# EC-Tech Chronicle

## 2021-22

**Department of Electronics and Communication Engineering**

PRAGATI ENGINEERING COLLEGE (AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK, Kakinada & Accredited by NAAC with ' A' Grade

## Vision of the Department

To be an acknowledged Leader in providing quality education, training and research in area of Electronics and Communication Engineering to meet the industrial and Societal needs.

## Mission of the Department

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|---|---|
| **M1** | To facilitate students with a state-of-the-art infrastructure, learning environment and value-based education to improve technical knowledge and skills for continuous learning process. |
| **M2** | To impart high quality education with well qualified faculty and enable students to meet the challenges of the industry at global level |
| **M3** | To promote innovation and active industry institute interaction by facilitating the students to improve their leadership and entrepreneurship skills with ethical values. |

## Program Educational Objectives (PEOs)

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|---|---|
| **PEO 1** | To prepare Graduates with sound foundation in fundamentals of mathematics, science and engineering to assist them exhibit strong, independent learning, analytical &problem solving skills in Electronics and Communication Engineering domain. |
| **PEO 2** | To facilitate learning in the core field with effective use of modern equipment and programming tools to solve real life, multi-disciplinary problems with professional, ethical attitude and also to make them aware of their social responsibilities. |
| **PEO 3** | To assist and enable individuals to imbibe lifelong learning in thrust areas related to research & innovation to have Progressive Careers or Entrepreneurs. |

## PROGRAMME SPECIFIC OUTCOMES (PSOs)

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| **PSO-1** | The ability to apply concepts in electronics and communication engineering, to design and implement complex systems in the areas related to analog and digital electronics, communication, signal processing, VLSI & ES. |
| **PSO-2** | Ability to provide discerning solutions based on the their expertise in electronics and communication courses in competitive examinations for successful employment, higher studies and research. |

# PROGRAM OUTCOMES (POs)

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|---|---|
| **1** | **Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.** |
| **2** | **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. |
| **3** | **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. |
| **4** | **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. |
| **5** | **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations. |
| **6** | **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. |
| **7** | **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. |
| **8** | **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. |
| **9** | **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. |
| **10** | **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. |
| **11** | **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. |
| **12** | **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. |

# LPWAN

**SigFox** provides a cellular style network operator that provides a tailor-made solution for low-throughput Internet of Things and M2M applications.

For a host of applications from smart meters to control nodes that need connectivity over long ranges the only option until recently has been to use a cellular connection. This option has several disadvantages because cellular phone systems are focused on voice and high data rates. They are not suited to low data rate connections as the radio interface is complex and this adds cost and power consumption - too much for most M2M / IoT applications. The SigFox network is aimed at providing connectivity for a variety of applications and users. It is not aimed at one area, but at being for general use by a variety of different types of users. The SIGFOX network performance is characterized by the following:

- Up to 140 messages per object per day
- Payload size for each message is 12 bytes
- Wireless throughput up to 100 bits per second

The SigFox radio link uses unlicensed ISM radio bands. The exact frequencies can vary according to national regulations, but in Europe the 868MHz band is used; in the US it is 915MHz; and 433MHz in Asia.


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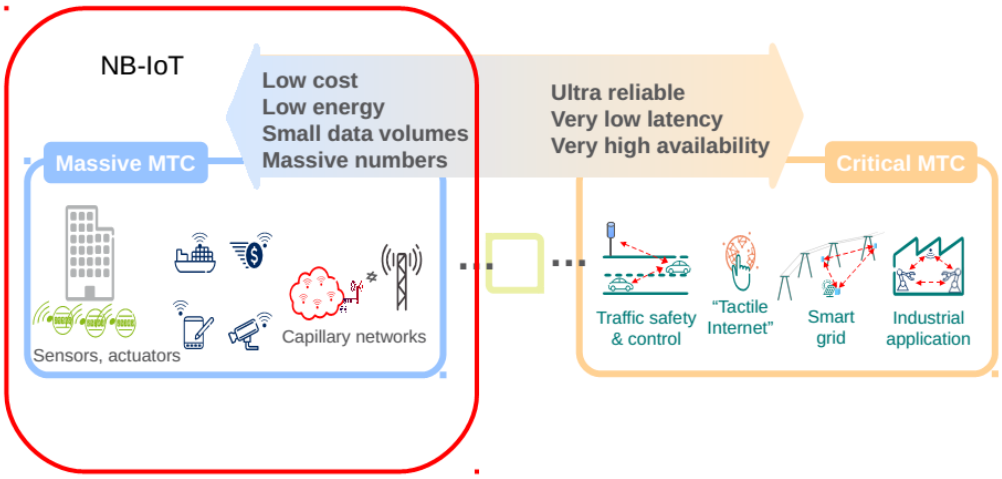
***Mrs.V Ujawala***
Asst.Professor
Dept of ECE

# IoT

**Internet of Things** is a standards-based low power wide area (LPWA) technology developed to enable a wide range of new IoT devices and services. NB-IoT significantly improves the power consumption of user devices, system capacity and spectrum efficiency, especially in deep coverage. Battery life of more than 10 years can be supported for a wide range of use cases.




New physical layer signals and channels are designed to meet the demanding requirement of extended coverage – rural and deep indoors – and ultra-low device complexity. Initial cost of the NB-IoT modules is expected to be comparable to GSM/GPRS. The underlying technology is however much simpler than today's GSM/GPRS and its cost is expected to decrease rapidly as demand increases.

Supported by all major mobile equipment, chipset and module manufacturers, NB-IoT can co-exist with 2G, 3G, and 4G mobile networks. It also benefits from all the security and privacy features of mobile networks, such as support for user identity confidentiality, entity authentication, confidentiality, data integrity, and mobile equipment identification.

*Mr CH Lakshmi Narayana*
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# E-Toll Collection

Toll Collection is a generally mature technology that allows for electronic payment of highway tolls. It takes advantage of vehicle-to-roadside communication technologies to perform an electronic monetary transaction between a vehicle passing through a toll station and the toll agency. This project is implemented using the innovative technology of Radio Frequency Identification (RFID).

Radio-frequency identification (RFID) is a technology that uses communication via electromagnetic waves to exchange data between a terminal and an electronic tag attached to an object, for the purpose of identification and tracking.

An RFID system consists of a reader and transponders. Transponders (derived from the words "transmitter" and "responder") are attached to the items to be identified. They are often called "tags". Radio Frequency Identification (RFID) involves contact less reading and writing of data into an RFID tag's non-volatile memory through an RF signal. The reader emits an RF signal and data is exchanged when the tag comes in proximity to the reader signal. The RFID tag derives its power from the RF reader signal and does not require a battery or external power source.

***K Paspalanrao***
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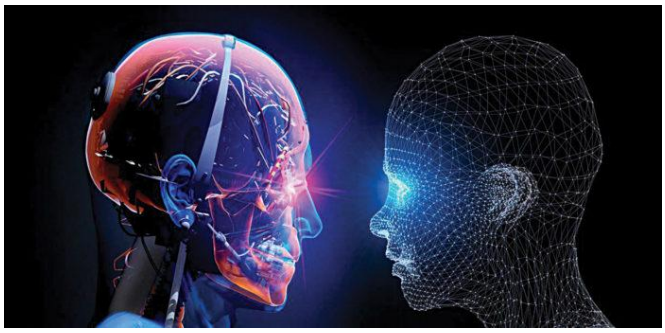
# Artificial Intelligence in Medicine

*AI technology is making its presence felt in the healthcare industry at a very fast pace. However, these new developments raise the question: Will AI replace doctors and nurses in the future?*

Tens of millions of people die each year from diseases that are treatable. Cancer treatment is not affordable by many. Now, AI is being employed in diagnosing cancer, tuberculosis, skin, eyes, stroke and other conditions, and it is more precise, accurate, faster and cheaper. AI is not only an industry-disrupting force but an important component that leads to affordability and accessibility for common people.



An ultrasound machine is quite costly, but as technology progresses, its cost will come down and it will be affordable by individuals. There are promising signs of AI solutions in ultrasound imaging. For example, iQ probe with semiconductor chips, developed by Butterfly Network, can be used by patients to perform their own ultrasound tests. Understanding the results of an ultrasound can be hard for untrained patients, but iQ has an AI component in it. As AI gets smarter, risks-associated image interpretation will eventually reduce. Israel-based DiA Imaging Analysis, in partnership with GE Healthcare, has developed Vscan, a smartphone-sized ultrasound device. It also collaborates with Google Cloud to offer AI-powered automated ultrasound analysis for patient care, enabling quick analysis and easy accessibility anywhere, anytime.

There is concrete proof that AI is way better than a radiologist in detecting various parameters of the human body. A recent report showed that Google AI machine can tell vital body details including gender, heart conditions or other cardiovascular problems just by scanning the eyes.

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# Wireless Communication Protocols

**Wi-Fi** is a technology based on the IEEE 802.11 suite of standards that uses radio frequencies (RF) extend wired Ethernet-based local area networks (LAN) to Wi-Fi-enabled devices, allowing the devices to receive and send information from the internet.

**Li-Fi** is a form of visual light communication that uses light waves from LED bulbs for high-speed wireless communication. It is used to exchange data quickly and securely at a much lower power level compared to Wi-Fi.

**Bluetooth** sends and receives radio waves in a band of 79 different frequencies (channels) centered on 2.45 GHz, set apart from radio, television and cellphones, and reserved for use by industrial, scientific and medical gadgets. Bluetooth's short-range transmitters have very low power consumption and are more secure than wireless networks that operate over longer ranges, such as Wi-Fi.

**ZigBee** is a 2.4 GHz mesh local area network (LAN) protocol. It was developed as an IEEE 802.15.4-based specification for a suite of high-level communication protocols used to create personal area networks with small, low-power digital radios.

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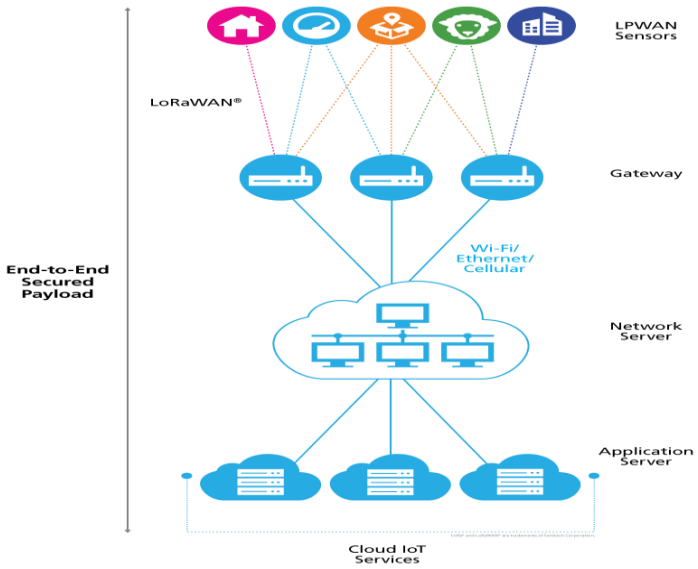
# Long Range Communication

**Lo**ng **Ra**nge low power wireless standard intended for providing a cellular style low data rate communications network.

Aimed at the M2M and IoT market, LoRa is ideal for providing intermittent low data rate connectivity over significant distances. The radio interface has been designed to enable extremely low signal levels to be received, and as a result even low power transmissions can be received at significant ranges. The LoRa modulation and radio interface has been designed and optimized to provide exactly the type of communications needed for remote IoT and M2M nodes.

Although LoRa had been fundamentally developed by Semtech, opening he standard out enabled it to be adopted by a wide number of companies, thereby growing he ecosystem and gaining significantly greater engagement, a wider variety of products and an overall increase in usage and acceptance.




There are several key elements of LoRa technology. Some of its key features include the following:

- Long range: 15 - 20 km.
- Millions of nodes
- Long battery life: in excess of ten years

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# Replacing Silicon

In fact, according to UnitedSiC President and CEO, Dr J. Christopher Dries, there are over 300 million low-voltage chargers being used in the market today, and each one includes a flyback converter. With such a great reliance on these devices, power conversion has never been so important, so designers are looking to boost efficiency, avoiding the conversion losses which come from using traditional switching circuits used in power converters.Right now, the low voltage charger market is dominated by silicon and has been for decades.


GaN Systems

"Silicon dominates the market and if we are going to be serious about increasing efficiency we need to reduce the thermal output of these devices," explains Aly Mashaly, Manager Power Systems, ROHM Semiconductor Europe."It used to be the case that if you left a laptop on for a few hours it became extremely hot, today we have seen a marked improvement due to the increased efficiency of the electronics. However, as devices become more power hungry so there's a need to improve the efficiency of low-voltage adaptors – it's a growing trend we need to address."At present, the low-voltage adaptor is well served by silicon powered by MOSFETs," says Dr Dries, who goes on to explain that it's an affordable solution because consumers aren't willing to spend a lot of money on a phone charger. But equally, he argues, people are always looking to improve efficiency, in particular in terms of size and weight."After all, don't we all want our charging time to go down, the weight of the charger to be less and the cost to be reasonable?"

To help push this forward, UnitedSiC is developing a silicon carbide alternative which it believes can compete with and outperform its more affordable counterpart.A lot of silicon carbide or SiC companies are focused on the high-power market – that is anything from 600V and up, for example on-board car chargers," Dr Dries, explains. "We saw a market opportunity to take our SiC devices into the low-power segment with our SiC JFET solution. Virtually no one has done this. We enable people to spend just a little bit more than they would for silicon, but for that they get extraordinary levels of performance in terms of efficiency and operating frequency.

***Mr.B.Sudhir***
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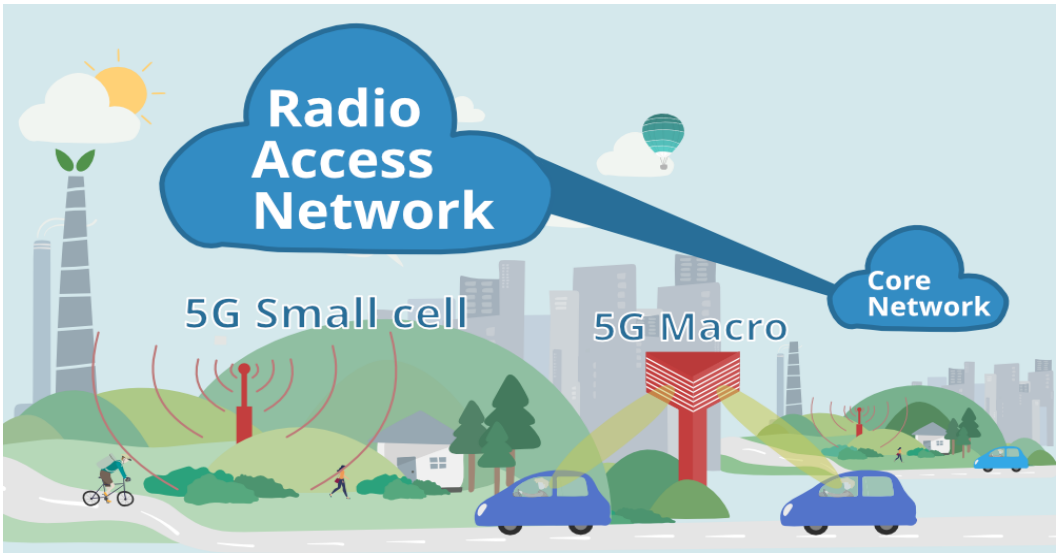
# Future Wireless Technology

The 5G mobile cellular communications system provides a far higher level of performance than the previous generations of mobile communications systems.The new 5G technology is not just the next version of mobile communications, evolving from 1G to 2G, 3G, 4G and now 5G.

Instead 5G technology is very different. Previous systems had evolved driven more by what could be done with the latest technology. The new 5G technology has been driven by specific uses ad applications.

The data speed for wireless broadband connections using 5G would be at a maximum of around **20 Gbps**. Contrasting that with the peak speed of 4G which is **60 Mbps**, that's a lot! Moreover, 5G will also provide more bandwidth and advanced antenna technology which will result in much more data transmitted over wireless systems.




***Benefits***

- 5G will make our smartphones much smarter with faster and more uniform data rates, lower latency and cost-per-bit and this, in turn, will lead to the common acceptance of new immersive technologies like Virtual Reality or Augmented Reality.
- 5G will have the convenience of ultra-reliable, low latency links that will empower industries to invest in more projects which require remote control of critical infrastructure in various fields like medicine, aviation, etc.
- 5G will lead to an Internet of Things revolution as it has the ability to scale up or down in features like data rates, power, and mobility which is perfect for an application like connecting multiple embedded sensors in almost all devices.

***Mr.P.KrishnaChaitanya***

*Asst.Prof-ECE*