EEE ASSOCIATION

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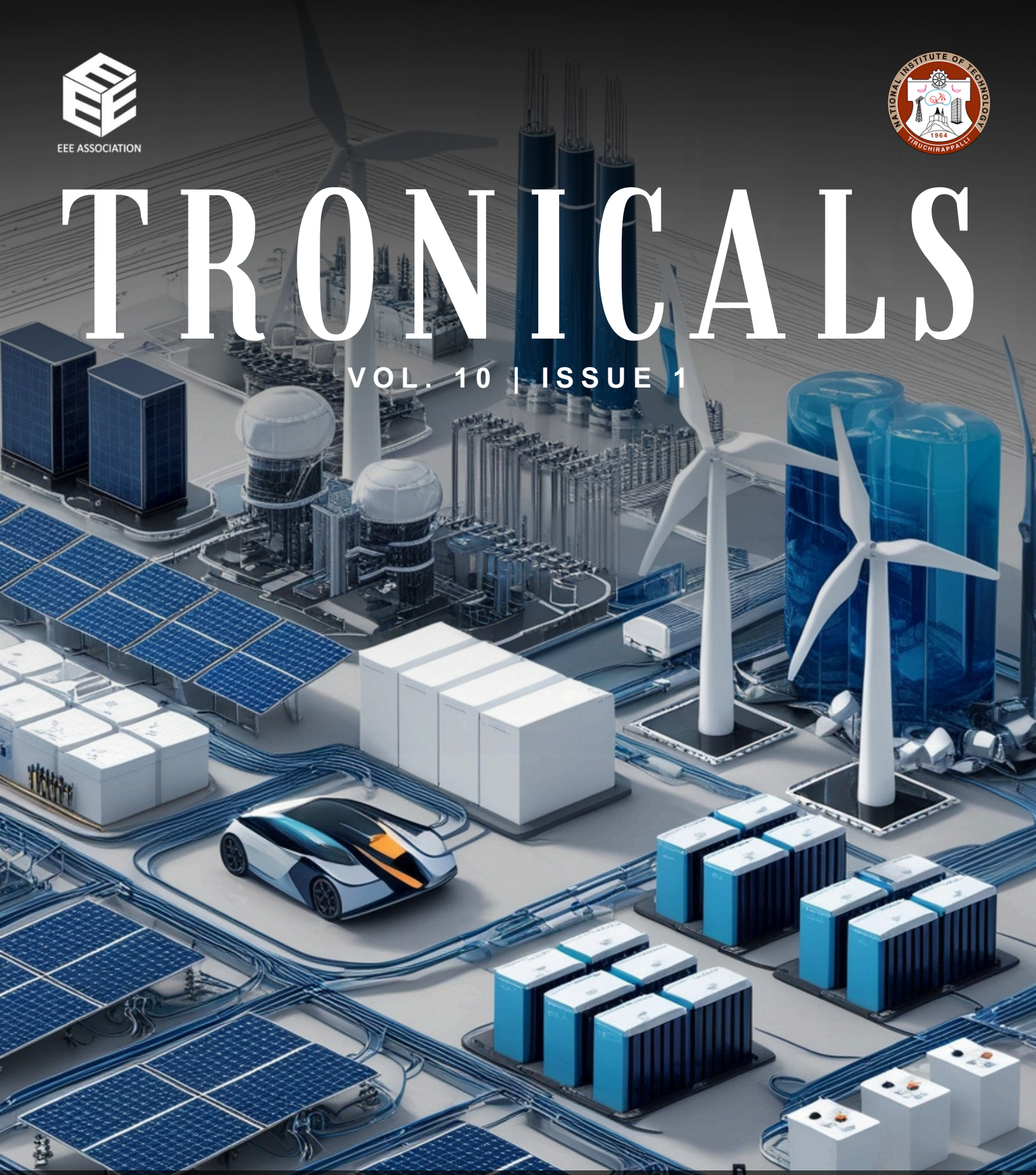

COVER STORY:
Decarbonization Technologies: Innovation in Electrical systems for Net zero goals

2024

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MESSAGE FROM THE H.O.D.

Dr. M P SELVAN

It is with immense pleasure that I present the 10th volume of Tronicals, our department's biannual magazine. This edition comes at a time of great achievement for the Department of Electrical and Electronics Engineering, having been awarded the Best Department Award 2024 by the institute.

Our B.Tech. program has recently received NBA accreditation for six years, further cementing our commitment to academic excellence. We are also proud to have achieved a QS subject ranking between 451-500, underscoring our department's global presence.

This year, we welcome five new faculty members with expertise in power systems, power electronics, AI, and cybersecurity. Their addition increases our faculty strength to thirty, allowing us to introduce program electives in innovative areas like AI and cybersecurity.

Our students have earned prestigious international internships through programs such as IUSSTF-Viterbi, SURI, MITACS, and DAAD, showcasing their talent on a global stage. Additionally, our recent placements include top companies like NVIDIA, Oracle, Qualcomm, Texas Instruments, Wells Fargo, HSBC, Pernod Ricard, and John Deere.

Dr. M P SELVAN
Head of the Department, EEE

On the infrastructure front, our M.Tech. Power Electronics Lab is being upgraded with equipment relevant to electric vehicle (EV) drives and control systems, and our Computer Lab is now being equipped with NetSim software, expanding opportunities for our students to do projects and research in application of latest communication technologies for smart electrical power systems.

I extend my sincere thanks to the editorial team for their dedication in bringing this edition to life. I hope you enjoy reading it.
Happy reading!

MESSAGE FROM THE FACULTY ADVISOR

Dr. JOSEPHINE R L

On behalf of the EEE Association, I am delighted to extend my warm greeting to the EEE family of NIT Tiruchirappalli. It is my pleasure to serve as the Faculty Advisor for the EEE Association. The EEE Association plays an integral role in organising various technical workshops, events, guest lectures, and an annual technical symposium “Currents”, which has garnered enthusiastic participation from students.

As we move on to yet another remarkable year of the EEE Association, we focus on the inevitable climatic changes and, as electrical engineers, how we can reduce its effects.India is progressing in adopting greener technologies and in utilising sustainable energy resources. Our country is set to achieve its ambitious target of 500 GW of renewable energy by 2030. Our focus should be on improvising the existing green energy technologies and on Net zero bills, taking into account that the environment is not harmed.

Dr. JOSEPHINE R. L.
Faculty Advisor, EEE-Association

Coming to our EEE Association’s Social Responsibility activity, it is with great pride that we announce the second edition of our initiative, LIGHT UP 2.0, a growing endeavour. LIGHT UP 2.0 is dedicated to providing career guidance and fostering a love for education among students of rural backgrounds. As members of the EEE department at NIT Tiruchirappalli, we feel privileged to give back to society, sharing the knowledge and opportunities that we have been fortunate to receive. This initiative continues to grow, and we remain committed to making a meaningful impact in the lives of those we serve.

Taking into account the several significant projects we received through the EEE Association last year, we are making remarkable progress in socially responsible innovative projects. The collaborative effort and dedication from all involved continue to drive these initiatives forward, fostering a culture of excellence and innovation.

Talking about Tronicals, our department’s technical magazine that highlights various innovations happening in the fields related to Electrical and Electronics Engineering. It provides information on the recent achievements of our department and students, providing a platform for the readers to get insight into various milestones our department has achieved. I congratulate the editorial team for their consistent efforts and creativity in curating this magazine and wish the readers an insightful experience.

I wish the EEE Association team a successful year ahead and laud their meticulous work, diligence, and enthusiasm.

VISION AND MISSION OF THE DEPARTMENT

ABOUT

The department of Electrical and Electronics Engineering, NIT Tiruchirappalli was started in 1964. It offers one Under-Graduate programme (B.Tech.), two Post-Graduate programmes (M.Tech. in Power Systems and M.Tech. Power Electronics) and also research programmes (M.S. and Ph.D.) in the various fields of Electrical and Electronics Engineering. After the institute became NIT, the department has grown not only in terms of student and faculty strength but also in improving the laboratory facilities for teaching and research purposes. The department is recognised for excellence in research, teaching and service to the profession.

The faculty members have a strong sense of responsibility to provide the finest possible education for both graduate and undergraduate students. The academic strength of the faculty is reflected by the alumni, many of whom are in the top echelons of industry and academia both in India and abroad.

VISION

To be a centre of excellence in Electrical Energy Systems.

MISSION

- Empowering students and professionals with state-of-art knowledge and Technological skills.
- Enabling Industries to adopt effective solutions in Energy areas through research and consultancy.
- Evolving appropriate sustainable technologies for rural needs

B. TECH PROGRAMME

Programme Educational Objectives

The major objectives of the B.Tech. programme in Electrical and Electronics Engineering are to prepare students:

- for graduate study in engineering
- to work in research and development organisations
- for employment in electrical power industries
- to acquire job in electronic circuit design and fabrication industries
- to work in IT and ITES industries

Programme Specific Outcomes

- Apply fundamental knowledge of Electrical , Electronics and Computer Engineering concepts to understand, analyse and solve complex problems in Power Engineering and allied areas.
- Analyse, design and develop Electronics circuits and systems
- Adapt to the changing needs for self and continuous learning, communicate effectively and practise professional ethics for societal benefits.

Programme Outcomes

The students who have undergone the B.Tech. programme in Electrical and Electronics Engineering (EEE) will be able to:

- Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 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.
- Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- 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.
- Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 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.
- Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

M. TECH IN POWER SYSTEMS

Programme Educational Objectives

The major objectives of the M.Tech. programme in Power Systems are to equip the students with adequate knowledge and skills in Power Systems Engineering and to prepare them for the following career options:

- research programmes in Power Systems Engineering
- employment in power research and development organisations
- to work in electric power industries and energy sectors
- faculty positions in reputed institutions

Programme Outcomes

A student who has undergone M.Tech. programme in Power Systems (PS) will:

PO1 An ability to independently carry out research /investigation and development work to solve practical problems

PO2 An ability to write and present a substantial technical report/document

PO3 Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

M. TECH IN POWER ELECTRONICS

Programme Educational Objectives

The major objectives of the M.Tech. programme in Power Electronics are to equip the students with adequate knowledge and skills in Power Electronics and to prepare them for the following career options:

- research programmes in Power Electronics and related areas
- employment in R & D organisations related to sustainable technologies
- to work in power electronic circuit design and fabrication industries
- faculty positions in reputed institutions

Programme Outcomes

A student who has undergone M.Tech. programme in Power Electronics (PE) will:

PO1 An ability to independently carry out research /investigation and development work to solve practical problems

PO2 An ability to write and present a substantial technical report/document

PO3 Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

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CURRENTS 2023 - 2024

Date: March 22nd - 24th, 2024

Venue: National Institute of Technology, Tiruchirappalli

Currents '24, the Electrical and Electronics Engineering Department's annual symposium at NIT Trichy, aimed at facilitating knowledge exchange between academia and industry. This national-level event featured a series of enlightening guest lectures, bridging the gap between theoretical learning and practical application.

The events organized by Currents demanded a creative and innovative approach from the students, aligning with the theme. The Workshops, Guest Lecture series, and Events series provided a significant opportunity for many students to interact with distinguished, accomplished, and innovative minds of this nation.

With the release of the official website, several events like Capture Currents – an online photography competition, Colloquium – Paper Presentation event, Circuit Craze – a hardware circuit troubleshooting event, Dhruva – an event testing problem – solving and aptitude skills, Code Currents – a coding contest to test one's programming skills with specially curated coding challenges, Electrabet – the EV enthusiast event of Currents, Eureka – a science and innovation event for young minds and Enigma – the online case study event of Currents, began accepting responses about a week before the inauguration.

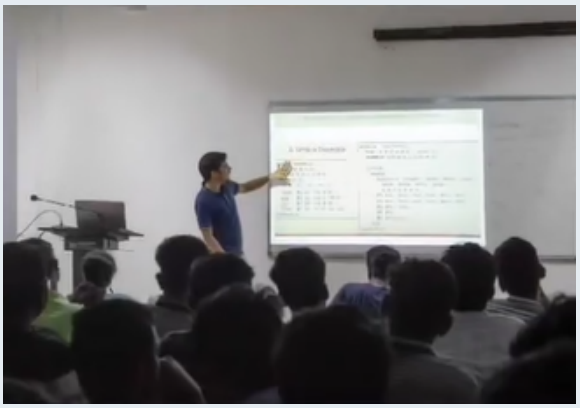
A variety of workshops were organized by our EEE students and industry experts. Texas Instruments hosted a hands-on workshop titled “Getting Started with Embedded Software Development on Microcontrollers (TI MSPM0),” which was held over two sessions on Day 1 (22nd March) and Day 2 (23rd March). Additionally, industry experts from Synopsys conducted the "Software for Hardware" workshop on “Verilog to SystemVerilog for Digital Designs” across two sessions on Day 2 (23rd March) and Day 3 (24th March). The students of the EEE department also organized the Cipherchat - Web Development Workshop on Building Social ChatApp with e2e Encryption, the ML Workshop - Implementing Image Segmentation Algorithm Using Popular Python Libraries Such as TensorFlow, PyTorch, and OpenCV , and the Hardware Workshop - Advanced Arduino Course with Morse Code Detector. These workshops were a great success, with over 500 participants registered across various domains

Day 1 (22nd March) featured a guest lecture by Anand Devanathan, Director-IT at Palo Alto Networks and a proud alumnus of the EEE department, who shared his insights on “Fundamentals in Times of Change.” This was followed by a lecture from experts at Micron, Sai Raghuram Durbha, Principal Engineer, NVMQRA MNAND System, and Sarita Yadav, Manager, Test Solutions Engineering, who provided valuable insights on “Micron Memory Makers.” , further reinforcing the importance of staying current with the ever-evolving field of Electrical and Electronics Engineering.

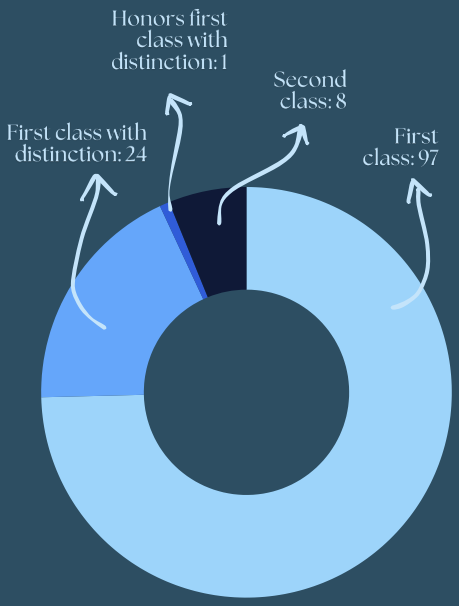
On Day 2 (23rd March), Dr. Anandarup Das, Associate Professor, engaged the audience with a talk on “Research in Power Electronics and Prospects in IIT Delhi,” followed by Arsh Goyal, Software Engineer at Samsung, who discussed “Kickstarting Your Career with an Edge.” The event concluded on Day 3 (24th March) with Sudharsanan R, Software Development Manager and Member Group Technical Staff at Texas Instruments, delivering a lecture on “Introduction to MSPM0 Microcontrollers.” This was followed by a guest lecture on “Enhancing Power Quality Monitoring with Dilated Convolutional Deep Neural Networks,” presented by T Ruban Deva Prakash, Co-Founder and Director at Effyies Smart Technologies.

Currents '24 provided a platform for industry experts to share their insights with students and faculty. The symposium underscored the significance of interdisciplinary collaboration, emphasizing social, economic, and environmental considerations in engineering. The diverse backgrounds of the guest speakers highlighted the EEE Department's commitment to providing a holistic education and fostering meaningful industry-academia partnerships.

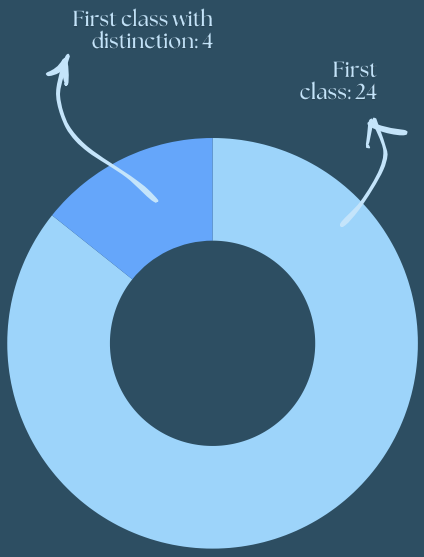
In conclusion, Currents '24 was a successful event that promoted the exchange of ideas, bridged the gap between academia and industry, and inspired a new perspective on sustainable engineering practices. The event left a lasting impact on the NIT Trichy community



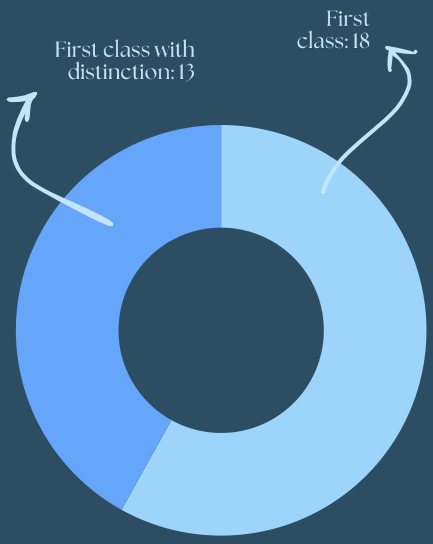
CONVOCATION 2024



B. TECH



M.TECH
POWER SYSTEMS



M.TECH
POWER ELECTRONICS

MEDAL WINNERS

H R S S NAGAVALLI CHATLA

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CGPA: 9.55

B. TECH

V VIJAY

207122032

CGPA: 9.59

M.TECH
POWER SYSTEMS

GANDAVARAPU MAHIDHARREDDY

207222009

CGPA: 9.5

M.TECH
POWER ELECTRONICS

PHD SCHOLARS

SL.No.	NAME	ROLL NUMBER	NAME OF THE GUIDE	TITLE OF THESIS
1.	RAVULAKARI KALYAN	407116002 10-Jul-2024	Dr. Venkata Kirthiga **Co-Guide:** Dr. P Raja	Certain Investigations on Power Control Techniques of Single-VSC Interfaced Wind Driven DFIG
2.	ARJUN VISAKH	407118002 05-Feb-2024	Dr. M. P. Selvan	Investigations on the Challenges and Opportunities with Residential Charging of Electric Vehicles
3.	BUDHAVARAPU JAYAPRAKASH	407118004 26-Feb-2024	Dr. Karthik Thirumala **Co-Guide:** Dr. Manoranjan Sahoo	Novel Power Quality-based Tariff Schemes and Smart Meter Development for Low Voltage Distribution Networks
4.	MALARVILI S	407118006 25-Apr-2024	Dr. S. Mageshwari **Co-Guide:** Dr. S. Moorthi	Design of Efficient Control Interaction with Power Converters for Photovoltaic Applications
5.	SINDHUJA S	407119011 10-Jan-2024	Dr. S. Mageshwari **Co-Guide:** Dr. S. Moorthi	Investigations on Design and Development of Improved Gain Non-Isolated SEPIC Converter
6.	N NAGESWARA REDDY	407118007 09-Nov-2023	Dr.S. Moorthi **Co-Guide:** Dr. P. Raja	Investigations on Various Fault Detection and Isolation Techniques for Low Voltage DC Microgrid
7.	RACHAPUTI BHANU PRAKASH	407118008 04-Jul-2024	Dr. R. L. Josephine **Co-Guide:** Dr. S. Moorthi	Energy Efficient Sensorless Control of Solar Photovoltaic Fed Induction Motor Drive for Water Pumping Systems
8.	A MARY BEULA	407918001 26-Jul-2024	Dr. R. L. Josephine	Novel Intelligent and Optimization based MPPT Techniques for PV Systems
9.	SUGALI HARINAIK	407118010 05-Feb-2024	Dr. Shelas Sathyan	Design and Analysis of Quasi-Resonant Isolated High Gain DC/DC Converters for Low Voltage Renewable Energy Sources

SL.No.	NAME	ROLL NUMBER	NAME OF THE GUIDE	TITLE OF THESIS
10.	SOFIYA S	407120009 03-Jun-2024	Dr. Shelas Sathyan	Design of Three-Port Isolated Converters and its Analysis with Various Modulation Techniques for DC Microgrid Applications
11.	MARISELVAM A	407119001 11-Sep-2023	Dr. M. Jaya Bharata Reddy	A Novel Secure and Dependable Distance Protection Methodology Immune to Stressed Conditions
12.	KANNAN M	407119004 19-Jan-2024	Dr. Sundareswaran K **Co-Guide:** Dr. P Srinivasa Rao Nayak	Application and Analysis of Deep Neural Network Architectures towards State of Charge Estimation of Lithium-Ion Batteries
13.	GIREESH V PUTHUSSERRY	407917055 29-Nov-2023	Dr. Sundareswaran K **Co-Guide:** Dr. Sishaj P Simon	Development and Analysis of New and Modified Optimization Algorithms for Maximum PowerPoint Tracking in PV Systems under Partial Shaded Conditions
14.	PADGHAN PAVAN RAMCHANDRA	407119008 03-Nov-2023	Dr. S. Arul Daniel **Co-Guide:** Dr. P. Raja	Blockchain Based Cooperative Energy Trading Framework for Prosumer Communities: Business Process Models
15.	SHAMEEM ANSAR A	407119014 20-Feb-2024	Dr. S. Sudha	Certain Investigations on the Classification and Prediction of Landslides in the Idukki District using Geospatial and Machine Learning Techniques
16.	CHANDRASEKAR V	407916001 09-May-2024	Dr. C. Nagamani	Investigations on Gallium Nitride based Power Electronic Technologies for High Frequency Converter Applications
17.	SHANMUGANATHAN U	407920053 29-Jul-2024	Dr. S. Senthil Kumar	Design and Development of Compact Variable Pulse Width Marx Generator for High Power Microwave Applications

PROFESSOR (HAG) INTERVIEWS

Dr. K. SUNDARESWARAN

What inspired you to take up a career in research and academics?

A career in research was accidental. I have always wanted to be a teacher and teach students. Research was just a by-product, and it helped me to teach more confidently. Research was not my first option. In fact, after my UG I did not have any specific interest, and then I got the opportunity to pursue MTech in power electronics.

When I was in the lab surrounded by machines, I was curious to learn more about it and that led me into research. Research helped me to learn more about the subject and to teach with more confidence. REC Trichy was well known for research even in those days.

My advice to a student who wants to pursue research would be to have patience. *Research is difficult and hectic, and it is not an easy road.*

Dr. K. Sundareswaran

How has the field of power electronics changed since you started? And where do you think it's headed?

The domain of power electronics has increased exponentially. Initially, it was limited mostly to SCR. Other devices, namely IGBT and Power MOSFETs, were just introduced in the subject. Earlier, power electronic devices were limited to motor drives. With the introduction of Silicon Carbide(SiC) Devices, power electronics have expanded largely. The circuit topologies have changed. Several concepts that were considered obsolete are now getting rejuvenated back into the circuits.
The syllabus we followed was also very generic, and I used to discuss how we could replace SCR with self-commutating devices to enhance the performance of power electronics circuits. I am fortunate to have enthusiastic, interactive and intelligent students. I learnt a lot from UG students.

If you were to start your career today, would you pursue the same path, or would you do something different?

During my PhD, my research guide was Dr. S Palani, whose research interests were in control systems. He encouraged me to pursue control systems as well. That is when I learnt about Fuzzy, Genetic Algorithm, and other Machine Learning algorithms.
If I had to start my career today, I would work on newer topics like the application of Machine Learning with Power Electronics.

How has this department changed over the course of your time here?

The strength of the department has increased. Initially, we were only 12 faculties, now there are many more faculties. The quantum of research has also increased. Earlier, there weren't many labs or instruments, but as the research quantum increased, there is an increase in disciplines of research and the number labs catering to these research has increased. And funding and facilities have also increased with time. I feel happy and satisfied to work in NITT.

What advice would you give to new professors or young academics who are just starting their careers?

My advice to the new professors or young academics would be to be punctual and dedicated to teaching. They should be extremely student-friendly. Students listen to us when we listen to them .They should always seek a better quality of teaching. They have to keep themselves updated with the subject so that they can deliver good information to students with much more clarity.

What do you believe is the most important lesson you've passed on to your students over the years?

I always believe in the verse " Matha, Pitha, Guru, Daivam" and I pass on this to my students as well. I always urge them to take care of their parents because parents work selflessly for their children no matter how tough the situation is for them. They make many sacrifices to ensure that their children have a bright future. Whenever you are depressed or upset, you can always talk to your parents and they will be there to support you. So I always tell my students to prioritise their parents first. Then comes the Guru or the teacher who helped achieve your goals. And then the almighty.

If a student wants to pursue research in power electronics, what advice would you give to such students?

My advice to a student who wants to pursue research would be to have patience. Research is difficult and hectic, and it is not an easy road. To pursue research, you should be ready to work hard and have an open mind to learn from everyone. With respect to power electronics, I would suggest learning more about the combination of machine learning with power electronics and electric vehicles.

Dr. S. ARUL DANIEL

What inspired him to take up a career in teaching and research?

Teaching has long been a cherished tradition in my family, with my grandparents, parents, and my father's sister serving as educators. Their influence has been pivotal in shaping my career. Observing their dedication from a young age impacted me profoundly; notably, my grandmother's receipt of an award from the Chief Minister of Tamil Nadu before my birth was a significant source of inspiration.

I joined the Regional Engineering College (REC) as a teaching assistant in 1989, when the institute primarily emphasized teaching. However, the Electrical and Electronics Engineering (EEE) department featured several senior faculty members actively engaged in research, which piqued my interest. Even before embarking on my teaching career, I had the opportunity to assist the then Head of Department, Dr. Mishra, with his computer architecture classes and Dr B Ilango (the then Principal and later the HoD of EEE, with his power electronics classes). Dr Ilango was an excellent communicator with his stentorian voice and ear-tingling diction. While Dr. Mishra encouraged me to explore the field of artificial intelligence, my true passion remained rooted in power engineering.

On September 5th, 1994, coinciding with Teachers' Day, I transitioned from a teaching assistant to a regular faculty member. Since then, I have had the privilege of guiding numerous BTech and MTech students and several PhD scholars.

Influential figures such as M.R. Krishnamurthy, an IEEE Fellow, and Prof. Maria Louis played a crucial role in fostering a research culture within the EEE department. As recounted by their contemporaries, their contributions significantly impacted my professional development. Prof. Subbiah, who taught me power electronics, greatly directed my interests toward power electronics and power systems. His dedication to his students and their welfare was visibly seen. He demonstrated professionalism, integrity, and hard work and has shown how to maintain professional relationships in the workspot.

Among my mentors, Dr. N. Ammasai Gouden left an indelible mark on me through his well-rounded approach to research, general topics, sports, and fitness, alongside his commitment to teaching. His dedication, meticulous class preparation, and focus on hardware development remain vivid. I learnt research journaling from Profs Subbiah and Ammasai Gounden

While most will have strong subject knowledge, *the key is in communication.*

-Dr. S. Arul Daniel

How has the field of power systems changed since you started, and where do you think it's headed?

The core principles of power systems, such as Faraday's law, Kirchhoff's law, and the fundamentals of transformers and induction machines, have remained unchanged.

However, the field has evolved significantly with new technologies shaping its application. The "skeleton" remains the same, although significant grafting of the basic skeletal system has occurred. The generation system now has inverter-based resources in addition to conventional generators. The "outer cover" has also been transformed by advancements like data analytics, AI, and smart grids, reshaping how power systems are managed and optimized.

If you were to start your career today, would you pursue the same path or do something different?

DoS-based Email served as the primary mode of digital communication in the 90s.

REC, Trichy was a leading hub for computer technology, with the Octagon being the most prominent computer center in southern Asia. The use of computers was not uncommon back then. But, online resources were nonexistent, YouTube lectures were unavailable, and only a few cassette tapes, which were prone to damage, existed. Printed materials were scarce and expensive unless one was fortunate enough to receive complimentary copies. Otherwise, we had to visit institutions like IISc or the IITs, where even photocopying was costly, at around 10 rupees per page. Today, with platforms like IEEE Xplore, it is remarkable how easily accessible research papers are, including some that date back a century. Therefore, if I begin, I must know how to access and incorporate these information sources into my teaching to be effective. Nevertheless, the fundamental essence of a teacher remains unchanged over time.

What advice would you give new professors or young academics starting their careers?

I advise new professors or young academics to thoroughly prepare and do their homework to communicate their expertise effectively in the classrooms.

The time spent preparing lectures early on will pay off in the long run. I also believe in an old-school approach: connect with students, understand their needs, and tailor your teaching accordingly.
While most will have strong subject knowledge, the key is in communication. There is a real need for training in teaching, especially in engineering. I was fortunate to attend a two-week training program at IIT Delhi in 1997, where we were asked to deliver lectures and receive feedback on our teaching styles. I was encouraged to teach with more energy, and I understood and took this advice seriously.

What is the most important lesson you've passed on to your students over the years?

I have always aimed to foster the holistic development of my students. Despite time constraints, I prioritize connecting with them to understand their needs. Over the years, I have found it increasingly easy to relate to them, as they are now closer in age to my own children. This understanding has profoundly shaped my approach to teaching and mentoring. But, I do not know what lessons I have passed on to my students besides the domain knowledge.

An alumna in Canada sent the following message on Teacher's Day this year "I finished my masters from the University of Toronto in Fall 2023. My research was on power system economics and optimization.
Since then, I have been working with the Independent System Operator in Ontario. My role is to run power flow studies in the day-ahead time-frame and provide a suitable operating plan for the control room. The course you taught was one of the few classes that made me fall in love with power systems, and I'm so happy to be working in that field now. Thank you for all the knowledge and passion in teaching us". Another student texted, "I am missing those days when conversations with you were so blissful. I am very much moved by your personality, especially your calmness and simplicity." I cannot be categorical in stating that "this is the lasting lesson I have passed on," for the impact made by a teacher is primarily intangible and cannot be quantified.

If a student wants to pursue research in power systems, what advice would you give to such students?

The field of power systems offers vast opportunities as the sector grows day by day

with an ever-increasing installed capacity of plants. I advise students interested in pursuing research to seek out international experiences and work with top experts at leading universities. Many of our alums have found success abroad, like Ramakrishnan, who works on power system protection at Eastern University in Saskatchewan, Canada, and G.R.Chandramouli, at TU Delft, who works on Electric mobility.
It's beneficial to collaborate with faculty abroad and focus on solving real-world problems, which is one of the critical differences between pursuing a PhD in India and overseas.

DECARBONIZATION TECHNOLOGIES:

As the global push for sustainability gains momentum, decarbonization technologies have become critical in achieving net-zero carbon emissions. Central to this goal is the transformation of electrical systems, which account for a significant portion of global greenhouse gas emissions. Innovative solutions are reshaping the energy landscape, accelerating the transition to cleaner, more efficient, and more sustainable electrical systems. In this article, we will explore how cutting-edge technologies drive decarbonization in electrical systems and help achieve net-zero goals.

Renewable Energy Integration: A Clean Power Source

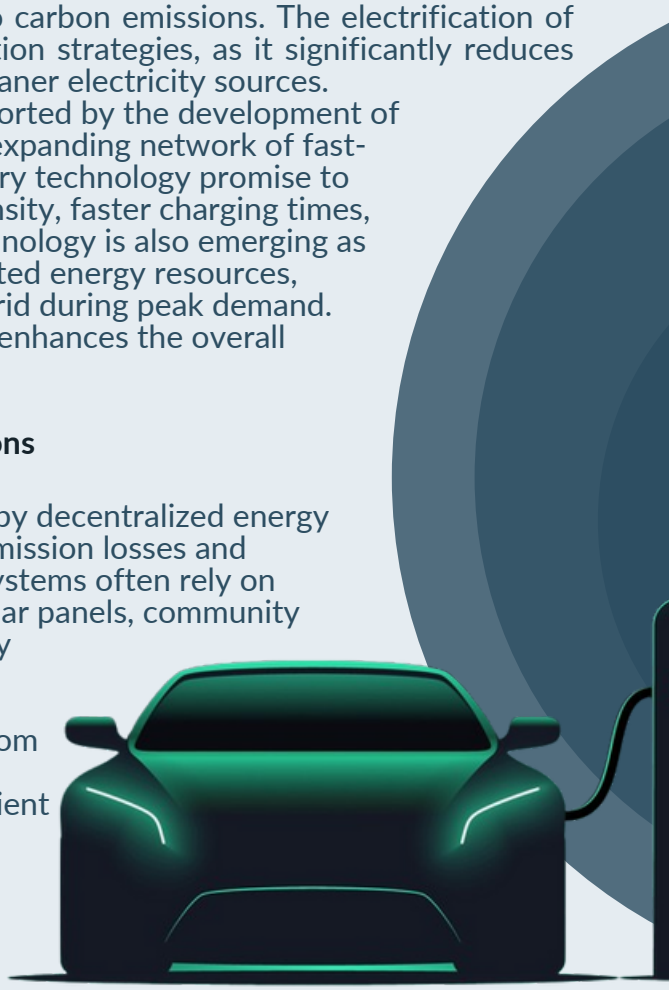
The shift from fossil fuels to renewable energy sources like solar, wind, and hydropower has been one of the most transformative innovations in decarbonization. Renewable energy accounts for a growing share of electricity generation worldwide, reducing reliance on carbon-intensive power sources. This transition is facilitated by developing advanced technologies that enable better integration of intermittent renewables into the grid.
One key innovation is smart grid technology, which enhances the efficiency, reliability, and resilience of electrical systems. Smart grids use sensors, advanced metering infrastructure, and AI-driven analytics to optimize the balance between energy supply and demand. This allows for real-time adjustments to renewable energy input, ensuring a stable grid even with fluctuating wind and solar output.
Moreover, energy storage systems like lithium-ion batteries and emerging solid-state batteries are playing a pivotal role in overcoming the intermittency of renewables. These systems store excess electricity during periods of high renewable generation and release it when demand exceeds supply, ensuring continuous clean energy availability.

Electrification of Transportation: Driving the Future

The transportation sector is another major contributor to carbon emissions. The electrification of vehicles (EVs) is one of the most promising decarbonization strategies, as it significantly reduces the demand for fossil fuels and shifts transportation to cleaner electricity sources.
The widespread adoption of electric vehicles (EVs) is supported by the development of more efficient and affordable EV batteries, along with an expanding network of fast-charging infrastructure. Breakthroughs in solid-state battery technology promise to revolutionize EV performance, offering greater energy density, faster charging times, and longer lifespans. Innovative vehicle-to-grid (V2G) technology is also emerging as a game-changer. V2G systems allow EVs to act as distributed energy resources, where parked vehicles can supply electricity back to the grid during peak demand. This two-way flow of energy improves grid resilience and enhances the overall efficiency of electricity usage.

Decentralized Energy Systems: Empowering Local Solutions

Centralized power generation is gradually complemented by decentralized energy systems, which are particularly effective in reducing transmission losses and improving energy access in remote areas. Decentralized systems often rely on small-scale, renewable energy sources, such as rooftop solar panels, community wind farms, and micro-hydro projects. Microgrids are a key component of decentralized energy systems. They enable local communities, businesses, and industrial parks to generate, store, and distribute electricity independently from the larger grid. When integrated with renewable energy sources and energy storage, microgrids offer a highly efficient and resilient solution for decarbonization particularly in areas prone to power outages or regions with limited grid infrastructure.



INNOVATIONS IN ELECTRICAL SYSTEMS FOR NET-ZERO GOALS

By Harsha Pradeep

Peer-to-peer energy trading platforms, which use blockchain technology, further empower decentralized energy systems. These platforms allow individuals and organisations to buy and sell excess renewable energy directly from one another, promoting more efficient use of clean energy resources and reducing reliance on large, centralized power plants.

Energy Efficiency and Digitalization: Smarter Energy Use

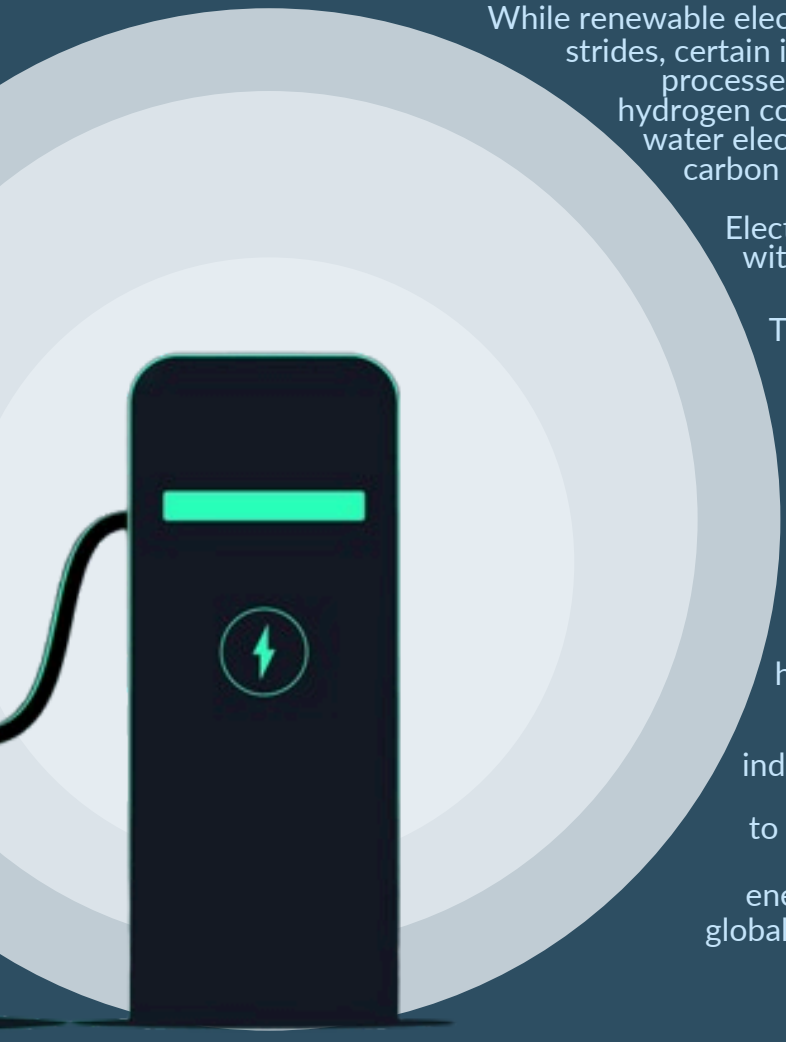
Improving the energy efficiency of electrical systems is an essential component of decarbonization. Digital technologies, such as the Internet of Things (IoT), machine learning, and big data analytics, are transforming how energy is consumed and managed. These technologies enable more intelligent control and monitoring of energy usage across industries, commercial buildings, and households, significantly reducing carbon footprints.

For instance, smart meters and home energy management systems allow consumers to track their energy consumption in real-time, providing insights into how and when energy is used. This data can be used to optimize energy consumption patterns, reduce waste, and lower electricity bills.

On a larger scale, industrial energy management systems (EMS) and artificial intelligence (AI) are helping factories and industrial plants minimize energy waste and improve operational efficiency. By predicting demand patterns and optimizing equipment usage, these systems enable substantial energy savings, reducing emissions from energy-intensive industries.

Hydrogen and Electrification of Industry: A Cleaner Future

While renewable electricity and energy efficiency havemade significant strides, certain industries, particularly those that rely on high-heat processes, need more time to electrify. This is where green hydrogen comes into play. Green hydrogen,produced through water electrolysis using renewable electricity, offers a zero - carbon alternative to traditional fuels in steel production, cement manufacturing, and chemical industries. Electrification of industrial processes is also advancing with the help of innovations like electric arc furnaces in steelmaking and electrified cement kilns. These technologies allow industries to decarbonize by replacing fossil fuel-based heat with electricity from renewable sources.



Conclusion: Charting the Path to a Net-Zero Future

Achieving net-zero carbon emissions will require a combination of innovative technologies, policy support, and international cooperation. The decarbonization of electrical systems lies at the heart of this effort, and the ongoing advancements in renewable energy integration, electrification, decentralized systems, energy efficiency, and industrial decarbonization offer a promising roadmap for the future. As these technologies continue to evolve, they will play a pivotal role in accelerating the transition to a more sustainable, low-carbon energy system bringing us closer to the realization of global net-zero goals. The future of electrical systems is bright,clean, and, most importantly, within reach.

The Revolution

Autonomous vehicles, once just a dream of the future, are now reshaping how we travel. At their core, these self-driving wonders rely on a sophisticated web of technologies, where semiconductors play a crucial role. These small yet powerful electronic components act as the vehicle's brain and nervous system, empowering them to sense their surroundings, analyze data swiftly,and make split-second decisions—all in real-time.

What is Autonomous Vehicle Technology?

An autonomous vehicle is equipped with sensors and artificial intelligence (AI) that allows it to operate without human intervention. These vehicles use a combination of technologies, including cameras, radar, LiDAR (Light Detection and Ranging), and ultrasonic sensors, to gather information about their surroundings. This data is then processed by on-board computers, which use algorithms to make decisions about steering, acceleration, and braking.

Autonomous vehicles (AVs) are categorized into different levels based on the degree of automation:

- *Level 0:* No automation, where humans control the vehicle entirely.
- *Level 1:* Driver assistance systems, such as adaptive cruise control.
- *Level 2:* Partial automation with features like lane-keeping and acceleration, but human intervention is required.
- *Level 3:* Conditional automation, where the vehicle handles all aspects of driving but still requires human attention.
- *Level 4:* High automation, where the vehicle can operate independently in specific conditions.
- *Level 5:* Full automation, where the vehicle requires no human involvement in any conditions.

Semiconductors: The Backbone

Semiconductors, primarily silicon-based integrated circuits (ICs), are the fundamental building blocks of modern electronics. They are used in various applications, from sensors and processors to communication systems and power management.

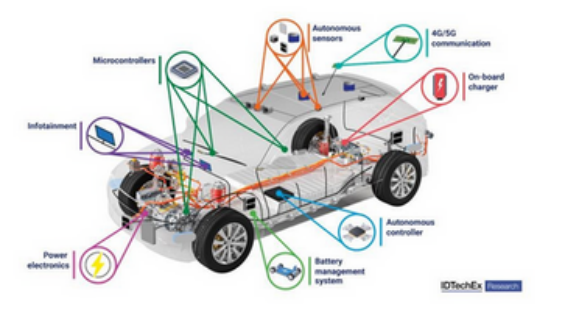
Types & Applications

- Microcontrollers: These are specialized microprocessors designed for embedded systems. They are used in autonomous vehicles to control various functions, such as motor control, sensor data acquisition, and communication with other systems. They are often chosen for their low power consumption, small size, and cost-effectiveness.
- Micro-processors: More potent than microcontrollers, microprocessors are used for complex tasks like running AI algorithms, processing sensor data, and performing high-speed computations. They are often found in the central processing unit (CPU) of autonomous vehicles.
- Power Semiconductors: Power management is key for autonomous electric vehicles (EVs), with power semiconductors like MOSFETs and IGBTs playing vital roles in motor drives, battery management, and charging circuits. These devices efficiently convert and regulate power, ensuring smooth operation and minimizing losses
- Sensors and MEMS (Micro-Electro-Mechanical Systems): Sensors like radar, LIDAR, and cameras are essential for autonomous vehicles, gathering environmental data for processing. MEMS, tiny integrated mechanical and electrical systems, are used in accelerometers, gyroscopes, and pressure sensors for vehicle stability and positioning.
- FPGA (Field Programmable Gate Arrays): FPGAs are reprogrammable semiconductor devices used in autonomous vehicles for high-computation tasks like sensor fusion and real-time data processing. They offer flexibility by adapting to new algorithms and sensor setups without hardware redesign.

SEMICONDUCTORS IN AUTONOMOUS VEHICLE TECHNOLOGY

-by Tejasvini G

- Communication Chips: V2X communication is essential for operating autonomous vehicles, enabling them to communicate with other vehicles, infrastructure, and pedestrians. Communication chips must support high-speed data transfer, low latency, and robust security features.



Integration of AI and Deep learning

Integrating AI and Deep Learning in tonomous vehicles has led to the development of specialized chips designed to handle the complex computational tasks required for autonomous driving.

- **Neural Processing Units (NPUs):** NPUs are designed specifically for AI workloads, offering high efficiency and performance for deep learning tasks such as image recognition, object detection, and decision-making.

Companies like Huawei and Cambricon are developing NPUs that can be integrated into autonomous driving systems, providing the necessary computational power for real-time processing.

- **Graphics Processing Units (GPUs)**: Initially designed for rendering graphics, GPUs have found a new role in autonomous driving due to their ability to handle parallel processing tasks. Nvidia's GPUs, particularly the Drive AGX platform, are widely used in autonomous vehicles to process large amounts of sensor data and run complex AI algorithms.
- **Custom ASICs**: ASICs are custom-designed chips optimized for specific tasks, such as image processing or machine learning. They are used in autonomous vehicles for specialized tasks like lane detection, object recognition, and high-speed data processing. Tesla's Full Self-Driving (FSD) chip is a prime example of a custom ASIC designed to handle the demanding requirements of autonomous driving.

Technological Advancements in Autonomous Vehicles

Autonomous vehicles are rapidly evolving, driven by advancements in several key areas:

- ***Edge Computing***: Real-time decision-making is enhanced by processing data locally, reducing latency, and improving responsiveness.
- ***Neuromorphic Computing***: Inspired by the human brain, this technology promises more efficient and parallel processing, accelerating AI and machine learning.
- ***Wide-Bandgap Semiconductors***: Silicon Carbide and Gallium Nitride offer superior power efficiency, density, and thermal performance, leading to increased range and faster charging in electric vehicles.
- ***System-on-Chip (SoC) Solutions***: The automotive industry has increasingly adopted SoC designs, integrating multiple functionalities such as computing, graphics, networking, and AI processing into a single chip.

Key players

- NVIDIA's Xavier and Orin platforms, part of its DRIVE series, are built for autonomous driving with integrated AI accelerators, GPUs, and CPUs, processing data from cameras, LIDAR, radar, and sensors. The Orin platform delivers up to 254 TOPS of AI computing power.
- Intel's Mobileye EyeQ chips excel in vision-based driver-assistance, handling tasks like lane detection and object recognition.
- Texas Instruments' TDA4VM processor, optimized for ADAS, combines an ARM-based CPU with AI accelerators for sensor fusion.
- Renesas R-Car H3 integrates ARM cores with a GPU and IPU, enabling real-time image recognition and vehicle control.

Conclusion

Semiconductors are the foundation of autonomous vehicle technology, enabling advanced features like AI-driven decision-making, sensor fusion, and real-time data processing. Recent advances in AI accelerators, SoCs, wide-bandgap materials, and neuromorphic computing are pushing the boundaries of what autonomous vehicles can achieve. As semiconductor technology continues to evolve, autonomous vehicles will become safer, more efficient, and capable of operating in increasingly complex environments.

AUGMENTED REALITY IN ELECTRICAL ENGINEERING: A GLIMPSE INTO THE FUTURE

By Yashvi Chauhan

Augmented Reality (AR) is revolutionising industries, and electrical engineering is no exception. AR technology blends the digital and physical worlds, allowing engineers to visualise complex electrical systems, troubleshoot issues, and perform tasks with real-time data overlay. With AR, electrical engineers can tackle challenges more efficiently and with greater precision, making it a game-changer for the field.

Bringing Designs to Life

In the world of electrical engineering, understanding how various components work together is crucial. Traditionally, engineers rely on static blueprints and diagrams. However, with AR, they can project these designs directly onto real-world setups. Imagine looking at a physical circuit board while AR glasses display voltage readings, wiring details, and part numbers in real-time. This immersive experience enables engineers to spot potential issues faster and make adjustments on the fly. Whether it's designing a new electrical system or retrofitting an existing one, AR helps engineers gain a more comprehensive understanding by visualising the relationships between components in three dimensions. This not only speeds up the design process but also minimises errors that can occur when relying on traditional two-dimensional plans.

Efficient Troubleshooting and Maintenance

AR is especially useful in troubleshooting electrical systems. For example, an engineer working on a malfunctioning substation can use AR glasses to view live data, such as voltage fluctuations or thermal readings, directly on the equipment. This digital overlay makes it easier to pinpoint faulty components without needing to consult separate devices or manuals. Instead of pausing to reference a diagram or manual, the necessary information is projected in real-time onto the system itself. This saves precious time and allows engineers to perform tasks more accurately, reducing the likelihood of human error.

In large-scale electrical infrastructure like power grids, AR can also assist in managing maintenance. Engineers can use AR tools to inspect power lines, substations, or transformers without having to rely on physical blueprints, improving safety and efficiency.

Training the Next Generation of Engineers

AR isn't just for seasoned professionals—it's also transforming how the next generation of electrical engineers is trained.
New engineers can use AR to simulate real-world electrical systems and practice tasks in a safe environment. These virtual models offer hands-on experience without the risks associated with working on live circuits. For instance, AR can guide a trainee through the steps of wiring a complex system or diagnosing an issue. The immediate feedback AR provides helps build confidence and competence before they transition to working on real equipment.

AR in Power Systems

As power systems grow more complex, AR offers a critical tool for managing them. Utility companies can leverage AR to monitor real-time data from their grids, identifying faults, diagnosing issues, and even guiding engineers through repairs. By combining sensor data with AR interfaces, engineers can better understand how the entire system is performing. For example, AR can display power flow data overlaid on transmission lines, giving utility workers a clear view of where faults are occurring. This real-time information helps reduce downtime and improves the reliability of power delivery.

Conclusion

Augmented Reality is more than just a cool technology—it's reshaping how electrical engineers design, troubleshoot, and maintain systems. By providing real-time information and immersive visualisations, AR makes engineering more intuitive, efficient, and safe. As AR continues to evolve, its applications in electrical engineering will only expand, unlocking new possibilities and pushing the boundaries of what's possible in the field.

ALUMNI INTERVIEWS

PALANIAPPAN J
BATCH: 1983

1. Looking back, how would you describe your time at NIT Trichy, and how did it shape your career path?

At that time, NIT allowed everyone to explore, take personal responsibility, and build partnerships. Reflecting back, these aspects helped me thrive in my career.

2. How was the academic culture at NIT Trichy in the early '80s, and how do you think it has evolved over the years?

There was less stress & minimal rigor during the academic year. That was a mixed blessing. The good thing is I can go to the library, research how different books present the subject, and learn from the ones I can relate to. I understand that the academic program is very rigorous. The institution has high recognition everywhere.

3. Were there any specific professors or mentors at NIT Trichy who had a significant impact on your journey?

We had many great professors in the EEE department. Dr. KLP Mishra's control system course and his approach to teaching impressed me.
A basic control system unit consisting of input->processing unit->output and feedback to processing unit based on output is such a simple and powerful concept in engineering & management. That is also the basis of all the ML concepts. Our Principal, Prof. P.S. Manisundram, had an open-door policy for managing students. He always kept a very close connection with students. I followed a similar management style whether I had a 10-member or 200-member team by getting to know each employee in some context. This is known as proximate leadership.

4. After graduating in 1983, what were your initial career steps, and how did they lead you toward becoming a leader in technology?

I grew up fascinated by space satellites & rockets. I always wanted to create something new. I also had exposure to calculators.
In fact, my first internship was at UMS calculator factory in Coimbatore. My final year project was a computer-based simulation of heat distribution in a transformer.
We wrote the FORTRAN program on BHEL's ICL computer. That project led me to pursue a further understanding of computers. I finished my master's in computer science at the College of Engineering at Guindy. While I had a few opportunities with the IT sector doing COBOL work, I chose to do an internship at HCL's R&D facility, which was doing cutting-edge OS/system software work for their Horizon brand mini-computers at that time. That opportunity paved the way for my journey in system software.

5. What were some of the biggest challenges you faced while working on large-scale projects like Make in India and 5G deployment, and how did you overcome them?

Large-scale projects are naturally cross-functional (i.e., departments within the company, departments within the customer organisation, and many company partners or customers). Many of these groups have multiple projects going on in parallel. Aligning them all together for a common goal/milestone of my projects and overcoming known & unknown technical issues is the major challenge. Planning is the key. However, we can't plan everything as there are unknowns. Understanding the risks/unknowns and having an approach to mitigate these risks is critical. We need to constantly review progress against goals, review changes in risk characteristics, and re-adjust the plan or resources. It goes back to our control system with a feedback loop.

6. Many individuals prefer pursuing careers in IT jobs over core engineering roles. What's your opinion on this trend?

In general, the undergraduate program gives a broad exposure to engineering concepts in the chosen field and introduces one to adjacent fields like software, project management, etc. When we joined an undergraduate program at 17+, we had some ideas about what we were trying to achieve. However, our understanding of the program's changes, students' passion changes, and the industry/world around us changes as we grow. We try to adapt to these changing dynamics. If people pursue something that they consider to be worthwhile, then that is good. If they feel passionate about it, it is even better.

7. What critical areas within EEE and related fields should students prioritize to excel and succeed in today's evolving industry?

The second electric revolution is just in the beginning stage. We have a clean environmental theme: trying to eliminate/reduce fossil fuel in every aspect of life, from home to industry. We have an emerging AI/ML & Crypto boom requiring much power. These two currents will bring a reinvention boom to the EEE field, from power generation to distribution & storage batteries, and offer opportunities to develop new and efficient electrical machinery (EVs, Electric Trains, Electric Planes, etc) and control systems. So, any project aligned with this transition will have growth opportunities.

8. What is your perspective on pursuing a master's degree after a bachelor's or starting a career immediately after graduation? What key factors should be considered when making this decision?

Suppose one is passionate about a particular field/sector in the master's program and understands what to achieve with this degree. In that case, it makes sense to pursue a master's degree immediately. Otherwise, one could try to find a job in that sector of interest, get some experience, see whether they want to enhance their knowledge in this area, and then join a master's program.

9. As someone who has made significant contributions to India's technological progress, what message or final words of wisdom would you like to share with the NIT Trichy community and future engineers?

India has a large pool of talented and hard-working engineers. If the engineers act and think like entrepreneurs, they will figure out ways to take the country to the next level of technological growth. As an employee, always look for opportunities to improve yourself, improve the process/workflow, or improve the functions/efficiency of the product. Take accountability for whatever you are doing.

RAJBARATH KR
BATCH: 2013

1. As an alumnus of NIT Trichy, can you share some of your fondest memories from your time here? Do you have any memories you get that you can recollect now to share with us?

I have so many fond memories. We used to have a blast across batches during Nittfest & Pragyan. I was in-charge of arts and participated in English lits too. To get a break from mess food, we used to visit third Dabha, Bamboos all the time. We never had AC or power backup like you guys, so we had to find inventive ways to keep our hostel rooms cool like setting up table fans on windows to pump fresh air. As a last resort we used to go to Octa for AC during summers. The most significant memory is from 2013 when I chaired the EEE Association and organized Currents. What was once a relatively low-key event with just a few hundred participants transformed into a grand affair with 1,800 participants, featuring workshops, guest speakers, and sponsors like Schneider Electric. The success was rewarding, and we even bought an LED signboard for the department from the remaining funds. I am so glad to see that Currents is going strong as a juggernaut even today.
I am deeply indebted to our professors for their unwavering support and trust in us.

2. As an Electrical & Electronics Engineering graduate from NIT Trichy who later pursued an MBA, how did your technical background contribute to your success in management?

These two fields are quite different, so let me approach this from a different angle. Where do you think an institute like NIT Trichy derives its value from? It's from the entrance tests, which select the crème de la crème from the applicants. For such a talented group, NIT Trichy helps to cultivate three key skills: problem-solving, critical thinking, and analytical thinking. The environment at NIT Trichy fostered personal growth and taught me how to "learn, unlearn, and relearn."Let me illustrate this with a story: in my second year, we were tasked with creating a DC motor from scratch. Instead, we ended up designing a rotary converter, which converts DC to AC completely through electro-mechanical means, without using any inverter circuit. I took inspiration from a similar machine in our DC machines lab to create it. This hands-on experience not only solidified our understanding of technical concepts but also nurtured creativity, resilience, and a solution-oriented mindset—all of which have been crucial in my journey in management.

3. You've worked in various leadership roles across multiple industries, from Tata Motors to Amazon. Can you share some defining moments that shaped your professional trajectory?

That's a great question! But years of experience have taught me that there's no single "silver bullet" that changes everything. Success is more like the gradual growth of bamboo—years of developing roots underground with nothing visible above ground, and then suddenly, it shoots up in a matter of weeks. What may seem like "overnight success" is usually the result of consistent, behind-the-scenes work. I do have some defining moments in my career, such as getting admitted to IIM, securing the Tata Administrative Services (TAS) internship—one of the most prestigious management programs, becoming a product owner at TCS at the age of 28 (while most of my peers were in their 40s), receiving various awards, and speaking at global forums with CXOs. However, these breakthroughs were more consequential than causal. I've also faced setbacks, like a promising contract that didn't materialize or a partnership that didn't work out. These "defining failures" were just as important as my successes. So, my message to students is this: don't chase the next shiny thing. Work on yourself, go through the grind and one day you will shine.

4. You've worked in over 25 countries. How has your global exposure influenced your approach to business strategy and leadership?

Thank you for the thoughtful question. One thing that stands out about India is our "jugaad" mindset - our ability to creatively solve problems in any situation. Abroad, I have noticed that people are very disciplined. For example, the Japanese are extremely meticulous, punctual and have low tolerance for errors. A COO in Australia, a client of mine once remarked, "If you can work with the Japanese, you can work with anyone". However, the Japanese are the worst example for work-life balance. Europeans, especially Germans and Italians, taught me the importance of balancing work and life. In Norway and Bhutan, I saw a deep commitment to sustainability. For example, when I was interning for Tata Motors in Bhutan, saw that they were building substations for hydro power plants inside mountains just to avoid cutting trees. From Americans, I learned the value of straightforwardness and accountability. In the U.S., a "yes" is firm. We can't stretch our yes's and expect it to be perceived as a "no." Ultimately, business strategy and leadership is a factor of human behaviour. That way, my global experiences have shaped my thinking, enabling me to craft better strategies.

5. So interestingly, You are certified in leadership through storytelling. How do you use this skill to inspire and manage teams, and why is storytelling such a powerful tool in leadership?

Simply put, if I just gave you facts, you'd likely zone out. But when those facts are shared through stories, they keep you engaged. Over time, I've realized how powerful storytelling is and often use it in my messages. For example, during my second year at IIM, I interned at Tata Administrative Services (TAS) and received a Pre-Placement Offer. So I gave a lecture on general management to first-year students who were planning their career path ahead of their placements. In the lecture I shared stories about Tata's legacy, like how their employees risked their lives during the Taj Hotel bombing. IIMB students have traditionally been interested in consulting roles. But after my talk, about 180 out of 300 students got interested in general management and asked me to review their CVs. This experience showed me the power of storytelling. I've since used it in my work, especially during recruiting at TCS, where sharing the company's vision through stories helped attract top talent. Storytelling cuts through the noise, connects emotionally, and makes facts memorable, inspiring action.

6. You've held roles in engineering, business development, strategy, and product management. How do you manage the transition between these different domains, and what advice would you give to those looking to diversify their career paths?

The key to transitioning between different domains is always asking "why." Understanding your motivations is crucial for diversifying your career. Never pick something because you want to run away from where you are. Pick something only if you want to run towards it. I'm currently a product manager, which I enjoy, but I've held roles in engineering, business development, and strategy. It took me seven years to realize product management is my passion, but it's important to stay flexible and explore new paths if something isn't working out. Trusting the process is also essential. Like M.S. Dhoni says, take the time to fully understand something before deciding if it's right for you. I often see impatience today, especially when decisions are based on short-term factors like work-from-home options, pay which can limit growth. An analogy I like is how firefighters handle chaos—they focus on the next safest step rather than planning everything in advance. You can't predict your entire career path, but you can make the best decision in front of you. Long-term planning still matters though. When I was with TAS, I chose TCS to stay in the digital domain, which eventually led me here. With AI and macro-economic changes, adaptability is key—treat your career like a flexible relationship with your goals and not a marriage.

7. As a Senior Product Manager at Amazon, what are the key skills required to succeed in product management, and how can engineers develop these skills early on?

As a Senior Product Manager at Amazon, one of the most critical skills for success is 'common sense.' You need to design intuitive user experiences that address real problems while keeping the solution user-centric. Another essential skill is 'problem-solving,' especially for engineers transitioning into product management. Focus on understanding customer pain points before developing solutions. 'Influencing without authority' is also crucial; you'll collaborate with teams across engineering and marketing without directly managing them. A solid grasp of technical basics—like software development lifecycle, client server architecture, databases, APIs and cloud computing - is important, though you don't need to be an expert coder. Hands-on experience with GitHub projects can be beneficial. For aspiring product managers, I recommend *Cracking the PM Career* by Gayle Laakmann McDowell and Jackie Bavaro, which is a great resource. In summary, develop problem-solving skills, customer empathy, and the ability to influence others while enhancing your technical knowledge to succeed in product management

8. Looking forward, what new challenges or projects are you excited to pursue in your career?

I'm currently working on projects related to the tax domain, specifically GST (Goods and Services Tax), which is a completely new area for me. The learning curve has been steep, and I'm still navigating the complexities. Although I can't share many details, it's been exciting to tackle something entirely different from my previous roles. Exploring new domains like this keeps my career fresh and helps me continue to grow.

9. As a proud alumnus, what advice would you give to students today about making the most of their college years?

My advice to students is to make the most of your time on campus—it's fleeting. College is a safe space for experimenting, failing, and learning without severe consequences. Aristotle's paradox of time reminds us that while the past is gone and the future is uncertain, the present is brief. Embrace every opportunity, take risks, and don't fear failure—remember, fear kills more dreams than failure ever will. I'd recommend a bunch of hacks to manage difficult emotions you face every day. If you are overthinking, write. If you feel anxious meditate. If you are stressed, take a walk. If you are sad, exercise. If you feel angry, listen to music. If you feel lazy, reduce your screen time. And if you feel tired, take a nap. Lastly, I want to leave you with this favourite quote of mine: "We often fail in life not because we aim too high and miss, but because we aim too low and hit." Aim for the stars, you'll be one, some day.

SOUNDARYA JAYARAMAN
BATCH: 2023

1. Looking back, how would you describe your time at NIT Trichy, and how did it shape your career path?

My journey there was a rollercoaster ride. Being away from home for the first time, I learned to balance academics, extracurricular activities, and personal interests. Unsure of my interests and career path, I explored my interests as much as I could. The support and guidance from faculty, seniors, and the alumni network were invaluable in this process.

In my first year, I learned about international internships from seniors, which motivated me to maintain strong academics to qualify for these opportunities. By my third year, I secured internships through MITACS at Simon Fraser University and IUSSTF-Viterbi Fellowship at the University of Southern California, and I decided to pursue the latter. I have always been interested in problem-solving and have worked passionately for a couple of months. I ended up publishing an IEEE paper.

Alongside my studies, I had the privilege of leading two clubs, which gave me essential experience in team management and delivering results. Additionally, NIT Trichy's Women Inclusivity Network connected me to inspiring female alumnae, broadening my perspective on career paths beyond the technical field. This exposure sparked my curiosity about the business side of companies.

I was nominated for the OP Jindal Engineering and Management Scholarship, where I presented a business proposal. This experience was rewarding and pivotal in motivating me to pursue a management degree.

2. What critical areas within EEE and related fields should students prioritize to excel and succeed in today's evolving industry?

Emerging technologies such as bio-electronics, renewable energy, electric vehicles, IoT, and AI/ML show great promise for future growth and innovation. Hands-on experience combined with theoretical knowledge allows a better understanding of the concepts and also helps you determine if you truly enjoy working in these fields.

Engineers from top institutions like NIT Trichy are hired because of our tenacity to go through academic rigour and our ability to learn quickly and effectively. Additionally, strong communication and interpersonal skills are equally crucial in today's collaborative work environment. However, no educational program can fully prepare a person to face real-world challenges; much of that understanding comes from practical experiences. Thus, adaptability and lifelong learning are important traits for succeeding in this fast-changing world.

3. You have received the presidential award by having the highest CGPA of your batch. What kept you motivated to achieve this milestone, and how did you manage your academics with co-curricular activities?

When I joined the EEE Department at NIT Trichy, I was the closing rank candidate, securing my seat only in the CSAB round. This near miss left me feeling out of place, surrounded by those who seemed more deserving. Yet, it made me appreciate the opportunity even more, knowing how close I came to missing it entirely. My father's words, "When you have nothing left to lose, you can fight like you have everything to gain," motivated me to push my boundaries and dare to dream big. I set an ambitious goal—to earn the President Medal.

In my first year, I focused solely on academics and earned the SJ Chainlu Medal of Excellence for being the department topper. This gave me the confidence to take on new challenges. From the second year onward, I learned to balance academics with co-curricular activities. I engaged in Carnatic music, content writing, leadership roles in college clubs, pursued an international internship, and presented my research at an International Conference. Balancing these activities with my studies helped me stay focused and build resilience. When I reached the milestone of being the batch topper, it all came together—each experience had shaped my perspective, both academically and personally, making the journey truly fulfilling.

4. You've had the unique experience of exploring international internships, which led to valuable research opportunities, followed by a corporate career, and now you're pursuing an MBA at IIM Lucknow. What guided your decisions to take on such varied roles, and how would you describe the experiences and key differences across these diverse paths?

My decisions were driven by a mix of curiosity and the desire to find out what interested me. I have always tried to seize every opportunity to learn and grow. To be honest, it was also an attempt to push myself out of my comfort zone and work really hard on projects I deeply resonate with and feel proud about.

Each role came with its own set of expectations, which in turn shaped my experiences and personal growth. As a research intern, I was required to think analytically and develop innovative solutions. I proposed a hardware-optimised solution to accelerate sorting, a fundamental computation challenge. The solution outperformed contemporary models and culminated in a published IEEE paper, a proud milestone for me.

During my stint at Qualcomm, I was a part of the power team. I realized the significant difference between industry work and classroom learning. The use of advanced tools and automation systems required me to quickly learn and upskill. I was given a lot of autonomy in my work and held accountable for delivering outputs within the deadlines. It provided me insights into how large companies function through multiple small teams collaborating to tackle complex real-world challenges while driving substantial revenue. Now, as an MBA student, I am gearing up for a fast-paced life amidst career-oriented and accomplished peers.

Although I am still early in the course, I have learned invaluable lessons on prioritization and crisis management.

The key difference across these roles is their approach to problem-solving: research focuses on innovation, corporate roles prioritize execution, and management emphasizes business strategy. Each role offers a unique learning curve, but together, they have provided me with a more holistic view of technology and business.

5. What are your plans for the future after completing your MBA?

Post-MBA, the career path becomes highly performance-driven – either one should grow in that company or move out. I plan to work in the consulting domain because it offers exposure to various industries and complex problem statements, allowing me to explore and learn from diverse fields. I am interested in the technology sector, where I can use both my technical background and business knowledge. I've always been motivated by the question, "Am I satisfied with my work?" and this mindset has shaped my decisions so far. I plan to continue discovering new opportunities and challenges along the way.

6. What message or final words of wisdom would you like to share with the NIT Trichy community and future engineers?

I believe engineering shapes analytic thinking and problem-solving abilities. It is important to do justice to every endeavour you undertake, so make sure that the core learnings from engineering are not compromised. These four years also offer ample time to explore your interests, so I would encourage you to try out different activities that even remotely pique your interests to determine if they truly resonate with you. While seizing new opportunities may initially seem daunting, it facilitates personal growth and builds confidence. I also recommend talking to batchmates, seniors, juniors, faculty, and alumni for their guidance and support. Many exciting opportunities I pursued were discovered through casual conversations.

INTERNSHIP EXPERIENCES

D.E. SHAW INDIA PVT. LTD

Rohit Meena

I was a Technology Developer Intern at D.E. Shaw India Pvt. Ltd, Hyderabad, Telangana. I secured this internship opportunity through our campus placement cell. I was working on the 'Qualitative Inputs Collection Tool'. This tool helps extract specific metadata from posts uploaded by analysts to build a dashboard where users can efficiently view, filter, and query posts.

I spent my leisure time apart by visiting different places in Hyderabad, playing games in the office, and attending events organized by the firm. I also learned about the technology required to be used in the project in my free time.

When preparation for securing an internship is concerned, I started by learning a programming language, C++. Then, I started learning various data structures and algorithms; after having a good base with my data structures and algorithms, I began to give lots of online contests, which significantly improved my problem-solving skills. Solving a problem in a fixed time and competitive environment is very different from casually coding a problem, considerably impacting my performance during company online tests. Also, I had a lot of people with similar interests so that I could discuss and clear doubts. I also focused on other computer science fundamentals like OOPs, OS, DBMS, etc. I learned essential web development, which helped me immensely in my project. For reference, I had attended 150 contests and solved 1500+ questions till my internship.

NVIDIA GRAPHICS LIMITED

Anurag Jagtap

I undertook my corporate internship at NVIDIA Graphics Limited. While NVIDIA is primarily known as a GPU-based company, it is involved in much more than what is commonly known. I secured my internship through an on-campus process, which involved several stages. The first stage was resume shortlisting, followed by an online test and a personal interview. The online test consisted of 20 multiple-choice questions covering topics such as digital electronics, VLSI, C programming, aptitude, etc. The personal interview lasted approximately one hour and included a mix of technical questions, HR questions, and some puzzles.

During my internship, I worked on a project involving the verification of APIs present in a superset UVC using a VIP B2B Testbench. The primary focus of the project was on validating setter and getter APIs.

Since my internship was offline in Hyderabad, I spent most of my weekends working, but I preferred to spend my leisure time exploring the city and relaxing The company provided accommodation, so I would often explore the nearby areas around my hotel by walking, visiting malls, and checking out different places during my off days. I also enjoyed playing team games with friends or engaging in sports like cricket with my colleagues after finishing work for the day. In preparation, I received significant guidance from seniors, who were very helpful throughout the process. The most important thing is to have a clear understanding of your basics. I recommend building strong connections with seniors in your respective domain, as they can provide valuable advice and guidance. Ultimately, however, it comes down to your own effort and hard work in securing an internship.

TATA RESEARCH AND INNOVATION

During the summer of 2024, I had the privilege of undertaking a research internship at TATA Research and Innovation in Mumbai. My project focused on Gen-AI Based Solutions for Building Efficient Code, where I developed a Log Sculptor tool. I later submitted this work as a research paper at an AI-ML systems conference. I secured this internship through on-campus recruitment, which involved a rigorous selection process. This process included resume shortlisting, followed by two rounds of interviews. The interviews involved Python coding and technical questions related to my projects and knowledge of AI and ML.

he Log Sculptor utilized a multi-agent system (MAS) to enhance code quality by addressing suboptimal logging practices. The MAS comprised multiple agents, each specializing in a specific task: detection, evaluation, and modification. LLMs were integrated into the agents to provide the necessary intelligence for analysing log statements and suggesting optimizations. This combination of multi-agents and LLMs enabled Log Sculptor to efficiently and accurately identify and rectify issues, demonstrating the effectiveness of this approach in improving code quality and reducing debugging time.

Prathit Mehta

During my internship, I maintained a healthy balance between work and leisure. We engaged in fun activities and went out for dinners, creating a positive team atmosphere that fostered collaboration and camaraderie.

When preparation for securing an internship is concerned, Here are some pieces of advice I would offer to the candidates:

- Build a Strong Portfolio: Focus on completing relevant projects that showcase your skills.
- Deepen Your Knowledge: Invest time learning key concepts and technologies related to your field, mainly through online courses, research papers, and hands-on projects.
- Network and Seek Guidance: Connect with peers, professors, or alumni to gain insights and guidance.

SAINT GOBAIN INDIA PVT LTD

Laavanya

During my two-month internship in the techno-managerial role at Saint Gobain India Pvt Ltd., I had the opportunity to gain valuable insights into the renowned French multinational manufacturing corporation. Saint Gobain specializes in building materials with production in a wide range of products.

The company is known for its innovative solutions and commitment to sustainability.

The process included a Pre-placement talk, an Online test and a personal interview, similar to other companies. Primarily focusing on core subjects, I realized the importance of a strong foundation and a collaborative approach needed in the preparation.

The key recommendations are to strengthen basic understanding, develop management skills, and create a compelling resume. Relevant PoRs can significantly enhance interview performance. As a techno-managerial intern at a Solar Glass Processing Plant, I worked on reducing defects in chip and microchip production. My role involved data collection, analysis, root cause identification, corrective action, and proposing solutions. By implementing strategies, I contributed to improving production efficiency and quality.

My internship at Saint-Gobain had a flexible work culture with a team-based structure that ensured smooth project flow and minimized delays. The environment was friendly and approachable, allowing me to complete work efficiently during office hours and focus on personal commitments during free time. Overall, it was an enriching experience that greatly contributed to my personal and professional growth.

TATA STEEL

I completed an 8-week research internship at Tata Steel in Jamshedpur, focusing on the Raw Material Management (RMM) department. Securing the opportunity involved a multi-stage selection process: an online test on electrical engineering concepts, a group discussion on alternative energy sources, and a personal interview covering technical and HR topics, including transformers, transmission and distribution, and induction machines.

My project was centered around developing a prototype for automating bulged Wagon Detection Technology. The goal was to design a cost-efficient and highly effective system with incorporated safety measures. Seeing my work implemented in the Jamshedpur plant, and later considered for the Kalinganagar plant, was an immensely rewarding experience. The practical exposure I gained, along with plant visits to understand the larger steel manufacturing process, was invaluable.

Varshini Giri

Outside of work, I made time to explore the local culture and enjoyed visits to popular spots like PM Mall, Cafe Regal, and Jubilee Park on weekends. I also ventured into local cuisine and embraced Jharkhand's rich culture. For those aspiring to pursue similar opportunities, I'd recommend focusing on a solid understanding of core concepts like electrical machines, circuit theory, and digital electronics. Preparation is key, and staying calm under pressure, especially in interviews, is crucial to success. My time at Tata Steel was a balance of technical learning, personal growth, and cultural exploration, making it an experience I'll always cherish.

DAAD WISE

Atharva Rathi

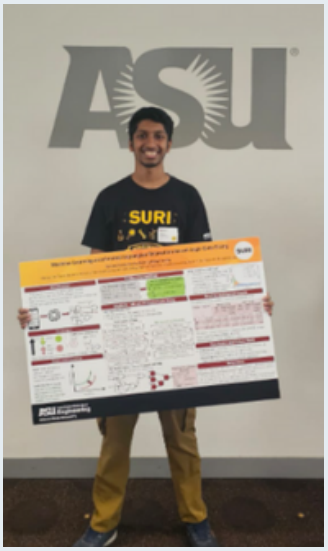
During the last summer, I undertook my research internship at the PEARL Lab (Perception and Active Learning) at TU Darmstadt, Germany, under the guidance of Professor Georgia Chalvatzaki. The PEARL Lab specializes in advancing machine learning, robotics, and computer vision, with a focus on reinforcement and imitation learning. I secured this opportunity through a structured application process, applying for the DAAD WISE (Working Internships in Science and Engineering) Scholarship, which supports Indian undergraduate students in science and engineering fields.

To secure this scholarship, the most crucial step involved cold emailing professors whose research aligned with my interests, convincing them to host me as an intern. This required a lot of patience and persistence. Once I received a positive reply from Professor Chalvatzaki, I followed the detailed application procedure outlined on the DAAD WISE website, ensuring I met all the requirements before submitting my application through the DAAD portal.

During the internship, my project titled "Generic Attention for Multitask Control Transformers" focused on developing a GUI to visualize attention mechanisms within transformers used in robotics. Working closely with a PhD student, I built a visualization pipeline for attention maps, allowing users to better interpret model inputs. This involved adapting existing research on Vision Transformers for use in Control Transformers, particularly in robotics tasks.

In terms of advice, I would recommend aspiring candidates to start building a strong resume by actively participating in research projects, technical clubs, and gaining leadership roles. Maintaining a high CGPA, ideally above 9.1, is also crucial for eligibility in programs like DAAD WISE.

SURI, ASU



Soham Kumar Dash

I completed my research internship at Arizona State University (ASU) in the USA through the SURI (Summer Undergraduate Research Initiative) program under the guidance of Professor Vidya Chhabria. Securing this position required persistence and proactive efforts. After submitting my official application, I didn't receive an immediate response, so a friend advised me to reach out directly to the professor I was interested in working with.

During my internship, I worked on "ML Accelerated Lagrangian Relaxation-based Logic Gate Sizing," where I focused on using machine learning techniques to enhance the efficiency of the gate sizing process. This project allowed me to apply my previous knowledge and skills, while also gaining deeper insights into VLSI design.

ASU offered a flexible work environment, and I typically structured my day around working from 2 p.m. to 9 p.m., taking breaks to unwind at the gym or sports complex. On weekends, my friends and I explored the city, visited restaurants, malls, and popular attractions. One of the highlights was a trip to Los Angeles and Las Vegas during a long weekend, where I had the chance to visit Universal Studios and Hollywood, making the summer both enriching and fun.

For those aiming to secure a similar opportunity, I would suggest to not get discouraged by rejections. Whether you pursue a research internship abroad or in India, focus on building a strong profile by taking relevant courses and improving your skills. Even if your GPA is lower, persistence and a well-rounded profile can help you land meaningful opportunities.

MITACS

Manush Patel

During my research internship, I worked at the University of Manitoba, Winnipeg, in the Electrical and Computer Engineering Department under Prof. Shaahin Filizadeh. I secured this opportunity through the Mitacs Globalink program, which I learned about from seniors at my college. I applied because I saw it as a great way to gain exposure to international research. The Mitacs application process involves submitting academic details, a SOP, research experience, and LORs. To improve your chances, I recommend applying for projects that align with your background. Personally, my seniors were incredibly helpful in guiding me through the application process, which made a significant difference

I had never used it before and always assumed MATLAB was more commonly used.

I had to learn PSCAD while working on my project, which involved designing a bi-directional DC-DC converter for electric bikes with regenerative braking using PWM control. My design initially featured a half-bridge topology, with plans for a full-bridge model later on. The lab environment was collaborative, and the PhD and master's students were always willing to help.

In my free time, I travelled around Canada, visiting cities like Toronto,Montreal,Quebec City, Niagara Falls and Banff.

Work-life balance in Canada was much better than in India. I typically finished my day by 5:00 p.m., giving me plenty of time for personal activities like sports and cooking.
If I could offer one piece of advice to others with similar aspirations, it would be to believe in yourself and remain open to the possibilities. You never know what opportunities might come your way. Programs like Mitacs Globalink are a great stepping stone, especially if you plan to pursue a master's degree immediately after your undergraduate studies.

SRIP (IIT GANDHINAGAR)

Mayank Pachauri

I undertook my research internship at IIT Gandhinagar. The process to secure the internship was through the Summer Research Internship Program (SRIP) at IIT Gandhinagar which generally opens its portal in February.

Applicants are required to select projects based on their interests and can apply to any number of projects. The application involves submitting basic details (such as email and college name), including your college CGPA and a Statement of Purpose (SOP), but no resume is required. After applying, the results are typically emailed within 1 to 1.5 months.

During my internship, I worked on a research project named "Analysis of SRAM-based Digital In-Memory Compute (IMC)" under Professor Joycee Mekie.

In this project, we conducted a performance analysis, comparing the latency and energy consumption of Bit-parallel and Bit-serial architecture-based compute logic for the same SRAM array size. All the analysis was done using Cadence Virtuoso software.

IIT Gandhinagar offers excellent facilities for interns, including access to a swimming pool, gym, sports complex, and a library open until midnight. In my free time, I made the most of these amenities. Additionally, IIT GN regularly organises sessions on interesting and valuable topics, which were great to attend and added to the overall learning experience during the internship.

Junior candidates seeking a research internship should focus on building a solid academic foundation and relevant skills. Identify projects or areas of interest early on, and craft a compelling Statement of Purpose (SOP) that highlights your passion and how your skills align with the research. Networking with professors and being proactive in seeking guidance also helps. Be persistent and patient; securing a research opportunity can be competitive, but preparation and dedication will significantly improve your chances.

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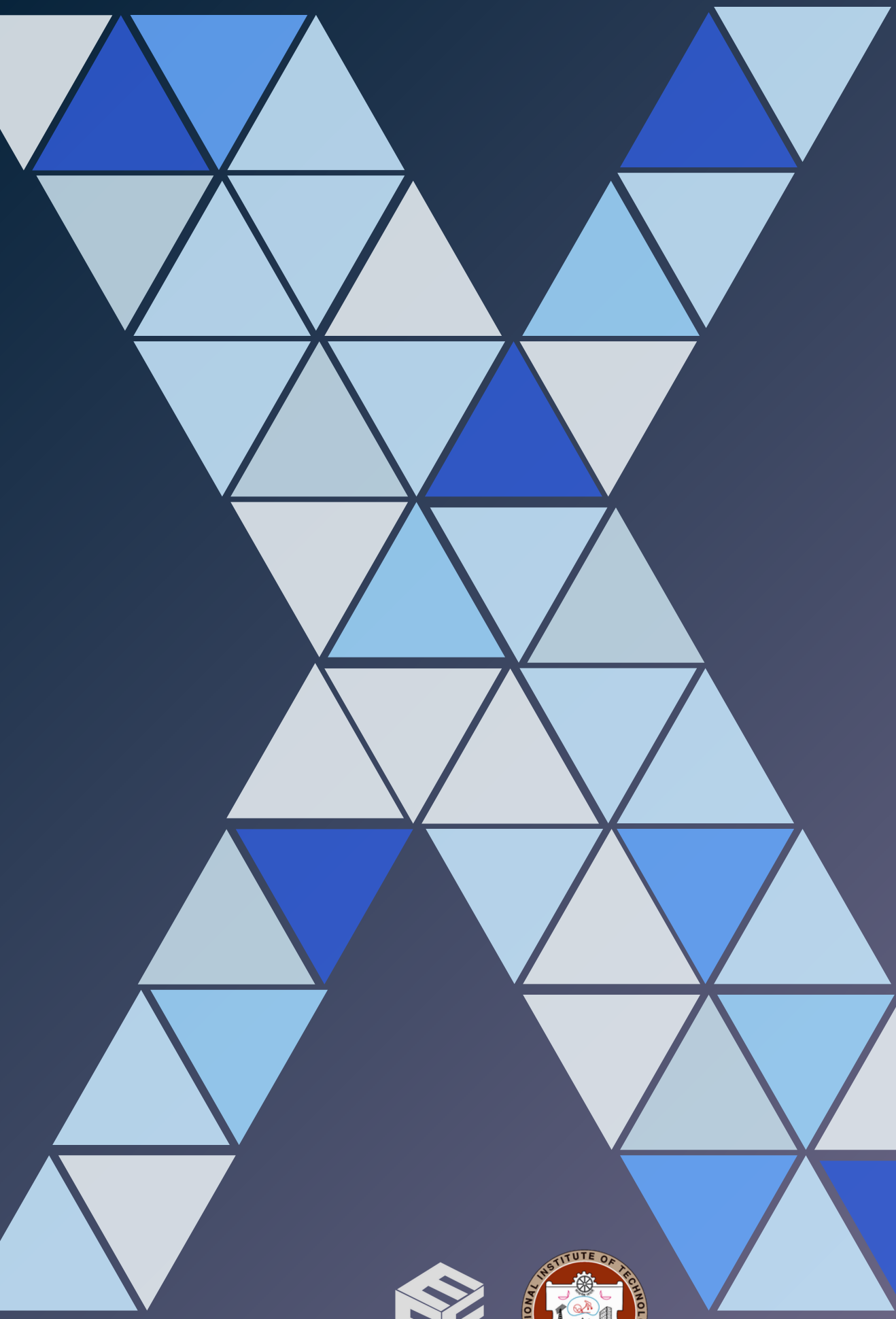

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