Principles and Modeling of Electromagnetic Non-Destructive Evaluation  
(November 18-22, 2022)

Overview
The Non-Destructive Techniques are used in the science and technology industry to evaluate the properties of materials, components, or systems without opening the box and without causing damage. It is a highly valuable technique that can save both money and time in product evaluation, troubleshooting, and research while maintaining its integrity. The most frequently used NDT methods are eddy-current, magnetic-particle, liquid penetrant, radiographic, ultrasonic, visual testing, microwave/millimeter wave technique and Terahertz wave technique. NDT are commonly used in Forensic Engineering, Mechanical Engineering, Petroleum Engineering, Electrical and Electronics Engineering, Civil Engineering, Systems Engineering, Aeronautical Engineering, Medicine and art. Innovations in the field of nondestructive testing have profoundly impacted medical functional imaging, including echocardiography, medical ultrasonography, and digital radiography. Various national and international trade associations exist to promote the industry, knowledge about non-destructive testing, and to develop standard methods and training. These include the American Society for Nondestructive Testing, the Non-Destructive Testing Management Association, the International Committee for Non-Destructive Testing, the European Federation for Non-Destructive Testing, and the British Institute of Non-Destructive Testing. NDT methods rely upon the use of electromagnetic radiation, sound, and other signal conversions to examine a wide variety of articles (metallic and non-metallic, food-product, artefacts and antiquities, infrastructure) for integrity, composition, or condition with no alteration of the article undergoing examination.

Objectives
- Exposing the participants to the fundamentals of Electromagnetic NDT.
- Understanding the basic principles of various NDT techniques importance of NDT techniques, various applications of eNDT techniques, limitations of eNDT techniques, standards and specifications related to non-destructive testing techniques etc.
- Providing exposure to composite material properties, defect detecting techniques and applications.
- To know how to select optimized NDT techniques for specific applications.

<table>
<thead>
<tr>
<th>Modules</th>
<th>Each Lecture is of 2 hours</th>
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<tr>
<td>Day 1: 18 Nov 2022</td>
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<tr>
<td>Lecture 1 (10:00AM): Introduction to Non-Destructive Testing/Evaluation (NDT/NDE), Need for NDT, Applications of NDT.</td>
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<td>Day 2: 19 Nov 2022</td>
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<td>Lecture 3 (10:00AM): Magnetic NDE Methods, Magnetic materials, B-H curves, Magnetic Barkhausen Noise (MBN) methods.</td>
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Day 3: 20 Nov 2022
Lecture 5 (10:00 AM): Eddy current techniques, Basic Principles, Physics, Transformer analogue Inspection systems, Eddy current probes, Instrumentation.
Lecture 6 (02:30 PM): Eddy current probes – coil configurations, GMR, Pulsed Eddy current Technique, Applications.

Day 4: 21 Nov 2022
Lecture 7 (10:00 AM): Introduction to microwave NDE Methods, Far-field and Near-field Methods
Lecture 8 (02:30 PM) : Application to NDE of Composites

Day 5: 22 Nov 2022
Lecture 9 (10:00 AM): Introduction to NDE forward problems, Analytical methods (1 hour).
Describe the EPRI project
Demo of SGTSIM (2D)

You Should Attend If…

- You are a student (B.Tech./M.Sc./M.Tech./Ph.D.) and aspiring researcher within the broad domain of Non-destructive Testing & Evaluation.
- You are an Executive/engineer or researcher from manufacturing, service and government organizations including R&D laboratories.
- You are Faculty and staff from reputed academic institutions and technical institutions.

Fees
The participation fees per person for attending the course are as follows:

Participants from abroad: US $400
Industry/ Research Organizations: Rs. 10,620/- (GST included)
Academic Institutions:
Students: Rs. 2950/- (For students attending online Rs.1770/- only)
Non-Students: Rs. 4720/- (For Non-Students attending online Rs.3540/- only)

*If you are registering for the course “Non-Destructive Evaluation Inverse Problems and Signal Processing in Non-Destructive Evaluation” from November 23-27, 2022.

Participants from abroad: US $ 600
Industry/ Research Organizations: Rs. 14,160/- (GST included)
Academic Institutions:
Students: Rs. 4720/- (For students attending online Rs.2950/- only)
Non-Students: Rs. 7080/- (For Non-Students attending online Rs.5310/- only)

The above fees include all instructional materials, computer use for tutorials, and free internet facility. A limited number of single-bedded shared accommodation requests can be considered from participants which, if allotted, would be on an additional payment basis.
The faculty

Prof. Lalita Udpa (Life Fellow, IEEE) received a PhD degree in electrical engineering from Colorado State University, Fort Collins, CO, USA. She is currently the University Distinguished Professor with the Department of Electrical and Computer Engineering, Michigan State University, East Lansing, MI, USA. She works primarily in the broad areas of electromagnetic nondestructive evaluation, signal processing and analysis. Her research interests include various aspects of NDE such as the development of computational models for NDE, new sensor designs, signal and image processing, data fusion, and inverse problem solutions. Dr Udpa is a Fellow of the American Society of Nondestructive Testing and the Indian Society of Nondestructive Testing. She was on the Editorial Board of ASNT’s Research Journal of NDE and an Editor of IEEE TRANSACTIONS ON MAGNETICS.

Dr Neeraj Rao is an Assistant Professor with the Department of Electronics and Communication Engineering, Visvesvaraya National Institute of Technology, Nagpur, India. He completed the Bachelor of Engineering (B. Engg.) degree in Electronics and Communication Engineering from Government Engineering College, Jabalpur, India in 2009 and a master’s and PhD in Electronics and Communication from Indian Institute of Information Technology Design and Manufacturing Jabalpur, India in 2011 and 2017. His current research interests include Microwave NDT and Antennas.
Visvesvaraya National Institute of Technology, Nagpur is one of the thirty-one National Institutes of Technology in the country. The Govt. of India conferred on the Institute, the Deemed to be University status (under University Grants Commission Act, 1956 (3 of 1956)) with effect from 26th June 2002. Subsequently, the Central Govt. by Act of Parliament (National Institutes of Technology Act, 2007 (29 of 2007)) declared VNIT Nagpur as an Institute of National Importance along with all former regional engineering colleges. The Act was brought into force from 15th August 2007. Earlier, the Institute was known as Visvesvaraya Regional College of Engineering (VRCE). It was established in the year 1960 under the scheme sponsored by Govt. of India and Govt. of Maharashtra. The college was started in June 1960 by amalgamating the State Govt. Engineering College functioning at Nagpur since July 1956. In the meeting held in October 1962, the Governing Board of the College resolved to name it after the eminent engineer, planner, and statesman of the country Sir M. Visvesvaraya.
The department of Electronics and Computer Science was created in 1994 by the department of Electrical Engineering. Later, the Department of Electronics and Communication Engineering has been created in May 2014. Department of ECE offers B.Tech. in Electronics and Communication Engineering, M.Tech. in Communication System Engineering, and PhD. The department has well-qualified and well-motivated faculty members and support staff. There are more than 30 full-time PhD students enrolled in the different areas of RF and Microwave, Antennas, signal and image processing, medical image analysis, embedded system design, communication system, etc. Department has a Centre of Excellence in Combedded Systems and a Centre for Artificial Intelligence. The department is actively involved in R&D as well as consultancy projects and has collaborations with several industries, academic institutions and R&D organizations in the country and outside.