# KSR INSTITUTE FOR ENGINEERING AND TECHNOLOGY

**KSRIET**
WHERE FUTURE BEGINS...

**TIRUCHENGODE -637 215.**

## DEPARTMENT OF INFORMATION TECHNOLOGY

**VOLUME 4**
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# DIGITIMES

## Wireless Technologies

# KSR INSTITUTE FOR ENGINEERING AND TECHNOLOGY

### Vision

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| To become a globally recognized Institution in Engineering Education, Research and Entrepreneurship. |

### Mission

| M1 | Accomplish quality education through improved teaching learning process |
|---|---|
| M2 | Enrich technical skills with state of the art laboratories and facilities |
| M3 | Enhance research and entrepreneurship activities to meet the industrial and societal needs |

## DEPARTMENT OF INFORMATION TECHNOLOGY

### Vision

| |
|---|
| To produce competent Information Technology Professionals and Entrepreneurs with ethical values to meet the global challenges. |

### Mission

| MD1 | Impart quality education with ethical values in Information Technology through improved teaching learning process |
|---|---|
| MD2 | Provide an ambient learning environment using state of the art laboratories and facilities |
| MD3 | Encourage research and entrepreneurship activities to meet the dynamic needs of Information Technology industry and society |

### Program Educational Objectives (PEOs)

| PEO | Key Words | Description |
|---|---|---|
| PEO 1 | **Core Competency** | Graduates will be successful professionals in career by applying the knowledge of mathematics, science and engineering with appropriate techniques and modern tools. |
| PEO 2 | **Professionalism** | Graduate will exhibit soft skills, professional and ethical values and thrust for continuous learning to maintain professionalism in the IT industries. |
| PEO 3 | **Higher Studies and Entrepreneurship** | Graduates will engage in higher studies and outshine as entrepreneurs through life-long learning which leads to societal benefits. |

# DIGITIMES

# *Editorial*

We would like to wholeheartedly thank our honorable Chairman, **Lion.Dr.K.S.Rangasamy** and vice chairman **Mr.R.Srinivasan**, and Principal **Dr.M.Venkatesan** for their continuous encouragement and constant support for bringing out the magazine. We profoundly thank our Head of the Department **Dr.P.MeenakshiDevi** for encouraging and motivating us to lead the magazine a successful one right from the beginning. **DIGITIMES** serves as a platform for updating and enhancing upcoming technologies in Information Technology. We are also grateful to all the contributors and faculty coordinator to bring this magazine.

**By,**
**Editorial Board**

## CONTENTS

## WIRELESS TECHNOLOGY

**What does Wireless mean?**

Wireless is an encompassing term that describes numerous communication technologies that rely on a wireless signal to send data rather than using a physical medium (often a wire). In wireless transmission, the medium used is the air, through electromagnetic, radio and microwave signals. The term communication here not only means communication between people but between devices and other technologies as well.
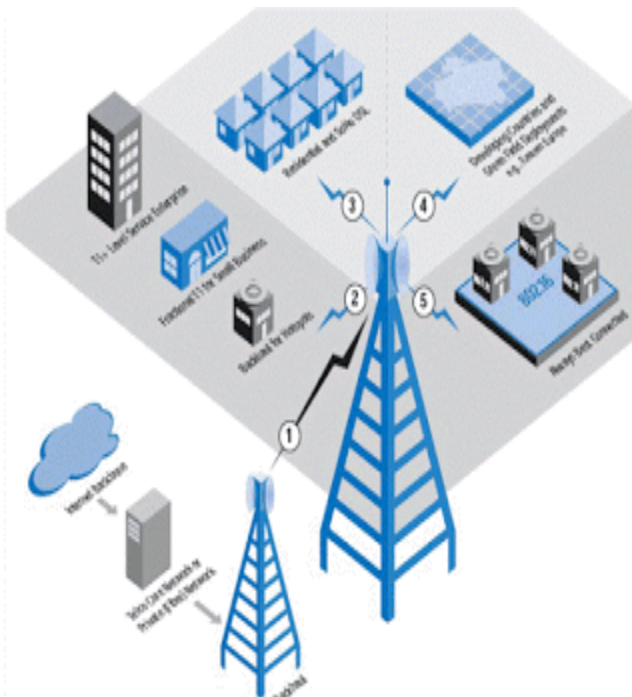
## Wired Network

"wired" is the term that refers to any physical medium consisting of cables. The cables can be copper wire, twisted pair or fiber optic. Wired network is used to carry different forms of electrical signals from one end to the other. Mostly in wired network one internet connection is being taken using T1 line, cable modem or using any other means. This connection is shared among multiple devices using wired network concept.

EXAMPLE #1: LAN (Local Area Network): This network consists of Ethernet cards housed in PCs or laptops. These cards are connected using Ethernet cables. The data flows between these cards. For small wired network router is used to connect few number of desktop or laptop computers. In order to increase the network coverage for more number of systems multiple switches and routers are used.
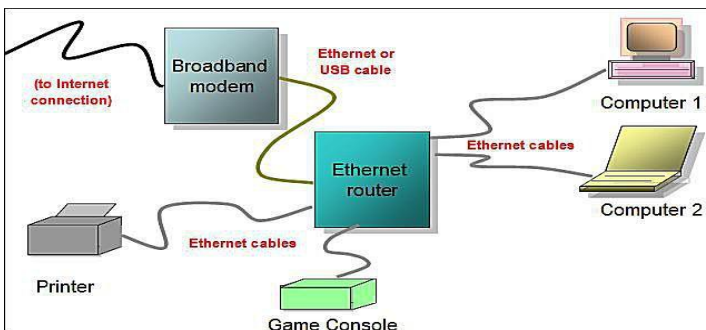
**Wireless Network**

"Wireless" is the term refers to medium made of electromagnetic waves or infrared waves. All the wireless devices will have antenna or sensors. Typical wireless devices include cellular mobile, wireless sensors, TV remote, satellite disc receiver, laptops with WLAN card etc.Wireless network does not use wires for data or voice communication. It uses radio frequency waves as mentioned above. The other examples are fiber optic communication link and broadband ADSL etc.



Wireless Router Network Diagram

EXAMPLES:

1. Outdoor cellular technologies such as GSM, CDMA, WiMAX,

LTE, Satellite etc.

2. Indoor wireless technologies such as Wireless LAN(or WiFi),

Bluetooth, IrDA, Zigbee, Zwave etc.

**BY
SARATHKUMAR, IV Year/IT**
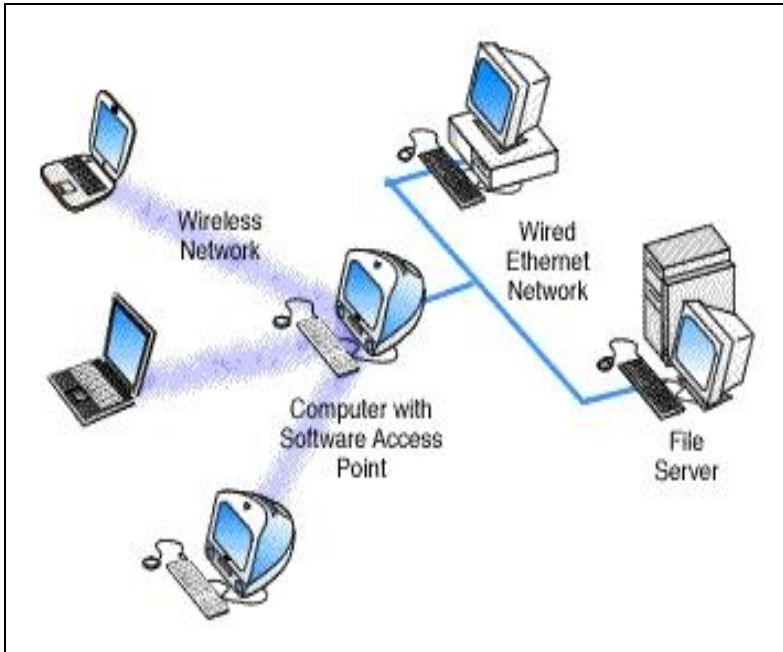
## HOW WIRELESS TECHNOLOGY WORKS

Different types of signals are used in communication between the devices for wireless transmission of data. The following are the different electromagnetic signals that are used depending on their wavelength and frequency.

- Radio Frequency Transmission
- Infrared Transmission
- Microwave Transmission
- Lightwave Transmission

**Radio Frequency Transmission**

Radio frequency is a form of electromagnetic transmission used in wireless communication. RF signals are easily generated, ranging 3kHz to 300GHz. These are used in wireless communication because of their property to penetrate through objects and travel long distances.

Radio communication depends on the wavelength, transmitter power, receiver quality, type, size and height of the antenna.

**Drawbacks**

- These are frequency dependent

- These have the relatively low bandwidth for data transmission.

**Radio Wave Propagation**

Transmit Antenna

Receive Antenna

Transmitter

Transmission Line
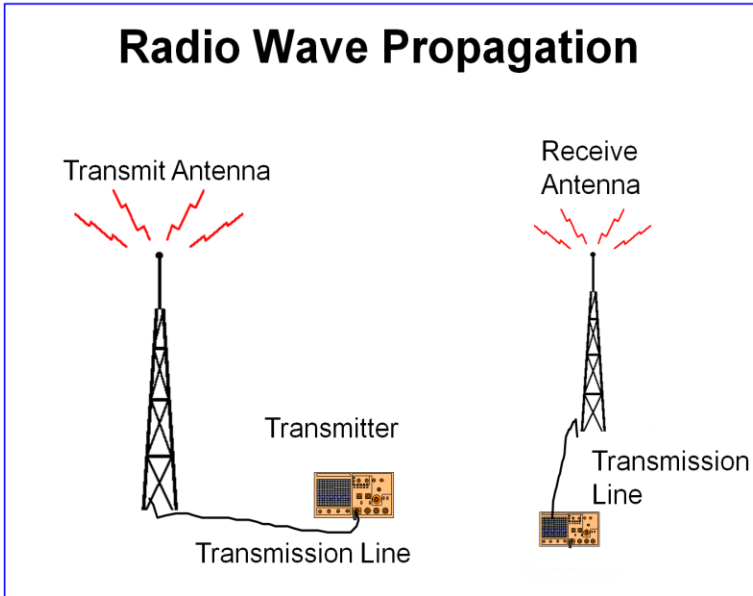
Transmission Line

Infrared Transmission

Infrared radiations are electromagnetic radiations with longer wavelengths than visible light. These are usually used for short-range communications. These signals do not pass through solid objects.

Examples like Television remote control, mobile data sharing.
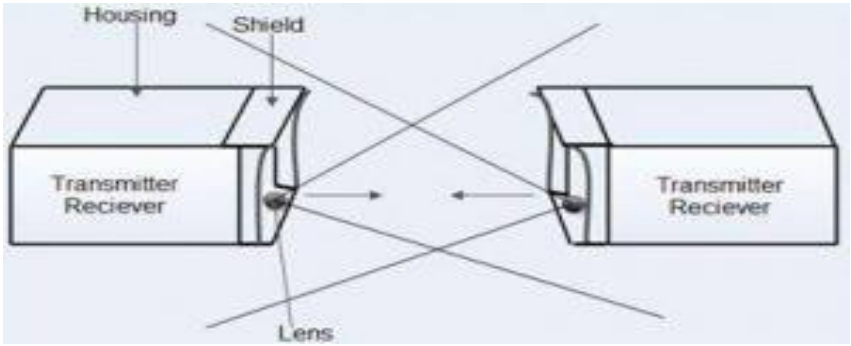
**Infrared Transmission**

**Microwave Transmission**

Microwaves are the form of electromagnetic transmission used in wireless communication systems. The wavelength of microwave ranges from one meter to one millimeter. The frequency varies from 300MHz to 300GHz. These are widely used for long distance communications and are relatively less expensive.



**Microwave Transmission Node**

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## Drawbacks

- The microwave does not pass through buildings.
- Bad weather affects the signal transmission.
- These are frequency dependent.

## Lightwave Transmission

Light is an electromagnetic radiation with a wavelength ranging between infrared radiations and ultraviolet radiations. The wavelength ranges from 430 to 750THz. These are unguided optical signals such as laser and are unidirectional.
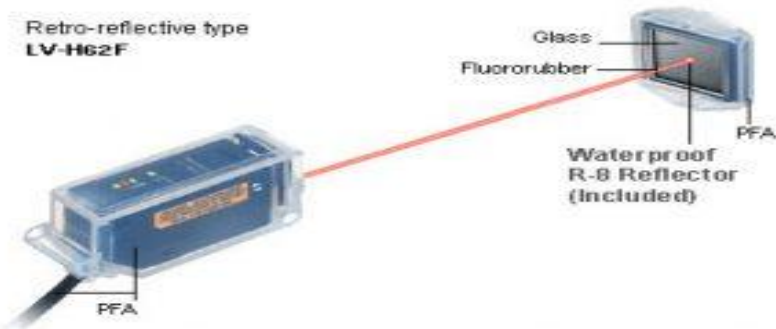


**Lightwave Transmission**

## Drawbacks

- These signals cannot penetrate through rain and fog.
- The laser beam gets easily diverted by air

**BY**

**GIFTSON GEETHA PRIYAN,IV Year/IT**

## WIRELESS TECHNOLOGY EVOLUTION

# Wireless Technology Evolution

- 4.3 billion mobile subscribers
- 1.5 billion 3G mobile broadband subscribers

| Market Impact | 2000 | 2006 | 2009 | 2010 | 2016 |
|---|---|---|---|---|---|
| Peak Rate | 172 kbps | 7 Mbps | 42 Mbps | ~150 Mbps | ~1 Gbps |

ProfEdge
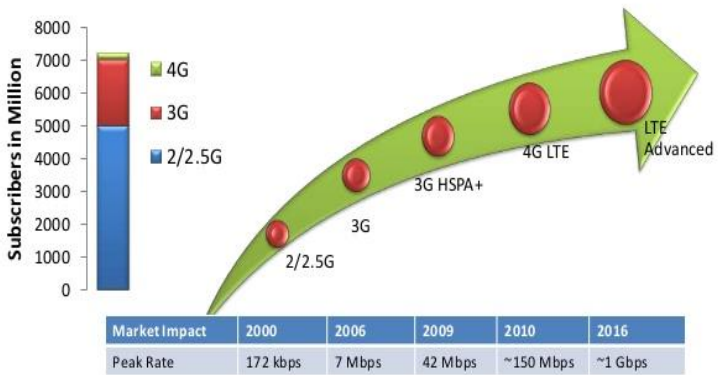
   Listing down and comparing the advantages and disadvantages of 1G, 2G, 3G and even 4G may not be the best approach to really appreciate the value of these technologies. That would be like looking at the advantages and disadvantages of being a kid, a teenager, an adult and then a fully grown person. 1G, 2G, 3G and 4G are the different generations of mobile communications that reflect the evolution that the industry has gone through to bring us to where we take mobile coverage and bandwidth for granted. As you may already

know, "G" in this context stands for generation. 1G networks started the evolution of commercial mobile networks but these networks were only sufficient for voice calling and were not highly secure.

That then led to the digital world where 2G technologies like GSM (and D-AMPS) provided us with high-quality voice and text messaging (SMS). Then 2.5G added data (mobile internet) to the equation. 3G then enhanced the data part even more and we were able to browse the internet in a decent way through our mobile phones. Then HSDPA/HSUPA came in which enhanced our mobile internet speeds even more. And now 4G with LTE provides us some seriously high data rates which are good enough to stream high-quality videos when we are out and about. 5G will make our lives even better with even higher mobile internet speeds and reduced latency (which means a lot quicker to respond than 4G).

**BY**
**ILAKKIYA S III Year/IT**

When wireless is perfectly applied the whole earth will be converted into a huge brain, which in fact it is, all things being particles of a real and rhythmic whole. We shall be able to communicate with one another instantly, irrespective of distance.

Nikola Tesla

## WIRELESS NETWORKING TECHNOLOGIES

## Wi-Fi

The main benefit of using Wi-Fi is lesser usage of wires. This is wireless connection that can merge multiple devices together. Wi-Fi network is particularly useful in cases where it is not possible or even unacceptable. Fox example, it is often used in the halls of conferences and international exhibitions. It is ideal for buildings that re-considered architectural monuments of history, as it excludes the wiring cables.

Another advantage can be pretty easy to create a mesh Wi-Fi. To connect a new device to your network, simply turn on the Wi-Fi and do the simple setting in the software. In the case of wire technologies still need to pull the wire. Therefore, many modern offices are switching to this technology.

**Bluetooth**

Bluetooth does not require a clear line of sight between the synced
devices. This means that the devices need not be facing each other,
and it is also possible to carry out transfers when both the devices are
in separate rooms.

The fact that this technology requires no cables and wires is
something that has made it so popular. With so many devices
engulfing our lives today, the need for clutter-free technology is
becoming more intense.

The maximum range that it offers is 100 meters, but this range is not
the same for all similar connections. It depends on the nature of the
devices and the version that they operate upon.

The processing power and battery power that it requires in order to operate is very low. This makes it an ideal tool for so many electronic devices, as the technology can be implemented pretty much anywhere.

One major advantage is its simplicity of use. Anyone can figure out how to set up a connection and sync two devices with ease. Moreover, the technology is completely free to use and requires no charges to be paid to any service provider.

The chances of other wireless networks interfering with yours are very low. This is because of the low powered wireless signals that the technology adopts, and also because of something known as frequency hopping.

**Infrared**

The greatest advantages of infrared are being able to use your own receiver with public transmitters (like in movie theatres) and getting the best sound reproduction. Because of their superior sound reproduction, they are often used in movies, plays and musical productions. They may not be the best system for profound hearing losses as they lack the acoustic output (loudness) of FM systems. On the other hand, they also present less risk of injury.

**Infrared** systems are secure systems because the signal will not leave the room. Thus, it is the system of choice for jury deliberations and business meetings that need to protect discussions (e.g., around development of new materials or software).

Because light does not transmit through walls, multiple systems can be used within a building. With the exception of high frequency lights and bright sunlight, there are few sources of interference with infrared systems.

**VoIP**

Many people tend to forget VoIP – Voice over IP – is another wireless protocol. In fact, this technology has become so common over the past few years, one would almost forget there once was a world without VoIP solutions. Conducting voice communications and multimedia sessions over the Internet Protocol is an excellent way to stay in touch with friends and family, regardless of where they are in the world at that time.
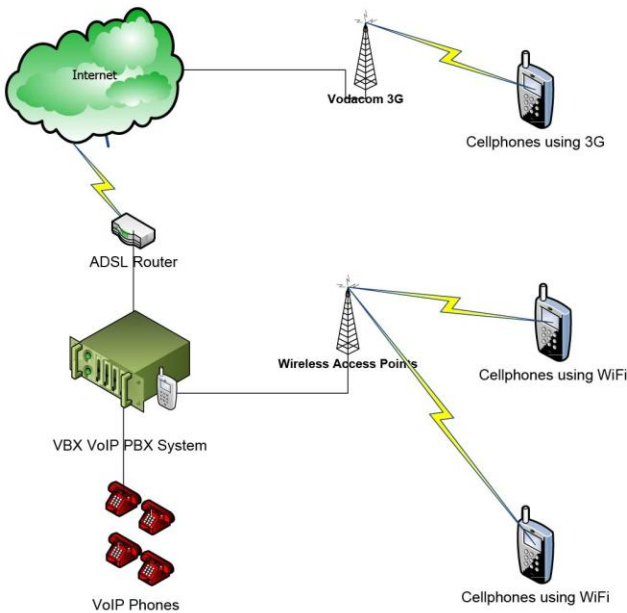
## ZigBee

ZigBee is a wireless communication standard designed to address the unique needs of low-power, low-cost wireless sensor, and control networks. ZigBee can be used almost anywhere, as it is easy to implement and requires little power to operate. Zigbee has been developed looking into the needs of the communication of data with a simple structure like the data from the sensors.



### Apple iBeacon

The name makes it clear that it is an advanced wireless technology, associated with iPhones and iPads. Basically, iBeacon is a division of Bluetooth Smart which is used on retailing services. That means, if

you have it on your Apple smartphone, you can get retail-related information around you within short distances.

From product information to sales and discounts, you will get everything on your phone.



## Cisco Intelligent Proximity

Though this is one of the unusual wireless technologies those are winning the market, it is now highly targeted, and soon, it will be available in beta. Its function is very interesting and is appropriate for corporate use. If you are participating in a high-definition video conferencing with a foreign client, you can connect your Android or iPhone with the device and talk while you walk.

**BY
ELANKANEI , II Year/IT**

## WIRELESS NETWORKING SECURITY PROTOCOLS
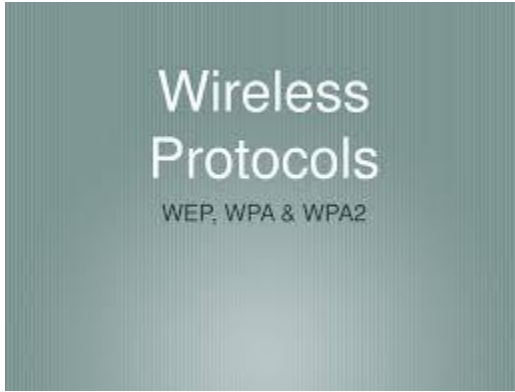


Wireless networks are inherently insecure. In the early days of wireless networking, manufacturers tried to make it as easy as possible for end users. The out-of-the-box configuration for most wireless networking equipment provided easy (but insecure) access to a wireless network.

Although many of these issues have since been addressed, wireless networks are generally not as secure as wired networks. Wired networks, at their most basic level, send data between two points, A and B, which are connected by a network cable. Wireless networks, on the other hand, broadcast data in every direction to every device that happens to be listening, within a limited range.

Descriptions of the WEP, WPA, and WPA2 wireless security protocols:

**Wired Equivalent Privacy (WEP):**

The original encryption protocol developed for wireless networks. As its name implies, WEP was designed to provide the same level of security as wired networks. However, WEP has many well-known security flaws, is difficult to configure, and is easily broken.

**Wi-Fi Protected Access (WPA):**

Introduced as an interim security enhancement over WEP while the 802.11i wireless security standard was being developed. Most current WPA implementations use a preshared key (PSK), commonly referred to as WPA Personal, and the Temporal Key Integrity Protocol (TKIP, pronounced tee-kip) for encryption. WPA Enterprise uses an authentication server to generate keys or certificates.

**Wi-Fi Protected Access version 2 (WPA2):**

Based on the 802.11i wireless security standard, which was finalized in 2004. The most significant enhancement to WPA2 over WPA is the use of the Advanced Encryption Standard (AES) for encryption. The security provided by AES is sufficient (and approved) for use by the U.S. government to encrypt information classified as top secret.

**BY**

**HEMAPRIYA,IV IT**

## WIRELESS TECHNOLOGIES IN REAL WORLD

**Wireless network, a world of magic**

Wireless network a magic word which can change your status very promptly that can get access to internet very speedily, and make possible conversation more and more than two users such as text messages, downloading and uploading of pictures, hear online radio, music and video downloading with a very high speed. Wireless network offering hotspot therefore now the usage of internet at airport, business companies is not an issue now.

**Uses of Wireless Technologies in Medical Science**

With the development of science the profession of medicine becomes more and more complex and sophisticated. Therefore at this time we need a technology which can serve and solve all big complication in hurry for the benefit of patient and progress of science and for all above purposes and the solutions are Bluetooth, wireless network are the best application to solve all problems. The main applications of medical science are remote monitoring of patient, biometric data of wireless network, and dispensers applications.

Now the checking of certain body functions, print reports, and quick result of test all things possible only with wireless technology. Now

doesn't matter where you live because if you are suffered with a big illness then you can contact medical specialist doctors living other country discuss your illness and cure it. All type of measuring equipment's, electrocardiograms and others which are used to get complete detail of body functional are allowing the doctor to measure and get convenient report via wireless technologies. Same as in dispenser's applications any person delivers medicine if got any problem or confusion in patient then he will immediately contact to related doctor. Then can get advice and medicine dosage and could be attuned in actual time depend on the response of patient's and for all these purposes biometric measurements can be used. Examples of monitoring are several such as checking of heart beat, blood pressure, checking blood flow rate, dissolve of oxygen, hovering residue, checking of acidity for various purpose and surety or presence of living organisms etc.

**Uses of Wireless Technologies while Traveling**

Everyone is in hurry and wants to go at their destination on time or before the time. Every agency related to travel desire to offer more facility and better opportunities to their customers to make their travel business more profitable. Wireless technology has ability to fulfill all above requirements as like airline.

Air line industry included in such a large business industry or a journey without at ticket. Nowadays you can travel from one location to another location without any ticket or by electronic ticket. Check-in kiosks are a self service used at airport. Paper boarding is still issue in electronic tickets and Check-in kiosks refer to use credit card



recurrently. Credit card used to identify the user. Through wireless communication a traveler may check his personal identity. A travel gets rid of them should be insert a card at terminal. Bluetooth also facilitates to store boarding card. Wireless technology also facilitates the airport with Wi-Fi hotspot through which any user exist in specified location of hotspot can get access to internet.

## Uses of Wireless Technologies in Hotels

The uses of wireless technology in Hotels have been established in Hotel industry as a business show. The usage of wireless network in hotel is various such as via wireless network checking of hotel automatically is possible perhaps with the help of kiosk. Wireless

network guest list may be retrieved and receive messages to provide room services. Wireless network is also helpful for many other hotel services as telephone, fax machine, printer, and internet etc. Wireless network is also offering the opportunity to use portable devices. Opening and closing of doors are also an illustration of wireless network.



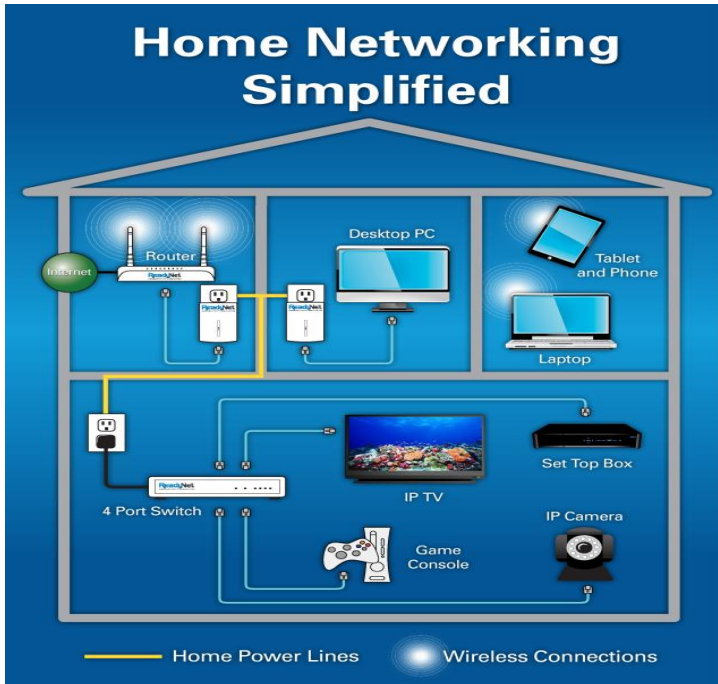**Uses of Wireless Technologies in Business**

Nowadays each and every type of business desire to get more profit from their business and wireless network helpful to do this. Because now there is no matter business is small or big because every one want to know about business what's technologies used business company to serve their customer and because of this the first priority of each business is wireless network.

**Uses of Wireless Technologies in Home Networking**

The uses of wireless technology in home boost the user for their ease. IT provides much security rather than a wired network. There are no wires, cables, for irritation. Just configure your system and connect to internet. User can also convert it's mobile into cordless phone. Wireless network is allowing you to use all devices that are used at office. A user may connect PDA's with the wireless system to have fun and enjoy online radio, games, music, gossip, new etc.

**Uses of Wireless Technologies in Mobile communication**

Wireless network is most incorporated in mobile devices. Wireless network enable mobile technology to create text messaging, use built in cameras and color display. Through wireless network intelligence, multimedia approach, interconnection, transfers of data etc everything is in your range. The wireless technology offer new prospect in services such as competence, considerably which enhanced data rates and latency presentation.

**Uses of Wireless Technologies in Voice communication**

Wireless technology facilitates the user with voice communication method because before wireless technology user may conversant only by radio. But now two or more than user conversant each other in ease manners .They can talk send and receive messages via internet access.

**Uses of Wireless Technologies in Remote Controls**

The other technology offering by wireless network is remote control. There are many usage of remote control such as doorbell at home, TV, car remote, garage opener, heat pump,

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CD and DVD remote, games controller etc.

**Uses of Wireless Technologies in Entertainment**

Are you feeling bored and want something which entertain you then just choose wireless technology and get fun via games, home theatre, ear buds, headphone, and speaker.



**Uses of Wireless Technologies in Navigation Systems**

Wireless network is very popular among user because Navigation and Location facility which enable you to take radio signals. You can check the position of satellite. Through GPS can measure movement in bridge.

**Uses Wireless Technologies in Quality Control Systems**

Wireless network emphasized on all fields of human. A supplier care, skill and integrity are the basic of its company. Now by means of wireless you can track progress of your product and make your business more profitable. Shipping agent, producer, supplier all used wireless technology to maintain goods temperature.

**Applications of Wireless Technology**

Wireless communication has wide applications.

- Space
- Military
- Telecommunications
- Wireless Power Transmission
- IoT
- Radar communication
- Artificial intelligence
- Fiber optics

**Wireless Technologies in Hospitals:**

**Clinical Communication** - Better communication means better care. When clinicians communicate easily, they can diagnose and treat patients more quickly. Clinicians get lab results as soon as they're ready. They can easily access vast medical databases from their smartphones, tablets and other mobile devices. Ultimately, patient outcomes improve.



Video can dramatically improve the quality of conversations and patient communication. Mobile Videoconferencing can help solve problems that arise from missing "Visual cues". Visual cues get lost when interpretive services for hearing-impaired and non-English-speaking patients are provided soley over a telephone. **Guest Access** - Guest Access is a secure way to share your hospital wireless network with visitors, patients, contractors and other guests. Idenity-based security seperates internal and guest traffic to provide iron-clad security for the hosptial's LAN and servers.

**Location and Tracking** - When healthcare institutions know where their staff, patients and assets are located at any moment, they can improve workflow, reduce costs, and increase patient and staff safety. Wi-Fi Location services improve response time and reduce loss of high-value assets by providing visibility into their precise location.

**Medical Device Connectivity** - As wireless LANS (WLANs) are quickly becoming the connection of choice for patient monitors, electrocardiograms (EKGs), portable CAT scans and other medical devices, hospital wireless networks need to improve information flow and the quality of care.

**Inventory Management** - One of the most effective ways to increase profits is to control or reduce costs. For a hospital, real-time inventory management plays a strong role in cost control. With a clear view into the supply chain, hospitals can control the movement of their assets and maximize the utility of stock locations, such as available or used prescription drug counts.

**BY**

**GOWTHAM T IV Year/IT**

# FUTURE ADVANCEMENTS IN WIRELESS TECHNOLOGIES

Wireless technology has become popular because of ease of its use and low cost. Less maintenance and cost are the basic reasons of advancement in this technology which started with the evolution of telephone and radios several years back and is still continued to the era of smartphones and satellite communication systems. Some of the future advancements in wireless technology are given in this article for your reference.

**Google Glass:**

Google is going to invent goggle Glasses which will provide smartphone to your eyes. A camera and a GPS system connected to your Google Glass will link you to a relevant user on their location on the basis of information received. Though it is not new to use technology wherever you go but this advancement in wireless technology will keep you informed and linked with your base at every step where you go.

**Wireless Charging**:

Wireless charging of the gadgets will soon bring revolution in the wireless technology market. You will be allowed to charge your smartphones and ultrabooks without using any wire. The prototype displayed this year can be used as wireless charging stations by attaching them into cars, handbags, countertops or desks. The plans of integrating wireless charging technique into the ultrabooks have been confirmed by Intel. This advancement in wireless technology will not only save the time and energy but also money spent in replacing chords due to damage or loss.

**Worldwide Interoperability for Microwave Access (WiMAX):**

This next generation improvement in wireless technology will improve the existing wireless networking system without changing your present hardware. Though the procedure is still under process but it will surely make a drastic change in future wireless communication technology. The biggest advantage of this technological advancement in the field of wireless is that it will enable you to cover wider area up to say 50 kilometres.

Thus, the voyage of advancement in wireless technology is still going on in the service of mankind.

## Wireless project ideas for students

- Vehicle Tracking System
- Accident Identification System
- Wireless Camera Position System
- Remote Home Security System
- Wireless Voting Machine
- Wireless Security System
- Video Signal Transmitter
- Audio Signal Transmitter
- Remote Controlled Dish Antenna
- Wireless Home Appliances Controller
- Centralized Monitoring System for Taxies
- Wireless Audio Communication System
- Wireless Traffic Light Controller
- Wireless Motor Monitoring System
- Wireless Transformer Monitoring System
- Remote Industrial Security System
- Intelligent Wireless Controller for Oil Wells
- Wireless Attendance Recorder
- Wireless Process Controller
- File Sharing Using Bluetooth
- Simple Radar Communication System

- Wireless Hospital Management System

*Advantages of Wireless Communication*

- Communication has enhanced to convey the information quickly to the consumers.
- Working professionals can work and access Internet anywhere and anytime without carrying cables or wires wherever they go. This also helps to complete the work anywhere on time and improves the productivity.
- Doctors, workers and other professionals working in remote areas can be in touch with medical centers through wireless communication.
- Urgent situation can be alerted through wireless communication. The affected regions can be provided help and support with the help of these alerts through wireless communication.
- Wireless networks are cheaper to install and maintain.

*Disadvantages of Wireless Communication*

- Security Wireless - transmission is more vulnerable to attack by unauthorized users, so particular attention has to be paid to security. See our guide on securing your wireless systems.

- Installation problems - You may suffer interference if others in the same building also use wireless technology or where other sources of radio signals are present. This could lead to poor communication or, in extreme cases, loss of wireless communication altogether.

- Coverage - In some buildings getting consistent coverage can be difficult, leading to 'black spots' where no signal is available. For example, in structures built using steel reinforcing materials, you may find it difficult to pick up the radio frequencies used.

- Transmission speeds - Wireless transmission can be slower and less efficient than 'wired' networks. In larger wireless

- Networks the 'backbone' network will usually be wired rather than wireless.

BY

**ROSHAN, III Year/IT**

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1864: James Clerk Maxwell proved the existence of electromagnetic waves.
1920: First commercial radio broadcast
1930: BBC began television experiments.
1935: First telephone call
1974: FCC allocates 40 MHz for cellular telephony.
1982: European GSM and Inmarsat established.
1984: AMPS cellular system

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## APPLICATIONS OF WSN

Applications of Sensor Networks

- Using in military
    - Battlefield surveillance and monitoring, guidance systems of intelligent missiles, detection of attack by weapons of mass destruction such as chemical, biological, or nuclear
    - Using in nature
    - Forest fire, flood detection, habitat exploration of animals
    - Using in health
    - Monitor the patient's heart rate or blood pressure, and sent regularly to alert the concerned doctor, provide patients a greater freedom of movement
- Using in home (smart home)
    - Sensor node can built into appliances at home, such as ovens, refrigerators, and vacuum cleaners, which enable them to interact with each other and be remote-controlled
    - Using in office building
    - Airflow and temperature of different parts of the building can be automatically controlled

- Improve their inventory control system by installing sensors on the products to track their movement

## Comparison with Ad Hoc Wireless Networks

- Different from Ad Hoc wireless networks
    - The number of nodes in sensor network can be several orders of magnitude large than the number of nodes in an ad hoc network.
    - Sensor nodes are more easy to failure and energy drain, and their battery sources are usually not replaceable or rechargeable.
    - Sensor nodes may not have unique global identifiers (ID), so unique addressing is not always feasible in sensor networks.
    - Sensor networks are data-centric, the queries in sensor networks are addressed to nodes which have data satisfying some conditions. Ad Hoc networks are address-centric, with queries addressed to particular nodes specified by their unique address.
    - Data fusion/aggregation: the sensor nodes aggregate the local information before relaying. The goals are reduce bandwidth consumption, media access delay, and power consumption for communication.
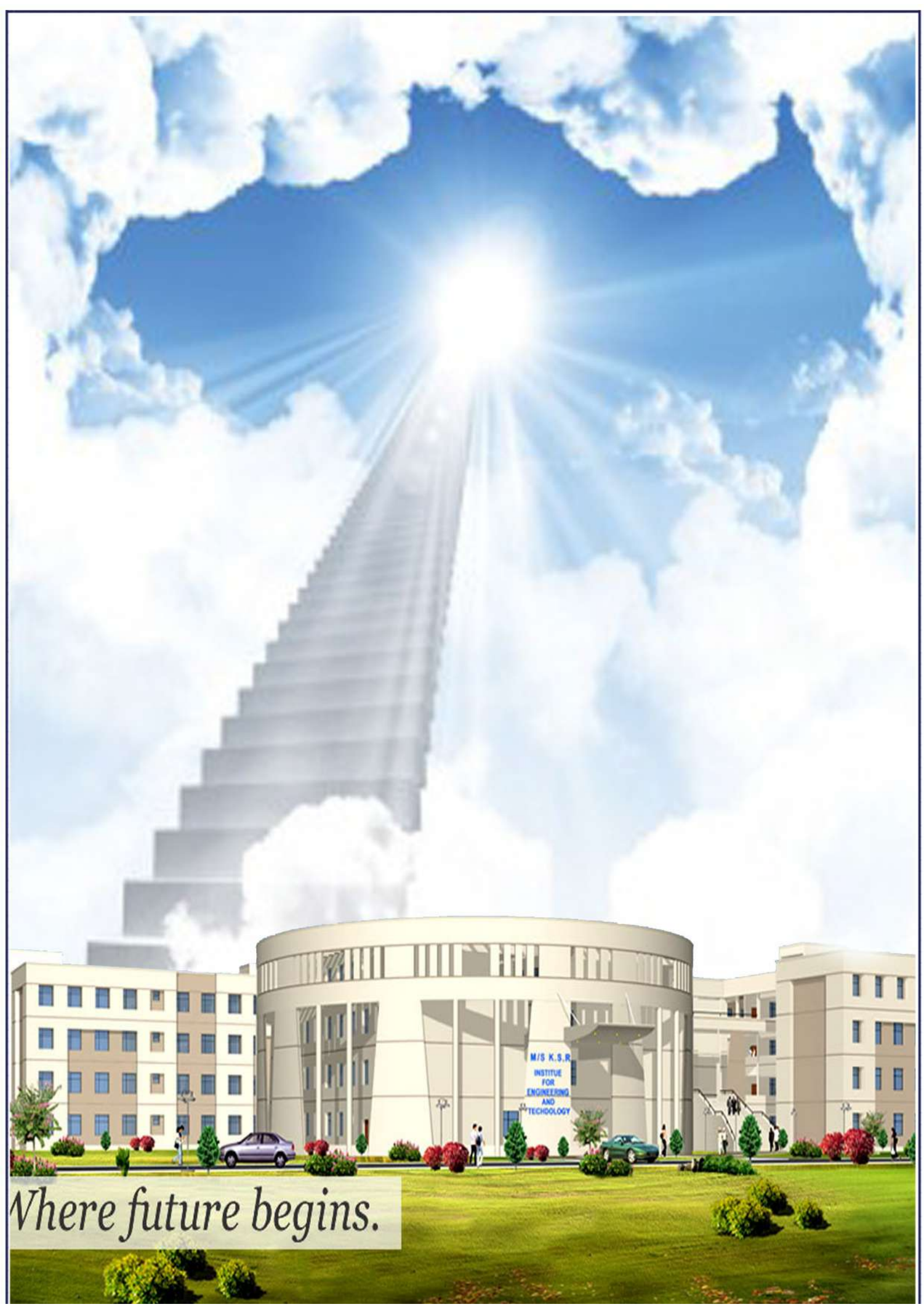
BY

**AJITH KUMAR, II Year/IT**

## Program Outcomes (POs)

| | |
|---|---|
| **PO1** | **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the IT enabled solution of complex engineering problems. |
| **PO2** | **Problem Analysis:** Identify, analyze and provide solutions to the problems reaching substantiated IT enabled conclusions. |
| **PO3** | **Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the desired needs within realistic constraints. |
| **PO4** | **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. |
| **PO5** | **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. |
| **PO6** | **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. |
| **PO7** | **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. |
| **PO8** | **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice. |
| **PO9** | **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. |
| **PO10** | **Communication:** Communicate effectively on engineering activities with the engineering community and with society. |
| **PO11** | **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. |
| **PO12** | **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(PSOs)

| | | |
|---|---|---|
| **PSO1** | **Programming Skill** | Work as Software Engineers for providing solutions to real world problems using programming languages and open source software. |
| **PSO2** | **Web Designing Skill** | Ability to use the web designing skill to establish new solutions for the societal needs. |

Where future begins.