

FR. CONCEICAO RODRIGUES COLLEGE OF ENGINEERING

TECHNOEDGE

Technical Newsletter

WHAT THIS ISSUE CONTAINS:

Technical Articles



DEPARTMENT OF ELECTRONICS ENGINEERING

We present you the first issue of technical newsletter.

March 2019



"Creating Engineers with a competitive edge"



From HOD's Desk

DR. DEEPAK BHOIR

“ *'Past is experience, Presence is experiment and future is expectation, Use your experience in your experiments to achieve your expectations'* ”

It is with great pleasure and confidence, we present our first news letter “Techno Edge” of the Department of Electronics Engineering under the Fr. Conceicao Rodrigues College of Engineering affiliated to University of Mumbai. The UG program is accredited by the National Board of Accreditation (NBA). The cutting edge areas include Communication Technologies, Signal and Image Processing, Network sensors and Security, VLSI, Embedded system, Instrumentation, Automation etc.

The academic curriculum has an optimum mix of Electronics, Communication and Computer Engineering. The adherence to strict quality norms in teaching and evaluation has always been the strength of the Department. Regular updates in the hardware and software advances are made to keep in pace with the advances in the both the fields. The undergraduate students are exposed to interdisciplinary problems and encouraged to develop leadership skills. Department has produced capable leaders to lead most of the technical teams such as Robocon, Baja, Aero etc. Department has nurtured a good culture by establishing CRCE- IEEE chapter, WIE and Project Cell for attaining the pace with rapidly expanding horizon of Science and Technology. Faculty members along with students publish technical papers at national and international level either in conferences or journals.

The manpower generated from the programs is finding excellent employment opportunities in Electronic Industries, IT sector in different verticals, Academic Institutions etc. Students perform very well in lifelong learning by registering for higher studies in reputed institutes and foreign Universities The graduates possess a potential for self-employment as envisaged by the present government policies

ABOUT THE NEWSLETTER

We are proud to present the first-ever Departmental Newsletter of the Department of Electronics of Fr. CRCE. One of the most important attributes of an Engineer is the ability to express one's ideas and written communication is an excellent way to do so. Also, the lines between various branches of Engineering are blurring and every future engineer must acknowledge this fact and equip themselves with as much information as possible.

The world of technology is rapidly changing and it is almost mandatory for every budding engineer to keep himself/herself abreast of latest trends to remain relevant in industry/research. The Newsletter aims at sharing some interesting technical articles in the field of technology to aid this process.

- *Dr. Sapna Prabhu*

EDITORIAL TEAM



Dr Sapna Prabhu



Prof. Narayanan K



Swaroop Raste



Roystan D'Silva



Direct Sequence Code Division Multiple-Access (DS-CDMA) is a multiplexing technique where several users simultaneously transmit information over a common channel. To permit the transmission of several users without undue interference between them, CDMA employs spread-spectrum technology, where a spreading code spreads the bandwidth of the data uniformly for the same transmitted power. The spreading code used is a pseudo-random code. These codes i.e. the signature waveforms with low mutual cross correlations are known to the receiver.

The signals from individual users can be detected without interference from other active users as long as these signals are orthogonal to each other. However, in asynchronous transmission and/or in case of multipath propagation, the signals from the users lose their orthogonality, which results into the signals from the multiple active users interfering with each other. This type of interference is called as Multi User Interference (MUI) or Multiple Access Interference (MAI). The probability of error increases at the receiver due to MAI, thus limiting the capacity of the conventional detector. Hence, it becomes imperative to mitigate the MAI.

The BPSK modulated received signal, encompassing multipath signals of all users in the Rayleigh fading environment is given by,

$$y(t) = \sum_{k=1}^U \sum_{l=1}^L \{d_k(t - \tau_{kl}) w_k(t - \tau_{kl}) \cos \omega_0 t + n_{kl}\}$$

where U is the total number of active users, L is the number of multipaths, d_k is the data sequence of the k th user, w_k is the spreading code of the k th user, τ_{kl} is the transmission delay for the k th user in the l th path and n_{kl} is the noise added by the Rayleigh channel in the l th path of the k th user.

Did you know that **Tunnel Diodes** are resistant to nuclear radiation?



Monica Khanore

After coherent demodulation, the received signal is low pass filtered. The filtered received signal, $r(t)$, contains interference from all active users.

Assuming that the path delays, τ_{kl} , of all users are correctly estimated, the correlation coefficients for all the multipaths of each user are obtained by employing a bank of matched filters. The correlation values obtained for the multipaths of each user are combined to estimate the strength of the user. The users are then arranged in the descending order of their strength before performing the IC.

The multistage HIC consists of U groups with each group consisting of the multipath signals of the k th user. Once the groups are formed, the multipaths are cancelled within each group, which gives the data estimate of that user in each multipath. The estimated data is used to regenerate the user signals from which the MAI due to that user is calculated. The MAI is then subtracted from the received signal. The residual signal after subtraction is used for parallel detection of the next group. This process of Parallel Interference Cancellation (PIC) within the groups and Serial Interference Cancellation (SIC) among the groups continues until the last group in that stage is detected.

The residual signal from the last group of the m th stage is used for the PIC of the first group of the $(m+1)$ st stage. And the process of interference cancellation proceeds as described earlier. The estimates of the users at the end of the m th stage are combined with the channel estimates to detect the data. This scheme of interference cancellation exhibits a robust BER performance for low SNR and increasing traffic. Hence, it can be deployed for the practical systems. Also, it eliminated the need for the complex RAKE receiver for multipath combining.



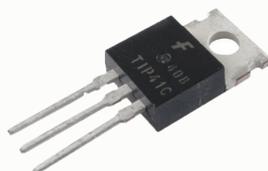


As quoted by Steve Jobs -
"Design is not just what it looks like and feels like. Design is how it works."

Web design describes the visual appearance of a website. Traditional approach involves contrast, colouring, balance, emphasis, rhythm, style of graphical elements (lines, shapes, texture, colour and direction), use of icons, background textures and general atmosphere of overall website design. All these elements are combined with the fundamental principles of design in order to create a superb result that meets the goals set for the website.

This article deals with an online application termed as "Quiz Management System". This project aims to create an online platform for the students to give exams on different coding languages. It uses both front-end languages like HTML, CSS, JavaScript, jQuery and back-end languages like JSP's and Servlets. It uses a database connection MYSQL for storing the data as soon as it is entered. This keeps the data updated and secure. The first page is the home page which asks the user whether it is admin or a student. For the admin, it allows the user to make changes in the courses and the questions related to it and mark the right answer out of the four random options given by him and this answer is stored in the database through the database connection which is done in the Servlets. The admin can also display the student information for keeping a record. For students, they have to submit their basic information which is stored in the database, then a random ID and password are autogenerated from the database.

Did you know that in 1954, George Teal, a scientist at Texas Instruments created the first Silicon Transistor?



Urvashi Dhingra
SE Electronics

After that, students enter the page where they are given another randomly generated ID which should be remembered by the student for future result checking. The students are then asked the course they want to attempt for the quiz and a set of questions appear. The answer marked by the student is verified from the correct answer in the database and the marks are recorded for that question for each student in the database. The styling of the web page is done using HTML, CSS and BOOTSTRAP. The students can opt for more than one course.

The database connection ensures end-to-end security for the student by making sure that once the student is logged in, he should not be redirected to the home page unless he logs out and once a course selected and the reconfirmation is done the student cannot change the course. After the crosschecking of the answers the result is displayed in terms of marks for each question and total marks with a percentage.

The JSP gives the data to be printed on the web page and the connection with the database is done using Servlets, where the directory is created in WEB.xml file.

In a nutshell I would like to conclude that this project can be a really useful web application for the schools and colleges to put up a quiz exam for the students. Also it provides security to the students while writing the exam.

Sensory Substitution
Devices
on Page 7

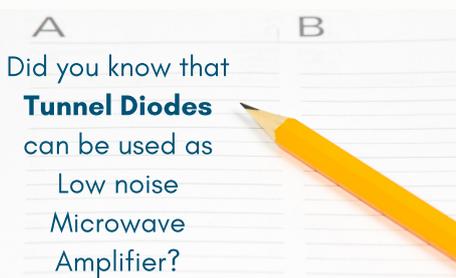




Bio-Robotics is a term for representing the amalgamation of several sciences which includes the fields of bionics, genetic engineering and cybernetics. The collective study of different sciences has allowed us to explore how robotics can interact with biology. Bio-Robotics essentially allows robotics to be a substantial substitute for biological organisms. This article speaks about Bio-Robotics and its recent advances.

The first design for an Airplane was designed by observing the direction in which pigeons point their wings. The Japanese bullet train was inspired by observing the swooping movements of the Kingfisher. Design of many surgical instruments are inspired from the beaks of birds which have a very precise grip, strong enough to crack a nut but gentle enough to pick up small grains. In recent times, prosthetic arm matches the dexterity of an average human arm.

Mimicking animal motion have resulted in many technological advances that have revolutionized how manmade machines move through air, water and on land. With the rapid development of biology and computer technology, it is possible for us to clearly understand and imitate the behaviors of many animals. Currently, Brain Computer Interface (BCI) allows the use of computers by the physically handicapped, for taking signals directly from the brain. Bio-robotics is increasingly contributing back to biology in fields such as biomechanics and neuroscience. Indeed, bio-robots are becoming important scientific tools and can be used to investigate locomotion and to test hypotheses about the underlying interactions of body, control, and environment. Robots have multiple properties to replicate animal behavior.



Jatin Dodiya

TE Electronics

Animal locomotion is based on two key principles. First principle is the generation of periodic movements using muscles (which is quite different from the rotational movement of electromagnetic motors), and second principle is the generation of asymmetries in the interaction forces with the environment, such that periodic movements of muscles are transformed into a forward acceleration (as opposed to back-and-forth movements in place). The biomechanics of locomotion requires the investigation of all the internal forces in the high-dimensional musculoskeletal system and also all the complex interaction forces with the unstructured environment—with further complication the interaction will change the environment itself, such as when a motion displaces water or sand. Understanding locomotion therefore requires a systems-level approach that explores the interaction of all involved components, in addition to studying components in isolation. Such an approach comes naturally in robotics, which is by essence the science of integration of many components (materials, actuators, sensors, and control loops). Bio-robots can play a key role in animal locomotion studies by offering an “understanding by building” approach.

In future, Bio-Robotics has a wide scope for learning and research work in applications like dynamic motion, military purposes, industrial applications, space explorations etc. Boston Dynamics, HAMR (Harvard Ambulatory Micro Robot), Stanford Engineers, University of Tokyo Biotechnology Research Center, Harvard SEAS, MIT Biomimetic Robotics lab and many more platforms are currently working on this type of projects showcasing interest in the field of robotics and biotechnology.





To understand the significance of this topic, we need to understand the limitations of a stepper motor. Stepper motors are one of the best solutions for open loop control of a robotic system. Like every other motor in a system, the speed of operation of a stepper motor is limited by the friction and drag in the system. But at zero load, the RPM of the stepper motor is limited by the charging time (L/R) of the inductor formed by the electromagnetic coils of the stepper motor. This is more common in case of a stepper motor due to its large electromagnetic coils with huge inductance.

The charging time of an inductor, brings the ambition of driving the stepper motor faster than given RPM, seem almost impossible. So, to navigate through this problem we need to understand what is required for the motor to turn? And that turns out to be a magnetic force created by the coils. This magnetic force (torque) is directly proportional to the amount of current flowing through the coils of the motor. Thus, we breakdown the problem on how the stepper motor parameters like current, voltage, torque and RPM are calculated.

The maximum current of the motor is decided by the diameter of the coil wire and the power dissipation in the motor. And thus, remaining parameters are calculated on basis of current, that is the torque is directly proportional to the current in coils, maximum rpm is given by inductance of coils, voltage is calculated by simply using ohm's law with maximum current and coil resistance (inductance is not accounted as stall condition is considered). Over-Volting: At the end, we just need to limit the current to maximum specified value while having room to play around with the voltage across coils.

If tuned correctly this method significantly increases the RPM of a stepper motor. As a result of increased RPM, torque reduces, hence limiting its applications to only light loads.

Elnino Rosario

TE Electronics

Reduced torque also indicates a reduced acceleration, and since the rotor of a stepper motor is very heavy due to magnets, the motor needs to be ramped to the intended speed. If the ramping is too quick, then we risk a stall across the motor (unwanted vibrations without rotation) and if the ramping is too slow, then we risk the motor getting stuck in an intermediate resonance state. Thus, a proper Goldilocks ramp slope needs to be determined. The final RPM is a Goldilocks RPM with problems similar to that of ramp slope. With increased RPM the torque of motor is reduced. Hence, it can be used in applications where torque of the motor is not as important as the RPM. The above mentioned principle finds applications in areas like:

- Wheel drive of a heavy-duty warehouse robot (The robot when loaded will work under normal RPM and when it is not loaded will increase its RPM thus reducing transit time)
 - Pick and Place Robotic arms for heavy-duty purposes.
 - Spring coiling machines as a feeder.
- Over-volts speed control of stepper motor is recommended in variable torque applications



*Did you know **Deep blue** became the first Chess playing system to beat a reigning world Chess champion Gary Kasparov on 11 May 1997?*





Parent Teacher Meeting
(S.E Electronics)



Talk on Active Teaching-Learning methods by
Ms. Anita Diwakar



Staff Visit to MICA Labs



Farewell function of
Mr. A Rumao



Mentoring session by Alumni



Industrial Visit to Rajasthan
(Organised by IEEE-WIE CRCE)





Won Best Hardware Award
in E-yantra competition
(*Pani-puri Vending Machine*)



Team received award from
Dr. Anil Sahshrabudhe,
AICTE, Chairperson





Technology nowadays is helping us regain, what was taken out from humanity. Now you may be thinking what this is all about? What if you were told that there are new innovations that can help about 285 million people around the world living with visual impairment to move around a little more easily?

Basically vision works like a camera. But it is not as simple as that. A person sees through his brain more, than his eyes. A majority of blind people cannot see because of various problems in their eyes but their brain functions very well. What if we find something to deliver information in their brain to bypass the problems in their eyes? This is the key about which the entire research travels. The key here is the algorithm or the translation key that keeps the visual information inside the sounds or music. The second aspect is the training programme. It means how you train your brain to learn the procedure. At TEDxJerusalem, Prof.Dr. Amir Amedi has beautifully demonstrated the above said process. The major motive being to use non-invasive sensory devices in combination with invasive bionic eye procedures to enable blind people to see. The brain is actually a flexible sensory independent task machine, rather than a pure sensory machine. Having said that, this innovation works by using the surface of their tongues. There is an increasing number of sensory substitution devices being developed that uses the brain in the most remarkable way. You may wonder how these things work. These devices take in visual information and translates it into the form of physical touch or sound order, to be interpreted by the user as vision

*Did you know that
Altair was the first
home computer to
be manufactured?*

Yash Kane

BrainPort V100 with its advanced technology is helping the blinds to see with their tongues. At present this technology is successful in picking up shapes of people in front of the visually impaired quite easily. For example, if someone is raising hands, the device easily makes it possible for the blind person to perceive the movement. For now, this technology is not yet capable of picking fast moving objects for example a walking person, however a similar device is being developed which at present is successful in eliminating this particular drawback. These devices enable the blind people to receive the sound of the colours which may be weird to know.

Hence it provides us with an exciting possibility for compensating the loss of sensory function to augment deficient senses by conveying missing information through an intact sense. Detailed design of such devices require assessment of the nature of spatiotemporal continuity and neuroscientific research into representations of the environment. We hope to see such efficient devices which are feasible to be introduced into the lives of visually impaired people.



BrainPort V100





Optical Line sensors are a simple integration of a photo transmitter and a photo receiver arranged in a closed packed array where a line is usually considered as a white line on a black surface. Conventional line sensors are based on IR transmitter LED and an IR receiver phototransistor.

Since black colour absorbs all the visible as well as infrared light, the conventional IR line sensor detects white line accurately. But a white line on a black surface scenario is too idealistic to be found on warehouse floors which are usually coloured. And a coloured surface absorption of infrared light depends on the properties of colour type and is always a lot less than black colour. Thus to solve this problem, we introduced a coloured LED operating in visible spectrum and a phototransistor capable of detecting visible light. The phototransistor found in market was 'PT333'. The selection of the LED is based on the background colour as a wrong selection of LED may result in detecting the background as a white line. In this case we look at the colour wheel, the reason why the colour red looks red is because it absorbs its complementary colour which is green. In order to test our theory, the simplest way is to colour the floor red and draw a white line on it, then take it into a pitch-dark room and flash a green light on it. If you are able to easily distinguish between the white line and the background red surface then you should go ahead with this LED. Now thus for every floor colour we will have a complimentary colour LED in hand. By doing this we lose the universality of our designed sensor.



*Did you know that the first Internet market was called **The Branch Mall?***

Elnino Rosario

TE Electronics

So, we go back to our drawing class where we learn that green colour is made by mixing yellow and Blue pigment colours. All the commercially available green colour that we use today is a mixture of yellow and blue colour. If analysed by a spectroscope it is clear that its blue and yellow. But the green LED available (known as parrot green) emits pure green wavelength light. Coming back to our dark room experiment conducted by green LED, blue and yellow colour pigments both absorb green wavelength allowing the white line on green background to be clearly distinguishable in green light (background appears darker than line). Thus, to make our sensor universal we just switch over to green LEDs.

Another issue we face is ambient light interference. This can be easily eliminated by just calibrating the comparing voltage at phototransistor output. Since the robot is an autonomous moving system, the intensity of ambient light will always keep on changing. To counter this interference, we directly sample the voltage at the receiver's output using an ADC. For filtering two samples per cycle are taken, wherein in one cycle the transmitting LED is turned OFF for first sample and LED is turned ON during the next sample. Both readings are subtracted to get a perfectly filtered output signal which is compared with offset values and the output obtained. The reason why an LDR cannot be used is due to its high rise and fall time.

This sensor has a huge scope in warehouses where AGVs are required. Upgrading a warehouse without interfering in much of its aesthetics is possible. Places with ambient light can be tolerated, to increase the number of elements in an array we just require an Analog mux to multiplex the ADC pins.

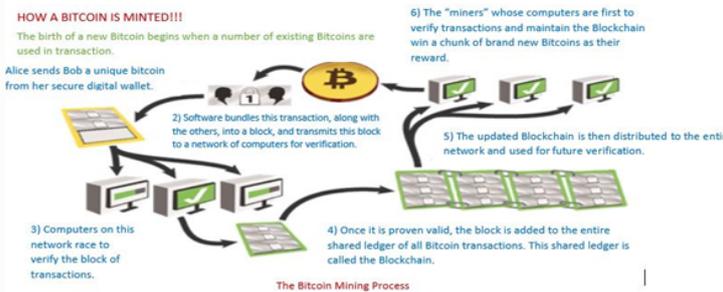




"Blockchain technology is coming to replace the old, rotten system of governance around the world. Embrace it!" — Olawale Daniel

A decentralised computation and information sharing platform that enables multiple authoritative domains who do not trust each other to cooperate, coordinate and collaborate in a rational decision making process. Thus, we can define Blockchain as "an open (accessible to all), distributed ledger (no single party control) that can record transactions between two parties efficiently (fast and scalable) and in a verifiable (everyone can check the validity of the information) and permanent way (the information is persistent)".

In a centralized system, (Eg: Google Docs) the major problem is that it works as a single point of failure. That is why we need Blockchain i.e. a decentralized system. Blockchain works as a public ledger that means everyone gets to maintain a local copy of the global data sheet or we can say that it works like a database system whose information is available to everyone. Blockchain technology offers new tools for authentication and authorization in the digital world that preclude the need for many centralized administrators. As a result, it enables the creation of new digital relationships.



Pranjal Mahajan

SE Electronics

There remain many reasons why a third party should be in charge of some authentications and authorizations. There are times when third-party control is totally appropriate and desirable. If privacy of the data is the most important consideration, there are ways to secure data by not even connecting it to a network. Blockchain uses private key cryptography which enables push transactions, wherein they don't require centralized systems and the elaborate accounts used to establish digital relationships. If this database requires millions of dollars to secure lightweight financial transactions, then there is a chance that blockchains will be the probable solution.

Blockchain is a technology which is used to create crypto money like Bitcoin or Ethereum.

I believe that the technology is really very helpful and has a bright future. Blockchain can be used in different spheres and industries. Small and middle-size companies can use them successfully just like large ones. For example: payments, smart contracts, storage systems, notary etc.




Did you know that the first integration of data signals with telephone was conceptualized by Nikola Tesla in 1909?





“I keep saying that the hottest jobs in the next 10 years will be statisticians and I’m not kidding” – Hal Varian, Chief Economist at Google.

In today’s times and in the upcoming years, Data Science is very much growing and interesting field in Computer Science and Mathematics. In Data Science there are many programming languages used but the languages preferred by scientists are R, Python and SQL (Structured Query Language).

R is a programming language and free software environment for statistical computing and graphics supported by the R Foundation for Statistical Computing. The R language is widely used among statisticians and data miners for developing statistical software and data analysis. R can be used for producing graphs and mathematical symbols and it offers a strong object oriented programming. Usually in C or JAVA, lots of lines of code are needed to make a matrix but in R we can create a matrix just in one line. For learning and programming in R, you must have a good mathematical background. We can also create vectors, arrays and data frames. This is an alternative to SAS (Statistical and Analysis Systems) and MATLAB. It is very much used in data prediction and graphical analysis. Google is utilizing R Programming and it is a satisfactory language for doing any form of statistics or data manipulation/visualization, however, IMHO, its power lies in the constructed-in capabilities and libraries instead than its strengths as a language itself (syntax, design, readability, and so forth.)



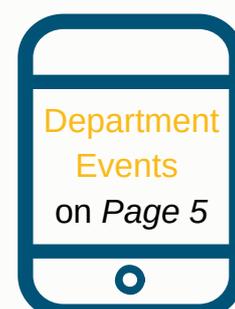
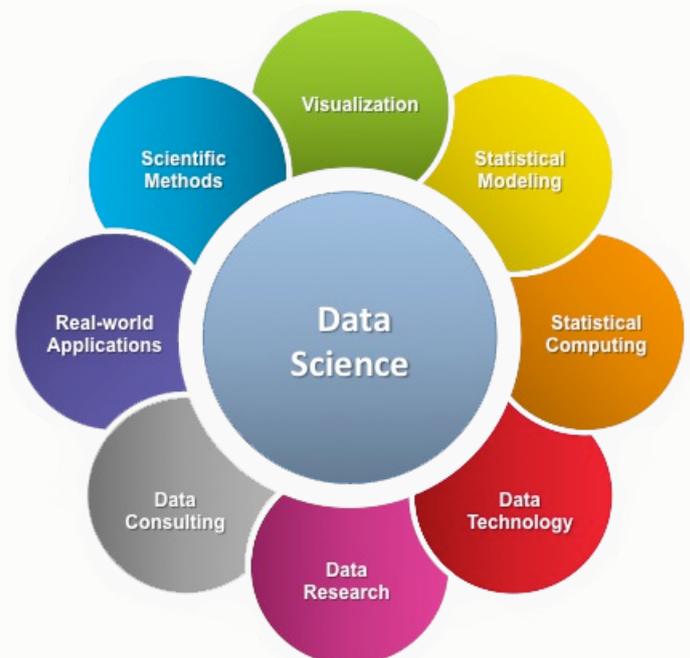
*Did you know that the first Android device, **HTC Dream** was released on September 2008?*



Joel Paul

SE Electronics

Hence I would like to conclude this discussion by saying that every budding Computer Science engineer and any other engineer aspiring to make Data Science as their field of interest must learn R. The future scope of this programming language is very bright. Big Data, Data Analytics and Data Science are some of the fields that use this language. Google, Facebook, Genpact, Accenture, MuSigma and many other companies are using the R platform.



Program Outcomes (POs)

Engineering graduates will be able to

- Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- Design/Development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and the cultural, societal, and environmental considerations.
- Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling of complex engineering activities with an understanding of the limitations.
- The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable development.
- Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- Project Management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- Life-long learning: Recognized the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

Engineering graduates will be able to

- Provide solutions for real-life problems in the areas of Automation, Embedded Systems, Signal Processing and Communication Systems.
- Test, and debug hardware and software for Electronic Systems.

VISION

Creating Engineers with a competitive edge

MISSION

- To impart state-of-the-art technical education in Electronics Engineering
- To create a platform for research, development and learning of latest technology by providing qualified faculty, good infrastructure and industry interaction
- To improve employability by creating competitive engineers, with ethical and professional attitude
- To encourage entrepreneurship skills in the students

Program Educational Objectives (PEOs)

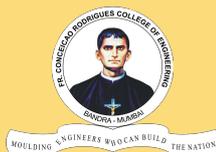
Engineering Graduates will be able

- To be proficient in technical writing, public speaking and group discussions
- To effectively perform time and resource management
- To demonstrate the desire for continuous learning



Imagination is more important than knowledge

- Albert Einstein



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