongwith registration fee to:

Prof. Pallab Banerji
Materials Science Centre
IIT Kharagpur - 721302
Email: pallab@matsc.iitkgp.ernet.in

About IIT Kharagpur

History

First in the chain of IITs to be set up by the Government of India, Indian Institute of Technology, Kharagpur started in 1951 in the erstwhile Hijli Detention Camp. It has now blossomed into one of the finest technical institutions in the world, with 585 faculty members in 19 Departments, 9 Centres, and 12 Schools offering 6 M.Sc. programmes, 5 Joint M.Sc. -Ph.D. programmes, 15 B.Tech (Hons.) programmes, 49 joint M.Tech. - Ph.D programmes, 2 M.Tech. programmes (in video-conferencing mode), 1 Master of City Planning programme, 1 Master of Medical Science and Technology programme, 1 LL.B. in Intellectual Property Rights programme, 34 Dual-Degree (both B.Tech and M.Tech) programmes, and 2 Management programmes. It also has MS, Ph.D, and D.Sc. programmes.

Location

Kharagpur is known world over for two landmarks. One, the longest railway platform, and the other, the Indian Institute of Technology, more commonly known as IIT. Situated about 120 km west of Kolkata, Kharagpur can be reached in about 2 hours by train from Howrah railway station of Kolkata or 3 hours by car from Kolkata Airport. Kharagpur is also connected by direct train services to most major cities of the country. The Institute is about 10 minutes drive (5 km) from the Kharagpur railway station. Private taxi, auto-rickshaw or cycle-rickshaw can be hired to reach the Institute.

Weather

Winter (October to February) is moderate and pleasant (10 to 25°C) in Kharagpur. Summer (March to June) is hot (25 to 40°C) and sometimes humid. Rains are normally confined to the months of June to September.

THERMOELECTRICITY: THE ART OF WASTE HEAT RECOVERY

Overview

The shortage of energy resources is the main problem of recent times. More than half of the energy consumed worldwide is wasted as heat. The recovery of small fraction of this waste heat can change the global energy scenario. Thus thermoelectricity has become significant in the field of waste heat recovery. It is also advantageous for localized cooling of microelectronic systems for its ability to maintain its efficiency in small scale dimension. However, the major problem associated with thermoelectricity is the low efficiency of commercially available materials. Recent progress in thermoelectric research has enabled researchers to develop new materials with enhanced thermoelectric efficiency. The efficiency of a thermoelectric material is defined in terms of a dimensionless parameter,

$$ZT = \frac{\alpha^2 \sigma}{k} T$$

where α is the Seebeck coefficient, σ is the electrical conductivity, T is the absolute temperature and k is the thermal conductivity. So, to enhance ZT, the value of α and σ must be enhanced with a simultaneous reduction in k of the system.

In this course discussion will be made on different strategies those could be adopted to increase the thermoelectric figure of merit by independently enhancing the value of the various parameters with an emphasis on the nanostructuring systems.

Goals and Objectives

- Building confidence in the minds of students and / or faculty members from academic institutions in learning the techniques of waste heat recovery by using thermoelectric effects, the materials used and their characterizations..
- Creating interest on various aspects of materials and their structures including thin film materials for the application of waste heat recovery.
- Imparting technical knowledge in developing modules for waste heat recovery using the principle of thermoelectric effect.

Venue

IIT Kharagpur and its extension centers at Bhubaneswar and Kolkata through online video lecture. All video-conferencing enabled classrooms at Kharagpur, Kolkata and Bhubaneswar are equipped with high definition video-conferencing system. Each of these acoustic treated air-conditioned video enabled classrooms with multiple HD cameras, document viewers and large display monitors permit teachers to conduct LIVE interactive sessions from Kharagpur with multiple remote classrooms at Kolkata and Bhubaneswar. 8 Mbps leased line connectivity of Kolkata and Bhubaneswar centers with Kharagpur ensure uninterrupted bi-directional lossless audio video transmission.

Course Schedule and Methods

5.00 – 7.00 PM on Fridays and

10.30 AM – 12.30 PM on Saturdays

Eligibility

Category - 1 (AICTE Sponsored / TEQIP Sponsored):

Faculty from AICTE approved Colleges / Institutions / Universities.

Category - 2 (Student / Industry / others):

B.E. / B.Tech. / AMIE / Diploma in Engineering / B.Sc. / M.Sc. or any higher qualification in relevant field.

Persons from Industries & Govt. Organizations related in this field are also eligible.

Important Dates

Last date for receiving application : June 30, 2015
Intimation to the applicants : July 15, 2015
Course duration : November 6, 7, 20, 21, 27, 2015

pallab@matsc.iitkgp.ernet.in

Course Contents

1. Introduction to thermoelectric effect: Figure of Merit; its dependence on Seebeck coefficient and resistivity of the materials.
2. Review of the art of waste heat recovery with special emphasize on the materials and temperature regime
3. Different strategies to enhance the thermoelectric figure of merit: carrier energy filtering, mass fluctuation and endotaxial nanostructures
4. Resonance of the impurity level and impurity band induced transport
5. Thermoelectric generator, Numerical problems and questions

The Faculty

Prof. Pallab Banerji is currently a Professor in Materials Science Centre, Indian Institute of Technology, Kharagpur. He teaches various courses related to electronic materials for energy and photonic applications in both undergraduate and postgraduate levels. His primary interest is on thermoelectric and photovoltaic phenomena in materials, low dimensional structures and devices. He has supervised several M.Tech. and Ph.D. theses.

Registration Fees

Category-1: Nil (for TEQIP Institutions)

Category-2: ₹ 500 (for IIT Kharagpur Students)

Category-3: ₹ 5000* (For Industry/Self Sponsored)

To confirm participation please send the scanned copy of the Demand Draft to pallab@matsc.iitkgp.ernet.in by 30 June 2015 positively.

Accommodation

Outstation participants will be provided accommodation at IIT Kharagpur on self payment basis as per availability on prior request.

Course Co-Ordinator

Prof. Pallab Banerji
Principal Coordinator
Materials Science Centre
IIT Kharagpur
Kharagpur - 721 302, West Bengal, INDIA
Phone: +91-3222-283984 (O), 283985 (R)
+91 9434722493 (M)
Email: pallab@matsc.iitkgp.ernet.in

REGISTRATION FORM

KNOWLEDGE DISSEMINATION PROGRAMME

THERMOELECTRICITY: THE ART OF WASTE HEAT RECOVERY

November 6, 7, 20, 21, 27, 2015

Name _____

Date of Birth _____

Gender ☐ Male ☐ Female

Category ☐ Academic ☐ Student ☐ Professional
(Please enclose a bonafide certificate from your parent institution)

Organization _____

Address for Correspondence _____

_____

_____

Preferred location for attending _____

Phone _____

E-mail _____

Highest Academic Qualification _____

Experience (in years) _____

_____

_____

Accommodation Required (at IIT Kharagpur) ☐ Yes ☐ No