

**DEVELOPMENT OF MICROSTRUCTURE AND
NANOSTRUCTURE BY PHYSICAL VAPOUR DEPOSITION
AND ITS ELECTRICAL, OPTICAL CHARACTERIZATIONS**



(JANUARY 22 – JANUARY 26, 2018)

DEPARTMENT OF PHYSICS

National Institute of Technology

Durgapur- 713209, W.B., India

An international winter term course -2018 as per MHRD scheme

“Global initiative of Academic Network (GIAN)”

REGISTRATION FORM

Name (Block Letters):

M/F:

Designation/Professional Title:

.....

Organization:

.....

Address:

.....

Tel:, Mobile:,

E mail:

[Type text]

Application ID (Generated during One-time registration at GIAN portal of IIT Kharagpur):

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Course Fee: Covers only course materials without boarding and lodging.

Students/Research Scholars: **2000/-** (Bonafied letter is required from the head of the Department/ Institute)

Faculty/Staff of Academic Institutions : **4000/-**

Industry/Research Personnel: **Rs 6000/-**

Participants from abroad: **US \$200**

Accommodation is available in Institute Guest House/Hotels on request basis. Additional charges will be paid for accommodation.

Payment may be made through:

1. Demand Draft: In favour of "GIAN AMSBMBE" payable at Durgapur.

DD /Cheque No:

Date:, Amount:

Bank:

OR

2. National Electronic Funds Transfer (NEFT) to the account "GIANAMSB PVD" (Account Number : 8569101002942)

Bank: Canara Bank ,NIT campus, M G Avenue. IFSC Code: CNRB0008569. MICR Code: 713015203.

Date:

Signature of Candidate

[Type text]



COURSE BROCHURE

GLAN

(GLOBAL INITIATIVE OF ACADEMIC NETWORKS)

COURSE 2018

ON

**DEVELOPMENT OF MICROSTRUCTURE AND
NANOSTRUCTURE BY PHYSICAL VAPOUR DEPOSITION
AND ITS ELECTRICAL, OPTICAL CHARACTERIZATIONS**

(January 22 – January 26, 2018)

COURSE COORDINATORS:

DR. ANIRUDDHA MONDAL

&

DR. SOUMEN BASU

**DEPARTMENT OF PHYSICS, NATIONAL
INSTITUTE OF TECHNOLOGY, DURGAPUR,
MAHATMA GANDHI AVENUE, DURGAPUR,
WEST BENGAL, INDIA, 713209**



ABOUT GIAN:

Overview:

Global Initiative for Academic Network (GIAN) programme approved by Union Cabinet in Higher Education aimed at tapping the talent pool of Scientist and Entrepreneur 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. In order to (i) gather the best international experience into our systems of education, (ii) enable interaction of students and faculty with the best academic and industry experts from all over the world, (iii) share their experiences and expertise to motivate people to work on Indian problems, there is a need for a Scheme of International Summer and Winter Term.

Objectives:

The proposed GIAN is envisaged to achieve the following objectives:

1. To increase the footfalls of reputed international faculty in the Indian academic institutes.
2. Provide opportunity to our faculty to learn and share knowledge and teaching skills in cutting edge areas.

3. To provide opportunity to our students to seek knowledge and experience from reputed International faculty.
4. To create avenue for possible collaborative research with the international faculty.
5. To increase participation and presence of international students in the academic Institutes.
6. Opportunity for the students of different Institutes/Universities to interact and learn subjects in niche areas through collaborative learning process.
7. Provide opportunity for the technical persons from Indian Industry to improve understandings and update their knowledge in relevant areas.
8. Motivate the best international experts in the world to work on problems related to India.
9. Develop high quality course material in niche areas, both through video and print that can be used by a larger body of students and teachers.
10. To document and develop new pedagogic methods in emerging topics of national and international interest.

ABOUT THE INSTITUTE:

The National Institute of Technology, Durgapur (formerly Regional Engineering College, Durgapur), was established by an Act of Parliament in 1960 as one of the eight such colleges aimed to function as a pace setter for engineering education in the country and to foster national integration. It is a fully-funded premier Technological Institution of the Government of India and is administered by an autonomous Board of Governors. The Institute is a University which awards B.Tech., M.C.A., M.Sc., M.B.A., M.Tech. and Ph.D. degrees to students after their successful completion of the specified courses. The Institute imparts education in the disciplines of Chemical Engineering, Civil Engineering, Computer Science and Engineering, Electrical Engineering, Electronics and Communication Engineering,

Mechanical Engineering, Metallurgical and Materials Engineering, Information Technology, Biotechnology, Physics, Chemistry, Mathematics, Environmental science, Materials Science and Management Studies. As decided by the Ministry of Human Resource Development, Government of India. In addition to the normal intake, a few seats are reserved for Foreign Students who are nominated by the Ministry of External Affairs, Government of India, and the Indian Council for Cultural Relations, Government of India.

ABOUT THE DEPARTMENT:

This is one of the oldest departments of the institute which has been providing the basic knowledge of physics to innumerable budding engineers who have studied in this institute. Physics means "knowledge of nature", which essentially is a natural science that involves the study of natural laws and its consequences in both microscopic and macroscopic domain. The interest of the department of physics spreads over many interdisciplinary areas of science and the boundaries are not rigidly defined. The department encourages and appreciates new ideas in physics that have relevance to technologies useful for the mankind.

ABOUT THE PROGRAMME:

Overview

This course is an in-depth introduction into various thin film technologies which are essential in most high-tech industries including microelectronics, space exploration, nanotechnology, optics, and protective coatings.

The course will discuss both the fundamentals of thin film growth and the practical aspects of vacuum deposition techniques. After a short introduction into vacuum science and technology, we will discuss the following topics in detail:

- Thin film evaporation techniques

- Sputter deposition methods
- Plasma and ion-beam processing
- Various chemical vapor deposition processes
- Glancing and oblique angle deposition by the al above process.
- Electrical and optical properties of the microstructure and nanostructure.

The second part of the course will cover the atomistic processes during layer growth and a discussion of how these can be controlled by various parameters of the above deposition methods, with topics ranging from surface diffusion, nucleation and growth, epitaxy, surface chemical reactions, microstructural evolution, nanostructure formation, and layer stress. The course will also include a brief overview of thin film characterization techniques. The details electrical and optical characterizations will be discussed in the course. In present era it is required to develop the antireflection coating on the front panel of the solar cell as well as on the light emitting diode to enhance its ultimate efficiency. The technique which will be discussed in this course is very easy for the development of such specular films. This technique can be adopted very easily by any company with little investment in third world countries like India. Unfortunately, in our country there are no such highly experienced experts in this field. So, it will be beneficial to the researcher, students as well as industries to get exposure from the course.

***OBJECTIVES OF THE PROGRAM, EXPECTATIONS
AND STUDENT LEARNING OUTCOMES:***

This course introduces thin film deposition by sputtering and discusses the atomistic processes that control the microstructure of thin films. Sputtering is essential in most high-tech industries including microelectronics, space exploration, nanotechnology, optics, and protective coatings. Therefore the objectives are:

- (i) Exposing participants to the fundamental aspects of plasmas and ion-surface interactions,
- (ii) Providing exposure to dc, ac, magnetron and reactive sputtering in its practical field
- (iii) To develop basic knowledge of surface diffusion and island nucleation models
- (iv) To develop the fundamental aspects of surface morphology, competitive grain growth, atomic shadowing, texture, stress, and microstructure development.

FEES DETAILS:

Participants from abroad: US \$200

Industry/ Research Organization: Rs. 6000/-

Academic Institutions: Rs. 4000/-

Students/Scholars: Rs. 2000/-

(Bonafide Letter is required from the Head of the Department /Institute)

The above fee includes all instructional materials, computer use for tutorials, 24 hr free internet facility. Accommodation will be arranged twin sharing basis on payment basis.

ELIGIBILITY:

- Executives, Scientists, engineers and researchers from Industries, educational Institute and R & D laboratories.
- Students at all levels (B.Tech/M.Sc/M.Tech/PhD) or Faculty from reputed academic institutions and technical institutions.

REACHING NIT DURGAPUR:

The Institute is located about 160 KMs north-west of Kolkata on the Howrah-Delhi Main Railway-Route and overlooking the National Highway No. 2(the great Grand- Trunk Road).

REGISTRATION PROCESS:

Registration for GIAN course is not automatic because of the constraints on maximum number of participants allowed to register for a course. In order to register for one or multiple non-overlapping courses, you have to apply online using the following steps:

1. Create login and password at www.gian.iitkgp.ac.in
2. Login and complete the registration form.
3. Select courses
4. Confirm your application and payment information.
5. Pay Rs.500 through online payment gateway.

The course coordinator of the course will go through your application and confirm your selection as a participant one month before the starting date of the course. Once you are selected you will be informed and requested to pay the full fees through online gateway service.

MODULES:

Module A: Fundamentals: January 22 – January 25, 2018

Module B : Applications: January 26, 2018

Number of participants for the course will be limited to fifty.

THE FACULTY:

- **Professor Daniel Gall** is Professor of Materials Science and Engineering department in the Rensselaer Polytechnic Institute, Department of Materials Science and Engineering, USA. He has published 120 research journals and several books on nano structure fabrication. His expertise is on glancing angle deposition technique for the fabrication of Sculptured thin films: nanorods, nanopipes, nanosmiles. He got several awards and positions in different institutes and organizations. He received IBM Faculty Award for research on “Post-CMOS Nanoelectronics.” In 2008.



Dr. Aniruddha Mondal is an Assistant Professor of Physics department NIT Durgapur. His research interest is Fabrication of III-V, III-N semiconductor material, 1d metal oxide semiconductor nanostructure using glancing angle deposition technique and fabrication of UV-Vis detector, plasmonic detector, hybrid semiconductor detectors.



Dr. Soumen Basu is an Assistant Professor of Physics department NIT Durgapur. His research interest is Nanostructured materials, Multiferroics materials, Rare earth orthoferrites, Multiferroic polymer nanocomposites, Ferrite based gas sensing materials, Rare earth doped Bismuth ferrite, Graphene based materials, Rare earth chromate for SOFC.



FOR MORE DETAILS PLEASE CONTACT THE PERSONS :

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Weblinks :

- 1) [http:// www.nitdgp.ac.in](http://www.nitdgp.ac.in)
- 2) www.gian.iitkgp.ac.in

VENUE:

**Dept. of Physics, NIT Durgapur, West
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