

Motilal Nehru National Institute of Technology Allahabad Prayagraj

Online GIAN course on “Advances in Nanotechnology & its Application in Future Electronics”

March 07 to March 11, 2022 (One Week)

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 and news services and multi-media talk and video communications 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 miniaturisation 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.

Course Objectives

The primary objectives of the course are as follows:

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

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| Dates: | March 7th - March 11th, 2022 | | |
| Location: | Online Programme using Web-conferencing system (MNNIT Allahabad) | | |
| Course Schedule: | 7 th March 2022 | Lecture 1: | 1 hr: Modern Digital electronic design techniques, synchronous design and applications. |
| | | Lecture 2: | 2 hrs: Design for test, built-in self-test, component, circuits and systems level tests. |
| | | Lab/ Tutorial 1: | 1 hrs: CAD design and simulation examples. |
| | 8 th March 2022 | Lecture 3: | 2 hrs: Asynchronous circuit design 1, high speed level mode design, low-power design. |
| | | Lecture 4: | 1 hrs: Network-on a-chip, design, simulation and test |
| | Lab/ Tutorial 2: | 1 hrs: Asynchronous design exercises, CAD exercises. | |
| | 9 th March 2022 | Lecture 5: | 2 hrs: Asynchronous design 2, hazards and races, test strategies. |
| | | Lecture 6: | 1 hrs: Nanotechnologies, state-of-the-art in electronics, design strategies, circuit simulation and test. |
| | | Lab/ Tutorial 3: | 1 hrs: Problem solving session with examples: Synchronous and asynchronous design, Built-in test, power management. CAD exercises. |
| | 10 th March 2022 | Lecture 7: | 2 hrs: Reliability and validation tests for lifetime assessment. |
| | | Lecture 8: | 1 hr: Transistor level validation, testing, delay, scalability, power solutions and future directions. |
| | | Lab/ Tutorial 4: | 1 hr: Problem solving session with examples: Through lifetime reliability assessment, accelerated life tests, failure modes and possible solutions. CAD exercises. |
| | 11 st March 2022 | Lecture 9: | 1 hrs: 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: | 1 hr: Simulation of transistor level circuits down to nanotechnology scales. |
| | | Lab/ Tutorial 5: | 2 hrs: 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. |
| Who can attend? | <ul style="list-style-type: none"> • Executives, engineers and researchers from manufacturing, service and government organizations including R&D laboratories. • Student at all levels (BTech/MSc/MTech/PhD) or Faculty from academic institutions | | |

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| Course Fee: | <p>One-Time GIAN Registration: Please visit http://www.gian.iitkgp.ac.in/GREGN/ and register by paying Rs. 500/- (those who have already been paid, need not pay again). The participation fees for attending the course is as follows:</p> <p>Participants from abroad: US\$ 100 Industry/ Research Organizations: Rs. 500 Academic Institutions (Faculty members): Rs. 300 Academic Institutions (Students/Research scholars): Rs. 100</p> <p>The above fee includes all instructional materials (soft copy only). Minimum 90% attendance necessary to be eligible for certificate Appearing for evaluations/examinations during the course is necessary for certificate of grades in the course.</p> |
| Bank Account Details: | <p>The Course Participation fee is required to be deposited in the bank account mentioned below through online transfer or bank deposit; the account detail is as under:</p> <p>Account Name: GIAN-DMCW-2022 Account No.: 77660200001307 Bank Name: Bank of Baroda Branch: MNNIT Allahabad U.P. India IFSC Code: BARB0VJMNRE [Fifth Character is Zero] Last Date of Registration: February 28, 2022</p> |

International Expert



Prof David Mark Harvey received the BSc (Hons) and PhD degrees in Electrical and Electronic Engineering from Liverpool Polytechnic, Liverpool, UK in 1979 and 1984 respectively. From 1983 to 1984 he was Principal Electronics Design Engineer at Kratos Analytical Instruments, Manchester, UK, and from 1984 to 1985 Principal Electronics Engineer at Plessey Crypto, Liverpool, UK. In 1985 he joined Liverpool Polytechnic, now Liverpool John Moores University (LJMU) where he has been a Professor of Electronic Engineering since 2003. He was the Director of two large Technology Transfer projects funded to €10M; The

Electronic Design and Manufacturing (EDAM) Centre at LJMU from 1996 to 2001, and The Engineering Development Centre (EDC) at LJMU from 2002 to 2008. All research work has an industrial bias and the graduates produced have entered industry in the electronics sector. Of three recent PhD graduates, one is European validation manager for a large multinational automotive electronics company, one is working in product validation at Intel in Penang, and a third entered Cambridge Silicon Radio (now Qualcomm). In the past he has helped set up two design centres in India at former RECs in Allahabad and Jaipur. His research has been concerned with design and test of electronic instrumentation and optical metrology systems. His recent focus has been on the non-destructive evaluation of manufactured automotive electronics using novel techniques. Professor Harvey is a Fellow of The Institution of Engineering and Technology, UK, and Chartered Engineer, Engineering Council UK.

Host Faculty:



Prof. Rajeev Tripathi completed his B. Tech. in 1986, M. Tech. in 1992 and PhD in 1998 from the University of Allahabad. He joined MNNIT Allahabad as a faculty member in 1988 and is currently a Professor since 2005. He was faculty member at The University of The West Indies, St. Augustine, Trinidad (WI) from 2002 to 2004. He was Visiting Faculty at School of Engineering Liverpool John Moores University U.K. in the year 1998 and 1999. Besides vast teaching and research experience of around 30

years, he also has a vast administrative experience at MNNIT Allahabad. He worked as Vice-President Gymkhana from 1998 to 2000, Faculty In charge Communications from 1996 to 2013, Coordinator, Quality Improvement Program (QIP) from 2005 to 2016, Chairman, Senate Post Graduate Committee from 2005 to 2009, Dean, Academic Affairs from 2009 to 2011, Head, Department of Electronics and Communication Engineering from 2011 to 2013, and Professor In charge, Training and Placement from 2011 to 2016.

Prof. Tripathi has made pioneering research contributions and has solved a number of open problems. He has published more than 160 papers in international journals and conferences of repute and supervised nineteen Ph.D. students. He has worked closely with Government as well as industry on various problems and has successfully led and completed large projects and programmes at national and international levels. Important among them include sponsored project by Govt. of India and British Govt. under Indo-UK Science and Technology Research Fund and project sponsored by Ministry of Human Resource Development, Government of India. He is a well-known teacher and mentor who has not only graduated a large number of students and developed well appreciated teaching modules but has also motivated and mentored many students' innovation and entrepreneurial activities which have achieved unique successes.

Prof. Tripathi has pioneered personnel and Institute level research collaboration with foreign universities and visited several countries in this regard. Important among them include Liverpool John Moores University, Liverpool, U.K., The University of The West Indies, St. Augustine, Trinidad (WI), Barbados campus of University of West Indies, Moncton New Brunswick, Canada, University of Waterloo (UoW), Waterloo, Canada, Spain, U.S.A., etc.

Prof. Tripathi worked as reviewer of many international journals including IEEE Communication Letters, Adhoc Networks, Elsevier, Wireless Personal Communication Springer, International Journal of Electronics, Taylor and Francis, IETE Journal of Research, Taylor and Francis and West Indian Journal of Engineering. He has organized many international conferences in the capacity of conference chair and co-chair and served as program committee of several international conferences of repute in the area of wireless communication and networking. Prof. Tripathi is a senior member of IEEE, USA, Life Fellow of Institution of Electronics & Telecommunication Engineers (IETE), India, Life Member of Institution of Engineers (IE), India, Life Member of Indian Society of Technical Education (ISTE), India and Life Member of Indian Institute of Public Administration (IIPA), India.

Contact:

| Course Coordinator | Course Co-Coordinator and Local Coordinator, GIAN |
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| <p>Prof. Rajeev Tripathi Director MNNIT Allahabad, Prayagraj- 211004, India. Professor, ECED, MNNIT Allahabad Email: rt@mnnit.ac.in</p> | <p>Prof. G. P. Sahu Professor, SMS MNNIT Allahabad, Prayagraj – 211004, India. Tel: +91-9305508002 Email: gsahu@mnnit.ac.in</p> |