# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## RISE-MAGAZINE

## Recent Innovations In Sophisticated Electronics



**INSIDE THIS ISSUE:**




VOLUME 15 JULY-DEC-2019


### DEPARTMENT PROFILE

Electronics and Communication Engineering has emerged as the major driving force in the present day Information Technology revolution. It is acting as a bridge between different disciplines of engineering and technology. It has penetrated into other prominent sectors such as health care, instrumentation, agriculture, automation, signal processing, remote sensing etc.., The recent developments such as IoT, Artificial Intelligence and the mercurial advancements in the field of communication.

### Vision

To be a focal centre for academic excellence in competing global standards and dynamics in the field of Electronics and Communication Engineering with research and services focusing on effective communication skills, entrepreneurial, ethical and social concern.

### Mission

To impart quality technical education in Electronics and Communication Engineering with well established infrastructure, state- of- the art laboratories, core instructions and cognizant faculty.

To prepare the young and dynamic Electronics and Communication Engineers professionally deft and intellectually adept with knowledge, behaviour and information competency.

To enable the learners for changing trends in the field of Electronics and Communication Engineering with a focus on career guidance, placements and higher education by Industry-Institute relationship.

**SV College of Engineering Tirupati**
**svce.edu.in**

## PROGRAM EDUCATIONAL OBJECTIVES

**PEO 1.** Graduates should be cognizant in basic science, fundamental engineering stream along with core related domains in ECE and Allied fields.

**PEO 2.** Graduates should understand issues related to design, problem solving, and intellectually adept with knowledge, behavior and information competency.

**PEO 3.** Graduates should demonstrate their technical, communication, research, aptitudes along with leadership skills in professional environment to empower employability, higher education and entrepreneurs successfully through industry-institute interaction.

**PEO 4.** Graduate should be motivated with high ethical, human values and team work towards development of the societ.

## PROGRAM OUTCOMES

**ENGINEERING KNOWLEDGE:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

**PROBLEM ANALYSIS:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**DESIGN/DEVELOPMENT OF SOLUTIONS:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**CONDUCT INVESTIGATIONS OF COMPLEX PROBLEMS:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**MODERN TOOL USAGE:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

**THE ENGINEER AND SOCIETY:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**ENVIRONMENT AND SUSTAINABILITY:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**ETHICS:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**INDIVIDUAL AND TEAM WORK:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**COMMUNICATION:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**PROJECT MANAGEMENT AND FINANCE:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**LIFE-LONG LEARNING:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## PROGRAM SPECIFIC OUTCOMES

**PSO 1.** An ability to get an employment in Electronics and Communication Engineering field and related industries and to participate & succeed in competitive examinations like GRE, GATE,TOEFL, PSUs, etc.

**PSO 2.** Should be able to design and test various electronic systems that perform analog and digital processing functions.

## Arduino kit simplifies IoT development

iArduino, the IoT development platform, has launched the Oplà IoT Kit, the first open programmable IoT platform that allows anyone to build custom IoT devices, with full control over personal data. The entry-level kit comes complete with a set of 8 self-assemble projects ready to show users how to easily turn everyday devices into 'smart devices'. The Oplà IoT Kit makes it possible to manage and control connected devices from multiple interfaces, such as the Oplà hardware device, custom web dashboards and the iOS/Android mobile app. The 8 IoT projects offer different experiences for each user based on their individual level of expertise, from maker to professional. This includes 4 out-of-the-box projects that are ready to deploy around the house: remote controlled lights, a home weather station, a smart garden and a thermostat control. In addition, there are 4 projects for users to grasp core IoT concepts and how they can be integrated into real-life applications: home security alarm, solar system tracker, remote messaging and inventory management - all of which can be monitored and controlled via the Arduino IoT Cloud. More projects will be released in the future as online tutorials, in addition to projects shared by the community of users on Arduino Project Hub.

The Oplà IoT Kit is intended for beginners, but it is also a valuable resource for experienced users. It is based on the Oplà unit, which is a carrier board with an OLED colour display, on-board sensors (temperature, humidity, pressure, IMU, light), capacitive touch buttons, buzzer, colour LEDs, 24V relays, SD card reader. The carrier includes a slot for a battery with an integrated battery charger, which makes the device portable and wireless.

The kit also contains an MKR WiFi 1010 board and a round plastic enclosure, and two more external sensors, such as motion sensor and moisture sensor. Thanks to the swappable MKR WiFi 1010 board, users will be able to choose another connectivity method by plugging another board from the MKR family in order to switch to GSM, LoRa, NarrowBand or more.

The Oplà IoT Kit acts as the physical interface of the Arduino IoT Cloud, which allows users to build dashboards and plot data in realtime, while browsing values along a timeline. This is all controllable from a mobile with the Arduino IoT Remote app. Compatibility with Amazon Alexa enables seamless voice control to integrate custom connected devices into a real-life setting. The kit comes with a 12 months subscription to the Arduino Create MKR Plan, with premium access to the Arduino IoT Cloud.**-------------D Vishnu- 16BF1A0450**

## Data privacy concerns

Based at the Politecnico di Milano University in Italy, Professor Antonio Capone is leading a team of experts in applied and basic research that is focused on the Internet of Things (IoT), and the university's IoT Laboratory is conducting research into how to design for the implementation of complex IoT systems. In particular the professor's team is targeting different vertical application scenarios whether that's smart buildings, factories or smart cities. The IoT Laboratory's work is focused on all the elements that form part of the IoT technology stack whether that's sensors and actuators for remote monitoring and control, communication systems, edge computing, cloud platforms or advanced user interfaces. "The Laboratory is a test-bed for the collection of information from the physical world and operates much like an open "platform" for the development of different vertical applications," explains Prof. Capone. The IoT Laboratory provides support to applied research that's aimed at the design, development and testing of solutions related to the IoT, and its services are offered to Politecnico di Milano research groups as well as to external public and private parties, as part of collaboration agreements and research projects. "At the moment we are currently working across a number of different domains but one area of particular interest is smart cities," explains Prof. Capone. When it comes to collecting data it's necessary to use thousands of touch points that citizens will come into contact with every day. Each IoT device that gets integrated into a smart city will be used to collect data which will then be used to inform usage and help optimise services for citizens.

"We have created what we call 'smart gates', essentially an evolution of flow monitoring devices that are equipped with cameras and that use wireless technology – such as WI-Fi and Bluetooth – to monitor pedestrian traffic." By regularly and accurately analysing the data that's provided by these 'gates' it's possible to draw insights on how pedestrians navigate the city, identifying problems and issues that will, in turn, lead to better decision making. "We have been using these devices to analyse the movement of people using public transport. These 'gates', together with an associated app, are able to provide us with data that is helping us to better understand and monitor traffic flows. We can use that data to identify patterns, estimate flow and by using the associated camera technology to better understand who is using the network – not just numbers but their gender and age," according to the professor. Prof. Capone says that these types of devices will start to appear more frequently in the coming years and will become increasingly viable in cities as they use data-driven solutions to address everyday challenges, bene ting not just people, but the environment and the wider economy.

**Data privacy**

While Prof. Capone is a keen advocate of smart cities and believes that one of their key bene ts is that they will enable authorities to leverage data to create safer, more sustainable societies he is concerned that there needs to be a better balance between privacy and how the technology is deployed and the data is used. "Look, in the EU we have GDPR to regulate our privacy. It was established to ensure that data was accessed and used with the consent of the user, but I don't believe that the legislation is sufficient," he argues. "In Europe we are in possibly the best position to understand and strike a better balance between technology and privacy. There is one aspect that, in my opinion, needs to be reformed and that is around the whole concept of consent." At present the professor believes that the way in which consent is obtained from a user is inadequate. "Consent is not in the full control of the user, due to the way in which it is implemented. Simply clicking your 'acceptance' is not sufficient. I think most people do so without truly understanding what they are doing. We need to force applications and systems to allow the average user to really be in control of their privacy settings.**----------- M Rishitha- 16BF1A04B7**

# Debugging P2P resistance using path segmentation in IC reliability verification

In integrated circuit (IC) reliability verification, point-to-point (P2P) resistance simulations identify when net parasitic resistance may affect circuit reliability and performance. Debugging using individual resistor body data can, to a certain extent, point designers to the location where there might be a high resistance point. Designers can also use path segmentation to better identify and reduce total effective P2P resistance. P2P simulations report nets containing out-of-range effective P2P resistance values between device pins and ports (pin-pairs). However, designers must be able to identify which segment of a reported pin-pair path is contributing to the high resistance value, especially if the reported P2P effective resistance is a much higher value than expected, which may indicate a routing mistake or false violation.

While individual resistor body resistance values provide some value, designers must factor in the relationship of those resistances to other polygons in the complete interconnect circuit. If there are multiple parallel paths, a high resistance value for one polygon does not necessarily mean that resistor body contributes greatly to the total effective path resistance. There may be smaller parallel resistances that together cancel out the effect of that higher resistance polygon. Coordinate-based P2P simulation lets designers place source and sink points along the net interconnect at selected locations. These points enable measurements not easily calculated using individual resistor body data. Placing sources and sinks along the interconnect path polygons when setting up P2P simulations allows designers to segment portions of the routing that contain parallel paths to get effective series total resistances.

In particular, shorting multiple sources and sinks enables accurate segmentation of parallel paths that factor in how the paths combine. This principal allows designers to segment their interconnect tracing along parallel paths to get accurate path segmentation of more complicated interconnect traces, where the path must be split at a portion of the tracing that has parallel branches.

When a P2P simulation result is significantly higher than what is typically expected, segmenting the net to isolate and identify a high resistance point can be an effective way to begin navigation to the problem areas causing P2P violations in an IC layout.**--------PM Saiteja- 16BF1A04G5**

## Time sensitive networking

Today, unlike in the past, connected industrial devices are expected to communicate directly with enterprise applications. In order to gain detailed and differentiated insight into their own production operations, some companies are even running these applications directly on industrial end devices. Whether the purpose is real-time analysis or full-blown AI algorithms, the integrity of these applications is quickly compromised if their components are not optimally matched. It is important to guarantee that devices and systems can continue to perform their core functions in real-time. Modern industrial engineers therefore need a concept that allows the integration of IT and OT technologies in a single device. Such a solution platform should ideally take advantage of standard IT networking and data processing while being deterministic, secure and reliable.

An important component for the realisation of such real-time data communication networks in the industrial Internet of Things (IIoT) is time-sensitive networking (TSN). TSN technology comprises a number of standards, such as IEEE 802.1q for virtual LANs via Ethernet, time aware shaping (TAS) as standardised in IEEE 802.1Qbv for guaranteed minimum transmission latency, or real-time synchronisation via the precision time protocol (PTP) defined in IEEE 1588. PTP is responsible for time synchronisation between nodes. A master sets the time and the An important component for the realisation of such real-time data communication networks in the industrial Internet of Things (IIoT) is time-sensitive networking (TSN). TSN technology comprises a number of standards, such as IEEE 802.1q for virtual LANs via Ethernet, time aware shaping (TAS) as standardised in IEEE 802.1Qbv for guaranteed minimum transmission latency, or real-time synchronisation via the precision time protocol (PTP) defined in IEEE 1588.

In the case of the I219 Intel Ethernet interface, the clock synchronisation is based 100% on this standard component, giving it the dual advantage of being cast in hardware and not requiring any additional proprietary applications or dedicated hardware.

**Workload consolidation**

At the same time, industrial devices are required to integrate enterprise functions, such as real-time edge analytics. Industrial systems, traditionally based on clearly defined functional units, are now grouped together on a multi-core processor under the heading 'workload balancing at the edge'. This increases the importance of using hypervisor technologies in industrial real-time systems. Virtualization technology allows some processor cores to perform data analysis, while others can be reserved for data acquisition or control tasks. As a result, realtime tasks such as robot control or vision-based AI, which is also ideal for collaborative robotics, can run on completely separate virtual machines (VMs) within a server platform alongside less timecritical applications such as remote administration or cloud connectivity. A proof of concept (PoC) of such a TSN-capable RTOS system with industrial real-time control was first presented by congatec, Intel and Real-Time Systems during a live demo at Embedded World a year ago. The industrial application server platform of this PoC is based on the principles of workload consolidation and TSN via Ethernet.

**Real-time application server in practice**

At the heart of the demo platform is a COM Express Type 6 module (conga-TS370). Equipped with an Intel Xeon E2 processor, it can provide up to six CPU cores for multitasking. Thanks to the RTS Hypervisor from Real-Time Systems, the processor is divided into multiple machines, each with its own operating system, whereby each VM is assigned one or more CPU core(s) and the required IOs.**---------V Poojitha- 16BF1A04M0**