



**Course Brochure**  
Global Initiative of Academic Networks  
(GIAN)  
International Winter Course – 2017  
on



**Advances in Nanotechnology and its Application in Future  
Electronics (ANFE-2017)**

**November 6-10, 2017**

**Organized by**



Department of Electronics and Communication Engineering  
Motilal Nehru National Institute of Technology Allahabad  
Allahabad 211004, India

**Course Coordinator(s):**

**Dr. Sanjeev Rai**

: Principal Course Coordinator

**Prof. Vijaya Bhadauria**

: Course Coordinator & Head ECED

**Dr. G. P. Sahu**

: Local GIAN Coordinator

# Advances in Nanotechnology and its Application in Future Electronics (ANFE-2017)

---

## Overview

Electronics systems are continually being designed with smaller devices at the component level, and with ever increasing power and capability at the chip and systems levels. New devices are enabling major progress in mobile technology, driverless cars, sensors and IoT. In fact advances in electronics technology now and in the future have made the world a smaller place with high speed interconnectivity, global broadcast TV, news services, multi-media talk and video communications are now part of daily life. As electronics has developed, design, simulation and test have struggled to keep up with new products. This short course will introduce modern design methods for electronics systems, namely synchronous design, asynchronous design, chip architectures, including network-on-a-chip and miniaturization effects.

Test and validation are difficult issues to solve for modern manufactured electronic systems. Test methods will be introduced at the component, chip and system levels including design for test, design for manufacture and design for reliability. Validation by accelerate testing, single and mixed mode reliability testing will be provided with case studies of real failures in the aerospace and automotive sectors. Key to understanding failure is to locate possible faults as soon as possible and provide safety critical systems with long lifetimes and accurate prognostics. Metrology and measurement techniques and equipment will be introduced, with examples of X-ray and ultrasound imaging for micro and nano-electronics failure analysis.

The course attendees will learn through lectures; followed by hands-on training and tutorials on the subject. The course will also provide an ample opportunity for the participants to interact with the expert throughout the course.

## Objectives

The primary objectives of the course are as follows:

- i) To provide an understanding of the principles and concepts of modern electronics design.
- ii) To introduce design for test and its application to modern VLSI design.
- iii) Design examples in micro- and nano-technology, practical simulation and test.
- iv) To provide an understanding of current research in validation testing, electronics metrology and prognostics/lifetime assessment.

## Teaching Faculty

1. **Prof. David M. Harvey (DMH)** - Professor of Electronic Engineering, Leader Electronic and Ultrasonic Engineering Research Group, Leader Electronic Manufacturing Technologies Group, General Engineering Research Institute, Liverpool John Moores University, UK.
2. **Dr. Sanjeev Rai (SR)** - Assistant Professor, Department of Electronics and Communication Engineering, MNNIT, Allahabad.
3. **Prof. Vijaya Bhaduria (VB)** – Professor, Department of Electronics and Communication Engineering, MNNIT, Allahabad.
4. **Dr. Santosh Kumar Gupta (SKG)** – Assistant Professor, Department of Electronics and Communication Engineering, MNNIT, Allahabad

## Lecture Schedule: November 6-10, 2017

The course is divided into lectures, tutorials and hands-on training modules.

### A. 10 Lectures of 1 hour each with following brief details;

**Lecture 1:** Modern Digital electronic design techniques, synchronous design and applications.

**Lecture 2:** Design for test, built-in self-test, component, circuits and systems level tests.

**Lecture 3:** Asynchronous circuit design 1, high speed level mode design, low-power design.

**Lecture 4:** Network-on a-chip, design, simulation and test.

**Lecture 5:** Asynchronous design 2, hazards and races, test strategies.

**Lecture 6:** Nanotechnologies, state-of-the-art in electronics, design strategies, circuit simulation and test.

**Lecture 7:** Reliability and validation tests for lifetime assessment.

**Lecture 8:** Transistor level validation, testing, delay, scalability, power solutions and future directions.

**Lecture 9:** Measurement and metrology equipment for validation testing and failure analysis. Methods for measuring hidden nanotechnology circuits Failure analysis techniques using X-ray, ultrasound, time-domain reflectometry (TDR) and other emerging methods.

**Lecture 10:** Simulation of transistor level circuits down to nanotechnology scales.

### B. 5 Tutorials/hands on training of 2 hour each With following brief detail;

**Tutorial 1:** CAD design and simulation examples.

**Tutorial 2:** Asynchronous design exercises, CAD exercises.

**Tutorial 3:** Problem solving session with examples: Synchronous and asynchronous design, Built-in test, power management. CAD exercises.

**Tutorial 4:** Problem solving session with examples: Through lifetime reliability assessment, accelerated life tests, failure modes and possible solutions. CAD exercises.

**Tutorial 5:** Problem solving on; nanotechnology circuits, finding hidden failures, examples of real failures in industrial products and the consequences of circuit failure to human life. CAD exercises.

## Evaluation

Participants will be evaluated through Assignments/Quiz. After successful completion of the course, all participants will get participation certificates.

**Number of participants for the course will be limited to Forty (40).**

## Prospective Participants

- Executives, engineers and researchers from manufacturing, service and government organizations including R&D laboratories.
- Students at all levels (BTech/MSc/MTech/PhD) or Faculty from reputed academic institutions and technical institutions.

## Fees

The participation fees for taking the course are as follows:

|  |                          |
|--|--------------------------|
| <b>Students</b>  | <b>: INR (Rs) 1000/-</b> |
| <b>Faculty/Researchers from Academic/Research Institutions</b> | <b>: INR (Rs) 2000/-</b> |
| <b>Participants from Industry</b>                              | <b>: INR (Rs) 4000/-</b> |
| <b>Participants from abroad</b>                                | <b>: USD (\$) 100/-</b>  |

The above fees include all instructional materials, computer usage for tutorials and assignments, and free internet facility.

All course registrations will be processed via the national GIAN portal ([www.gian.iitkgp.ac.in](http://www.gian.iitkgp.ac.in)), where **Rs. 500/-one-time fee is payable in addition to the above amount.**

Registration fee can be directly deposited by Demand Draft/Cheque, in favour of "GIAN-ANFE-2017" payable at Allahabad OR National Electronic Funds Transfer (NEFT) to the account "GIAN-ANFE-2017" (Account Number: 718400301000282) Bank: Vijaya Bank, MNNIT Branch, Allahabad-211004, UP, INDIA; IFSC Code: VIJB0007184

**No TA, DA will be provided to the participants. Participants have to arrange their own accommodation and food.** However, limited shared accommodation may be made available (subject to availability) in the Institute Executive Centre/ Guest Rooms of Hostels on request on first come first serve basis. Payment for accommodation & food is extra as per actuals.

**Last Date of Registration:** November 3, 2017

## About the Institute

**Motilal Nehru National Institute of Technology Allahabad**, Allahabad (MNNIT) is an Institute with total commitment to quality and excellence in academic pursuits. It was established as one of the seventeen Regional Engineering Colleges (Motilal Nehru Regional Engineering College, MNREC) of India in the year 1961 as a joint enterprise of Government of India and Government of Uttar Pradesh, and was an associated college of University of Allahabad. With over 45 years of experience and achievements in the field of technical education, having traversed a long way, on June 26, 2002 MNREC was transformed into National Institute of Technology with Deemed University status funded by Government of India. With the enactment of National Institutes of Technology Act-2007(29 of 2007), the Institute has been granted the status of institution of national importance w.e.f. 15.08.2007. The Institute now offers nine B. Tech., nineteen M. Tech. Degree Programmes (including part-time), MCA, MBA, M.Sc. (Mathematics and Scientific Computing) programmes. The institute also registers candidates for Ph. D. degree in various disciplines.

## About the Department

The **Electronics and Communication Engineering Department** offers one B. Tech. program in Electronics and Communication Engineering and three M. Tech. programs with specialization in Communication Systems, Digital System, Microelectronics and VLSI Design. The Department is actively involved in experimental and theoretical research in the emerging areas leading to Ph. D. degree. Besides this, the department is also recognized as a QIP center for M. Tech. and Ph. D. programs by Govt. of India.

## How to reach MNNIT Allahabad

The Institute is located at about 8 km. from Allahabad Junction and Allahabad Bus Station, Allahabad and 4 km. from Prayag Railway Station. Cycle Rickshaw and Auto Rickshaw are the common mode of transport. Taxis are also available.. The charges are about `100/- for cycle rickshaw, `200/- for Auto rickshaw and `400.00 for Taxi.

## Brief CV of Experts



**Prof. David Mark Harvey**, is a Professor in Department of Electronics Engineering, Liverpool John Moores University, UK. Prof. David has got his doctorate degree on Real-time Microprocessor-based Analysis of Optoelectronic Data in 1984. He has been working as a Principal Electronics Design Engineer, Kratos, Analytical Instruments. He has been working as Director Electronic Design and Manufacturing (EDAM) Centre, LJMU. He has also been working as Director Engineering Development Centre (EDC), LJMU. He has been consultant of over 250 companies. He has exhaustive experience in Metrology and advanced optical/acoustic/X-ray/electronic/AFM measurement systems at nano-and micro-scales.



**Prof. Vijaya Bhadauria** received her B. E. Degree in Electrical Engineering from MNREC Allahabad, India with honors in the year 1984. She also received her Masters Degree in Control and Instrumentation with honors from MNREC Allahabad, India in the year 1986 and was conferred Ph.D degree in the year 2012 from MNNIT Allahabad, India. She is currently Head of the Department, Electronics & Communication Engineering, MNNIT Allahabad, India. Her research area includes VLSI Design and analog circuits design. She worked as co-coordinator of "Special Manpower Development Program for VLSI Design and related software (SMDP-II)" project sponsored by Department of Information Technology, Ministry of Communication and Information Technology. Presently She is the Chief-Investigator of "Special Manpower Development Program Chip to System Design (SMDP-C2SD)" project sponsored by Ministry of Electronics and Information Technology (Meity), Government of India.



**Dr. Sanjeev Rai** received his B Tech Degree in Electronics Engineering from Govt. Engineering College, Raipur, India in the year 1997 and Masters Degree from MNREC Allahabad, India in the year 2002 and was conferred Ph.D degree in the year 2013 from MNNIT Allahabad, India. He is currently working as Assistant Professor in the department of Electronics & Communication Engineering, MNNIT Allahabad, India. His research area includes Low Power VLSI, semiconductor device modeling, simulation & characterization of advanced scalable MOS devices and circuits. He has published various research papers in renowned journals.

## Contact Details

| Principal Course Coordinator   | Course Coordinator   | Local GIAN Coordinator  |
|--|--|---|
| Dr. Sanjeev Rai<br>Assistant Professor<br>Department of Electronics and<br>Communication Engineering<br>Motilal Nehru National Institute of<br>Technology Allahabad<br>Allahabad - 211004, INDIA<br>Tel: +91-9415259955<br>Email: srai@mnnit.ac.in | Dr. Vijaya Bhadauria<br>Professor & Head<br>Department of Electronics and<br>Communication Engineering<br>Motilal Nehru National Institute of<br>Technology Allahabad<br>Allahabad - 211004, INDIA<br>Tel: +91-9415014160<br>Email: vijaya@mnnit.ac.in | Dr. G.P. Sahu<br>Associate Professor<br><br>School of Management Science Mo-<br>tilal Nehru National Institute of<br>Technology Allahabad<br>Allahabad - 211004, INDIA<br>Tel: +91-9305508002<br>Email: gsahu@mnnit.ac.in |