



**SAHYADRI**  
COLLEGE OF ENGINEERING & MANAGEMENT

# ELECTRONICA



**ASSOCIATION OF E&C  
ENGINEERING STUDENTS**

**ELECTRONICS & COMMUNICATION  
TECHNICAL MAGAZINE**

**2018-19**

## **VISION:**

To establish the department as a center of excellence in creating globally competitive, socially responsible engineers to excel in the field of Electronics and Communication by transforming future challenges to sustainable opportunities.

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## **MISSION:**

- Inculcating a distinctive teaching learning process to provide extensive knowledge of principles to provide solutions to challenges in the relevant domain.
  - Nurturing the growth of every individual through inventive, dynamic and conducive learning environment using modern education techniques and industry oriented pedagogy.
  - Imparting leadership qualities with ethical values among students to cater societal and environmental needs.
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## **PROGRAM EDUCATIONAL OBJECTIVES:**

- Applying the concepts of mathematics, science and engineering for solving problems relevant to environment and society.
  - Inculcating lifelong learning skills to adapt to dynamic global economics and technological trends.
  - Inducing ethics, communication skills and leadership qualities with the application of innovative tools and techniques for the betterment of mankind.
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## **PROGRAM SPECIFIC OUTCOME:**

- Exhibit competency in Embedded system and VLSI Design.
  - Capability to comprehend the technological advancement in Signal processing and Communication.
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# Editorial Board



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# VIRTUAL REALITY

## **Introduction:**

Virtual Reality (VR) is simulated experience that can be similar to or completely different from the real world. Currently standard VR systems use either VR headsets or multi projected environments to generate realistic Images , sounds and other sensations that simulate a user's physical presence in a virtual environment. Applications of VR can include entertainment and educational purpose. A person using VR equipment is able to look around the artificial world, move around in it, and interact with virtual features or items. Other, distinct types of VR style technology include augmented reality and mixed reality. The term "virtual" has been used in the computer sense of "not physically existing but made to appear by software".

## **Software used in VR:**

Virtual Reality Modeling Language (VRML), first introduced in 1994, was introduced for the development of "Virtual World" without dependency on headsets. Web-VR is an experimental Java script Application Programming Interface (API) that provides support for various VR devices, such as the HTC Vive, Oculus Rift, Google Cardboard or OSVR, in a web browser.



## Hardware used in VR:

Modern VR headset displays are based on technology developed for smart phones including: gyroscopes and motion sensors for tracking head, hand and body position; screens for stereoscopic displays and small, lightweight and fast computer processor.

## Methods of VR:

- Simulation-based VR: Driving Simulator is an example for this type. It gives a driver onboard experience of actual driving of an actual driver by predicting vehicle motion caused by driver input and feeding back corresponding visual, motion and audio cues to the driver.
- Projector-based VR: in projector-based VR, modeling of the real environment places a vital role in various VR applications, such as robot navigation, construction modeling and airplane simulation.
- Head-mounted display (HMD): A HMD more fully immerses the user in a virtual world. A VR headset ideally includes two small high resolution OLED or LCD monitors which provide separate images for each eye for stereoscopic graphics rendering a 3D virtual world, a binaural audio system, rational and positional real time head tracking for six degrees of movements.
- Avatar-image based VR (AIBVR): With AIBVR, people can join the virtual environment in the form of real video as well as an avatar. One can participate in 3D distributed virtual environment as form as either a conventional avatar or a real video.
- Desktop-base VR: Desktop-based VR involves displaying a 3D virtual world on a regular desktop display without use of any specialized positional tracking equipment.



## Types of VR:

**Augmented Reality (AR):** AR is a type of VR technology that blends what the user sees in their real surrounding with digital contents generated by computer software. The additional software generated images with the virtual sense typically enhance how the real surrounding looks in some way. AR systems layer virtual information over a camera live feed into headsets or smart glasses or through a mobile device giving the user the ability to view 3D images. Mixed Reality (MR): MR is a merging of the real world and virtual world to produce new environments and visualisations where physical and digital objects co-exist and interact in real time.

## Applications of VR:

- VR is most commonly used in entertainment applications such as video games and 3D cinemas. Consumer VR headsets were first released by video game companies in the early-mid 1990.
- 3D cinemas have been used for sporting events, fine art, music videos and short films.
- In social science and psychology, virtual reality offers a cost-effective tool to study and replicate interactions in controlled environment.

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# IMAGINING A LIFE WITHOUT ELECTRONICS AND COMMUNICATION ENGINEERS

Can we imagine our daily life without the electronic devices like mobile phone, laptop television, tablets, digital watch, internet banking, ATM cards, WI-FI, internet connection, microwave oven and much more.

**NO WE CANNOT!!!!**

All this is possible due to E&C Engineers.

Imagine that one fine day where you decided to be an electronics and communication engineer. Your interest towards innovation made you attract towards this field making your career. The demand for new electronics products in the market and the speedy research in this field makes ECE a better choice for once carrier in engineering.



ECE has been helped in various different fields as mentioned below:

**INFANT MORTALITY RATE:** Care monitor device was developed to reduce sudden infant death syndrome.

**DISASTER RELIEF:** These are some of the most inspiring inventions created to help survivors endure such calamity like flat-pack refugee shelters, radiation – detecting watch, solar powered, inflatable led light etc.



**SPACE COMMUNICATION:** Our activities in space is also increasing to be advanced in space communication, our communication system has to be very much advanced which is only possible through potential E&C engineers. This is also a very interesting field as many students have fantasies to do something in the field of space.

**HUMANOID ROBOTS:** In future humanoid robots are replacing persons work and making future much easier and simpler. Sooner all these gadgets are going to be a part of our lives. The best thing with ECE is that Robotic engineering is progressing with the introduction of butler bots which help in reducing human work remarkably.

All this makes ECE an interesting field. There is ample growth in the field of electronics and communication engineering, schemes like start up India fund the young professionals looking forward to be an entrepreneur in the digital world, by 2020 it will grow as one of the booming sectors in India.

In the next few decades there will be many revolutions in field of ECE as transparent smartphones is expected to be launched. On the other hand advancement in artificial intelligence has been taking the communication to next level where you can interact with the device and they respond your way.

For all this a student must have strong technical knowledge, great experience at a practical level, very good industrial exposure and perseverance. By all these the world will grow in leaps and bounds, there is no denying in this fact.

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# **AUTONOMOUS UNMANNED AERIAL VEHICLE FOR EMERGENCY BLOOD DELIVERY**

Increase in population has given rise to many problems, one such problem is lack of availability of blood in an emergency to the victim. It is a merely impossible to deliver blood on time due to heavy conjunction in traffic, lack of storage facilities and bad roads.

There are only 2903 blood banks across India. The count of blood banks is less than 3 for 10,00,000 people. So there is a need for faster delivery methods of blood. The usage of autonomous drones for this purpose is very efficient. The term Autonomous flight is used when pilots command is not used to fly an aircraft. Usually this mode is helpful for long flights. Autonomous flights can be achieved by having a flight controller like Pixhawk, APM on board along with these listed components given below.

**Hybrid VTOL UAV:** Hybrid UAVs combine vertical take-off and landing capability with the forward propulsion of a fixed wing UAV. In many hybrid VTOL UAVs, motors are incorporated into the aircraft's wings, which then transition for forward flight. These UAVs can be easily operated in cities as they do not require any runway for take-off and landing.

**Mission planner:** Mission Planner is a ground control station and calibration software for Plane, Copter and Rover. Using mission planner we can give the way points to the aircraft and also monitor the status of aircraft using this ground station.

**Pixhawk 2.1:** The Pixhawk 2.1 is a flexible autopilot intended primarily for manufacturers of commercial systems. It has 32 bit ARM cortex M4 processor with 14 PWM / Servo outputs and UART, I2C, CAN interface.

**GPS:** The Global Positioning System (GPS) is a network of about 30 satellites orbiting the Earth at an altitude of 20,000 km. The GPS module connects to the nearby satellites. Precision of the GPS increases with the number of satellites connected. And a minimum of 5 satellites has to be connected for an autonomous flight.

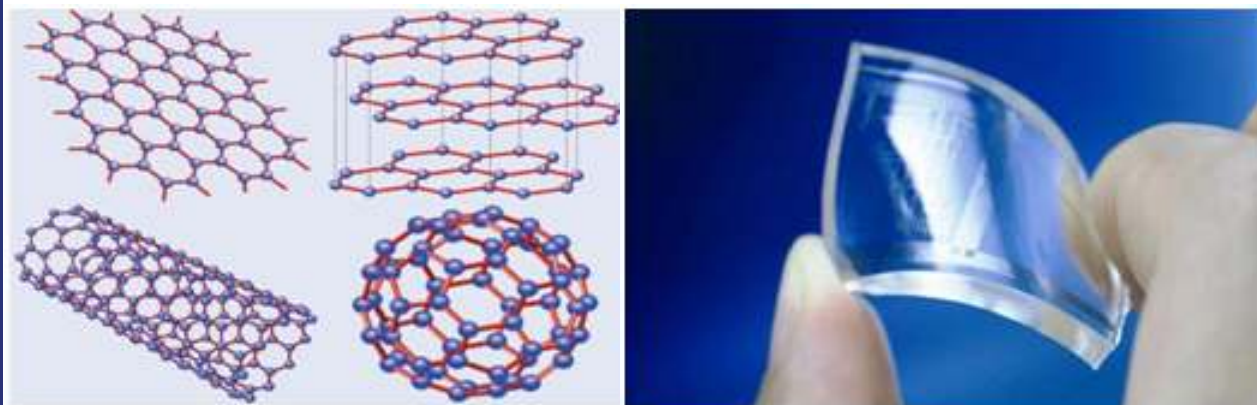
**Telemetry:** Telemetry is a device that gives all the information about the orientation and any errors in the controller. It is a must for any autonomous flight. We can track the position of the aircraft by using a telemetry system. A telemetry module is connected to both the ground station and the aircraft and both the modules can act as transmitter and receiver at the same time.

Fabricating an UAV with these components can be used to comfortably deliver up to 1 litre of blood package and travel a distance of 50km in less than 30 minutes and can become a life saver for a person in emergency.

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## **GRAPHENE - THE FUTURE ?**

With the rapid advancement in the field of electronics, size, speed and flexibility have become the most important aspects. With the existing technology, we have to compromise with any one of these aspects. The only way to not compromise with these three aspects is by using graphene. Graphene is an allotrope of carbon in the form of a single layer of atom in 2-Dimensional Hexagonal lattice in which one atom forms each vertex. Graphene is so small that it is considered the world's first 2-D crystal. It was discovered by Russian born scientists Andre Geim and Kostya Novoselov in 2004 and they won the Nobel Prize for their discovery in 2010. Graphene has very high conduction capability because of its electron mobility. The mobility of electrons is 100 times faster than silicon and its heat conduction is also two times better than diamond. Graphene possesses electrical conductivity about 13 times better than copper. Graphene is harder than diamond and also more elastic than rubber. It is one of the strongest known materials if not the strongest material and also it is tougher than steel and yet lighter than aluminum.



Graphene has the potential to create the electronics materials which are now considered as science fiction. Graphene might find its place in almost all engineering fields. Because of its conductivity it can be used as superconducting material, solar cells, transparent conducting electrode. In biomedical application graphene can be used for improved drug delivery and it can also be used in cancer treatment. It can be used in flexible displays, efficient solar panels, bulletproof vest as it can absorb twice as much impact as Kevlar which is normally used in bullet proof vests. Coming to aerospace industry, graphene can be used in space propulsion due to its lightweight and strong interaction with light. One day it might find its place in supercomputer. The only problem with graphene is that, it is not easy to produce in large quantities at a decent quality and it costs about 100 dollars to 200 dollars per gram.

All these things can be possible only if we can produce it in bulk or is it all just hype for the material!

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## **ELECTRIC VEHICLE**

World is too big for an individual to change it on their own but each one of us can change what we can; Our environment, our space, our people then we can change the world. There are several ways to change the world one of them is by switching to Electric Vehicles (EV).

Do Electric Vehicles really help the environment? yes it does. Because regular cars run on gasoline and pumps CO<sub>2</sub> directly into the atmosphere where as EV's run on electricity they don't burn gasoline at all. So, no gas, no CO<sub>2</sub>.

The main reason why everyone must shift towards EV's is because of the increased versatility. EV's use coal to power it. And also, it can use nuclear, or waste, or wind, or solar, or any other method of producing electricity. With gas cars, you just have gas. The switch to electric cars gives us the option to switch to better ways of producing electricity, rather than being stuck with what we got.



Recently to tackle air pollution the Delhi Cabinet has approved a policy on EV's. And the Indian government is also supporting switch to EV's by announcing 1.5lakh income tax deduction on interest paid on loans for the purchase of electric vehicles. There are number of great benefits to EV's, these are cheaper to

*"Scientists have become the bearers of the torch of discovery in our quest for knowledge."  
-Stephen Hawking*



run, cheaper to maintain, health benefits, and also reduces the petroleum import bill.

Norway is the world leader in the adoption of electric cars and other nations like France and UK announcing the plan to ban the sales of gas and diesel cars by 2040.

The EV's are actually nothing new, they started in 1832 well before the first gasoline vehicles. In fact, the first EV's were faster than 100km/hr was in 1899 called 'JAMAIS CONTENTE'. People were apparently satisfied with electric cars by 1910 they were almost twice as common on American roads as internal combustion engines. But then came Model T which at \$650, was significantly cheaper than the electric car's, and then these gas stations popped up all over the country.

There are many types of EV'S

- i) Plug in EV's these are any vehicles that can be recharged from an external source of electricity.
- ii) Hybrid EV's these are the type of hybrid vehicles that combines conventional combustion engine system with electric propulsion system
- iii) Railborne EVs The fixed nature of a rail line makes it relatively easy to power EVs through permanent overhead lines or electrified third rails, eliminating the need for heavy onboard batteries.
- iv) Space rover vehicles :- Related to space exploration, like Manned and unmanned vehicles have been used to explore the Moon and other planets
- v) Airborne EV's:- related to aircrafts, Currently flying electric aircraft include manned and unmanned aerial vehicles.
- vi) Seaborne EV's: - Electric motors can and have also been used in sailboats instead of traditional diesel engines.
- vii) Electrically powered spacecraft:- The power sources used for spacecraft are batteries, solar panels and nuclear power.

Electric motors don't require oxygen, unlike internal combustion engines; this is useful for submarines and for space rovers.

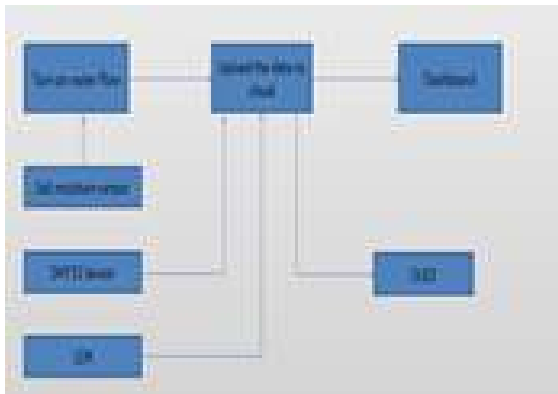
Recently Tesla has revealed its new model named Tesla Cybertruck. This is an all-electric battery-powered light commercial vehicle, with range estimates of 250–500 miles (400–800 km) and an estimated 0–60 mph time of 2. Major auto companies have invested heavily in this technology. Tesla has plans to build 1 million EVs by 2020.

EVs will soon become a reality for many drivers, auto companies and transport sector companies, and the impact of EVs on the environment will help create a greener future.

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## SMART POT

Smart Pot is the one of the methods to grow a plant effectively. Each and every thing related to grow a plant that is temperature, moisture, sunlight everything is monitored by Smart Pot. So, it will inform the owner about his/her plant. And also, Smart Pot saves water by turning off the water supply when plant is having enough amount of water. Two main effective things in this project is, it is concerned to save water and plant, which are very precious things on the earth. This project is modern way of growing plant. Because it includes technology like IoT and electronics things to monitor plants status. So, this is best way of growing plant effectively. It is our duty to protect the plant. If we allow to destroy our natural resources like this then it will be dangerous for all human beings. Because without oxygen we can't even imagine our life. Trees and plants are the source of oxygen. So, we have to think about saving greenery on the earth. Our innovation should not be harmful towards natural resources.



- The smart pot which will nourishes the plant itself without human effort.
- The components which are used to make this smart pot are esp8266, Oled, DTH11 sensor, Soil moisture sensor, servo motor.

*"The Web as I envisaged it, we have not seen it yet. The future is still so much bigger than the past."* -Tim Berners-Lee

- Soil moisture sensor gives the amount of water content in the soil and displays the reading on OLED.
- If water supplied is less, then servo motor runs and supplies the water.
- DHT11 sensor senses the humidity & temperature around the plant & displays that on dashboard.
- LDR measures the amount of sunlight fallen on the plant and displays that on dashboard.

**“Take care of the plants, they will take care of you”**

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## **HIGH-K DIELECTRIC MATERIALS**

The microelectronics revolution of the past six decades has been intimately connected with advances in computer aided design, material science and fabrication technology. Over the years, complexity has increased from single transistor to integrated circuits, to large scale integration to very large scale integration where entire subsystems are placed on a single chip. Moore's law is the empirical observation that component density and performance of integrated circuits doubles every year, which was later revised to doubling every two years. Guided by the scaling rules set by Dennard in 1974, smart optimization, timely introduction of new processing techniques, device structures and materials, Moore's law has continued unabated for the last 40 years and is likely to continue in the future. The present MOSFET based VLSI technology is working on the principle of small dimensions with high integration".

In recent years, the ever increasing demand for higher speed, low power dissipation and more function on a chip, has led to relentless scaling of MOSFETs from sub microns to nanometer regime. For this historical trend to continue existing materials and technologies are approaching their physical limits and several technological challenges need to be overcome. In addition to the critical dimension control, oxide thickness, shallow junction formation, isolation and interconnect technologies need immediate attention. When the channel length is of the same order of magnitude as the depletion layer widths of the drain and the source, a MOSFET is said to be short. This reduction in channel length has resulted in different physical effects such as enhanced leakage current, drain induced barrier lowering (DIBL), short channel effects, sub threshold conduction and so on. The thickness of silicon

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*"Technology will never replace great teachers but technology in the hands of great teachers is transformational." – George Couras*

dioxide ( $\text{SiO}_2$ ) gate dielectric is reduced as transistors are scaled down, in order to increase the drive current, reduce threshold voltage and increase device performance. Due to thinning of the standard  $\text{SiO}_2$  gate dielectric, tunneling induced leakage current and dielectric breakdown will lead to unacceptable device performance resulting in increased power dissipation thus leading to its replacement. High-k dielectric materials could be a solution to overcome the scaling limit of  $\text{SiO}_2$ .

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## **WIRELESS**

# **COMMUNICATION SYSTEM**

Communication is transfer of message or information from one point to another. Correspondence Systems can be Wired or Wireless and the medium utilized for this can be Guided or Unguided. In Wired Communication, the medium is a physical path like Co-axial Cables, Twisted Pair Cables and high speed Communication Optical Fiber Links etc. On the other land, Wireless Communication doesn't require any physical medium but propagates signal through space. Antennas will play very important role in wireless communication to transmit and receive signal over space.

Since the utilization of smoke signals, banners and glimmering mirrors, Wireless system has been a piece of human life and is persistently developing. Utilizing electrical signals and radio waves for correspondence has been around us for more than 100 years. Throughout the improvement of remote correspondence, there are numerous remote frameworks and strategies that thrived and many got disappeared. Throughout the development of wireless communication, there are many wireless systems and methods that flourished and many got disappeared. The best example for this is Telephone Communication and Television Transmission. Initially, all telephone related communication was carried out using wired network.

But the rapid growth of Mobile Communication started to replace the complex wired telephone system. In this scenario, the wired technology became outdated and got replaced by wireless communication.

There are numerous advantages of Wireless Communication Technology, Wireless Networking and Wireless Systems over Wired Communication like Cost, Mobility, Ease of Installation, and Reliability etc.

Today there are different types of wireless communication. One of the most important types of wireless communication is free space optics which uses light waves instead of radio waves for communication. Free space optics is the alternate for the high speed wired optical fiber communication. Free Space Optic interchanges may give adaptable, simple to introduce, and permit free view remote correspondences links. The rapid and huge data transfer capacity offered by light wave correspondence innovation makes Free Space Optics exceptionally appealing as a way to fulfill future need for broadband Communication. In order to overcome the bandwidth limitation free space optics are preferred compared to RF wireless communication. Driving factors for the growth of free space optics market also includes the reduced cost associated with its installation and incorporation of this technology in cellular networks such as 3G and 4G, whereas atmospheric turbulence or bad weather can be a restraint factor in the market. Advancement in free space optics technology and growing economies of emerging countries will bring new opportunities in the market.

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