K. J. Somaiya College of Engineering, Mumbai-77
(A constituent college of Somaiya Vidyavihar University)

Periscope

2020

E-Textile

The vogue of technology

(15-16)

Cervical Trainer MEND

Mend your ways out of cervical pain

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Made in India

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FOREWORD

EESA – Electronics Engineering Students' Association is a student body of the electronics department that organizes workshops to help students develop skills required in the corporate world. The council is Headed by General Secretary, Rinkal Keniya along with Joint General Secretary, Aman Savla and Treasurer, Animesh Prasad. It comprises a Technical Team, Public Relations Team, Literary team, Creative Team, Event Management Team.

The Chairperson of the council Dr. Jagannath Nirmal (HOD of Electronics Engineering), Faculty in-charge Prof. Makarand Kulkarni and Prof Bharti Khedkar and Lab Assistant Mr. Ragunath Patil look after the overall functioning of the council.

Many of our activities are focused on developing an interest in this vast domain of electronics while hosting several events with local professionals as well as the undergraduates who are keen on sharing their knowledge. These sessions lead the potential to grasp concepts practically or employment possibilities in the future. Calculator workshop marking as an origin to the event conducted at the prior stage of engineering to deliver a webinar amidst lockdown has been effectively managed by the council.

To keep the students updated with the new technology we have our own blog on WordPress – eesakjsce.wordpress.com. One can reach us via various social media platforms like Facebook, Instagram and LinkedIn.

FROM THE DESK OF HEAD OF DEPARTMENT

It is a pleasure for me to present the new edition of our departmental magazine, 'Periscope 2020'. This magazine is a compilation of the creativity and innovation of our students and faculty members, to share their ideas and knowledge with the world. It also narrates the various curricular and co-curricular activities and workshops organized by the department and the council.

I would like to appreciate the entire EESA Council for their diligence and dedication in accomplishing a successful year 2019-20. I wish them luck for their future endeavors and hope that the virtues acquired from this experience stay with them forever.

- Dr. Jagannath H. Nirmal
Professor and Head,
Electronics Engineering Department

FROM THE DESK OF FACULTY IN-CHARGE

With deep pride and great pleasure, we present to you the next edition of Periscope published by EESA. Congratulations to the team for successfully presenting Periscope under such a difficult time of Virus outbreak and lockdown. We would also like to thank Dr. J H Nirmal, Chairperson of EESA and Head of Department of Electronics and all the other faculty members who have always given a helping hand when asked. Last but not least we would like to thank the team.

Periscope 2019-20 will help you glance through all the activities conducted by EESA and the Department of Electronics engineering. Periscope will help one and all to learn about new events and technology, not only in the college but also happening in India and globally. From the workshop, lecture series to Abhiyantriki, Hyderabad IV and a Webinar under lockdown, we have strived to enhance the knowledge of our people.

Prof. Makarand Kulkarni
(Faculty In-Charge)

Prof. Bharti Khedkar
(Faculty In-Charge)

Mr. Raghunath Patil
(Lab Assistant)

FROM THE DESK OF GENERAL SECRETARY

From being a Joint PRO of EESA 2018-19 to General Secretary of EESA 2019-20, this journey is certainly unforgettable.

My vision was only to give the best opportunities and experience to the students and my fellow friends along with learning and growing together.

Throughout the journey, Nirmal Sir, Makarand Sir, Bharti Ma'am and Raghunath Sir have guided and supported me in fulfilling all our objectives to benefit every individual of the department. I am grateful to both Aman Savla and Animesh Prasad for all the support and time you have put in while sharing big tasks with me. I am really appreciative of all the efforts and generous contribution by all the members of the council throughout the year.

Periscope 2019-20 aims in delivering interest for the various technical subjects and project ideas. We, as a team, have amassed all the yearly gone activities into a single book, hereby presenting to you a new version which includes a few important changes acquired in the current pandemic period. As the outbreak of this virus struck, everything is at a standstill and while facing a new routine our aim was to design, educate and deliver ideas revolving in the young minds and publishing the annual magazine through all the possible means and efforts.

- Rinkal Keniya
General Secretary 2019-20

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A GUIDE TO WEB DEVELOPMENT

As we all know, in today's digital world every big tech company is looking for the best programmers in the world, and being a skilled programmer is not an easy task. There is always a confusion among the beginners of where to start their programming career. Web development is one of the easiest and best ways to kickstart their programming careers. Web development can range from developing a single static page to complex web-based internet applications. When it comes to creating websites there are mainly two types of websites. One of which is a Static website which is fairly easy to create as it displays fixed and same content for every user, usually written in HTML. The first three main languages one should learn when getting started to web development are **HTML, CSS, and JavaScript**. One can easily grasp these languages using official documentation or by watching free video tutorials available on various platforms. After successful learning of these three languages, one can easily be said the master of front-end development.

After the mastery of the basic languages, there come various libraries of JavaScript taking your static knowledge of

After the mastery of the basic languages, there come various libraries of JAVAScript taking your static knowledge of web development to the dynamic level.

web development to the dynamic level. When it comes to the development of dynamic websites, of course, these websites are more functional. It allows users to interact with the information that is listed on the page and that requires utilizing more than just HTML code. Now it's time to learn a real server-side scripting programming language. There are tons of them available having varied learning curves. But some of the most trendy and used programming languages in the modern world include **Node.js, PHP, ASP, Django**, etc. Sometimes even building front-end for these dynamic websites gets real problematic, hence there are various libraries for even developing the front-end.

Some of the most trendy front-end libraries include React.js, Angular.js, Vue.js, etc which makes our job easier. Although there are multiple languages and frameworks available for doing a single task, beginners might get confused as to which framework to use. Hence it is recommended, as we have mastered vanilla JavaScript, it would be easier to grasp **Node.js and React.js** as they are JavaScript libraries. After learning all the necessary languages and frameworks required for back-end development as well as the front-end development, one can call himself a full-stack developer.

Being a full-stack developer has its perks. One can easily build his portfolio website showcasing all the skills he learned during the process. As well as fill up his resume by adding various programming languages and technical skills he acquired while learning to build web-apps. Most of the companies prefer full-stack developers as they know how the web works as a full-stack rather than just knowing only the front-end or the back-end of an application.

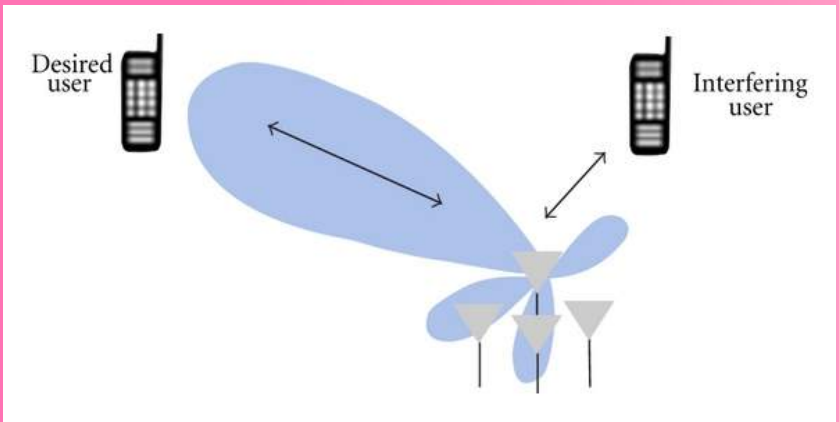
Being a web-developer in itself is a perk to your career and a type of skill every indie programmer must-have.

-Aryan Agarwal
FY ETRX

Did you know ?

CCR stands for carbon composition resistors. The plastic or paint is used to protect the resistor body. The mixture of powdered carbon and ceramic is used to produce the resistive element.

SMART ANTENNA SYSTEM



The smart antenna also is known as an adaptive array antenna, MIMO and many Antennas are antenna arrays or groups of antennas in which the spatial signal signature is identified with smart processing algorithms. A smart antenna source (transmitter), takes advantage of the diversity effect to increase the speed of data and reduce the error rate by transmission and/or reception of multiple radio frequency (RF) waves. This technology can overcome capacity limitations as well as improve signal quality and allow mobile telephones to operate at low power. Smart antennas include many personal antennas and related signal processors that provide signal transmission and signal reception. The major advantage of using a smart antenna is a decrease in overall system power, a decrease in communication interference, and increased system capacity and improved power efficiency. The smart antenna in the receiver reduces signal loss in a multitude of fading, which means more robust signal quality independent of signal variations due to physical environments and other electromagnetic transmitted interference. For mobile applications, there are fewer dropped calls, better reception in low-signal / no-signal or low zones of the dead zone, bit error rate reduction, handoff reduction, and higher data rates.

In traditional wireless communication, a single antenna is used at the source and the destination called SISO (single input, single output). Late arrival of scattered parts of the signal causes problems like fading, cut-out (cliff effect), and intermittent reception (picket fencing). In a digital communication system like the Internet, it can cause a decrease in data speed and an increase in the number of errors.

Functions of Smart Antenna:

- **The Direction of Arrival Estimation:** Smart antenna systems estimate the direction of the signal's arrival, such as MUSIC (Multiple Signal Classification), rotational invariance technique (ESPRIT) algorithms, matrix pencil method or estimation of signal parameters through one of their derivatives. These include finding a spatial spectrum of the antenna/sensor array and calculating DOA from the peaks of this spectrum.
- **Beamforming:** This is used to connect the radiation pattern of the antenna array to the phases of signals in the direction of the desired / target mobiles and to nullify the pattern of the target/mobiles which are unwanted/interfering targets. The weight of the FIR filter can also be changed favourably and is used to create an optical beam, in the sense that it reduces the MMSE between the desired and actual beam patterns formed. The base stations seek to support more users per user to reduce overall network costs and make services affordable for customers.

Consequently, wireless systems that enable high data rates and high capacities are a pressing requirement.

TYPES OF SMART ANTENNA:

- **Switched Beam:** Switchable beam antenna systems make many fixed beams with increased sensitivity in particular directions. Instead of shaping the directional antenna pattern with the metal properties and physical design of the identical element, switched beam systems combine the output of multiple antennas in such a way as to create granular directional beams with more spatial selectivity with traditional, single-element approaches.

> **The major advantage of using a smart antenna is a decrease in overall system power, a decrease in communication interference, and increased system capacity and improved power efficiency.**

Adaptive Array antennas: Using different types of new signal-processing algorithms, the adaptive system takes advantage of its ability to effectively find and track various types of signals to effectively minimize interference and maximize intended signal reception. Both systems try to increase the gain according to the user's location, however, only the adaptive system provides optimal gain while simultaneously detecting, tracking and minimizing the signal.

The categories according to the number of inputs and outputs of device used are given below:

1. SIMO (Single Input – Multiple Output)

In this method, one antenna will be used at the source and several antennas will be used at the destination.

2. MISO (Multiple Input – Single Output)

In this method, multiple antennas are going to be used at the source and only one antenna is going to be used at the receiver.

3. MIMO (Multiple Input – Multiple Output)

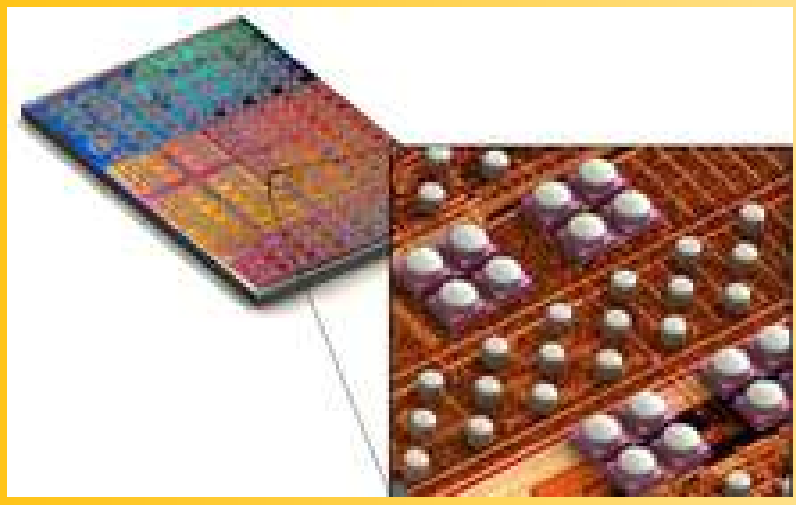
In this method, many antennas will be used for both source and destination. It is the most efficient method as it supports the spatial Information process.

-Aman Khakharia
SY ETRX

Did you know ?

Blue LEDs can help keep food fresh - they have been proved to have a strong antibacterial effect on major foodborne pathogens, and are now being used in fridges.

THERMAL COPPER PILLAR BUMP



The thermal copper pillar bump is a thermoelectric device made from thin-film thermoelectric material embedded in flip-chip interconnects (copper pillar solder bumps) for use in electronics and optoelectronic packaging, along with flip-chip packaging of CPU and GPU integrated circuits (chips), laser diodes, and semiconductor optical amplifiers (SOA). Contrary to conventional solder bumps, thermal bumps act as solid-state heat pumps and add thermal management functionality locally on the surface of a chip or to another electrical component. The diameter of a thermal bump is 238 µm and 60 µm high.

The thermal pump makes use of the thermoelectric effect, that's the direct conversion of temperature variations to potential difference and vice versa. In simple words, a thermoelectric tool creates a potential difference when there is a temperature difference on each facet. This effect may be used to generate electricity, to measure temperature, to chill objects, or to heat them.

For each bump, thermoelectric cooling (TEC) takes place while an electric current is passed through the bump. The thermal pump pulls heat from one facet of the tool and transfers it to the other as the current is passed through the material. This is known as the **Peltier effect**. The path of heating and cooling is determined by the direction of current flow and the sign of the majority electrical carrier within the thermoelectric material. Thermoelectric electricity generation (TEG), on the other hand, takes place whilst the thermal bump is subjected to a temperature gradient (i.e., the top is warmer than the bottom). In this instance, the device generates current, converting heat into electrical energy. This is named the **Seebeck effect**. The thermal bump was developed by Nextreme Thermal Solutions as a method for integrating dynamic thermal control capability on the chip level. Nextreme selected the copper pillar bump as an integration strategy due to its vast acceptance by Intel, Amkor and other industry leaders as the technique for connecting microprocessors and other advanced electronic devices to various surfaces all through a process noted as “flip-chip” packaging.

The performance of a thermoelectric device is measured by the amount of heat moved divided by the quantity of electrical power provided to move this heat. This ratio is named the coefficient of overall performance or COP and is a measured function of a thermoelectric device. The COP is inversely associated with the temperature distinction that the tool produces. As you distance the cooling device farther from the origin of the heat, parasitic losses between the cooler and the heat supply necessitate additional cooling power: the farther away the cooling device is from the heat source the more cooling is required. For this reason, the cooling of electronic

gadgets is maximum efficient while it happens closest to the source of the heat generation.

The thermal bump is compatible with the present flip-chip manufacturing infrastructure, extending the use of traditional solder bumped interconnects to offer dynamic, integrated cooling of a flip-chipped component employing the widely prevalent copper pillar bumping process. The result is better performance and efficiency in the present semiconductor manufacturing paradigm. Thermal bumps can achieve a temperature differential of 60 °C between the top and bottom headers; tested electricity pumping abilities exceeding 150 W/cm2; and when subjected to heat, have proven the capability to generate up to 10 mW of power per bump.

Applications:

- **General cooling:** Thermal bumps are equally distributed across the surface of a chip to supply a consistent cooling effect. The amount and density of thermal bumps are based on the heat load from the chip.
- **Precision temperature control:** They can be used to provide precision control of temperature for chips that must function within particular temperature ranges irrespective of ambient conditions.

> **The use of the thermal bump does not displace system-wide cooling instead it introduces a fundamentally new method for achieving temperature uniformity at the chip and board stage.**

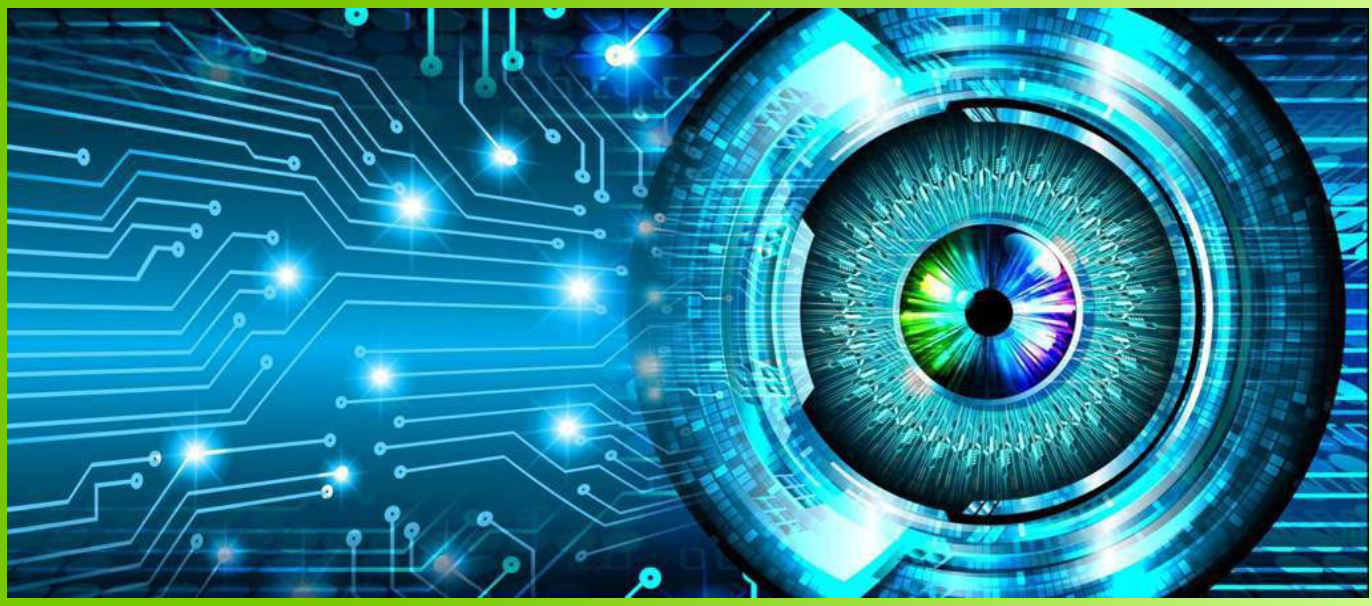
- **Hotspot cooling:** In microprocessors, graphics processors and other high-end chips, considering the small size of the thermal bumps, these structures are ideally suited for cooling hotspots. The thermal bumps would be concentrated in the area of the hotspot while areas of lower heat density would have fewer thermal bumps per unit area.
- **Power generation:** Apart from chip cooling, thermal bumps can also be applied to high heat-flux that links to ensure a constant, steady source of power for energy scavenging applications.

-Sukrut Kolhe
SY ETRX

Did you know ?

Printed circuit boards are almost always green because they are made from a glass- epoxy, which is naturally green.

IMAGE PROCESSING



In the 20th Century, many engineering-related branches have arrived which has changed the landscape of technology around the world by replacing older technologies in many ways. Image Processing is one of those newly developed branches. Have you ever thought how Google can search for information with an image, how google photos recognize your face and can search photos in your mobile gallery, why videos and movies have such great picture quality and how anybody comes up with an Instagram post with a perfectly edited photo? Answer to all of these questions is nothing but Image Processing.

So **What is Image Processing?** It is one of the subcategories of digital signal processing in which with the help of computers and some algorithms an image is processed. In simple words, it is a method to perform some operations on an image in order to get an enhanced image or to extract something useful from the image itself. Image processing has changed the post-processing unit of an image completely by optimizing the workflow and saving a lot of effort and mainly time.

Then **How does image processing works?** When an image or video is given as input to an IP system it first uses an image sensor that converts the given image into a digital image which is nothing but some digital signals. This digital image is then handled by different algorithms or programs of Image Processing which actually represents every pixel of the image in a mathematical form which could be easily altered as per requirement. After improving clarity, size, and quality of the image or after extraction

Image processing has changed the post-processing unit of an image completely by optimizing the workflow and saving a lot of effort and mainly time.

of required contents in image those digital signals are compressed for transmission of an image through the electric network. After that, the image is displayed in its processed form and the required content is obtained.

Image Processing can do a list of interesting things in different areas that have completely nothing to do with each other. It can give predictions of the weather by processing a continuous set of images of clouds or sky by analyzing other parameters such as wind, light intensity and humidity. It is also used for face detection in which it is not only able to recognize the face but also tell that if a person is telling the truth or lying by using some additional audio sensing features. Image processing is widely used in the crime and investigation department by biometric verification, signature recognition and fingerprint detection in which a person can be identified by sensing face, fingerprint, signature and special behavioral characteristics, body language and other characteristics. It also plays a major role in the medical section where it is used in MRI, X-Rays Tomography for enhancing the biomedical footages and images which helps in overall diagnosis as it makes extraction of required information easy and accurate. Image Processing has modified many medical technologies and obtained better results. In multimedia technology, it has developed many software and apps for digital video processing and image editing photoshop, etc. In these, the complicated algorithms are converted into simple effects on video and photo which everybody can understand. Image Processing can be used in association with many other technologies like machine learning, the Internet of Things (IoT), VFX which takes its applications to the next level.

The best thing about Image Processing is that it is a technology having creativity. Due to this creative element in science, Image Processing is capturing the attention of many young students to take this science forward. One thing is for sure that Image Processing is going to be huge.

-Anuvrat Marathe
SY ETRX

Did you know ?

The Cathode Ray Oscilloscope is one of the most widely used test instruments; its commercial, engineering, and scientific applications include acoustic research, television-production engineering, and electronics design.

E- TEXTILE

You might be wondering what a textile article is doing in this magazine? It's not only about the textile, but it's "E-Textile or Electronics Textile". Yes, you read it right.

E-Textile is a combination of fabrics and fibres of electronics. Also, it empowers the exchange of information, including sensor data on heat, light, movement, and other local conditions. The clothing itself carries only transmission lines and connectors so that it can be flexible and washable enough to be wearable. Components and interconnections are a part of the fabric and thus they're much less visible and more importantly, not susceptible to tangle along or snag the environment.

Embedded capacitive, resistive, and optical sensors are the main wearable e-textiles allowing it to sense touch, strain, pressure, temperature, and humidity. The sensors which are normally connected to control boards are responsible to process information. Whereas at the output, devices like Light Emission Diode (LED) arrays, thermochromic ink, vibration, and shape-memory alloys are used. The development of flexible conductive yarns, whose diameters are comparable to the traditional textile yarns, permits us to use traditional fabrication techniques to merge conductive threads with non-conductive threads. The conductive yarns incorporation processes, into conventional textiles threads, can be manually carried out by stitching conductive yarns or mechanically through embroidery, weaving, knitting, and breading machines. **"Electronic embroidery or E-embroidery"** refers to the usage of conductive threads as embroidery. Whereas data acquisition connection to systems is achieved by either mechanical or electrical mechanisms. This way, material structure

stages as woven, sewn, or nets can be utilized to create e-textiles, maintaining a strategic distance from joining electronics to textile substrates.

Electrical components such as electrodes, connectors, and interconnectors are used in E-textiles. When wearable e-textiles are used for the acquisition of electrical biological signals like electrocardiogram (ECG), the electrodes are the bridge between

"Embedded capacitive, resistive, and optical sensors are the main wearable e-textiles allowing it to sense touch, strain, pressure, temperature, and humidity.

the body and circuit. Also, the copper wire is utilized in applications without skin contact, and the silver thread is utilized in applications that need direct contact with skin. The energy required to power e-textile circuits is often provided by Lithium Polymer (LiPo) batteries. The LiPo batteries are chosen according to a trade-off between power autonomy and battery size. The goal is to choose the smallest LiPo battery that is able to request e-textile circuit power at some stage in a predefined amount of time.

Two major bond classes for connectors and interconnects are mechanical and physical. Mechanical connections are created with snaps that are directly pressed into conduction lines and are usually created when there's a requirement to detach any electrical module from the e-textile. Physical connections embrace micro-welding, thermoplastic adhesion, blended conductive polymer adhesion, joint soldering, and electroplating.

Textile circuits are electrical circuits constructed on textile substrates. Embroidery conductive thread into textile substrates is an extensively used method. This technique is used to sew patterns that outline circuit traces, component connection pads or sensing surfaces using Computer Assisted Design (CAD) tools. The conductive patterns can also be done using inkjet-printed techniques of graphene-based conductive inks. Many yarns accessible in the market can be used for connections and circuit elements. These include silverize yarns, stainless steel thread, titanium, gold, and tin. The best wearable control board is Xadow, which is available in the market due to its wireless communication and analog and digital pins on the board. The possibility to be washed is an additional vital advantage that allows a permanent connection with textile and textile fibres.

Also, wearable e-textiles aim to develop new e-textiles to enhance diagnostic and treatment of several diseases with embedded textile

electrodes are being developed to detect a variety of biological signals, such as an electrocardiogram (ECG) and electromyogram (EMG), as well as to measure physical impedance and pores and skin conductance. Possiblity of unexpected deaths of a person may be prevented using the ECG detection, which may do an early diagnostic of heart diseases. Also, sleep disorders can also be treated with wearable e-textiles that may be able to manage the temperature of the body during sleep.

-Niharika Somani
TY ETRX

Did you know ?

The word transistor is a combination of "transconductance" (transfer of a charge) and "variable resistor" or "varistor."

THE CONCEPT OF 5G

Telecom goes through a digital revolution in terms of technology, business models, services, and 5G is on the point of revolutionizing industries. 5G presents a huge likelihood for the medical care of economies and modernization of all business sectors. When Samsung declared that it tested 5G at speeds of 1 GB/second, the possibility of easily downloading an HD picture in thirty seconds created headlines. With users wanting faster downloads, and service providers need to provide customers with a smooth user experience, the world awaits 'real' 5G– not the 'concept' of 5G that we've got an inclination to with currently. **But what would a 5G network mean?**

5G is the fifth-generation mobile network. It will take some way a larger role than the previous generations. 5G will elevate the mobile network to not only interconnect people but also in the management of machines and devices. It will deliver new levels of performance and efficiency which will empower new user experiences. 5G will deliver multi-Gbps peak rates, ultra-low latency, very high capability, and plenty of uniform user experience.

5G to be undoubtedly faster than 4G, delivering up to twenty Gigabits-per-second peak data rates and 100+ Megabits-per-second average data rates and might support a 100x increase in traffic capability and network efficiency. A key 5G objective is to lower the data cost compared to 4G LTE, by the investment of a new and wider spectrum in higher bands. This would possibly allow mobile operators to continue to provide unlimited data plans even with increasing data consumption. This might build plenty of applications economically viable for broader adoption in the 5G network. For example, 5G can facilitate the increased immersive video game, that's possible currently with 4G LTE but might even be restricted by network capability and knowledge costs.

> **5G will elevate the mobile network to not only interconnect people but also in the management of machines and devices.**

How can 5G work?

Like 4G LTE, 5G is also OFDM (Orthogonal Frequency-Division Multiplexing) based and operates when supported by constant mobile networking principles. While 4G LTE targeted on delivering faster mobile broadband services than 3G, 5G is supposed to be incorporated, plenty of capable platforms which will not only lift mobile broadband experiences but also support mission-critical communications and so the IoT. 5G can naturally support all spectrum varieties (licensed, unlicensed) and bands (low, mid, high), and new ways within which to interconnect (such as device-to-device).

What are the benefits of 5G?

5G could also be a replacement moderate network: a platform for innovations that will not only enhance today's mobile broadband services, but can expand mobile networks to support a huge diversity of devices and services with improved performance, efficiency, and cost. 5G will redefine a broad range of industries with connected services from retail to education, transportation to entertainment and everything in between.

A 5G Economy study has found that 5G's full economic result will be seen across the planet by 2035, supporting a wide range of industries and possibly producing up to $12 trillion worth of services.

In general, 5G use can be typically classified into **three main types of connected services:**

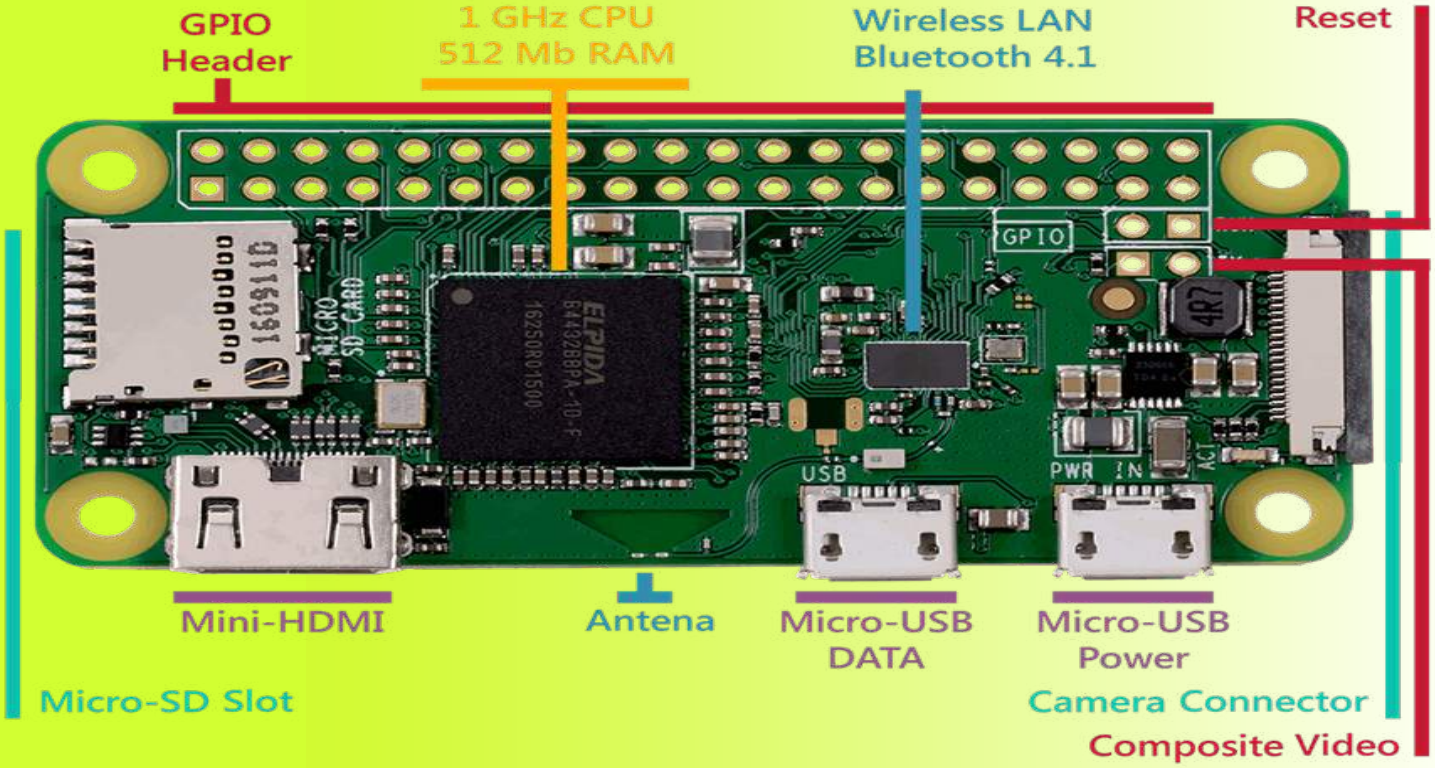
- **Enhanced Mobile Broadband:** 5G will not only make our smartphones faster, but will also introduce new experiences, like VR and AR, with faster, plenty of uniform data rates, lower latency, and low cost.
- **Mission-Critical communications:** 5G will modify new services that will work on industries with ultra-reliable/available, low latency links—such as remote vital infrastructure, vehicles, and medical procedures.
- **Internet of Things:** 5G will smoothly connect a vast number of embedded sensors in almost everything through the ability to scale down in data rates, power and flexibility to provide low-cost solutions.

-Taher Ahmedabadwala
SY ETRX

Did you know ?

In the early 1970s the introduction of large-scale integration (LSI)—which made it possible to pack thousands of transistors, diodes, and resistors onto a silicon chip less than 0.2 inches (5 mm) square—led to the development of the microprocessor.

RASPBERRY PI ZERO W: NEXT-GENERATION SINGLE BOARD COMPUTER

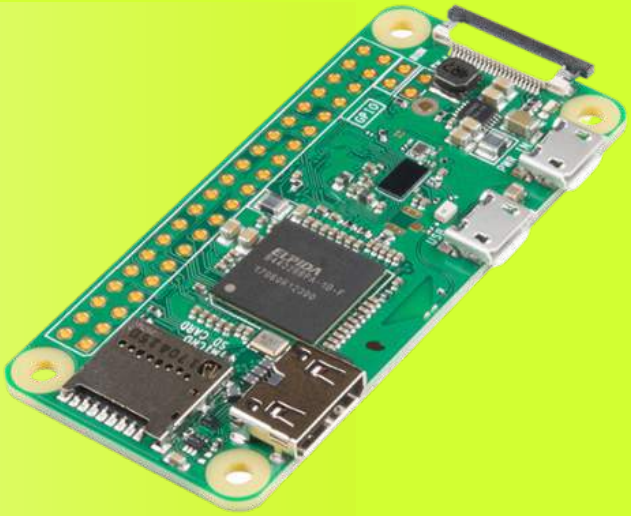


When purchasing a Single-board Computer (SBC), why lose all your pocket money to buy it? Or why to have space constraints in your project prototype? Raspberry Pi Zero W is the SBC, that fulfills low cost and small space requirements. RPi Zero W costing just Rs. 1400/- is one of the cheapest SBC out in the market and is offering equivalent performance. The RPi Zero W has dimensions of 6.5 cm x 3 cm, and 5mm in height, making it convenient to be used in hobby projects. RPi Zero W is used in projects like security cameras, robots, home automation systems and even in some tablets.

The R Pi zero W has in-built 802.11n wireless LAN, Bluetooth 4.1 and Bluetooth Low Energy (BLE), making it a great IoT platform to work on. RPi Zero W has the processing power of a 1GHz single-core processor with 512 MB RAM. RPi Zero W comes with Mini HDMI connector, to connect it to monitor or TV. It has a MicroSD cardholder, to load cards (up to 32GB size) with the operating system. Pi Zero has Broadcom ARM v6 processor and GPU in the SOC package. It has two MicroUSB ports one for powering the device through a regular mobile charger and the second MicroUSB is a USB OTG port to connect peripherals, like keyboard, mouse, etc. RPi Zero has a camera connector for connecting the RPi camera. It has onboard 40 pin header which enables it to be able to plug in Pi HATs, GPIO cables, etc. It has 26 GPIO pins to read sensor data or connect the output device, like Stepper motor, etc.

It is a single-sided board with no components on the backside, unlike traditional Raspberry Pi boards.

Raspbian PIXEL version can be loaded on the Raspberry Pi Zero W hardware. It can run Libre Office and Chromium as a web browser. It also supports basic programming languages such as Python, C, C++, and Java. RPi Zero W support headless mode, where it can work without mouse monitor and keyboard. It supports communication protocols, such as SSH and VNC.



Unlike traditional Raspberry pi, RPi Zero W is a single-sided board with no components on the backside.

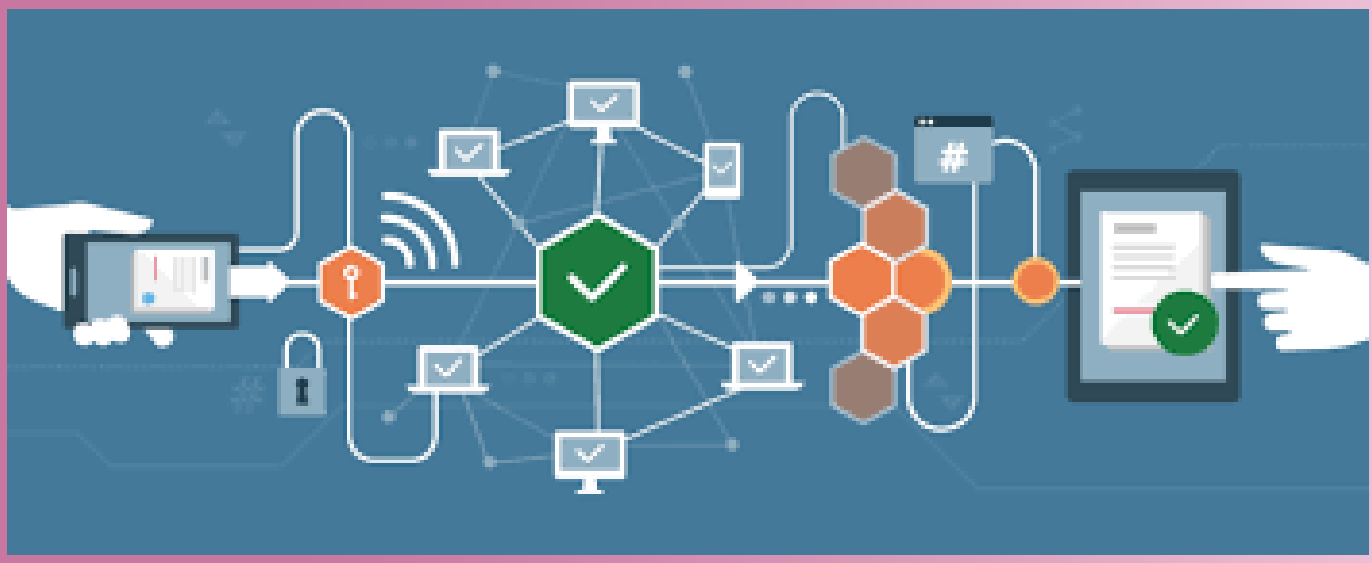
It lacks all the 4 regular USB ports, LAN connector, and audio port when compared to the Raspberry Pi 4. Although it cost double compared to RPi zero the inclusion of WiFI is worth that price.

- Dr. Ninad Mehendale
Faculty ETRX

Did you know ?

Magnetic circuit breakers function by increasing a magnetic field as the current flow increases. Once the magnetic field becomes strong enough, it moves a switch that stops the flow of electricity. When the current returns to a safe level, the magnetic field weakens and the switch can be reset.

BLOCKCHAIN TECHNOLOGY



A blockchain is a distributed database of records or a public ledger for all activities or digital events that have been created and shared among participants. Each activity in the public domain is guaranteed by the consensus of the majority of the program participants. Once installed, the details will never be deleted. Bitcoin, a fixed peer-to-peer currency, is a popular example that uses blockchain technology. The digital currency bitcoin itself is highly controversial but the subtle blockchain technology has worked flawlessly and has received many types of requests in both the financial and non-financial world.

The main hypothesis is that blockchain is launching a program to create a harmonious consensus in the digital online world. We then look at the challenges ahead and business opportunities in this basic technology used to transform our digital world.

The benefits of Blockchain technology outweigh the regulatory hurdles and technical challenges. One key to the use of blockchain technology involves "Smart Contracts". Smart contracts are computer programs that can automatically work on contract terms. Where the default status of a smart contract between the parties is met when the parties involved in the contract agreement are not automatically paid by the contract transparently.

Smart Property is another related concept related to the control of property ownership or property via blockchain using Smart Contracts. Financial institutions and banks no longer see blockchain technology as a threat to traditional business models.

FINANCIAL APPLICATIONS:

- **Bitcoin:** Bitcoin or digital currency was first made by an unknown person or group under the alias Satoshi Nakamoto in 2008. Examples of Bitcoins running are Bitbond, BitnPlay, BB Jam, Codus and DeBuNe.
- **Ripple:** Ripple is a real money exchange and money-laundering (RTGS) system that uses the protocol throughout the peer-to-peer network, a concept exchange that focuses on the banking market. It uses a computer-based distributed platform based on Blockchain with a full Turing language that enables the processing of Smart-blockchain contracts.

NON-FINANCIAL APPLICATIONS:

- **Ethereum:** It uses a computer-based distributed platform based on

Blockchain with a full Turing language that enables the processing of Smart-blockchain contracts.

- **Hyperledger:** Hyperledger is a basic Linux project that develops Blockchain technology for business, supported by only registered members. This is a global partnership, hosted by The Linux Foundation, which includes leaders in finance, banking, the Internet of Things, supply chains, manufacturers and technology.
- Many other financial systems use Blockchain technology such as Election Voting (Follow My Vote), Smart Agreements (Otonomos, Mirror, Symbiont), and Blockchain on IoT (plug, Filament).

What is BITCOIN?

New transaction records are continuously added to the Bitcoin community integrator and this process is called the Bitcoin mine. The Secure Hash Algorithm 2 (SHA-2) which is a hash function of graphics is used by Bitcoin. We can determine the reliability of the data provided by comparing the output of an SHA-2 algorithm called "hash" with an already known and expected hash value. The hash algorithm converts a large amount of data into a fixed-length hash. And the same data always produces the same hash but any small change in the data will completely change the hash.

Challenges:

This satisfies all stakeholders such as hospitals, health care providers and healthcare managers by meeting consumer information needs and protecting patient privacy by using Blockchain to make payments with Bitcoin. In the paperwork system, if information consumers need to see a patient's health record they must complete an application form and submit it to the registration office for approval. The information consumer then shows the receipt at the registration office to receive a copy of the patient's health record.

> **Smart contracts are computer programs that can automatically work on contract terms.**

Future of Blockchain Technology and Bitcoin:

Big Venture capital (VC) companies are big bets on Bitcoin and Blockchain. Mckinsey's report states that Blockchain has the potential to re-create the financial marketplace that has implications for business models, risk reduction, cost and cost savings. Recent research from the IBM Institute for Business Value (IBV) shows that 70 percent of first-time entrants surveyed prioritize Blockchain's efforts to reduce barriers to building new business models to reach new markets. Seven of the first 10 defendants surveyed at financial markets have Blockchain efforts focused on four areas: clearing and repayment, equity and debt issuance, total repayment and reference data.

-Aman Savla
TY ETRX

Did you know ?

Early transistors were used to amplify audio signals.

RF DESIGN FOR 5G

The radio frequency section of the mobile phone is one of the crucial areas as it consists of a transmitter and receiver. One of the key elements of the circuit design is to keep the battery consumption minimum. Smartphones have changed beyond recognition from Blackberry to iPhone. In the present time, there may be five or more radios present in a single phone competing for a crowded spectrum available.

Due to single-band radius, users are expecting contents to be rich with data, availability of wider bandwidth in their areas of work and living. Wide bandwidth requirements of 5G can be met by moving frequency translation and filtering from analog to the digital domain. According to Analog Devices, a company that has manufactured **AD9081** and **AD9082** ICs (these are mixed frequency RF converters) said that these ICs can be used by developers for installing multi-band radius in the same footprint as single-band ones in order to increase call capacity by three-folds as compared to call capacity available in today's 4G LTE base stations.

One of the important areas is the integration of multiple digital circuits on a single die by using deep submicron lithography. Functions such as digital pre-distortion are to be integrated and have to be removed from power-consuming FPGA logic, thereby reducing system power and size of the radio.

One important factor in the advancement of RF design is refining the CMOS process. In a CMOS transistor gate, the length is directly related to speed, size and power requirement of the chip. Smaller sized gates are faster, require less power and space which allows more on-chip digital signal processing without impacting power budget. With the help of deep submicron lithography circuitry of algorithms for optimizing power efficiency or system power consumption can also be integrated on the same RF converter die.

In the next step, we have to integrate RF converter digital circuitry with **microwave** or **mmWave** components for the reduction in size and complexity of radio design. By the use of MST(Mears Silicon Technology) the performance of transistors involved is improved by up to 50%. MST is a quantum engineered material and has enhanced the performance by a smart doping profile.

Wide bandwidth requirements of 5G can be met by moving frequency translation and filtering from analog to the digital domain.

The company has reported that **MST** has reduced channel on-resistance on 5V analog transistors by up to 50% and this technique can be applied to other Silicon devices as well, including planar CMOS chips. MST is an ultra-thin film of a semiconductor re-engineered to incorporate non-semiconductor material to create a Silicon Lattice which has control the flow of the current to improve performance and efficiency.The single crystal, Silicon-On-Silicon technology enables RF and mixed-signal devices (as well as microprocessors, logic and memory ICs) to run at lower power levels and reduce the die area. It reduces the gate leakage by up to as much as 50% says the company by impeding unwanted current flow in the vertical direction.This is particularly advantageous at lower process geometries, when gate leakage increases.

MST improves carrier mobility to lower on-resistance compared with to original version. Dopant profile engineering controls short channel effects for low loss switching along with good isolation. Result of which is voltage swings in the signal path are not affected by switching. The company has also reported that with the help of their partners they have re-engineered a 5V NMOS switch having 50% less on-resistance without affecting characteristics of the device in power management ICs and other

BIPOLAR-CMOS-DMOS (BCD) mixed-signal device. Channel doping or super steep retrograde profile (SSR) of MST reduces random dopant fluctuation which in-turn reduces variations in threshold voltage and improves transistor matching. The company reports a 50% reduction in threshold voltage by 3rd party evaluations.

MST showed improvement of the drive current of RF Silicon on insulator (RF-SOI) process technology with a low on-resistance at the same breakdown voltage and reduction in off capacitance which helps in boosting RF switching performance.

-Uttam Kumar Mishra
TY ETRX

Did you know ?

Gordon Moore, the co-founder of Intel, predicted that the number of transistors on a chip would double about every two years. This is known as Moore's Law.

KITCHEN GARDEN & HYDROPONICS THE FUTURE OF URBAN AGRICULTURE

Project by:
Prof. Kirti Sawlani
(Teacher Coordinator – E-Farm KJSCE
Mr. Kiran Kardile
(Staff-Helping assistant, E-Farm, KJSCE)

A kitchen garden is the need of the hour of every house. Studies show that kitchen gardening promotes physical health, mental health through relaxation and satisfaction and better nutrition. The detoxifying plants are lemongrass, coriander /cilantro, mint, basil, celery, fenugreek, etc

The kitchen garden with hydroponics can bring us the solution to get organic food in addition to all other physical and mental benefits. In situations like the current scenario of a pandemic where it is unsafe to buy veggies from the market, the kitchen garden brings a feeling of security and reliability. Soil-based agriculture leads to a lot of water wastage and requires large land areas for cultivation.

The required nutrients which the plants otherwise derive from the soil are now dissolved into water and depending on the type of hydroponic system used, the plant's roots are suspended in, flooded with, or misted with the nutrient solution so that the plant can derive the elements it needs for growth. Many hydroponic systems and companies currently exist, but very few of them employ automation and IoT to aid their system's functioning, and given the urban setting, it could be very helpful.

Hence, the e-Farm team has developed an IoT Based Hydroponic system, replete with an automated water flow schedule, artificial air conditioning and lighting system, and sensor feedback to an online custom made dashboard. The design uses an MQTT connection between an ESP32 which acts as the main control unit of the system and the sensors and actuators, with sensors including temperature, humidity, and pH sensors

to monitor the system parameters and a Raspberry Pi 3 B+ which acts as the processing unit. The system also has a water pump and valve, to pump water into the holding pipes for the plants and fans to regulate temperature. The sensor readings can be viewed on a dashboard present on a web-server hosted by the Raspberry Pi, and the various actuators can also be controlled via the dashboard.

This helps to create a completely artificial environment to enable plant growth since the various factors such as the temperature, pH and color of the artificial light are tailored to the plants' requirements. It's mainly useful for an urban setting, due to it requiring very less space to implement, and also the ability to be vertically stacked, hence it can be easily manifested as a garden in the kitchen or the balcony or terrace. A kitchen hydroponic garden leads to much shorter transport times, and the ability to grow various types of plants all year round due to it not being dependent on climate at all.

Future developments in the project include blending this concept with image processing and machine learning models to help predict plant growth under certain conditions. Image processing can be used to determine a plant's health and their stage of growth, making the system smarter, and reducing the user's hassle considerably.

One day, this could enable cities to be somewhat self-sufficient with their food products, thus enabling them to suffice the need of the growing population. The government can also use these systems for air cleansing as well, helping to keep the pollution in check.

PCB LAB PROJECTS

By FY Students

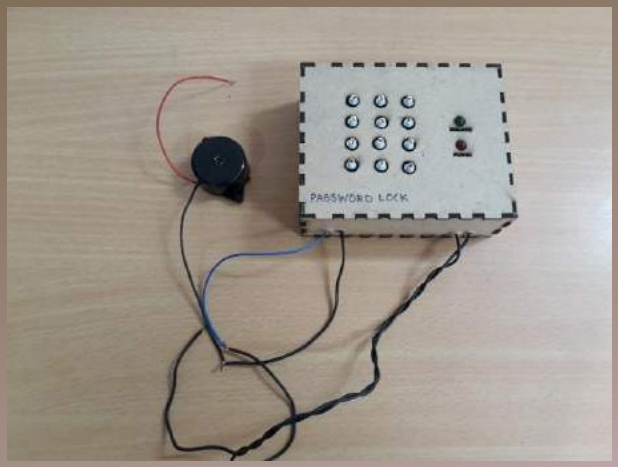
Alcohol Breath Analyzer

The main aim of this project is to create an electronic system for implementing an efficient alcohol detection system which will be useful to avoid accidents. In this project, initially, circuit checks whether the person has drunk or not by using the MQ3 Sensor. The developed project is very sensitive can easily detect the level of alcohol drunk by the person. The cost of the project is far lesser than the existing products of the market.

Automatic Exhaust Fan with Gas Leak Detection System

The objectives of this research are to design the model and circuit board that controls the exhaust fan automatically when detects leakage of gas and hot heat occurred. MQ-3 sensor is used to detect the gas. It is developed using simple circuitry and it is cost-effective.

Password Lock Using Logic Gates and 555 Timer IC



There are different types of locking system available which are based on software. This project includes is the method that uses hardware i.e a numeric keypad requiring the user to enter a secret combination in the correct sequence to unlock the appliances (like PC, Piggy Bank) or turn ON or OFF any load connected to it.

Muscle Stimulator

Electrical muscle stimulation (EMS), referred to as neuromuscular electrical stimulation (NMES).A muscle stimulator stimulates nerves of that part of your body where electrodes are attached. It is useful to relieve headache and muscular pain and also it is useful to revive frozen muscles that impair movement.

Motion Detector

Motion detectors are the devices that detected moving objects particularly people; such a device is generally integrated as a component of a system that automatically performs a specific task or alerts the user about the motion in the area.

Numeric Water-Level Indicator

Most water level indicator for water tanks is based upon the number of LEDs that glow to indicate the corresponding level of water in the container. Here we present a digital version of the water-level indicator. It uses a 7-segment display to show the water level in numeric form from'0' to '9'.

Automatic Plant Watering System.

In daily operations related to watering the plants are the most important cultural practice. No matter whichever weather it is, either too hot and cold or too dry and wet it is very crucial to control the amount of water reaches the plants. So, It will be effective to use an idea of an automatic plant watering system that waters plants once they need it. An important aspect of this project is: "when and how much to water".

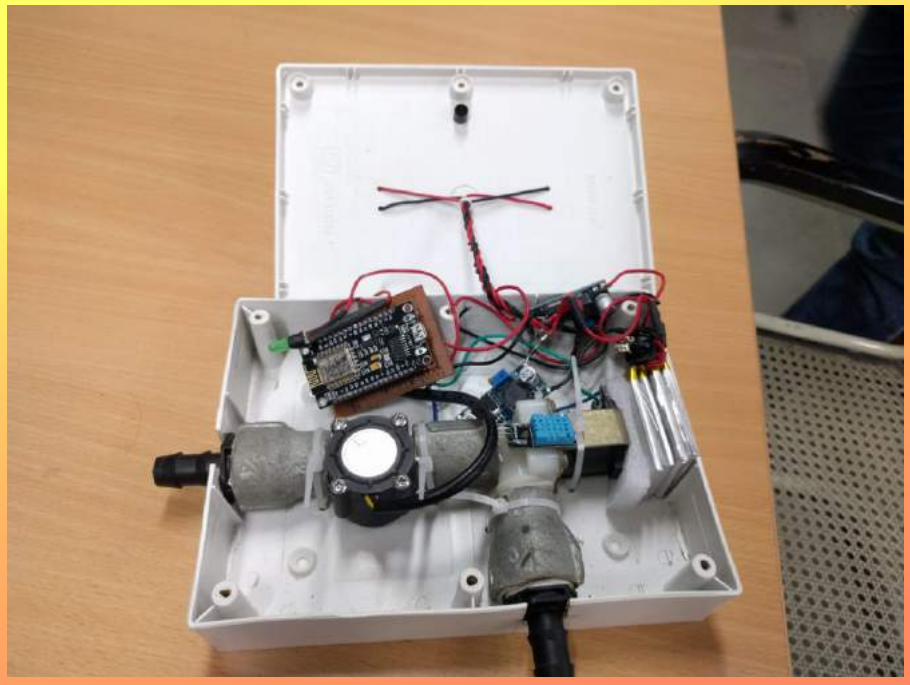
CAPACITIVE SENSING

-Students of Team E-FARM KJSCE

The global population is predicted to touch 9.6 billion by 2050 – this poses a big problem for the agriculture industry. Despite combating challenges like extreme weather conditions, rising climate change, and farming's environmental impact, the demand for more food has to be met. New smart farming applications based on IoT technologies will enable the agriculture industry to reduce waste and automate farming. BI Intelligence survey expects that the adoption of **IoT devices in the agriculture industry will reach 75 million in 2020, growing 20% annually.** At the same time, **the global smart agriculture market size is expected to triple by 2025,** reaching $15.3 billion (compared to being slightly over $5 billion back in 2016).

One of the current issues that farmers face is either watering their crops too less or too much, with more stress being on the latter one since that leads to wastage of water and erosion of soil.

Hence, we have designed a capacitive moisture sensor, in order to combat this problem, which works by measuring the changes in capacitance caused by the changes in the dielectric. Capacitive measuring basically means measuring the dielectric that is formed by the soil and water and the quantity of water is the most important factor that affects the dielectric. This sensor works on the principle of fringe capacitance, wherein two plates present in the same plane



but separated by a strong insulator or dielectric act as the capacitor plates, and the capacitance in the arc around the plates is measured, hence achieving the instance for the surrounding medium to act as the target dielectric. In order to measure the moisture, we place the probe capacitor as a part of an RC filter, wherein the changing capacitance leads to a changing peak value of an incoming square wave. We have used 555 Timer as an astable multivibrator fine-tuned at a frequency that gives maximum swing of the voltage. We then measure this voltage by using an analog to digital converter which produces a percentage that we can then interpret as soil moisture with the help of an ATtiny85 as the microcontroller.

Capacitive sensors, unlike their resistive counterparts, have minimal chances of catching rust and providing linear, reliable readings with the added benefit of covering more area. We can display and monitor these readings, to analyze the conditions of the plants and their water usage. Whenever the soil moisture reading falls below the optimum level, water could be provided to the plant.

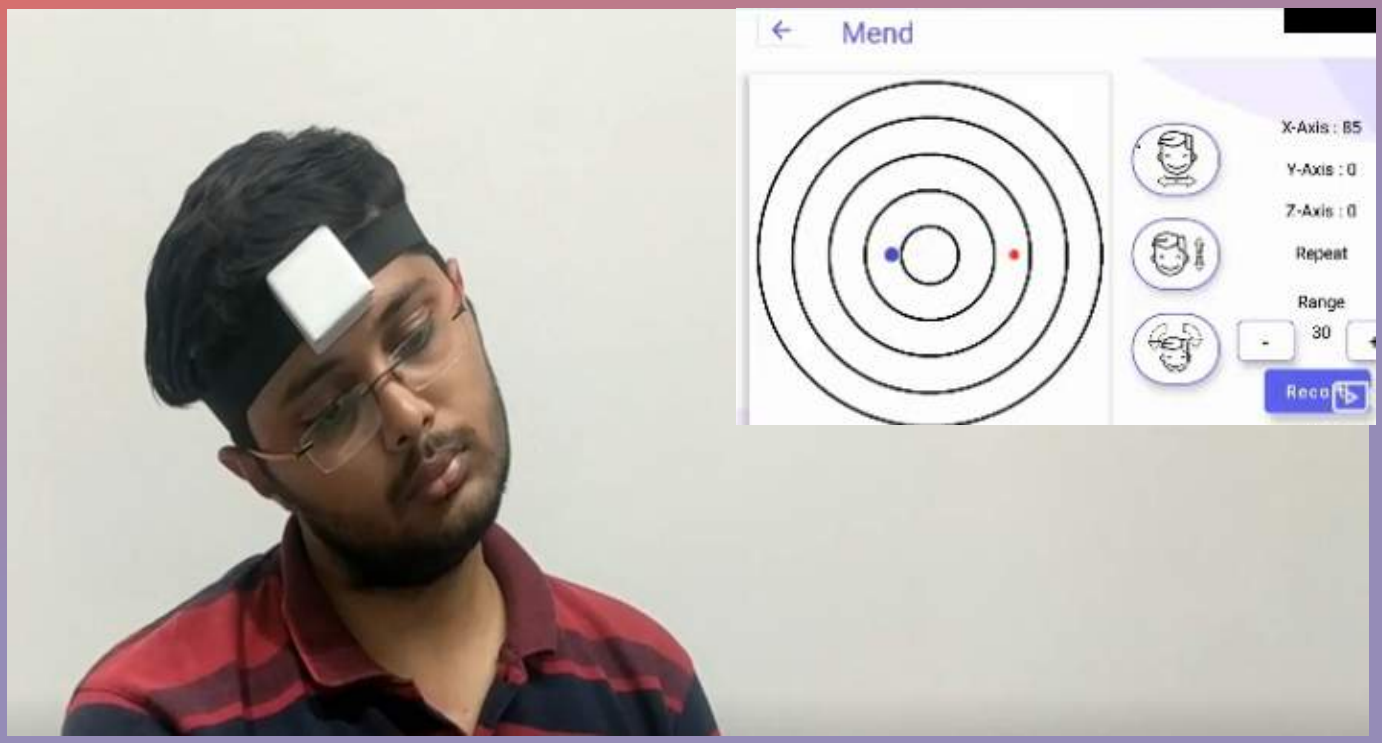
Further, we developed an independent response unit, along with the sensor, that can be placed directly into the soil and can wirelessly send data to a host server in order to receive or display data. The sensor doesn't just include moisture readings, but also light intensity, temperature and humidity of the surrounding area. The sensor circuit can run off a LiPo battery or be solar-powered. The communication part is handled via an ESP8266-01 module, which can connect to the same network as the host server so as to send readings using an MQTT protocol.

The sensor readings can be used for creating databases for plants, as in to monitor the water requirements and suitable temperature and humidity conditions a particular plant to grow. In turn, the databases can be used to know the individualized irrigation schedules for each crop. Machine learning algorithms can also be used to help with this task.

The various new and different sensors that await the farming industry in the future are an interesting and exciting topic to discuss, and one's mind can only imagine how they'll transform the industry as we know it today.

CERVICAL TRAINER MEND

The project was done by -
Abhishek Kansara, Shrey Shah, Bharathi Kumar Nadar, Arjun Patel



Nearly 80% of people suffer neck pain after the age of 30, and patients don't find it interesting doing physiotherapy exercise daily. As participation in the eYantra Ideas Competition(eYIC) held by eYantra Lab IIT Bombay, we proposed the idea for a cervical trainer, and in the course of developing the projects with inputs from IIT eYantra team, came across many physiotherapists and developed a device which has a modern solution.

The need for developing this project was that traditional methods of physiotherapists were outdated and those methods lacked a feedback system. They also needed a portable device which they can use easily for home visits, the patient recovery cycle is also a tedious job for doctors to trace for each and every patient.

Regular Exercises are boring for most of the patients and hence keeping them motivated and continuing with practicing becomes a challenge which leads to further problems. To cater to this need of patients, we added gamification, audio and visual feedback of the head movements via an android application.

The project comprises two parts, the hardware of the project is completely wireless and is connected to the mobile app via Bluetooth connection. The hardware continuously tracks the movement of the patient and sends the data to the app.

The app is very simple to use so that all age group people can use it, for the first time the patient enters details in the patient form and proceeds further for his/her training session, in the training session the physiotherapist does the analysis of the patient, this data is directly recorded in the database of the application, once the training is over, for

continuous practice movement the patient is asked to play a game in a specific direction. In gamification, the patient's movements are totally under the doctor's control, after the game is completed one more report is generated where the patient and doctor both can understand the progress report of the patient.

eYIC competition has helped us in understanding our problem domain in a very specific manner, they helped us focus on a specific set of people and also their business canvas model program taught us how to understand the need of any project in the real world and what steps are required to build.

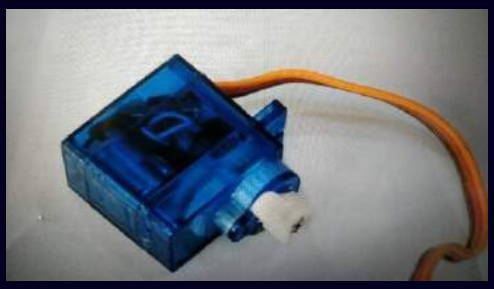
DIY

HOMEMADE ELECTRONIC SCREWDRIVER

Materials needed:

- Servo Motor
- Screwdriver extension
- 3-way 6-pin toggle switch
- 2 AA battery and its holder.

Step 1:



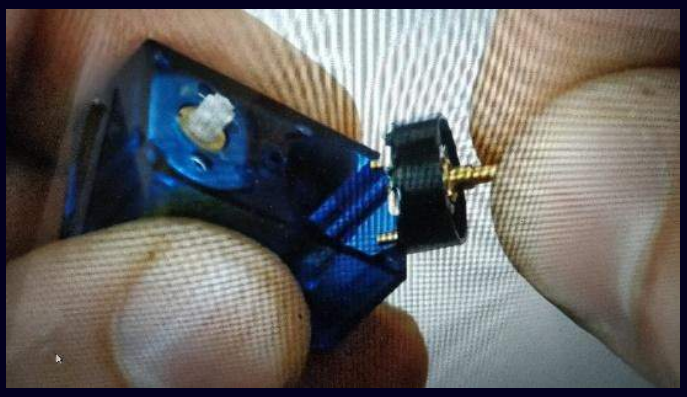
Take a servo motor and remove the circuit board from the same by cutting the wires connecting the motor. Remove the piece of plastic

on the top gear which restricts the motor to turn more than 360 degrees by cutting or heating it.

Step 2:

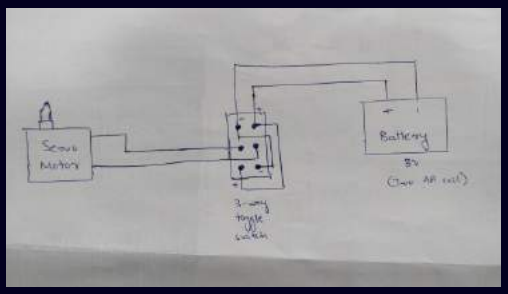
Also, remove every metallic part of the potentiometer except the shaft and then place everything back

together as we don't need the feedback circuit.



Step 3:
Attach the screwdriver extension to the servomotor. Cut the extension to appropriate small size (Make sure not to hurt yourself) such that it doesn't break the shaft of the motor when pressure is applied. Now stick the extension to the shaft using Araldite or any other contact adhesive.

Step 4:
Make connections according to the given diagram. Make sure that you connect the toggle switch strictly according to the diagram. Put everything together using a glue gun or other contact adhesives as in the diagram.



-Meet Shah
TY ETRX

ORION RACING INDIA

After successfully developing 12 combustion vehicles, Orion Racing India, the official formula student team of our college, took up the challenge of EVlution. The journey of the electric vehicle started in 2018 with the Formula Bharat design challenge and led to developing their first electric prototype Artemis. They represented India at Formula Student Germany 2019 emerging as the best Asian team in the electric category. Continuing the winning streak at Formula Bharat 2020, they were crowned as National Champions in the electric category.

1) How was your experience in Formula Bharat 2020?

The experience of the team at formula Bharat was heuristic. Orion Racing India had won the title of formula Bharat 3 times (only team to do so) in the combustion category and this time we participated in the electric category and won the title for the 4th time, continuing the winning streak.

2) What were the difficulties faced as a fresher in the electric category?

As a first-year electric team, our main aim was to make a robust and reliable vehicle keeping safety as the first priority. The integration of the subsystems and making the car rule compliant and thus clearing the Technical Inspection at the competitions was our only aim at the start of the year.

3) What are the technologies used in the car?

i) We use an Advanced Permanent Magnet Synchronous Motor (PMSM) as the main traction motor of the vehicle.

ii) For Driving the motor we use a 3 phase 4 quadrant inverter with pure sinusoidal output.

iii) We design our own battery pack for the vehicle, along with a fully custom self-designed Battery Management System. The Battery pack has a maximum voltage of 403 V and a maximum peak discharge rate of 420A.

iv) We use a self-designed Electronic Control Unit based on National Instruments' MyRIO Hardware, graciously provided to us by the Electronics Department.

v) This Network ties together all the different electronic control systems of the car and provides a unified communications interface that is employed for Data Logging,

4) Do the concepts studied in the curriculum help you in the designing and manufacturing of the car?

Yes, the concepts of the curriculum do help us in designing and manufacturing. The concepts of the MOSFET, BJT, transformer, logic gates, etc help us in the LV side of the car while the power electronics of the curriculum help us in the HV side of the system thus comprising the whole curriculum providing a base for the development of the car.

5) How do you function as a team? What is the role of electronics students in particular?

The role of electronics students in the team is to design, develop, test, and manufacture the electronic systems of the car. The different electronic systems in the car comprise basically of the LV and the HV side. The LV side of the car comprises of the safety circuits and the ECU which is the heart of the car which plays the major part in the running of the car and simultaneously collecting the required data to analyze the faults if any or rather for the further development of the car. The HV side of the car comprises of the Accumulator, motor and motor controller.

The students are thus divided into these subsystems as per their level of interest.

6) What are the upcoming competitions you are planning for?

Due to the current situation of a pandemic, we couldn't continue with the competitions in 2020. But as of now, the upcoming competitions are lined up as Formula Bharat 2021, Formula Student Spain 2021 and Formula Student Germany 2021.

7) What are your future plans as in what is the next technology after an electric car?

The next year's car has many changes such as establishing CAN bus on our car, flexible PCBs, and further updates on the accumulator and the HV side as a whole.

8) How will you encourage students of the Electronics department to participate in the Orion Racing Team?

Becoming a member of Orion is a great opportunity to learn and implement classroom concepts. Applying concepts and integrating them with the other subsystems in the car is a difficult challenge on its own and requires the base to be strong. Thus it is a great work to do for ourselves, the team and our college.

BRAIN CONTROLLED WHEELCHAIR

To give the physically challenged people control over their movement without the aid of fellow humans, Arvind Mishra(TY ETRX), Arvind Sridhar(TY COMPS), Poonam Chawda(TY ETRX) and Heeral Dedhia(TY COMPS) guided by Prof. Sushma Kadge, came up with the idea of a brain-controlled wheelchair. The physical inability of a person can be overcome by mental agility. The innovation of the inventors and the will power of the user will make the disabled person independent of others.

1. Can you give us a brief about your project?

It is an effective Human-Machine Interaction(HMI) for specially-abled people. The project deals with the engineering an interface between the human brain and an electric wheelchair using a portable EEG brainwave headset and firmware signal processing and filtering. It collects data in terms of Attention level and Blinking Strength using headset and transfers via Bluetooth medium to raspberry pi for further motor actions. Thus it proves to be a cost-effective and user-friendly device.

2. How did you come up with this idea?

As we were looking after the various applications of BCI (Brain-Computer Interface), **we realized that there can be an application of brain-signals for the people suffering from paraplegia and quadriplegia, who cannot use their hands or legs for daily activities. They face a lot of trouble in mobility.** Our body produces Biosignals which can be used as a source of information to trigger and control real-life applications. The idea is to develop a smart wheelchair that can assist disabled people in their daily life and provide them independence.

3. Can you elaborate on the stop mechanism of the wheelchair?

In order to have voluntary control over the wheelchair by a person's attention level of a person is constantly compared with a predefined threshold value, and if it's lower than that wheelchair is stopped immediately. Even on the detection of an obstacle, speed is lowered or it's stopped depending on the distance between them.

4. Did the concepts from the curriculum help you in the implementation of the idea?

Wheelchair functioning is controlled autonomously depending upon the sensor input values and it's provided to motion controlling part of wheelchair developed using electronic circuits. The study of electric vehicles as one of the subject helped us to figure

out the design for a real wheelchair. Also, the study of electric machines gave us insight about motor configuration and torque-speed characteristics needed for real-time application of a wheelchair in all-terrain. The mechanical design required for a wheelchair was analyzed using concepts of engineering graphics and mechanics.

5. What is the total time and money invested in this project?

We required 6 months to develop the prototype of the wheelchair system and now we'll be implementing on actual wheelchair taking real-time scenarios into consideration. We have invested around ₹16,000 for EEG Headset, Raspberry Pi, motors and sensors till now. The investment of money for the actual wheelchair will be as per requirements.

6. What are the key features of this model?

The key features are -

Obstacle Avoidance -Automatically detect and avoid obstacles.

AutoPilot Mode - Chose a destination such as a kitchen or a hall and it will get the user there in Autonomous Mode

Control using user Attention - If Low attention, then it will stop. Accelerate based on the attention level of the patient.

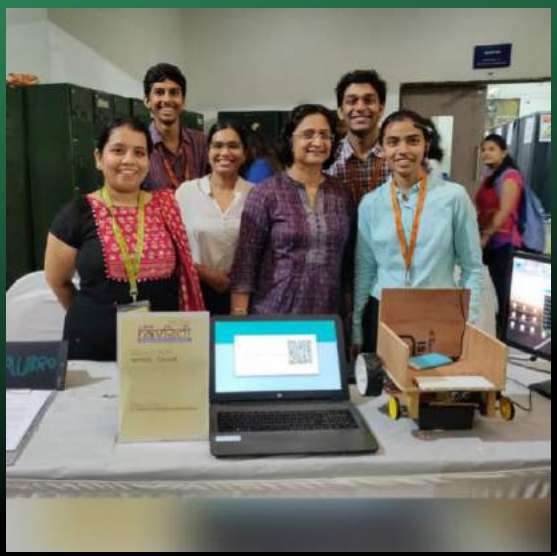
Emergency Braking System - If the user abruptly closes his eyes sensing some danger, then the Wheelchair will stop.

7. What are the difficulties faced to bring the idea into a final working model?

Developing a wheelchair as per the need in order to bring ease in interfacing it with EEG Headset. Obtaining a precise control over varied motions of an actual wheelchair, using EEG headset. We also found it difficult to simultaneously integrate the eye-blinking and attention level of the patient in real-time. These difficulties were resolved by doing extensive research and trying different approaches for maximum accuracy and efficiency.

8. How is your Brain-controlled wheelchair different from that of Sir Stephen Hawking's?

People with severe movement disorders like ALS(Amyotrophic Lateral Sclerosis), tetraplegia, quadriplegia, and severe cerebral palsy disorder do not have voluntary control over their muscles so there is a need of a wheelchair which can just operate with the brain as it's functioning well in their cases and can serve the purpose of moving independently by their own. So that makes our wheelchair different from the wheelchair used by Stephen Hawking which detects cheek movements and uses a sub-vocal system to understand his thoughts.



COVID-19
FAKE NEWS PREDICTOR

Kavya Moolya (TY ETRX)
Sumedha Majrekar (TY MECH)
Pinak Jani (TY EXTC)
Sameeksha Bhatia (TY IT)

In the world of social media, to cease the spread of fake news with the democratization of news sources becomes a big challenge. Fake news and rumors can cause a major menace in the time of this life-threatening pandemic. Here's the project from Sumedha Majrekar (TY MECH), Pinak Jani (TY EXTC), Sameeksha Bhatia (TY IT) and Kavya Moolya (TY ETRX), collaborating to build a solution and also the winners of **'COVID-19 Impact'** category in the e-Yantra Fighting COVID-19 Hackathon.

Firstly, can you please give us a brief about your project?

The Covid-19 Fake News Predictor is a model that detects fake news, without compromising privacy, and is based on deep learning algorithms. The user has to enter a message in a text box provided on the website and simply click on the 'Submit' button (currently, it works for the Hindi language). The message is then tested with the deep learning model and the output ('Fake' or 'Genuine') is displayed on the GUI. The model currently has an accuracy of more than 92% for the English language and also supports different languages (language translation model is to be improvised for better accuracy).

Could you tell us, why did you choose this project?

While staying at home we were wondering about how we as engineers could contribute in this situation of crisis and then one idea came just in form of ping of notification from a news app that stated: "Man commits suicide fearing infection to coronavirus".This news came as a shock that what could lead a person to such fear and the answer was Fake News and misinformation. At this point, we realized it was necessary to find a solution to this issue which led to the idea of developing "COVID-19 Fake News Predictor".

Talking about the segregation of news, how is news categorized as fake?

After manually verifying the examples and segregating it into two labels, Fake

and Genuine, we built a deep learning model that is fed with the tokens (individual words of the example), obtained by Natural Language Processing, and it gives the output as a tensor. The decision is made w.r.t the number of tokens associated with a label and also the token appearing before and after the label i.e the sequence of tokens is also considered (achieved by using a Bidirectional layer).

What materials did you pursue to gain knowledge on COVID 19?

We researched the content of Fake News on various news websites, WHO's website and also had mailed some govt authorities asking if they had any kind of a dataset. Every example in our dataset has been thoroughly verified by the International Fact-Checking Network website.

How many days did it take you to develop the app?

We first brainstormed the idea and then implemented Machine Learning and integrated the web app using Django. Our first prototype took us around a week's time to implement. We further developed it using Deep Learning algorithms and have also implemented a Watson Language Translator. It overall took us around 35 days to come up with a better prototype of our solution.

Coming to the real-life application, how do you propose to market it?

We initially plan to launch it as a web app and further launch a Whatsapp chatbot to reach a larger audience. The multi-language support feature is first of its kind, implemented for a deep learning model that checks fake news. Also, we plan to introduce the speech to text feature which would really elevate the usefulness of our product.

> **"After manually verifying and segregating the examples as Fake and Genuine, we built a deep learning model that is fed with the tokens.**

How was it to coordinate and work as a team in this period of lockdown?

Managing the whole process and coordinating through online meets was the most challenging part. Every small decision had to be made collectively and hence took a lot of time as there was always some difference in opinion.

TAKEAWAYS FROM COVID-19 PHASE

Prof. Milind Marathe was invited by Think India organization to give a speech on their YouTube channel in the lockdown period, on the 3rd of April. He began his speech by defining the word takeaways as 'a key fact, point or idea to be remembered, typically emerging from a discussion or meeting. 'Starting with appreciating the doctors, paramedics, health staff, police and other corona warriors, he discussed the current situation of our country. The deliberation of the situation was led by the observations drawn out of it. The contribution of the Indian economy for the welfare of its citizens, problems faced in maintaining social distancing among the population, struggles of the migrant workers and the importance of retail stores, doodhwalas, sabziwalas were some of his key observations. He then quoted a statement from Mr. Yuval Harari's piece, 'This storm will pass but the choices we make now could change our lives for years to come,' stressing on the importance of the choices of the government and the people. Further, he stated his takeaways from the COVID-19 phase. The first takeaway is the collaborative online teaching-learning and flip classroom is the future of education. The continuation of safety practices and improvement of the Indian Healthcare system comprised the second takeaway. The third one was the result of the observations promoting the introduction of new stable policies for migrant workers and switching from Global to Local. The last and the most insightful takeaway was 'Citizen Empowerment' emphasizing the world to be a family and act like one. The description of the indispensable role of the citizen marked the end of takeaways. Concluding his speech, Prof. Marathe acclaimed the worldwide acknowledgment of the gesture of Namaste by quoting, 'Divinity in me is saluting the divinity in you is Namaste'.

-Prof. Milnd Marathe

MADE IN INDIA

Asimov Robotics, a Kerala based start-up has deployed robots at public places to dispense hand sanitizer, deliver public health messages about the virus and in hospital isolation wards to carry food and medicines.

Centre for Fire Explosive & Environment Safety (CFEES), Delhi has developed an automatic mist-based sanitizer dispensing unit. It uses infrared sensors to detect hands and dispense the sanitizer.

Defense Institute of Physiology & Allied Sciences (DIPAS), Institute of Nuclear Medicine & Allied Sciences (INMAS) and DRDO laboratories in Delhi have developed an Ultraviolet C Light-based sanitization box used to sanitize a lot of things including wallets and keys.

Sree Chitra Tirunal Institute for Medical Sciences and Technology, Thiruvananthapuram developed a diagnostic test kit, called Chitra GeneLAMP-N, which can confirm COVID-19 in 2 hours at a low cost.

UNRAVELING SOFTWARES

Thinger.io

Thinger.io is an online dashboard and database management service that allows you to create your own IoT dashboard and display sensor readings and control devices connected to your microcontroller quite easily, all in real time and it's available for free for a limited number of devices. Thinger.io is also available in app format on the PlayStore. Moreover, it can be easily scaled over for a large number of individual devices as well without much hassle.

NodeRED

Being a flow-based graphical language programming tool, NodeRED was developed originally by IBM for wiring together hardware devices, APIs and online services as part of IoT. NodeRED comes pre-installed in the Raspbian OS, and can also be installed on other operating systems. It is browser-based, and uses JavaScript as it's programming language. NodeRED can be used to develop your IoT dashboard from scratch, allowing the user to customize every aspect and most importantly keep the whole system local if required.

Blynk

Blynk is one the most popular platforms for remotely controlling and monitoring your projects via iOS and Android devices. It's a digital dashboard where you can build a graphic interface for your project by simply dragging and dropping widgets. Blynk is an open source service, and can be used to interact with various microcontrollers using Bluetooth as well as Wi-Fi.

Cayenne

Cayenne is a free to use drag and drop IoT project builder that allows its users to quickly create and host their devices.It can control hardware remotely, it can display sensor data, it can store data, analyze and do many other cool things. It is a great tool for IoT developers given it's range of customizability and simplicity.

TinkerCAD

TinkerCAD, from Autodesk, is an online browser-based circuit simulation software. As the name suggests, you can tinker around with basic circuits, and work around with more modern microcontrollers such as Arduino. It offers an online Arduino IDE, so one can write and update the code on the go. The software also has a 3D designer tool available as well. The software is also completely free, and all you need is an Autodesk account to access it!

INDUSTRIAL VISIT TO HYDERABAD

EESA IV to Hyderabad was my first college IV but honestly speaking it was very well organized. All the council members and faculty had worked hard to plan the trip and make it memorable for everyone. I really appreciate the hard work. They had taken care of every small thing. The industries we visited and the sight-seeing was mind-blowing. Looking forward to the next EESA IV.

- **Yashvi Gosar (TY EXTC)**

The trip was amazing and I am glad I decided to go. This industrial visit not only made me learn so many things but also gave me the opportunity to make new friends and have a great time with them. It's difficult to identify one specific event that stood out as they were all so good. I wish the trip would have been a little longer. I feel so lucky to have had this experience and I really appreciate all the hard work EESA Council had put in to make this a trip of a lifetime for us. Thank you!

- **Nikita Sangal (TY IT)**

EESA IV was my first IV and unexpectedly it turned out to be a memorable one. The industrial visit was extremely well organized. The volunteers handled all the situations smoothly. The visit to Ramoji was the best thing in the IV. The time given for visiting every area in Ramoji was less according to me, especially at the BAHUBALI set. Expecting the same fun next time.

- **Jay Gohil (SY MECH)**

Well, it was a very fulfilling experience for me as I spent quality time with my friends and also learned many new things from the industries which we visited. I would like to thank the EESA council for making this possible and for giving us such an amazing experience and memories to cherish for a lifetime!

- **Madhura Pharande (TY IT)**

Appraisals

I would like to thank the EESA council's heads and all the members for arranging such a wonderful IV. The process from the selection of destination, arrangements up to the execution of the planning was done very well. Whenever any of the IV students faced difficulty, the organizers were there for them and solved the problem as quickly as possible. This is my last year and because of EESA, I spent a great time with my friends. Especially the day we spent at 'Ramoji film city' such a memorable one for me and my friends as well.

- **Suraj Rane (LY ETRX)**

My debut industrial visit turned out to be a memorable experience, having knowledge wrapped in fun. Kudos to the faculties and management for such a great opportunity and looking more for such opportunities leading in the application of our knowledge!

- **Vidhi Gohel (SY ETRX)**

It was a peaceful, mind refreshing journey for us. The industries which we visited also put motivation in students and they got exposure to the industrial environment. With their great efforts, they gave us some memories and moments to cherish for life long. I am thankful to the entire EESA council.

- **Kinjal Doshi (FY EXTC)**

IV is a weirdly amazing combination of fun and knowledge, EESA council did a great job in arranging and managing the IV which we will cherish for years to come. It was a wonderful experience knowing the jovial part of professors and technicalities in an industry.

- **Rushabh Shah (TY ETRX)**

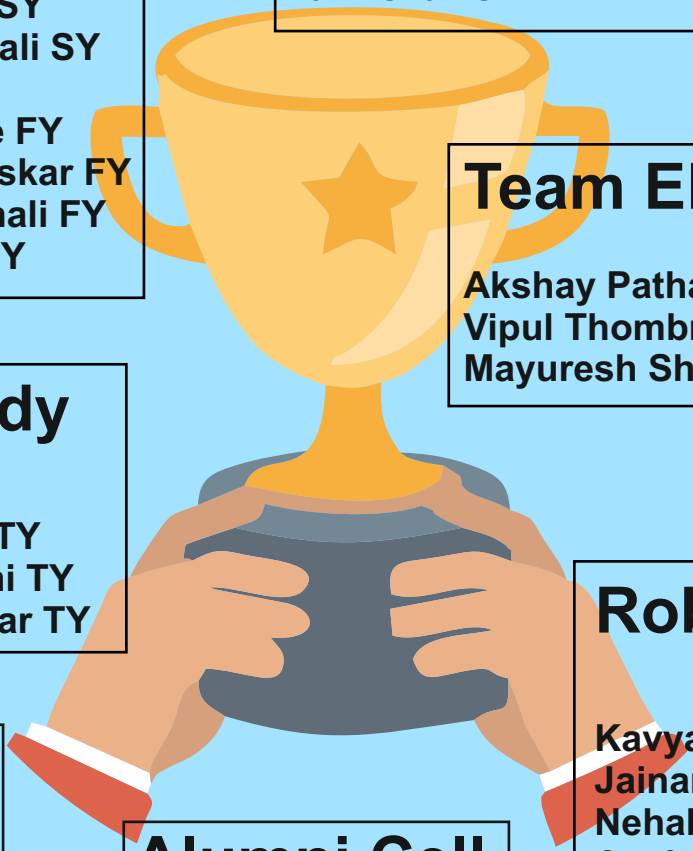
DEPARTMENT'S PRIDE

Orion

Saurabh Shah LY
Anubhav Bose TY
Arpan Biswas TY
Dhairya Kamdar TY
Vraj Brahmbhatt TY
Aaditya Rajgor SY
Dhruv Bhanushali SY
Arathi Gopi FY
Rudrakshi Bane FY
Shubham Pawaskar FY
Shubh Bhanushali FY
Sonal Kenche FY

Onyx

Arya Bafna TY
Harmanjeet Singh Bilkhu TY
Poonam Chawda TY
Aagam Mehta SY
Lakshya Jain SY
Rahil Shah SY



Team EESA

Akshay Pathak TY
Vipul Thombre TY
Mayuresh Shirke TY

Rhapsody

Mehul Doshi TY
Avee Bhaiyani TY
Meheru Parmar TY

Robocon

Kavya Moolya TY
Jainam Gogree SY
Nehal Jain SY
Ansh Mehta FY
Raj Patel FY

ISTE

Vishal Panchal TY
Fenil Chheda TY
Bhaskar Ajmera TY
Tejal Kadu TY
Divya Raul SY
Sankalp Jain SY
Karan Shah SY
Mitali Potnis SY

Alumni Cell

Bharvi Acharya SY
Toshith Manglani SY

Eta

Malhar Kharat TY

Octavium

Pranavkumar Sudhakar Tingare TY
Shreyas Nitin Parkar SY

Emfinity

Chaitanya Tambhat TY
Jibitesh Saha SY
Prutha Patel SY
Rhyme Risi SY

Bloombox, E-cell KJSCE

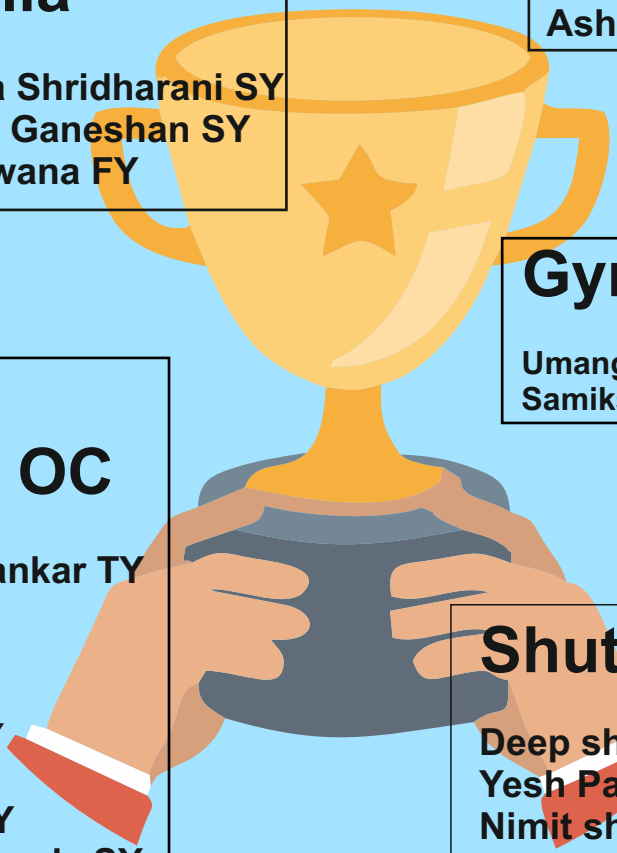
Vruksha Joshi SY

SAHAS

Ashish Doshi FY

Insignia

Akanksha Shridharani SY
Aksharan Ganeshan SY
Isha Makwana FY



Gyrations

Umang Agarwal TY
Samiksha Prachand FY

Students' Council & OC

Chaitanya Tamhankar TY
Mohil Khona TY
Nipun Shah TY
Nirav Shah TY
Rahil Thacker TY
Vrushali Sule TY
Daniel George SY
Ebrahim Bhinderwala SY
Harsh Panchal SY

Shutterbugs

Deep shah LY
Yesh Patel LY
Nimit shah LY
Dipansh Makwana TY
Kaushal Goradia TY
Gauri Pawar TY
Nikhil Naredla TY
Hardik Patel TY
Hiren Kachhadiya TY
Vatsal Kapadia SY
Toshith Manglani SY
Prathmesh Adarkar SY
Nihaal Singh FY
Vedant Kelker FY
Ansh Mehta FY

Illuminati

Tanmay Khanolkar TY
Nidhi Jajda SY

TIMELINE

Investiture Ceremony
Date: 6th August 2019

The newly formed council started their journey by organizing the investiture ceremony of EESA Council 2019-20. The General Secretary, Ms. Rinkal Keniya introduces the logo for the academic year and gave a presentation on the planned events for the tenure.

Calculator Workshop
Date: 30th August 2019

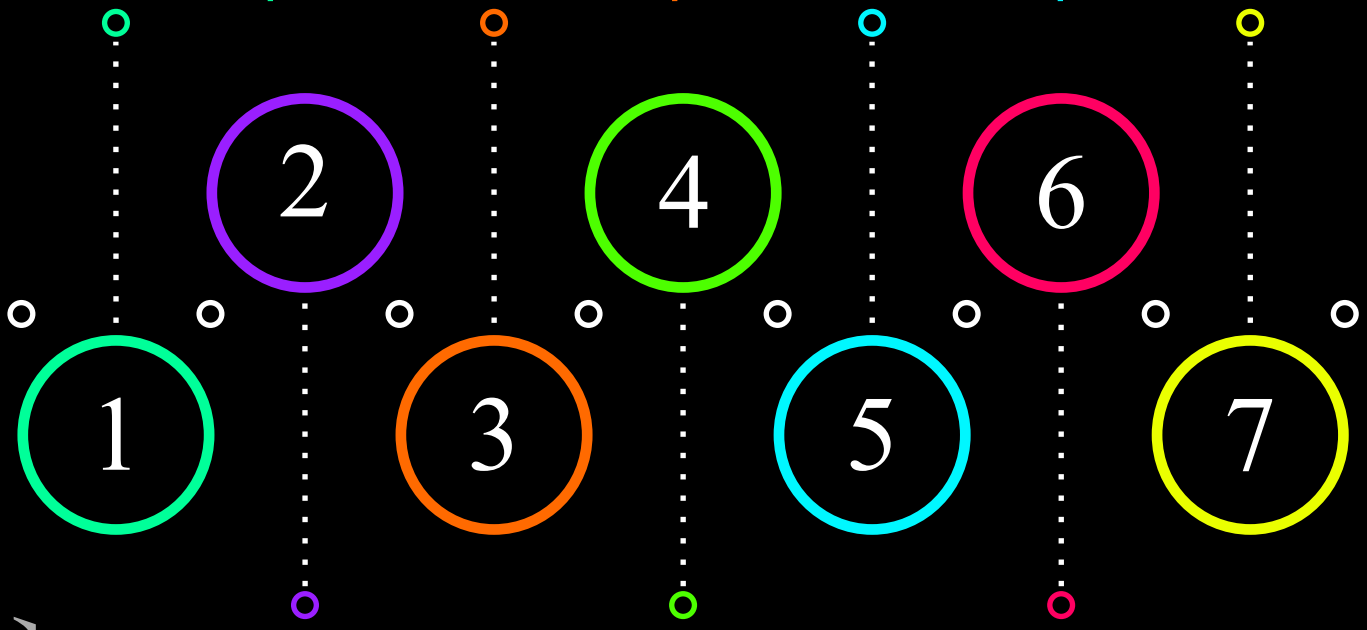
As you evolve in the engineering career, only one thing remains constant as a savior for solving all the calculations named "Scientific Calculator", hence the workshop was conducted for the newly admitted freshers of the college.

Lecture Series
Date: 3rd October 2019 - 23rd October 2019

A series of lectures wherein professionals delivered information about the exam patterns, admitting institutes and detailed description for GRE, GATE/CAT/GMAT. Impulsive session on Stress/Time Management, Career Counselling was also conducted.

Circuit Designing Workshop (2.0)
Date: 25th October 2019

To bring the electronic circuits built in phase I workshop in its physical form, PCB designing workshop was organized to benefit the students for their life long projects.
The basic setup and schematics were taught on two popular PCB designing software.



Circuit Design Workshop (1.0)
Date: 28th August 2019

The process of designing an entire circuit along with teaching the ins and outs of the software "LTSPICE" by the technical team of the council marked the beginning of the events organized.

Teachers' Day and Engineers' Day
Date: 17th September 2019

The faculties and non-teaching staff of the electronics department were invited for the celebration, wherein different entertaining games among the groups left the audience awestruck.

Abhiyantriki 2019
Date: 12th October 2019

"Circuit Frenzy" and "Drive with force" were the major events managed by the council for the annual Techfest of the college. The speed of building a circuit to navigating a bot through the maze led to the winning criteria of the competitions respectively.

TIMELINE

Industrial Visit
Date: 24th - 29th January 2020

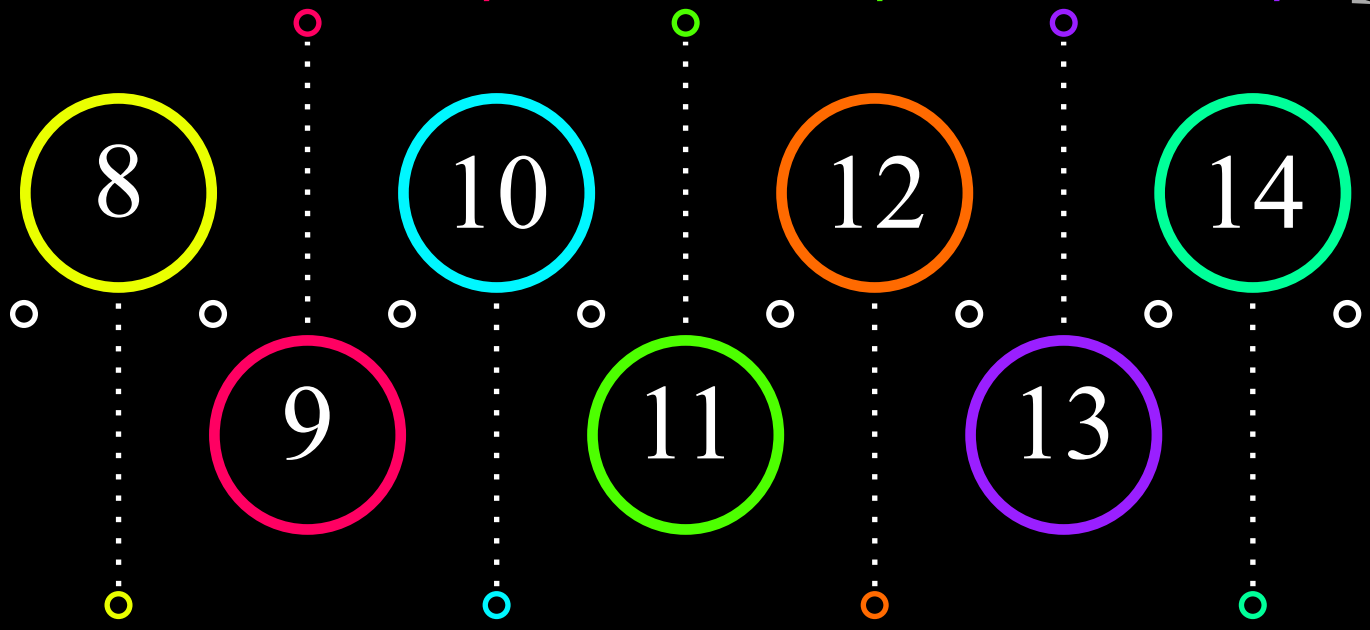
The start of the year 2020 witnessed a bunch of students getting insight into the internal working of "ETDC" and "Coco-Cola" companies located at Hyderabad. Historic sites including various other attractions made the High tech city visit worth it.

BEEE Workshop
Date: 6th March 2020

This workshop was conducted exclusively for the first year, to familiarize them with the basic components and equipment used in electronics laboratories, to benefit the students in the practical sessions/examinations and project building.

Best Outgoing Student Award ceremony
Date: 30th June 2020

Every year the Best Outgoing Student from the passing batch is awarded for his excellent performance in academic and co-curricular activities.



Arduino Workshop
Date: 11th November 2019

An introduction to the Arduino and its basics, software coding, simulating circuits and processing them were conducted by the council, as the last event during odd semester.

Interactive Web Programming Workshop
Date: 28th February 2020

The motive of the workshop was to engage the audience to design a user-friendly interactive website through different editors namely Javascript and p5.js. A deep introduction about the libraries and specifications was also delivered by the technical team.

Webinar on Industrial Automation
Date: 23rd May 2020

In the period of nationwide lockdown, a workshop was conducted to enlighten the students with the technologies used by the industries for automation. The webinar was organized on a youtube live session by Mr. Alister Dsilva.

Magazine Unveil
Date:: 8th July 2020

The annual periodical of our Council, 'Periscope', was launched, marking the end of the journey of EESA Council 2019-20.

Calculator workshop organised by the Technical Team.

Our Tech Head demonstrating Circuit designing for PCB.

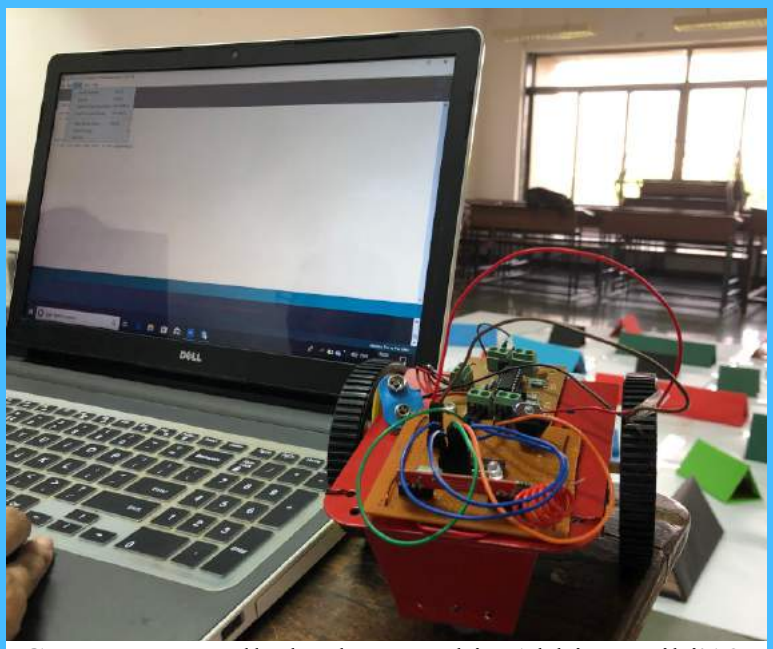
Our council member explaining the process of circuit designing.

A group picture at the Industrial Visit to ETDC Hyderabd.

Attendees of Lecture-1 on Time Management.

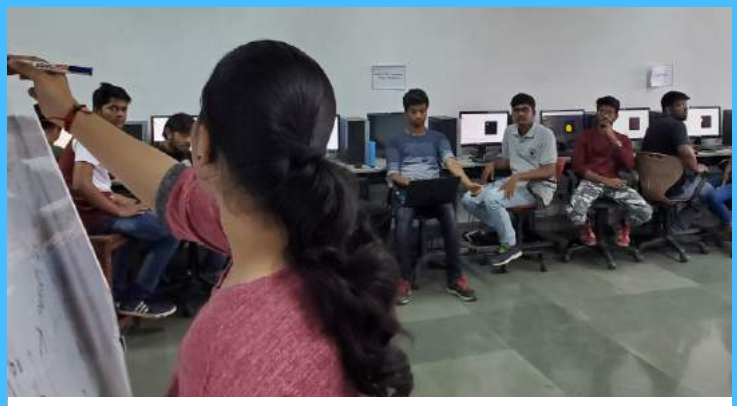
Participants building the circuits in ‘Circuit Frenzy'.

PHOTO GALLERY



Gesture controlled robot used in Abhiyantriki'19.

Mr. Mukesh Jain discussing Career Counseling and future perspectives.



A still from the Interactive Web programming workshop.

The juniors illustrating the basic circuits of electronics.

A still from the Interactive Web programming workshop.

The Arduino Workshop

GET TO KNOW THE COUNCIL

The Leading Team

Rinkal Keniya (General Secretary)
Leadership along with public relations, marketing, creativity and a lot of other qualities make her the finest Chief of the council.

Aman Savla (Joint General Secretary)
Can beat Usain Bolt in managing an event in addition to entertaining the crowd and the team.

Animesh Prasad (Treasurer)
Money matters are all that matter to him. Providing funds and making a profit would widen his smile.

The Technical Team

Siddharth Vaidya (Technical Head)
The 'Know-It-All' techie who is ever ready to take workshops and projects on anything and everything.

Divya Manikantan (Technical Head)
She possesses a supernatural power to find solutions to technical issues and bugs.

Sushant Bansal (Joint Technical Head)
Like Sheldon, he has answers to all the technical questions, coding is indeed his cup of tea.

Madhura Inamdar (Joint Technical Head)
Our very own version of Geet, makes the attendees feel comfortable to ask doubts.

The Public Relations Team

Soham Kalzunkar (Public Relations Head)
His infectious smile and friendliness attract the crowd at our events.

Pooja Shah (Public Relations Head)
A perfect blend of elegance and humor makes her stand out of the crowd.

Aditya Goud (Joint Public Relations Head)
Mr. funny bones, enthusiastic by nature, always on his feet to go for announcements.

Mitva Bhagat (Joint Public Relations Head)
Punny to the hilt, loves playing with words, friendly by nature thy name is Mitva.

The Literary Team

Pooja Nambiar (Literary Head)
Penning down thoughts into words is her forte, will beat the clock in creating content.

Anjali Golani (Literary Head)
Personifying beauty with brains through her content and especially reports (loves writing reports)!

The Creative Team

Hardik Patel (Creative Head)
His work is the quintessence of creativity leaving the viewers awestruck.

Gauri Bane (Creative Head)
Her chirpiness and understanding of the colors would lighten up both the events and the posters.

Harshid Bhinde (Joint Creative Head)
A fun-loving and adventurous guy with a good sense of humor whose creativity knows no bounds.

Jenil Seth (Joint Creative Head)
He will ask questions to satisfy his curiosity which leads him to the best creative ideas.

The Event Management Team

Siddharth Dumbre (Event Management Head)
Planning an event and want it to be a success, he's got you covered!

Kushal Gupta (Joint Event Management Head)
"On it bro!" keeps chanting these words while making sure the event goes well.

Mansi Nair (Joint Event Management Head)
As the name suggests, she listens to the voice of the heart and comes up with novel ideas for events.

This is us!

Top Row (L to R): Kushal Gupta, Manasi Nair, Madhura Inamdar, Harshid Bhinde, Jenil Seth

Second Row (L to R): Siddharth Vaidya, Hardik Patel, Anjali Golani, Pooja Shah, Mitva Bhagat

Third Row (L to R): Siddharth Dumbre, Pooja Nambiar, Divya Manikantan, Gauri Bane, Soham Kalzunkar, Animesh Prasad

Bottom Row (L to R): Rinkal Keniya, Prof. Makarand Kulkarni, Dr. Jagannath Nirmal, Prof Bharati Khedkar, Aman Savla

Missing: Sushant Bansal

Is silicon the new gold?

When we talk about materials, we consider copper, gold, silver and many more, but not many people prefer using silicon in the sentence. Did you know there are very few items in your daily world that do not include some percentage of silica? From smartphones in your pockets to electronic vehicles and supercomputers, every one of them is achievable because of semiconductors. The mechanics of computing started by using vacuum tubes but gradually silicon changed everything. Silicon is now poised to do something distinctive! No wonder parts of the cities have come to be recognized as Silicon Valley as many technology companies and their headquarters are situated there. Every evolution particularly Stone age, Iron age and Machine age had to cease after some time. Now, Is the next generation witnessing Silicon age?