NATIONAL ENGINEERING COLLEGE
(An Autonomous Institution, Affiliated to Anna University, Chennai)
K.R.Nagar, Kovilpatti-628 503.

EEE

NEWSLETTER

SEPTEMBER 2017

VOLUME NO. 5 ISSUE-3

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Dear fabricators,

The distance between dream and reality is called action.
Dream big
Work hard
Stay focused
Surround yourself with good people…

We are very proud to publish this new volume of our EEE newsletter volume 5. Issue 3 – September 2017. This is the pioneer forum where the flourishing engineers can put out their maiden publication. This is an unsurpassed compile for gathering quite a lot of vital information for mounting their logical and artistic thinking. Akin to the prior volume of our newsletter here are many fascinating thoughts for the forthcoming style in engineering pasture and for the wonderful technocrats. As the existence exceed, we also want to have the lucid image of belongings occurring around us and the amends in the meadow of engineering. This newsletter also has the seizure of assorted function and fests held in our department.
The secret of getting ahead is getting started..,

Rise up, start fresh

See the fresh opportunity in each new day...

I wish you all to get success in your life!!!

By

Ms. S.Meenakshi

Second EEE

CONTENTS

STAFF ACTIVITIES/PUBLICATIONS/ACHIEVEMENTS

ACTIVITIES:

S.No.	Name of the Staff	Events/Guest Lecture	Topic/Event	Date	College/ Industry
1.	Dr.M.Ravindran, Associate Professor/EEE	Guest Lecture	Awareness program for small scale industries	06.09.2017	Gandhigram University, Dindugal

Snap during our professor delivered a Guest lecture on Awareness program for small scale industries at Gandhigram University

PUBLICATIONS:

- ✓ ***RathinamMuniraj, Maria Siluvairaj Willjuice Iruthayarajan****, Ramaveerapathiran Arun*, "Tuning of Robust PID Controller with Filter for SISO System Using Evolutionary Algorithms", Studies in Informatics and Control, Vol. 26(3), pp. 277-286, Septemebr2017.**Impact Factor:** 0.776.

- ✓ Arun Ram Prasath Ramaian Thirugnanam, ***Willjuice Iruthayarajan Maria Siluvairaj*** and Karthik Radha, "Retreatment of aged mineral oil using semiconductive nanocomposites for power transformer application", International Transaction on Electrical Energy Systems, Volume 27, Issue 9, September 2017. **Impact Factor:** 1.085.

DEPARTMENT ACTIVITIES

EEE ASSOCIATION

Mr.M.Madhuram Brighton, Technical Personal Assistant In-charge delivered Guest lecture at EEE Seminar hall

A health awareness program was organized by EEE association for 3rd year EEE students on 15.09.2017 (Friday) at 3.30 PM in EEE Seminar hall. ***Mr.M.Madhuram Brighton***, Technical Personal Assistant Incharge, Deputy Director of Health Services (DDHS), Tuticorin was the speaker of the event. He started the session by delivering the definition of health as defined by **"WORLD HEALTH ORGANISATION".**

After that he told about the three states of health i.e. (PHYSICAL, MENTAL, SOCIAL). He also explained the gatherings about what is disease and the causes of disease? He also gave a clear idea on "**AIR BORNE"** and **"WATER BORNE" diseases**. He explained about the types of disease which include communicable and non-communicable diseases. Students actively participated in the session.

The speaker cleared various doubt on the diseases asked by the students and he also discussed the treatment and the preventive measures. Finally oath was taken by everyone to "**keep the environment clean".**

SPECIAL INTEREST GROUP

CONTROL AND INSTRUMENTATION

For the academic year 2017-18 (Odd Semester), a short term course on "**Time Response Analysis of Linear Time Invariant System in LABVIEW using ELVIS II+**" is conducted in odd Saturdays during 2.00-5.00PM by ***Mr.R.MunirajAP(SG) and Mr.M.Sivapalanirajan AP/EEE***. The course is conducted for the interested pre - final year in Control and Instrumentation laboratory of EEE dept.

The first session of the discussion is on the introduction part of using the LABVIEW platform with the elaboration of the terminologies like front panel, block diagram and three palettes available for programming in labview like control palette, function palette and tool palette. We also focused on the basic concepts of time domain specification for linear time invariant system and the connectivity of the labview environment in designing control engineering applications.

The second session was the hand on training session in LABVIEW **basic programming tool** with arithmetic, Boolean and iteration loop (while loop and for loop). Then the students were provided with exercise on the **control & design simulation tool**. Feeding a transfer function model in to the LABVIEW platform and display the model in front panel were demonstrated and practiced.

The session focus on the simulation of control engineering concepts in LABVIEW environment and implementation using ELVIS II+. Students are motivated towards final year project in LABVIEW platform and also attempt international conferences after the completion of the course.

SOCIAL AWARENESS CELL

As a part of Social Awareness cell of EEE department an awareness camp was conducted for **S.S.D.M college of arts and science, kovilpatti** on **22.09.2017** in the topic "***Electricity usage, conservation and safety***". The program was started with welcome address given by Robin Ponnarasu (final year B). Then **Dr.M.Ravindran, Associate Professor (SG/EEE)** told that energy conservation is unquestionably of great importance to all of us since we rely on energy for everything we do every single day. Energy supplies are limited and, to maintain a good quality of life, we must find ways to use energy wisely and without energy conservation, the world will deplete its natural resources. Then he explains the importance of renewable over non renewable energy resources as renewable energies generate from natural sources that can be replaced over a relatively short time scale and he listed out the pros of using renewable energy as follows,

- The sun, wind, geothermal, ocean energy are available in the abundant quantity and free to use.
- The non-renewable sources of energy that we are using are limited and are bound to expire one day.
- Renewable sources have low carbon emissions, therefore they are considered as green and environment friendly.

Following the session Mr.Subburaj explains the safety tips to be followed while handling electricity. He pointed out the rules as,

- Disconnect the power source before servicing or repairing electrical equipment.
- Use only tools and equipment with non-conducting handles when working on electrical devices.
- Never handle electrical equipment when hands, feet, or body are wet or perspiring, or when standing on a wet floor etc.

Finally the lateral entry students of third and final year gave presentation about electricity generation from renewable sources and show video demonstration on electricity generation and safety methods. They also put a drama on the theme "electricity conservation". The session was coordinated by Mr.K.Kumar, Asst.Prof/EEE, Mr.Subburaj along with lateral entry and NCC volunteers. Around 200 members attend the program and got benefited.

ALUMNI INTERACTION

Alumni interaction program was organized and conducted on 11th August of 2017 in EEE seminar hall with **Mrs.M.Rajeswari, Technology Lead, Infosys Ltd, Chennai** and alumni (2004) of EEE department had an interaction with Final year students. The interaction went on for about one hour from 3.30 PM to 4.30 P.M.

She advised the students should be strong in coding to get placed in IT sector. She insisted the students should be updated and be bold enough to answer the interviewer. Finally she spoke about the importance of communication skills. The students

Alumni interaction program was organized and conducted on 24th August of 2017 in H1 hall with **Mr. Amarnath, Marine Industry, Chennai** and alumni (2016) of EEE department had an interaction with Second year students.During that session, he gave the outline about marine industry. He guided the students to concentrate the course related to marine and gave tips to crack the job. He explained the current status and job opportunities available in marine industry. Finally, the students got an idea to face interview in marine industry.

Alumni interaction program was organized and conducted on 24th August of 2017 in H6 hall with **Ms. Bavithra, Mobius Knowledge Services,**

PLACEMENT DETAILS

TESSOLVE
Delivering Excellence in Semiconductor Engineering

On behalf of the Chairman, Managing Director, Director, Principal, Head of the Department and staff members, we heartily congratulates the final year students***Mr.MathanaGopal.B&Mr. Sritharan.R***who placed in TESSOLVE Semiconductor Engineering PVT. Ltd., Campus drive in our campus during the month of September 2017.

	
Mr.MathanaGopal.B	*Mr. Sritharan.R*

- *To be Continued*

STUDENTS EXPERIENCE IN FACING INTERVIEWS

TESSOLVE SEMICONDUCTOR ENGINEERING INTERVIEW EXPERIENCE

- *Mathana Gopal.B, Final, EEE-A*

First round(written): Basics in

- Electronics Devices &Circuits (Diodes, Zener diode)
- Linear Integrated Circuits (OP-Amp, Voltage regulator application)
- Digital Logic Circuits (Gates, Flip-flop)
- Circuit theory(Reduction of circuits)

Second round (Technical I):

They check basic knowledge in Electronics which depends on my area of interest. For example I had interest in Analog circuits, they ask only from my area of interest.

I start with self introduction. I said, "I had interest in doing projects". At that point one of them stopped me and asks what are the projects have you done? I answered, Very first I did clap switch and further I explain the circuit of the clap switch. When I came to relay circuit one of them were stopped and ask one application of transistor. I said transistor can act as switch. Suddenly he asked how? I said in Cut-off and saturation region it will act as switch. After that they ask about transient response of inductor and capacitor, I draw only for capacitor. Because of I explained all these thinks in practically they impressed. So they provide a clue for inductor response I told the answer. They ask the question from my written exam, from Op-amp. I answered most of the questions but I stuck with 2 questions they asked for that gave me clues.

(Technical II):

Only one person in there, again I start with self introduction. He asked only two questions, first one is Buck convertor and other one is transient response of capacitor as same in previous. I answered for one question.

HR:

Again I start with self introduction, madam checks my family background and most of the time she told me job is very stressful how do u survive? I said I can. And she suggests me to know about Tessolve after that I asked about Bond, Pay and Result. I finished my HR interview successfully.

TESSOLVE SEMICONDUCTOR ENGINEERING INTERVIEW EXPERIENCE

- *Sritharan.R, Final, EEE-B*

Online written test:

There will be totally 35 questions. The questions are belongs to second year and third year subjects.

Technical I:

I started with self introduction. After that they asked about the curiosity that made me to take engineering. I explained about the gadgets that I used to play in my childhood. They asked some basic question on CMOS, rectifiers, diodes and clipper clamped circuit especially response of inductor and capacitor in saturation time. They also asked about differentiator and integrator with various input signal. After that they provided me some electronic circuits and asked the output for those circuits.

Technical II:

Again I start with self introduction. He asked first question is Boost convertor and one is transient response of capacitor. I answered for one question. They asked about the gain of open loop in op-amp. And also they asked some basic questions on OP-AMP, ADC & DAC. Finally they asked about my mini project after my explanation they asked me to attend the HR panel.

HR:

I start with self introduction, She said to me that would you able to survive for 3 years in our company.

They asked whether you have a passport I replied that I have applied for that. After they checked about my family background. They asked about the software where they used for testing. I said that ATE and LABVIEW. I finished my HR interview successfully.

INDUSTRIAL VISIT TO NTPL

On 26th September, 2017 a total of 32 students participated on an industrial visit to **NLC Tuticorin Private Ltd.** based on the elective subject PLC, DCS and SCADA. The Head of our department ***Dr. WilljuiceIruthayarajan*** and EIE department professor ***Mr. Suresh*** accompanied the students for the Visit.

They were exposed mainly to the knowledge of how DCS is used in controlling the process power plant. The students were able to gain the knowledge about an overall layout of the plant. They were also able to know a lot about DCS practically which helped them to have a better understanding of the subject. Moreover, they were able to have an idea about the use of circuit breakers with their advanced and automated versions.

Overall the students were able to gain a lot of practical experience and knowledge about an advanced power plant which was a completely new experience.

This motivated the students to improve themselves to be able to work in those kinds of advanced working conditions.

GUEST LECTURE

A Guest lecture was organized by EEE association for final year EEE students on 05.10.2017. ***Mr. T. Piraisoodi, Assistant Engineer, Instrumentation II Division Tuticorin Thermal Power Station***, has delivered a Lecture on "Factors to be considered for selection of DCS".

Throughout the session the students were able to realize a basic concepts of DCS and its selection

INSTRUMENT SOCIETY OF INDIA (ISOI)

ISoI members of EEE department final year students organized "Circuit Debugging" event under ISoI students chapter for EEE and EIE (II and III year) on 21/09/2017 and 22/09/2017. 36 teams (2 per team) from second & third year EEE and EIE department participated in the events.

Venue: EEE seminar hall & C&I laboratory.


Round 1 – Prelims as objective type technical round was conducted on 21/09/2017 in EEE seminar hall. Based on the student performance, 6 teams from II year and 5 teams from III year were selected for the next round

Round 2 – Final round as circuit debugging was conducted on 22/09/2017 in EEE control and instrumentation laboratory for the shortlisted teams. The winners of the event are

S.No.	Name of students	Branch	Prize
III YEAR			
1.	M.Karan	EEE A	**I**
2.	A.Aasha	EEE A	**II**
II YEAR			
1.	M.Vavuniya	EEE C	**I**
	M.Vijayakumari		
2.	S.J.Shanmugavel	EEE C	**II**
	P.Siva Sankar		

Organizers of the event:

S.No.	Name of students	Branch
1.	Narainkrishna.R	III EEE B
2.	Rajesh.S	
3.	Sritharan.R	
4.	Vignesh.S	
5.	Deepa.N	III EEE A
6.	Arunkumar.R	

TECHNICAL ARTICLE BY EXPERT MEMBER/ALUMNI

Avionics in Launch Vehicles

Introduction

A Launch Vehicle (or Rocket as it is known in common parlance) is a transportation system for carrying cargo from earth to space or beyond. The similarity ends with the function definition where as the differences have more impact with the vehicle design. The velocity of launch vehicles is in excess of 5km/sec and there is no human control (fully automated). The vehicle also travels to a location where there is no reference to verify the location. The vehicle also has no brakes. To achieve these requirements large motors/engines using fuel with high energy density is required (in large quantities). The high velocities and limited fuel loaded in the vehicle afford only one chance to deliver the cargo. All this is done with the bare essential hardware to maximize the available cargo capacity (payload capacity).

While the speed and lifting power of the launch vehicle is attributable to the muscle power provided by the engines/motors, it needs nimble electronics which controls the engines and guides the vehicle to the desired target location with a high level of accuracy. Decisions are taken within very short time windows owing to the fast speed involved.

Electronics used in Aerospace and Aviation industry is collectively referred to as Avionics. This paper explores the role of avionics in the context of launch vehicles. The various applications and types of systems used are covered and the various grades of electronics used also discussed. The unique attributes which distinguish it from commercial electronics are also discussed.

Navigation Guidance & Control.

Launch vehicles travel without any external inputs after liftoff. Hence it generates all the inputs needed to know where it is going and also corrects its own course based on this input. These functions form the brain of the vehicle. The three major functions performed here are classified as Navigation,Guidance and Control. Navigation locates where you are presently, your velocity and also the angles in which you are headed. Guidance is a function which takes the inputs from navigation and uses the information about the target location to calculate the best path to reach the target. The control function computes the adjustments required in the engines to make the vehicle follow the path defined by the guidance. The control hardware also performs the actual adjustments on the engines/actuators to bring about the change. Additionally there is an operation required to turn on/off various engines, separate stages, jettison inert mass etc which is known as sequencing operation.

The major functional blocks in the NGC chain are the computers which perform the computations needed for “Navigation, Guidance and Control”, the sensors which provide the data for navigation and the actuators which affect the changes in the engines. The NGC computer coordinates all critical activities in the vehicle in addition to calculating the “position, velocity, heading”, the best trajectory (or flight path) and corrections needed to maintain the flight path. All activities happen in realtime (before scheduled deadlines) with fixed

periodicities. NGC chain plays a key role in ensuring mission success and hence is designed very conservatively. Design is made with abundant margins (factor of safety) and with proven components.

Telemetry, Tracking &Telecommand

Although the vehicles travel autonomously and all decisions needed are taken internally in the NGC function blocks it is highly desirous to know these decisions and their calculations on ground. This function is done by the telemetry chain. Additionally many of the other parameters related to operation of the engines/motor, performance of load bearing structures, temperature profiles on various members, vibration and acoustics of the vehicle, performance of batteries powering the vehicle, etc are also telemetered to ground. These data are needed for assessing the performance of the launch and for future performance improvements. A closely related function is for real time tracking of the path of the vehicle which is programmed to a predetermined corridor. Any gross deviation from the corridor increases the risk to inhabitants adjoining the corridor and also decreases the chance of a successful payload delivery. This is done by tracking the vehicle using radars. Both skin mode radars and interrogatives radars (secondary radars) are used. For operation of the interrogative radar a package is placed on board which check for the coded pulse sequence from ground and responds appropriately. Together with the ground based radar, this forms the tracking system.

In the unfortunate event of the vehicle deviating from its flight corridor, it would be inadvisable to continue the mission and hence the mission has to be terminated. This is done by using high energy explosives which vent out the engines and tankage there by cutting of the functioning of the engines. This is the only ground based command present in most Launch vehicles and such commands are known as Tele commands. This is a function which has to be designed and used with great caution. Simple malfunctions can highly impair the functions of the vehicle. A failure of the battery may lead to loss of the NGC function, but the engines may work taking the LV wildly off course. The battery failure may also lead to loss of the Tele command function and hence this equipment calls for very complex design philosophies.

Avionics

All electronics used in a launch vehicle falls to one of the above groups. Electronics used in LVs are mostly known as avionics. Avionics forms a very small percentage of a launch vehicle by weight but perform very important functions. Some of these avionics make or break the mission and while others have supplementary roles. Avionics is distributed along the entire vehicle depending on the functions to be performed and are interconnected by a great network of cabling. The cables carry power, signals from sensors picking up various functional & physical parameters,commands and decisions to different avionics blocks, data to be transmitted to ground etc.

As seen the avionics in a LV is composed of a multitude of parts which work in diverse locations. Some of the parts are located near the engines and subjected to high temperature, vibrations etc, which others may be located on the outer skin of the vehicle which encounters,

high skin temperatures due to aerodynamic heating. Also they encounter the vagaries of the weather while the vehicle is being assembled and prepared for launch.

The Launch vehicle being a very complicated system, takes a long time to manufacture and assemble. The avionics form part of various sub systems of the vehicle and some of them are assembled together at the early stages of preparation. So avionics need to have long life and ability to work in varied environments. In spite of adopting the best design and production standards, due to the large number of small parts involved occasional random failures have to be factored in at the design stage itself. Avionics is designed to contain "failures and their effects" and to ensure mission success in case of failures. This requires to partition them into smaller well defined zones where faults can be continued and using multiple/redundant units to do the same function, so that failure of one unit may be tolerated with minimum impacton the missions. These redundant units are interconnected through voter units which identify and remove failed units.

Avionics packages are veritable black boxes, Electronics are kept inside metallic boxes which are black in color for radiation cooling while operating in the vacuum of out space. As these packages communicate among themselves they are devoid of human interfaces. Interfaces between packages (power, signal, communication etc) have to adhere to well defined standards and protocols. Deviations can have disastrous consequences. This Avionics are mostly designed and produced based on standards. Standards also help to ensure repeated quality products and to endure life of products.

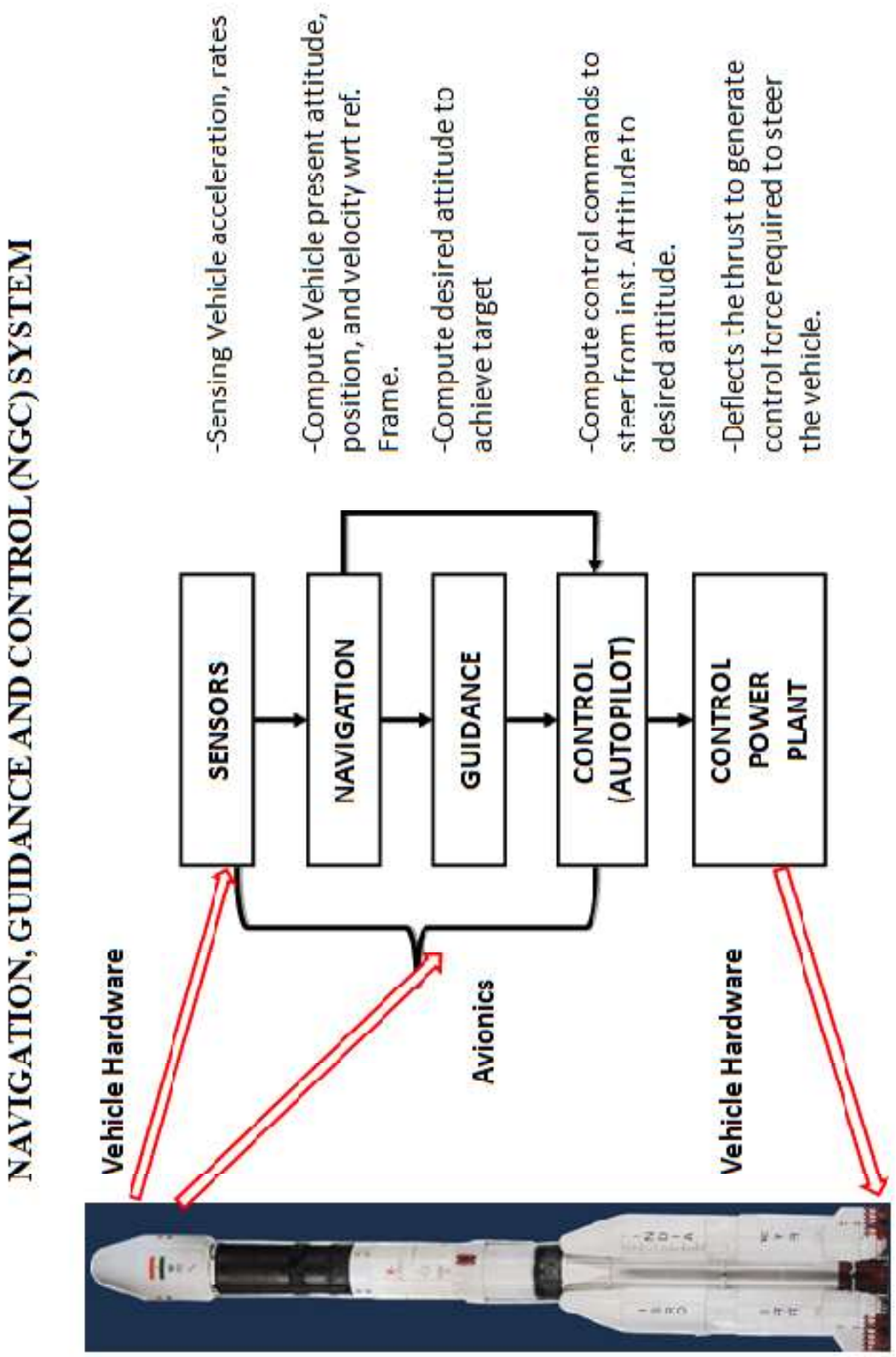
Another important aspect of avionics is testing. Extensive testing is carried out to ensure functional performance, life of the package, survivability in fault conditions. Testing starts and the component level where in each component is selected based on its functional quality and life expecting. The parts are tested rigorously to demonstrate functionalizing over the expected life and declared as qualified for avionics use. Further the avionics subsystems go through a "test flow" where it is tested at each point of its usage.

Conclusion

Avionics is a specialised branch of electronics catering to aerospace applications. It is a niche area in which design is carried out with the singular goal of "Mission Success" in the face varied challenges and possible failures. In the case of Launch Vehicles each launch is the only full test and avionics should be ready for any scenario. This contrasts with consumer electronics scenario where there is fast paced development and deployment but always with the backing of a second chance.

AUTHOR BIOGRAPHY:

Shri Rajesh George P graduated in Electronics Engineering from Cochin University of Science and Technology and joined ISRO Inertial Systems Unit in 1999. He is involved in design of Avionics pertaining to Navigation Systems for Launch Vehicles of ISRO. Major contributions are in development of precision analog electronics for navigation, development of Hybrid Micro Circuits, characterization of MEMS sensors, design of electronics for MEMS devices and simulation of electronics. He is interested in areas related to development of ASICs, development of digital control loops and data converters and vision aided navigation.


NAVIGATION, GUIDANCE AND CONTROL (NGC) SYSTEM
-Sensing Vehicle acceleration, rates
-Compute Vehicle present attitude, position, and velocity wrt ref. Frame.
-Compute desired attitude to achieve target
-Compute control commands to steer from inst. Attitude to desired attitude.
-Deflects the thrust to generate control force required to steer the vehicle.
SENSORS
NAVIGATION
GUIDANCE
CONTROL (AUTOPILOT)
CONTROL POWER PLANT
Vehicle Hardware
Avionics
Vehicle Hardware

STUDENT'S ACHIEVEMENTS

COCURRICULAR ACTIVITIES
PAPER PRESENTATIONS

S.NO	NAME	TITLE OF PAPER	VENUE	REWARDS	DATE
1.	M.AniNithsha	Fuel Cell	Coimbatore Institute of Technology, Coimbatore	Participation	16.09.17
2.	A.Aasha				
3.	M.AnjuAbinaya	OTEC			
4.	A.Nithiyasree				
5.	P.Kavitha	Zig-bee technology	University of VOC College of Engineering		15.09.17
6.	M.Muthuvaradha Lakshmi				
7.	S.LakshmiBrindha				
8.	P.Kasirani	Brain controlled car by using artificial intelligence	Ranganayagi Varatharaja College of Engineering, Sivakasi		01.09.17
9.	M.Gowsalya				
10.	DivyaBharathi				
11.	N.Navitha	OLED Li-Fi	PSR Engineering College, Sivakasi		15.09.17
12.	R.Nandhini				
13.	Muniraj.R	IOT	Kamaraj college of Engineering, Virudhunagar		07.09.17
14.	Muthuram.C				
15.	Ganesh				

COMPETITIONS

S.NO	NAME	EVENT	VENUE	REWARDS	DATE
1.	M.JothiBasu	General quiz	Holy cross Engineering college, Tuticorin	Participation	31.08.17
2.	R.Aravindhan			1st prize	
3.	S.Ariharan				

WORKSHOPS

S.NO	NAME	TOPIC	VENUE	DATE
1.	M.Gowsalya	Embedded System	National Engineering college	16.09.17
2.	P.Kasirani			
3.	P.T.Sowmiya			

CLUBS

S.NO	NAME	COMPETITION	REWARDS	CLUB	DATE
1.	M.Balakrishnan	Circuit Debugging	Participation	ISOI club	21.09.17
2.	C.K.Muthuram				
3.	M.Karan				
4.	N.Navitha				
5.	A.Aasha				
6.	R.Nandhini				

COCURRICULAR ACTIVITIES

PAPER PRESENTATIONS

S.NO	NAME	TITLE OF PAPER	VENUE	REWARDS	DATE
16.	J. Sankari	Ocean Thermal and Energy Conservation	Coimbatore Institute of Technology, Coimbatore	Participation	15.09.17
17.	K.Santhiya Lakshmi				
18.	P.Sathyagomathi	Internet of Things	P.S.R Engineering College, Sivakasi		15.09.17
19.	S.Rathna				
20.	G.Sindhuga	Li-Fi			
21.	B.Uma	OLED			
22.	S.ReshmaPriyadharshini	Blue Eye Technology	University VOC College of Engineering, Tuticourin		15.09.17
23.	K.VishnuPriya				
24.	B.Radha				
25.	S.PriyaDharshini	TALOS	Kamaraj College of Engineering, Virudhunagar		07.09.17
26.	S.Suriyakala				
27.	K.Yogesh	Robotics and Automation			
28.	G.R.Shankar Ganesh				
29.	E.Veeraputhiran	Renewable Energy			
30.	D.Shudharson	Renewable Energy	Meenakshi Sundharanar College, Chennai		31.08.17
31.	K.Rajkamal				
32.	M.VelMurugesan	High Voltage Transmission			
33.	M.Srinivasan	Li-FI technology			
34.	K.Sethanadevi	Wheel to Wheel Communication	Velammal of Engineering, Madurai		23.09.17
35.	M.Suganthi				
36.	T.Sreevidyachidambaravadivoo	IOT on Smart Cities	Kongu College of Engineering, Erode		22.09.17
37.	K.Shenbagadevi				

COMPETITIONS

S.NO	NAME	EVENT	VENUE	REWARDS	DATE
1.	N.PrasannaVenkatesan	Genaral Quiz	Holy cross Engineering College, Tuticorin	Participation	31.08.17

WORKSHOPS

S.NO	NAME	TOPIC	VENUE	DATE
1.	M.Rajashre	Workshop on Design of Stand Alone PV Solar System	Vellore Institute of Technology, Chennai	08.09.17-09.09.17
2.	C.Shibana			
3.	V.Ramya			
4.	S.ThangaAdhilakshmi			
5.	T.SreevidyaChidambaraVadivoo	MATLAB on Signal Processing	Kongu Engineering	22.09.17

6.	K.Shenbaga Devi		College, Erode	
7.	K.Sethanadevi	Networking and Security	National Engineering College, Kovilpatti	26.09.17
8.	S.Thangaathilakshmi			
9.	P.Sathya Gomathy			
10.	V.Ramya			
11.	C.Shibana			
12.	M.Rajashree			
13.	T.Sourabi Krishna			
14.	S.Saravana Kumar			
15.	I.Rameshmoorthi			
16.	C.V.Suryakumar	Internet of Things	PSG, Coimbatore	23.09.17
17.	G.Ranjith Kumar			

STUDENTS ARTICLES

THE NEXT 5 TRENDS IN ELECTRICAL

The era of electronics began with the invention of the transistor in 1947 and silicon-based semiconductor technology. Seven decades later, we are surrounded by electronic devices and, much as we try to deny it, we rely on them in our everyday lives. The performance of silicon-based devices has improved rapidly in the past few decades, mostly due to novel processing and patterning technologies, while nanotechnology has allowed for miniaturization and cost reduction. For many years silicon remained the only option in electronics. But recent developments in materials-engineering and nanotechnology have introduced new pathways for electronics. While traditional silicon electronics will remain the main focus, alternative trends are emerging. These include:

1. 2-D electronics

Interest in the field started with the discovery of graphene, a structural variant of carbon. Carbon atoms in graphene form a hexagonal two-dimensional lattice, and this atom-thick layer has attracted attention due to its high electrical and thermal conductivity, mechanical flexibility and very high tensile strength. Graphene is the strongest material ever tested. In 2010, the Royal Swedish Academy of Sciences decided to award the Nobel Prize in Physics to Andre Geim and Konstantin Novoselov for their “groundbreaking experiments” in grapheme research. Graphnene may have started this 2D revolution in electronics, but silicene, phosphorene and stanene, atom-thick allotropes of silicon, phosphorus and tin, respectively, have a similar honeycomb structure with different properties, resulting in different applications.All four have the potential to change electronics as we know it, allowing for miniaturization, higher performance and cost reduction. Several companies around the globe, including Samsung and Apple, are developing applications based on graphene.

2. Organic electronics

The development of conducting polymers and their applications resulted in another Nobel prize in 2000, this time in chemistry. Alan J. Heeger, Alan G. MacDiarmid and Hideki Shirakawa proved that plastic can conduct electricity. Organic electronics is not limited to conducting polymers, but includes other organic materials that might be of use in electronics. In terms of performance and industrial development, organic molecules and polymers cannot yet compete with their inorganic counterparts. Low material and production costs, mechanical flexibility, adaptability of synthesis processes and biocompatibility make organic electronics a desirable choice for certain applications. Commercially available high-tech products relying on organic semiconductors, such as curved television screens, displays for smartphones, coloured light sources and portable solar cells, demonstrate the industrial maturity of organic electronics. In fact, several high-tech companies, including LG Electronics and Samsung, have invested in cheap and high-performance organic-electronic devices.

3. Memristors

In 1971 Leon Chua reasoned from symmetry arguments that there should be a fourth fundamental electronic circuit-board element (in addition to the resistor, capacitor and inductor) which he called memristor. Although Chua showed that memristors have many interesting and

valuable properties, it wasn't until 2007 that a group of researchers from Hewlett Packard Labs found that the memristance effect can be present in nanoscale systems under certain conditions. Many researchers believe that memristors could end electronics as we know it and begin a new era of "ionics". While commonly available transistor functions use a flow of electrons, the memristor couples the electrons with ions, or electrically charged atoms. In transistors, once the flow of electrons is interrupted (for example by switching off the power) all information is lost. Memristors "memorize" and store information about the amount of charge that has flowed through them, even when the power is off. The discovery of memristors paves the way to better information storage, making novel memory devices faster, safer and more efficient. There will be no information loss, even if the power is off. Memristor-based circuits will allow us to switch computers on and off instantly, and start work straight away. For the past several years, Hewlett Packard has been working on a new type of computer based on memristor technology. HP plans to launch the product by 2020.

4. Spintronics

Spintronics, a portmanteau word meaning "spin transport electronics", is the use of a fundamental property of particles known as "electron spin" for information processing. Electron spin can be detected as a magnetic field with one of two orientations: up and down. This provides an additional two binary states to the conventional low and high logic values, which are represented by simple currents. Carrying information in both the charge and spin of an electron potentially offers devices with a greater diversity of functionality. So far, spintronic technology has been tested in information-storage devices, such as hard drives and spin-based transistors. Spintronics technology also shows promise for digital electronics in general. The ability to manipulate four, rather than only two, defined logic states may result in greater information-processing power, higher data transfer speed, and higher information-storage capacity. It is expected that spin transport electronic devices will be smaller, more versatile and more robust compared with their silicon counterparts. So far this technology is in the early development stage and, irrespective of intense research, we have to wait a couple of years to see the first commercial spin-based electronic chip.

5. Molecular electronics

The ultimate goal of electrical circuits is miniaturization. Molecular electronics and the organic electronics described above have a lot in common, and these two fields overlap each other in some aspects. To clarify, organic electronics refers to bulk applications, while molecular-scale electronics refers to nano-scale, single-molecule applications. The trend of miniaturization in electronics has forced the feature sizes of the electronic components to shrink accordingly. The smaller size of the electronic components decreases power consumption while increasing the sensitivity (and sometimes performance) of the device. Another advantage of some molecular systems is their tendency to self-assemble into functional blocks. Self-assembly is a phenomenon in which the components of a system come together spontaneously, due to an interaction or environmental factors, to form a larger functional unit. Several molecular electronic solutions have been developed, including molecular wires, single-molecule transistors and rectifiers. However, molecular electronics is still in the early research phase, and none of these devices has left the laboratory.

- *V.Iswarya, II Year EEE*

ENSURING SAFETY TO SOLDIER

From rifles that can track targets to providing battlefield monitoring via augmented reality, the military is seriously engaging with wearable technology to help improve its capabilities. In the UK Roke Manor Research has, working with the UK's Defence Science and Technology Laboratory (Dstl), demonstrated wearable kit designed to help troops navigate even when they can't access GPS, as well as to automatically detect threats and share information.The Dismounted Close Combat Sensor (DCCS) uses inertial and visual navigation sensors, combined with advanced algorithms to provide soldiers with 3D navigation data when a GPS signal is not available, which can happen in built-up urban environments. The drivers behind the adoption of wearable technology applications are varied but one key application is using this technology to monitor a soldier's physical condition. By employing sensors it is possible to both optimise the well-being of the soldier or, should they be wounded in action or injured in training, sensing injuries and relaying pertinent medical data back to medical support services. The protection of service personnel, whether during training or on active duty, is now seen as a priority by the military.In response to this and to better understand thermoregulatory and cardiovascular responses to heat and other physiological challenges during training, the Ministry of Defence, via Dstl, approached Bodytrak, a London based company which had developed a light-weight, precision monitoring in-ear device. The device which is non-invasive and portable is able to provide data in real time monitoring various body biometrics and activity.

The Bodytrak - hearable device

"Weighing just 18g this in-ear device can measure vital signs such as core body temperature, heart rate, VO2 and motion (speed, distance, cadence). All of that data can be collected and then sent wirelessly to the analyst or medical specialist in real-time via a smart phone, smart watch or internet hub."According to Creighton, by utilising miniature components, Bodytrak is able to access the ear and is able to detect changes in body physiology rapidly and accurately due to its proximity to the brain, and does so more effectively than when taking measurements from the

periphery of the body – such as from the wrist or hand.The main challenge in developing this product was its size.

"It was a major feat to develop a bespoke electrical system and mechanical integration to combine multiple functionalities in such a small form factor," says March. "Another issue was signal conditioning, ensuring sensor signals were of a high enough quality, despite the challenges of motion (for use in active, physically demanding scenarios), and changes in environment – such as excessive heat, for example."In terms of embedded software, "the product's core value is its range of machine-learning algorithms, developed entirely in-house, which calibrate raw bio-metrical data and provide insightful analysis on the person's physical condition and general well-being," explains Creighton. "The quality of the data analysis and its ability to instantaneously inform on life-critical vital signs, is where Bodytrak, we believe, can make the most impact on ensuring the welfare of military professionals."We offer a simple traffic light – red, amber and green - signal breakdown of current and past data," explains Creighton. "We can also use that data to look at recovery rates and help avoid injuries."

From a military perspective data, collected in real-time, can be seen locally by the soldier, or by a squadron commander, who can then be alerted should specific health parameters exceed safety ranges. The use of wearable technology is not just about collecting data but also involves combining data with machine learning to provide meaningful information that is actionable."While we are able to monitor heart rates over time, for example, we will now be able to personalise an individual's response to physical exertion and their exposure to extreme conditions," explains Creighton."We can create tailored road maps to identify specific points when an individual may be susceptible to heat stress of heart strain and able to alert operators to the possibility of fatigue."As a hearable device Bodytrak is not only more accurate but can be combined with two way communications."It can simply be added to the existing eco-system," Creighton explains. "It's very easy to incorporate into the ear protection that's already worn by most soldiers."The device, which remains a prototype, is set to be launched next year but Bodytrak is continuing to engage with industry partners with Open Systems architectures and the Ministry of Defence to ensure that the technology can be incorporated into existing and future technology platforms.

- *Ms.M.LeelaNivashini, II Year EEE*

TECHNICAL ARTICLE BY STAFF MEMBER

THE MOST COMMON METHODS OF MEASURING THE RESISTANCE OF AN EARTH ELECTRODE

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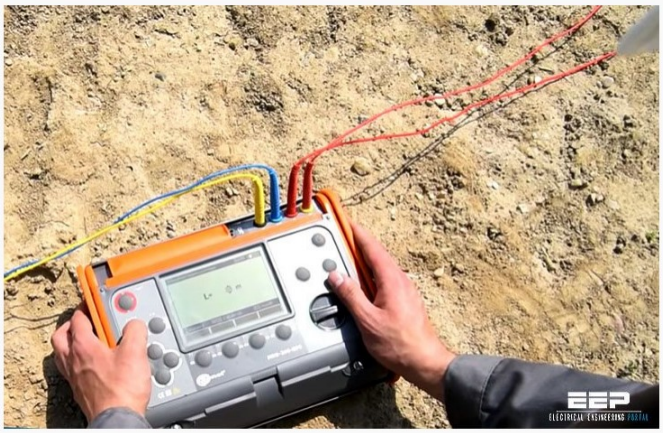
Earth resistance of an earth electrode

When an earth electrode system has been designed and installed, it is usually necessary **to measure and confirm the earth resistance between the electrode and "true Earth"**.



The most common methods of measuring the resistance of an earth electrode

The most commonly used method of measuring the earth resistance of an earth electrode is the 3-point measuring technique shown in Figure 1. **This method is derived from the 4-point method** – which is used for soil resistivity measurements. The 3-point method, called the **"fall of potential" method**, comprises the Earth Electrode to be measured and two other electrically independent test electrodes, usually labelled P (Potential) and C (Current). These test electrodes can be of lesser "quality" (higher earth resistance) but must be electrically independent of the electrode to be measured.

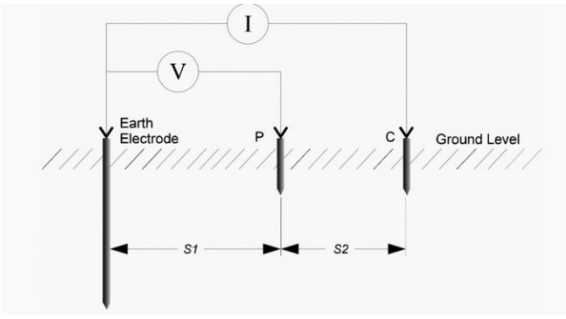


Figure 1 – The 3-point Method of Earth Resistance Measurement

An alternating current (I) is passed through the outer electrode C and the voltage is measured, by means of an inner electrode P, at some intermediary point between them.

The Earth Resistance is simply calculated using Ohm's Law: **Rg = V/I.**

Other more complex methods, such as the Slope Method or the Four Pole Method, have been developed to overcome specific problems associated with this simpler procedure, mainly for measurements of the resistance of large earthing systems or at sites where space for locating the test electrodes is restricted. Regardless of the measurement method employed, **it should be remembered that the measurement of earth resistance is as much an art as it is a science**, and resistance measurements can be affected by many parameters, some of which may be difficult to quantify. As such, it is best to take a number of separate readings and average them, rather than rely on the results of a single measurement. When performing a measurement, the aim is to position the auxiliary test electrode C far enough away from the earth electrode under test so that the auxiliary test electrode P will lie outside the effective resistance areas of both the earth system and the other test electrode (see Figure 2).

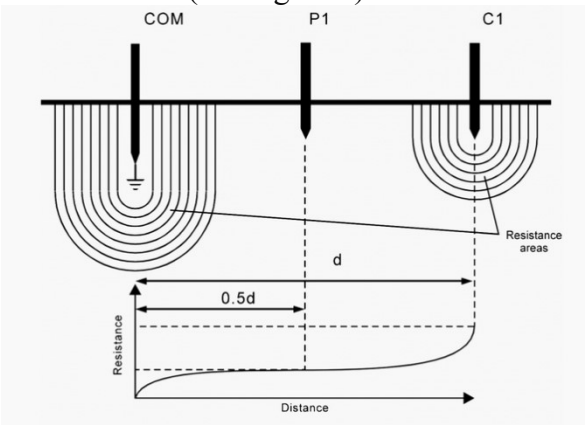


Figure 2 – Resistance areas and the variation of the measured resistance with voltage electrode position

- **If the current test electrode, C, is too close**, the resistance areas will overlap and there will be a steep variation in the measured resistance as the voltage test electrode is moved.
- **If the current test electrode is correctly positioned**, there will be a 'flat' (or very nearly so) resistance area somewhere in between it and the earth system, and variations in the position of the voltage test electrode should only produce very minor changes in the resistance figure.

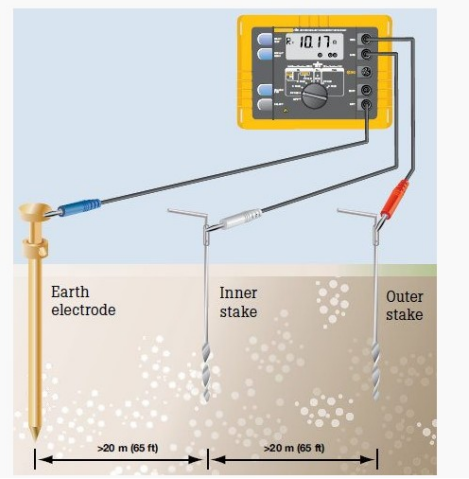
The instrument is connected to the earth system under test via a short length of test cable, and a measurement is taken. Measurement accuracy can be affected **by the proximity of other buried metal objects to the auxiliary test electrodes**. Objects such as fences and building structures, buried metal pipes or even other earthing systems can interfere with the measurement and introduce errors.

Often it is difficult to judge, merely from visual inspection of the site, a suitable location for the tests stakes **and so it is always advisable to perform more than one measurement to ensure the accuracy of the test**.

Fall of Potential Method

This is one of the most common methods employed for the measurement of earth resistance and is best suited to small systems **that don't cover a wide area**. It is simple to carry out and requires a minimal amount of calculation to obtain a result. **This method is generally not suited to large earthing installations**, as the stake separations needed to ensure an accurate measurement can be excessive, requiring the use of very long test leads (refer to Table 1). Normally, the outer test electrode, or current test stake, is driven into the ground 30 to 50 metres away from the earth system, (although this distance will depend on the size of the system being tested – refer to Table 1) and the inner electrode, or voltage test stake, is then driven into the

ground mid-way between the earth electrode and the current test stake, and in a direct line between them.



Measuring earth resistance with fall of potential method

Table 1 – Variation of current and voltage electrode separation with maximum earth system dimensions, in metres

Maximum dimension across earth system	Distance from 'electricalcentre' of earth system to voltage test stake	Minimum distance from 'electrical centre' of earth system to current test stake
1	15	30
2	20	40
5	30	60
10	43	85
20	60	120
50	100	200
100	140	280

The Fall of Potential method incorporates a check to ensure that **the test electrodes are indeed positioned far enough away for a correct reading to be obtained**. It is advisable that this check be carried, as it is really the only way of ensuring a correct result.

To perform a check on the resistance figure, two additional measurements should be made:

1. The first with the voltage test electrode (P) moved 10% of the original voltage electrode-to-earth system separation away from its initial position, and
2. The second with it moved a distance of 10% closer than its original position, as shown in Figure 3.

If these two additional measurements are in agreement with the original measurement, within the required level of accuracy, then the test stakes have been correctly positioned and the DC resistance figure can be obtained by averaging the three results. However, **if there is substantial disagreement amongst any of these results**, then it is likely that the stakes have been incorrectly positioned, either by being too close to the earth system being tested, too close to one another or too close to other structures that are interfering with the results.

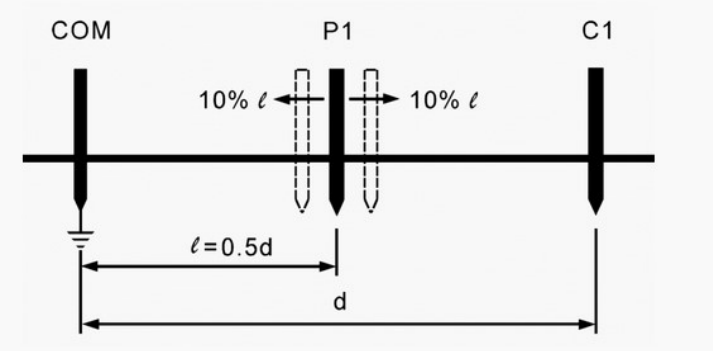


Figure 3 – Checking the validity of a resistance measurement

The stakes should be repositioned at a larger separation distance or in a different direction and the three measurements repeated. This process should be repeated until a satisfactory result is achieved.

The 62% Method

The Fall of Potential method can be adapted slightly for use with medium sized earthing systems. This adaptation is often referred to as the 62% Method, **as it involves positioning the inner test stake at 62% of the earth electrode-to-outer stake separation** (recall that in the Fall-of-Potential method, this figure was 50%). All the other requirements of test stake location – that they be in a straight line and be positioned away from other structures – remain valid. When using this method, it is also advisable to repeat the measurements with the inner test stake moved ±10% of the earth electrode-inner test stake separation distance, as before. The main disadvantage with this method is that the theory on which it is based relies on the assumption that the underlying soil is homogeneous, which in practice is rarely the case. Thus, care should be taken in its use and a soil resistivity survey should always be carried out.

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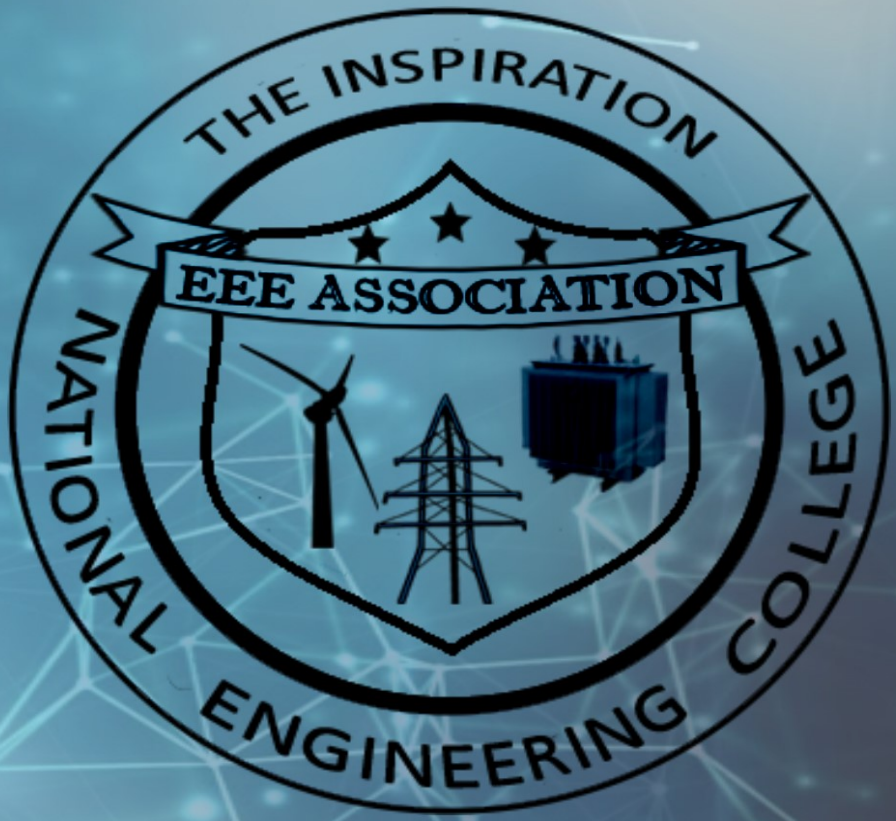

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