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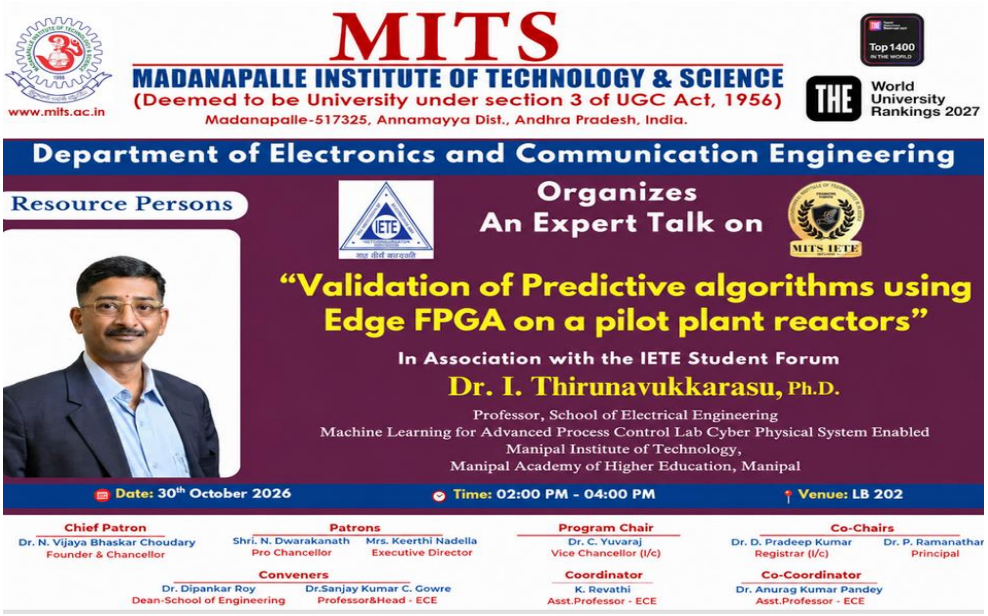
A Report on Expert Talk
"Validation of Predictive Algorithms Using Edge FPGA on a Pilot Plant Reactors"
Organized by Department of ECE in Association with MITS – IETE Students Forum (ISF)
On 30.10.2026



Report Submitted by: Mrs K. Revathi, Assistant Professor, Department of ECE.
Participants: 3 Year ECE Students of MITS Madanapalle.
Venue (College/ Institute): LB 202-Madanapalle Institute of Technology & Science (MITS), Angallu.
Date & Time: 30.10.2026 & 2.00 pm to 4.00 pm.
Organized by: Mrs. K. Revathi, Assistant Professor, ECE.
Dr. Anurag Kumar Pandey, Assistant Professor, ECE.
Resource Person Details: Dr. I. Thirunavukkarasu, Ph.D, Professor, School of Electrical Engineering, Manipal Institute of Technology, Manipal Academy of Higher Education (MAHE), Manipal.

Important Dignitaries attended/ organized: Dr.P. Ramanathan-Principal
Dr. Sanjay Kumar C. Gowre -HoD/ECE

All the esteemed guests, dignitaries, faculty members, and participants were cordially invited to the programme. The event commenced with the invitation of Dr. G. R. Hemantha, followed by Dr. Sanjay Kumar C. Gowre, Head of the Department of Electronics and Communication Engineering (ECE), and Dr. P. Ramanathan, Principal, MITS, to grace the occasion. Their presence added significance to the programme and encouraged the students to actively participate in the expert talk. Subsequently, the distinguished resource person, Dr. I. Thirunavukkarasu, Ph.D., Professor, School of Electrical Engineering, Manipal Academy of Higher Education (MAHE), Manipal, was invited to the dais. The gathering warmly welcomed the guest speaker, who was invited to deliver the expert talk on "Validation of Predictive Algorithms Using Edge FPGA on a Pilot Plant Reactors."
The programme was intended to expose students to the practical integration of machine learning, embedded hardware, instrumentation, and process control.

The key objectives of the expert talk were to:

1. Introduce the role of Field-Programmable Gate Arrays (FPGAs) in implementing computationally intensive algorithms close to the process.
2. Explain how predictive and machine-learning-based algorithms can support monitoring and control of pilot-plant reactors.
3. Connect sensor measurements, data acquisition, algorithm execution, and control actions in an industrial process-control loop.
4. Highlight the importance of real-time execution, reliability, and hardware validation when moving algorithms from simulation to practical systems.
5. Create awareness of interdisciplinary opportunities in embedded systems, FPGA design, machine learning, instrumentation, and industrial automation.





Technical Overview of the Expert Talk

An FPGA is a reconfigurable digital device that can be configured to execute parallel operations with predictable timing. In an edge-computing arrangement, computation is performed near the sensors and controlled equipment rather than relying entirely on a remote computing platform. This is useful in process-control applications where response time, dependable operation, and continuous monitoring are important.

Predictive algorithms use measured process variables and mathematical or data-driven models to estimate future process behaviour. When implemented on suitable edge hardware, such algorithms can support timely decision-making and control. The validation stage is essential: the algorithm's outputs and control performance must be assessed against the behaviour of the physical pilot plant.





A pilot-plant reactor provides a practical environment for studying process dynamics and testing control strategies before deployment at a larger industrial scale. Typical measurements include process temperature and other relevant operating variables, while actuators such as heating or flow-control elements influence the process. The control system must acquire sensor data, process it, calculate suitable control actions, and apply those actions within the required time.

The subject has direct relevance to Electronics and Communication Engineering because it brings together digital system design, embedded computing, sensor interfacing, signal acquisition, hardware acceleration, and intelligent algorithms. Students can relate their classroom learning in digital electronics, microprocessors, VLSI, embedded systems, signal processing, and machine learning to a practical industrial application.

1. Digital design and FPGA programming for parallel and deterministic computation.
2. Sensor interfacing, signal conditioning, data acquisition, and real-time monitoring.
3. Embedded implementation and optimization of predictive or machine-learning algorithms.
4. Communication between sensors, controllers, actuators, and supervisory systems.
5. Hardware-in-the-loop testing and validation of algorithms under practical operating conditions.

Conclusion

The expert talk on "Validation of Predictive Algorithms Using Edge FPGA on a Pilot Plant Reactors" provided an opportunity to understand the convergence of FPGA-based computing, machine learning, and industrial process control. The application of predictive algorithms on pilot-plant systems demonstrates how concepts from electronics, embedded systems, and intelligent computing can contribute to real-time monitoring and control. The topic is valuable for ECE students as it connects core engineering subjects with emerging industrial applications and research directions.