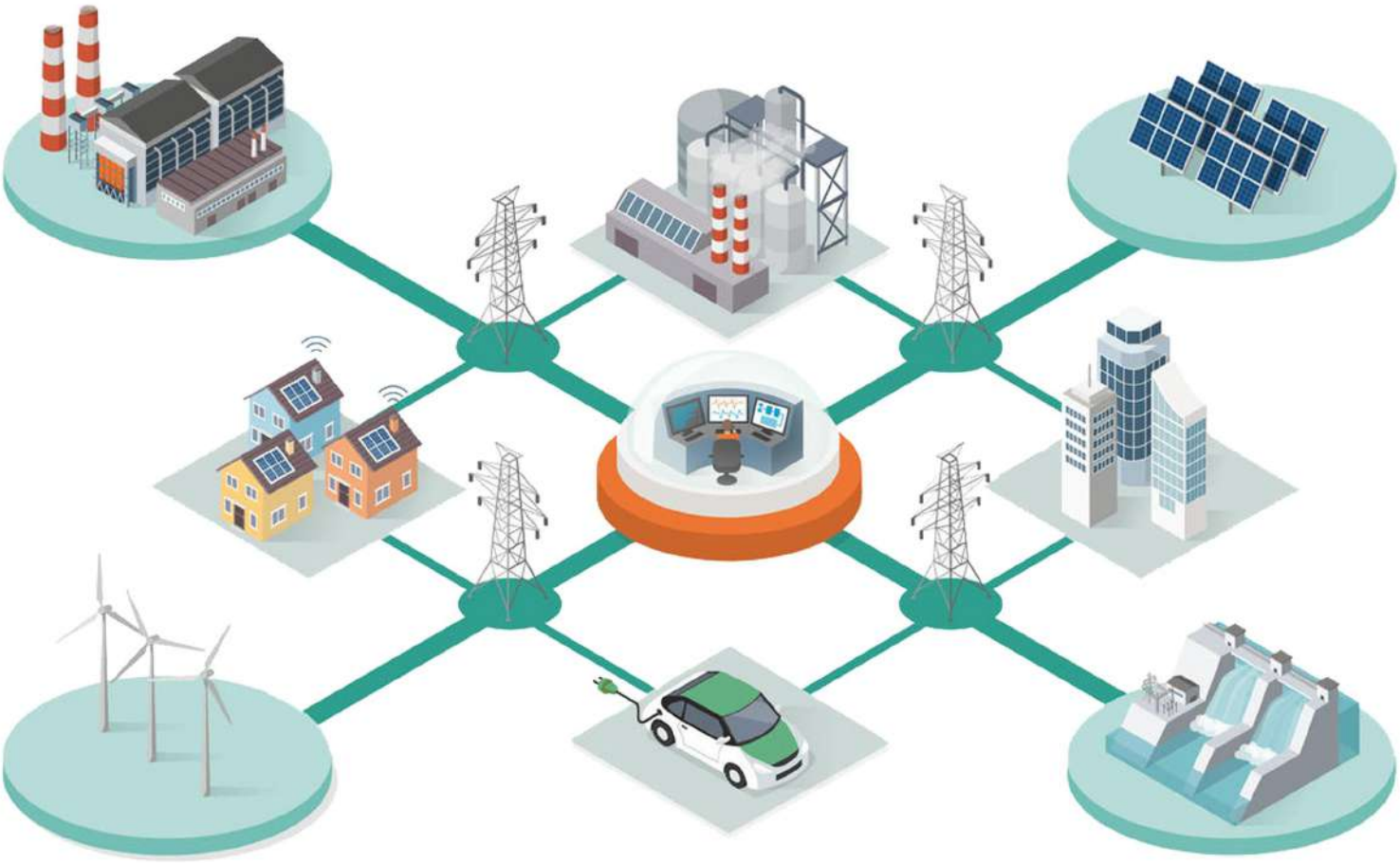
EEE ASSOCIATION

TRONICALS

VOLUME 6 | ISSUE 1



COVER STORY:
VIRTUAL POWER PLANTS

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY TIRUCHIRAPPALLI

CONTENTS

05 Editorial

06 Vision and Mission of the Department

10 Journals and Conference Publications

16 Convocation 2020

19 Currents 2020 report

20 Current Trends in Technology

44 Company Internships

48 Research Internships

51 Crossword

MESSAGE FROM THE HOD

Dr. V. Sankaranarayanan

I am delighted to pen a few words as a prologue to the sixth volume of Tronicals. The issue encompasses the achievements of the facuty, students, news about upcoming technologies, and much more. The department of Electrical and Electronics Engineering is known for its highly motivated and experienced faculty and since its inception, it has encouraged the students to do wonders in the field.

The department urges its students to take up projects in core as well as interdisciplinary topics. Its state-of-the-art infrastructure enables the students as well as scholars to conduct experiments and pursue research work without much hassle.

The Electrical and Electronics Engineering Association (EEEA) has always stood out of the crowd with their diverse set of events and activities that are both informative and innovative. The activities include workshops, seminars, technical contests and quizzes, exhibitions, and symposiums in the core field.

This magazine certainly brings out the creativity of the students. The editorial team has consistently done an excellent job for the past five years, and I hope that they reach greater heights.

MESSAGE FROM THE FACULTY ADVISOR

Dr.Aneesa Farhan M A

On behalf of EEE association and Tronicals, I wish to extend my warmest greetings to the EEE family of NITT. It is indeed a great pleasure to be the faculty advisor of this association with filled with innovative and motivated young minds. This association has actively conducted several technical workshops, events for schools and colleges , and humanitarian activities for society. This year has been arduous and filled with unforeseen challenges, but that has not deterred our association.

Our students are finding novel ways to make the best use of these unprecedented times with the resources available to them. We have conducted an orientation session for sophomore students, a case study challenge, the Trical Herald and much more. Tronicals is a medium to broadcast the activities and accomplishments of our enthusiastic students and distinguished faculty.

With highly talented, driven office bearers and members of the EEE Association, I am sure that we can attain even greater heights this year. I congratulate the editorial team for their valuable efforts in curating this magazine and I hope all of you enjoy reading this edition.

EDITORIAL

"Still round the corner, there may wait, a new road or a secret gate".

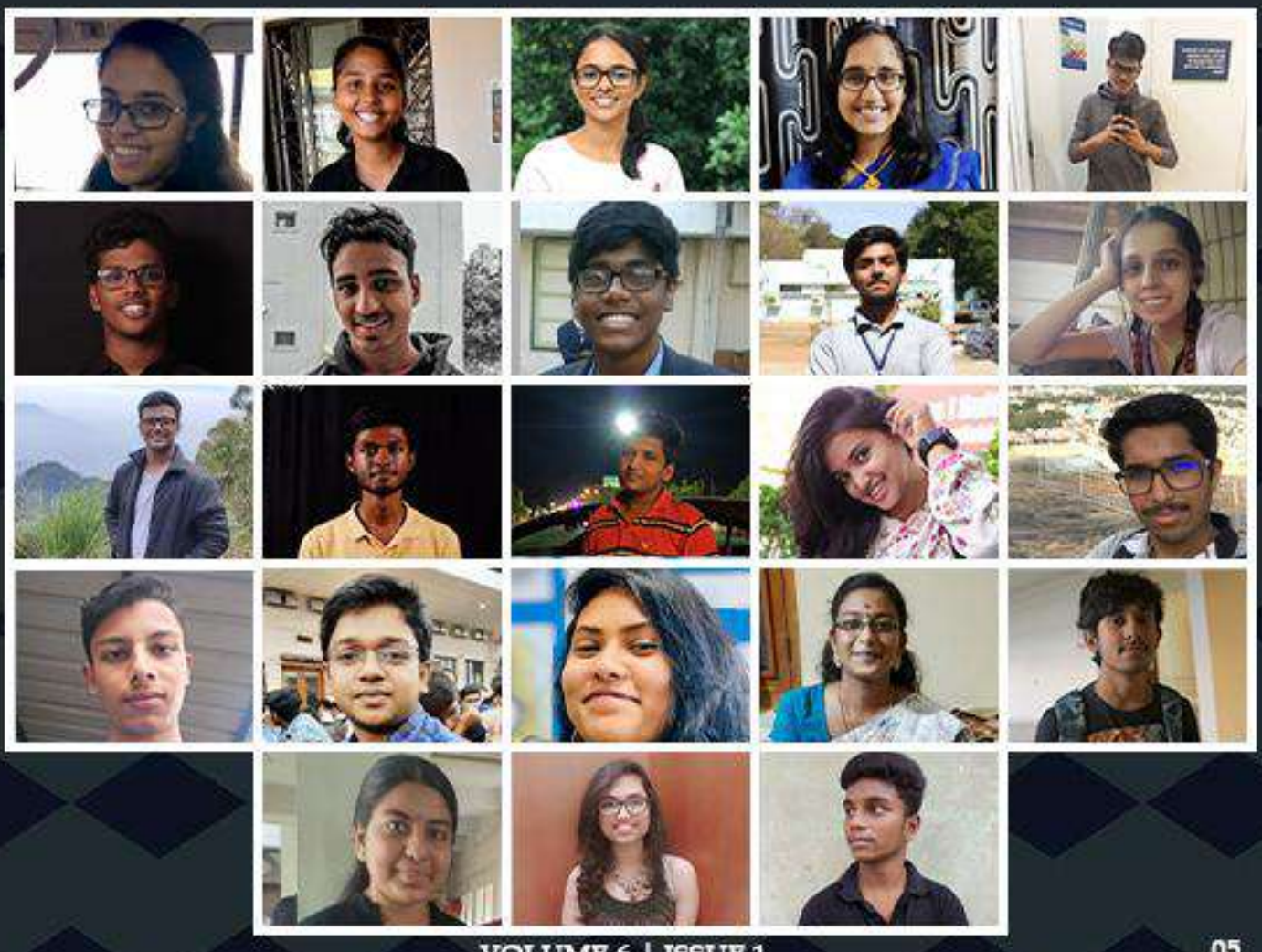
The last few months have been unlike any other, a long period of uncertainty and an impatient wait for light at the end of the tunnel. Along with it comes a window of opportunity, a time to reflect, reimagine and transform the world. As students of the Electrical and Electronics Engineering Department, at one of the premier technical institutes we too are called to make a difference.

In this edition of Tronicals, we bring to you an intriguing cover story on the future of electricity grids. We have tried to give the readers an insight into Virtualization and Implementation of Block Chain in Smart Grids. This edition also encompasses a broad range of articles that seeks to introduce students to the latest technologies in the field of Electrical and Electronic Engineering. In addition, there are articles on students' internships in industries and foreign universities to help the future aspirants. It is inspiring to see how each of them excelled in their internships despite the challenges involved in working remotely.

We hope that this edition of Tronicals will provide to be an enjoyable read and we will be back soon with more insightful content curated just for you.

Anjula Antonis and Nila K
Editors-in-Chief, Tronicals.

TRONICALS TEAM



VISION AND MISSION OF THE DEPARTMENT

About:

The Department of Electrical and Electronics Engineering, NIT, Tiruchirappalli was started in the year 1964. It offers one Under-Graduate programme (B.Tech.), two Post-Graduate programmes (M.Tech. in Power Systems and 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 the teaching and research purposes. Thus, the department has dedicated and state of the art teaching / research laboratories. The department is recognized for excellence in research (First Department in NIT-T to be accorded QIP status for Ph.D. programme), teaching and service to the profession.

The faculty members have 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 Objective:

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

1. for graduate study in engineering
2. to work in research and development organizations
3. for employment in electrical power industries
4. to acquire job in electronic circuit design and fabrication industries
5. to work in IT and ITES industries

Programme Outcomes:

The students who have undergone the B.Tech. programme in Electrical and Electronics Engineering (EEE)

1. will have an ability to apply knowledge of mathematics and science in EEE systems.
2. will have an ability to provide solutions for EEE problems by designing and conducting experiments, interpreting and analysing data, and reporting the results.
3. will have comprehensive understanding of the entire range of electronic devices, analog and digital circuits with added state-of art knowledge on advanced electronic systems.
4. will have knowledge and exposure on different power electronic circuits and drives for industrial applications.
5. will have in-depth knowledge in transmission and distribution systems, power system analysis and protection systems to pursue a career in the power sector.
6. will have a good knowledge in microprocessors/microcontrollers, data structures, computer programming and simulation software.
7. will be able to develop mathematical modelling, analysis and design of control systems and associated instrumentation for EEE.
8. will be able to systematically carry out projects related to EEE.
9. will have an ability to participate as members in various professional bodies as well as multidisciplinary design teams.
10. will demonstrate the ability to choose and apply appropriate resource management techniques so as to optimally utilize the available resources.
11. will be proficient in English language in both verbal and written forms which will enable them to compete globally.
12. will have confidence to apply engineering solutions with professional, ethical and social responsibilities.
13. will be able to excel in their professional endeavours through self-education.
14. will be able to design and build renewable energy systems for developing clean energy and sustainable technologies.

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M.TECH POWER ELECTRONICS

Programme Educational Objective:

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:

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

Programme Outcomes for Power Electronics:

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

1. have an ability to evaluate and analyse problems related to Power Electronic Systems and incorporate the principles in the state of art systems for further improvement
2. be able to investigate critical PE problems and to arrive at possible solutions independently, by applying theoretical and practical considerations
3. be able to solve PE problems such as switching control, converter design, analysis and control of solid state drives and stability studies
4. be able to develop appropriate power converters for sustainable energy technologies
5. be able to identify optimal solutions for improvising power conversion and transfer capability, enhancing power quality and reliability through PE based solutions
6. be able to evolve new power electronic topologies and control schemes based on literature survey and propose solutions through appropriate research methodologies, techniques and tools, and also by designing and conducting experiments
7. be able to work on small, well-defined projects with particular goals to provide real time solutions pertaining to power electronics
8. be able to develop, choose, learn and apply appropriate techniques, various resources including sophisticated digital controllers and IT tools for modern power electronic system simulation, including prediction and modelling with existing constraints
9. be able to develop dedicated software for analysing and evaluating specific power electronics and control problems
10. be able to participate in collaborative-multidisciplinary engineering / research tasks and work as a team member in such tasks related to PE domain, giving due consideration to ecological and economical intricacies, and lead the team in specific areas
11. be able to confidently interact with the industrial experts for providing consultancy
12. be able to pursue challenging professional endeavours based on acquired competence and knowledge
13. be a responsible professional with intellectual integrity, code of conduct and ethics of research, being aware of the research outcomes and serve towards the sustainable development of the society
14. be capable of examining critically the outcomes of research and development independently without any external drive.

M.TECH POWER SYSTEMS

Programme Educational Objective:

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:

1. research programmes in Power Systems Engineering
2. employment in power research and development organisations
3. to work in electric power industries and energy sectors
4. faculty positions in reputed institutions

Programme Outcomes for Power Systems:

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

1. have an ability to evaluate and analyse problems related to Power Systems and be able to synthesise the domain knowledge and incorporate the principles in the state of art systems for further enrichment
2. be able to critically investigate the prevailing complex PS scenarios and arrive at possible solutions independently, by applying the acquired theoretical and practical knowledge
3. be able to solve PS problems such as load flows, state estimation, fault analysis and stability studies
4. be able to develop broad-based economically viable solutions for unit commitment and scheduling
5. be able to identify optimal solutions for improvising power transfer capability, enhancing power quality and reliability
6. be able to evolve new schemes based on literature survey, and propose solutions through appropriate research methodologies, techniques and tools, and also by designing and conducting experiments
7. be able to interpret power system data and work on well-defined projects with well defined goals to provide real time solutions pertaining to PS
8. be able to develop, choose, learn and apply appropriate techniques, various resources including hardware and IT tools for modern power engineering, including prediction and modelling with an understanding of the limitations
9. be able to develop dedicated software for analysing and evaluating specific power system problems
10. be able to participate in collaborative-multidisciplinary engineering / research tasks and work as a team member in such tasks related to PS domain, giving due consideration to economic and financial intricacies, and lead the team in specific spheres
11. be able to confidently interact with the industrial experts for providing consultancy
12. be able to pursue challenging professional endeavours based on acquired competence and knowledge
13. be a responsible professional with intellectual integrity, code of conduct and ethics of research, being aware of the research outcomes and serve towards the sustainable development of the society
14. be capable of examining critically the outcomes of research and development independently without any external drive.

Journal Publications

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NS Suresh, Manish Kumar, S Arul Daniel, "Multi-agent strategy for low voltage DC supply for a smart home", Smart and Sustainable Built Environment, November 2019

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Naveen Yalla, Pramod Agarwal; New EABC for DC-link capacitor voltage equalisation of MPC-based 5-L HPFC, International Journal of Power Electronics, Volume 11, Year 2020, Pages 519-540

Conferences & Workshops

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D Sharma, S Sharma, S Paul, D Rawat, S Moorthi, "Design of photo-voltaic source fed efficient corridor lighting system in Green buildings", 2020 3rd International Conference on Emerging Technologies in Computer

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M. M. Roomi, P. H. Raj and B. Zhao, "Closed Loop Current Control of Dynamic Voltage Restorer for Rectifier Loads," 2020 IEEE International Conference on Power Electronics, Smart Grid and Renewable Energy (PESGRE2020), Cochin, India, 2020, pp. 1-6

P Upadhyay, R Kumar, shelas sathyan, "Family of High-Frequency Non Isolated DC-DC ZVZCS Converters with High Conversion Range", National Power Electronics Conference (NPEC)-2019

K Mistry, M Sahoo, shelas sathyan, "Single Stage Current Fed Switching Based Hybrid Converter for Photovoltaic Application", National Power Electronics Conference (NPEC)-2019

A. Kumar and P. Sensarma, "Review of Front-end DC-DC Boost Converters in Two-stage Micro-inverters", IEEE PEDES, Jaipur, Dec-2020 (Accepted for presentation).

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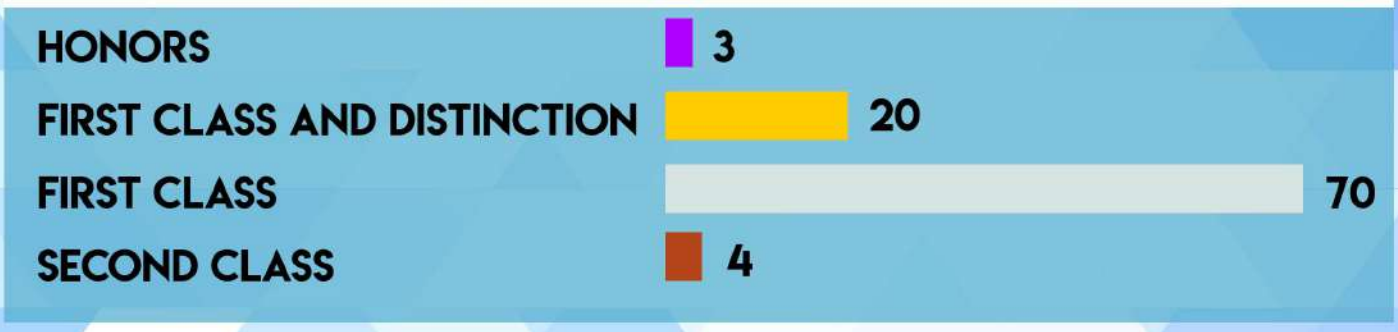
Naveen Yalla, Vinod Kumar Bussa, AVJS Praneeth, Pramod Agarwal; Reduced Switching State Five-Level High Power Factor Converter, 2020 IEEE International Conference on Power Electronics, Smart Grid and Renewable Energy, PESGRE 2020, Year 2020

Ashok Kumar; Invited speaker at a short term course on "Applications of Power Electronic converters for Sustainable Living" (September 18-22, 2020) at SVNIT Surat

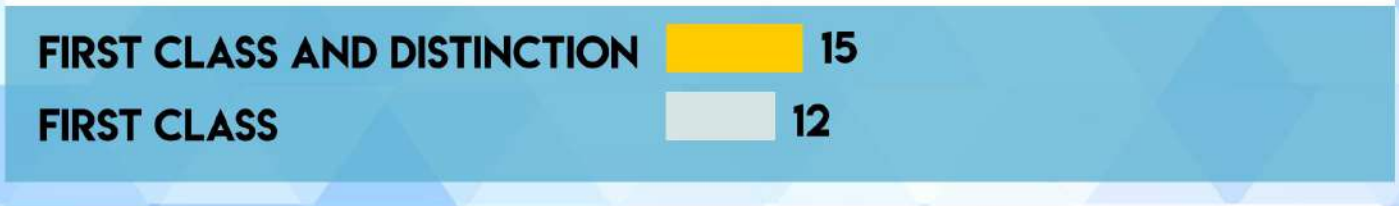
Ashok Kumar; Invited speaker at a short term course on "Sustainable Energy Systems: Topology, Control and Policy" (Oct 12-16, 2020) at MNNIT Jaipur.

CONVOCATION 2020

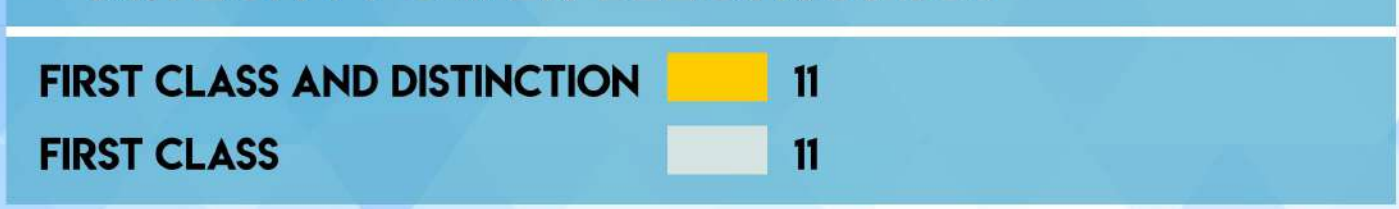
B.TECH



M.TECH : POWER SYSTEMS



M.TECH : POWER ELECTRONICS



MEDAL WINNERS

B.TECH	M.TECH	
	POWER SYSTEM	POWER ELECTRONICS
AARYAN S SHAH CGPA : 9.72	DEVARAJ S CGPA : 9.44	NAMAN AGARWAL CGPA : 9.73

DOCTOR OF PHILOSOPHY (PH.D)

SR. NO.	NAME	ROLL NUMBER	GUIDE	TITLE OF THESIS
1.	SURESH N S	407111053 30TH DECEMBER 2019	DR. S. ARUL DANIEL	INTERFACES FOR ENERGY INTERCHANGE BETWEEN DOMESTIC PROSUMER AND UTILITY NETWORK
2.	RAMYA R	407114003 21ST FEBRUARY 2020	DR. S. MOORTHI	INVESTIGATIONS ON APPROXIMATE MULTIPLIER ARCHITECTURES FOR IMAGE FILTERING AND BIOMEDICAL APPLICATIONS
3.	ANAND I	407114008 27TH FEBRUARY 2020	DR. S. SENTHIL KUMAR	DESIGN AND DEVELOPMENT OF POWER CONVERTERS AND ITS CONTROLLERS FOR ISOLATED SOLAR PHOTO-VOLTAIC GENERATORS
4.	MADHUSUDANAN G	407914004 21ST SEPTEMBER 2020	DR. S. SENTHIL KUMAR	INVESTIGATIONS ON RECONFIGURATION OF MODULES AND POWER ELECTRONIC CONTROLLERS FOR SOLAR ELECTRIC POWER GENERATION SYSTEMS
5.	PADMAGIRISAN P	407114009 25TH OCTOBER 2019	DR. V. SANKARANARAYANAN	CONTROL TECHNIQUES FOR ELECTRIC VEHICLES
6.	BALIMIDI MALLIKARJUNA	407114051 16TH AUGUST 2019	DR. M. JAYA BHARATA REDDY	REAL –TIME SYNCHROPHASOR ASSISTED ADAPTIVE RELAYING METHODOLOGY TO PREVENT MALOPERATION UNDER STRESSED CONDITIONS
7.	BIJUKUMAR B	407115002 9 TH DECEMBER 2019	DR. G. SARAVANA ILANGO	INVESTIGATION OF MODULE ARRANGEMENT SCHEME AND CONTROL STRATEGIES FOR THERMOELECTRIC GENERATOR FED POWER CONVERTERS FOR ENHANCED POWER EXTRACTION
8.	M MEENALOCHANI	407914002 11TH SEPTEMBER 2019	DR. S. SUDHA	INVESTIGATIONS ON ROUTING AND LOCALIZATION USING SOFT COMPUTING TECHNIQUES FOR WIRELESS SENSOR NETWORKS
9.	SURYANARAYAN A GANGOLU	407915004 6 TH DECEMBER 2019	DR. P. RAJA & DR. M. P. SELVAN	EFFECTIVE RELAYING SCHEMES FOR LONG TRANSMISSION LINE PROTECTION

MASTER OF SCIENCE (RESEARCH)

SR. NO.	NAME	ROLL NUMBER	GUIDE	TITLE OF THESIS
1.	K MARIMUTHU	307916051 7TH JANUARY 2020	DR. P. RAJA	A STUDY ON QUALITY ANALYSIS OF CERAMIC INSULATORS UNDER ELECTRO-THERMAL AND STEEP FRONT IMPULSE STRESSES
2.	ANNAMALAI A	307917052 8TH OCTOBER 2020	DR. K. SUNDARESWARAN	DESIGN, IMPLEMENTATION AND PERFORMANCE EVALUATION OF ELECTRIC DRIVEN BUTTER CHURNING SYSTEM
3.	JOTHIVELU A	307118001 19TH OCTOBER 2020	DR. SISHAJ P SIMON	IOT BASED SMART BASE TRANSCEIVER SYSTEM

CURRENTS 2020

Currents 2020 (fueled by Gulf, powered by Aurigo) was a phenomenal success with a footfall of 1804 people from various colleges all over India, coming to NIT-T to take part in the various events, workshops, and guest lectures. The national level technical symposium organised by the Department of Electrical and Electronics Engineering, NIT-T reached new heights with 3 guest lectures from eminent personalities like Dr Ramesh Rao, Director of Telecommunications, UCSD; Mr Amit Kumar, Manager, EV division, Mahindra; and Mr Ravishankar, NLC, talking about topics from different aspects of the domain. Our on-campus events like Colloquium, the paper presentation event was met with overwhelming participation. The outreach events such as Volts, the mock GATE examination organised in coordination with ACE Academy; Thrifty Wheels, a workshop on electric vehicles in Kochi; and so on were a massive success and received a lot of positive feedback. The team also exhibited their sense of gratitude through their socially responsible activities like their donations and visits to various Ashrams. The new initiative, Eureka, an exhibition for students from across various schools in Tamil Nadu, was a grand success with the participants expressing their zeal to learn and grow as the driving brains for the future world. Overall, the whole event has surpassed the legacy left by its previous editions and hopes for the best in the upcoming editions.

SUPERCAPACITORS

In today's world, where climate change is a concern to most of us, renewable energy generation is one of the most important aspects of the energy revolution. But, the major contributor to the said renewable energy sources, solar power from photovoltaic cells, are not capable of providing constant and reliable power. This made scientists and researchers think about novel energy storage techniques.

The most pertinent issue that keeps us from using batteries to a great extent is the fact that it is bulky and has a low number of charging and discharging cycles before the end of its lifetime. It is also well known that the Li-ion batteries in the market at present are expensive and also take a lot of time to charge. Supercapacitors, or otherwise known as ultracapacitors, are essentially by definition capacitors with a high capacitance value, and thus has larger time constants. These capacitors are generally in the order of a few farads, or three to six orders higher than the conventional electrolytic capacitors. Because of the longer charging and discharging cycles, these capacitors are known to store energy for longer durations. Hence, ultracapacitors are considered a bridge between electrolytic capacitors and rechargeable batteries.

The synthesis of these devices has been done with several forms of materials like activated carbon, mesoporous carbon, graphene, conducting polymers, and so on. The enhancement of the qualities of these capacitors is being researched on by material scientists all around the world.

Though these compact devices have such attractive qualities, its life span is relatively low compared to the conventional aluminium based electrolytic capacitors. The former is known to work well for an approximate amount of 5-10 years as opposed to the minimum of a 20-year lifetime for the latter. Since the basic working principle of a capacitor makes sure that charging time is quite fast, supercapacitors, while slower to charge and discharge compared to ordinary capacitors, are almost instant in comparison to Li-ion batteries.

In many places, large amounts of energy might be required to be transferred in a short period. For example, with the world racing towards the concept of electrification of transportation, fast charging of Electric Vehicles (EV) is a much-needed demand from consumers that companies and academicians are working on even now. Supercapacitors provide them with a whole new avenue of possibilities to explore how these small things could store energy temporarily for the batteries as they charge themselves quickly from the charging stations.

This is not the only place supercapacitors are being employed in EVs. With vehicles that have regenerative breaking in action, these supercapacitors are used to temporarily store the maximum amount of energy within the short duration of braking. This is unique property supercapacitors have, which can again be attributed to its quick-charging capability. This power is later transferred to the battery, and hence maximum utilization of energy is realized in the EV.

On the other hand, batteries are not used as a backup source in the main grid, primarily because of its low power density. It means that the battery cannot supply a lot of power in a short span of time. In these cases, usage of these supercapacitors as corrective or compensatory devices along with the known FACTS devices like UPFCs and STATCOMs, or can be used to power the said devices as well. Research is well underway to use ultracapacitors to improve the power quality in the grid, and also provide the grid with real and reactive power at times of a short voltage imbalance or voltage sag, while also charging itself during the similar imbalance or voltage swell.

It is evident that in a world with increasing energy demands, energy storage will become more necessary by the day. Research advancements in domains like this will definitely steer us forward in the path of technological but also sustainable development. But regardless of other inventions that may come in the future, the scope for supercapacitors for research seems very bright.

Vishnu Dhinakaran, Year III

ORGANIC LEDs

Over time, humanity has aimed at improving technology in all its aspects - let it be the computational power, memory, storage, or physical size. A decade ago, we had cathode-ray tube television sets about 4 feet in depth and needed two people to carry around. Now, most of us have computers and TVs with LCD screens, which are thin enough to mount on a wall. However, one such recent advancement that almost halved these electronic displays' sizes was the Organic Light-Emitting Diodes (OLEDs).

The first practical OLEDs were produced in the market in the late 90s. Ever since, organic LEDs have made their way into many fields - digital devices, medical electronics, and nanotechnology. OLEDs are used to create digital displays in television screens, computer monitors, smartphones, game consoles, and what not!

OLEDs are preferred highly due to their ability to work as a screen without a backlight as the organic layer present in the OLEDs are capable of emitting light themselves. This enables the displays to be able to display deep black levels, exhibit a better contrast ratio, and at the same time, be half as thin as its LCD counterparts.

How do OLEDs work?

OLEDs similarly emit light to LEDsby,, the process called electro-phosphorescence.
A simple OLED is made of six different layers.

* The top layer - seal
* Negative terminal - cathode
* Emissive layer - where the light is produced, which is next to the cathode.
* Conductive layer - next to the anode
* Positive terminal - anode
* The bottom layer - substrate

The battery or power supply of the device containing the OLED applies a voltage across the OLED. Electric current flows from the cathode to the anode through the organic layers. The cathode gives electrons to the emissive layer of organic molecules. The anode removes electrons/induces holes into the conductive layer of organic molecules. At the boundary between the emissive and the conductive layers, electron-hole recombination takes place. Thus, the electron gives up energy in the form of a photon of light. The color of the light depends on the type of organic molecule in the emissive layer. This radiation frequency depends on the bandgap of the material, which is the difference in energy between the HOMO and LUMO of the organic semiconductors. The light's intensity or brightness depends on the amount of electrical current applied: more the current, the brighter the light.

Why OLEDs? What's wrong with LCDs?

OLEDs excel in almost all aspects against the LCD screen. with OLEDs, we witness:
-Better picture quality with the screens providing better contrast, brightness, and a more comprehensive color range.
-Lower power consumption, as there is no need for backlighting in OLEDs.
-Simpler design that gives scope for the development of thinner, more flexible displays for the user.
-Durability is high.

Owing to these reasons, OLEDs have almost replaced LCDs in the recent displays. This is also a significant reason OLEDs are among the hottest topics of research in the electronics industry.

Research about OLEDs - Hot topics:

OLEDs are known to have a very high lifetime. In 2012, the Tandem white OLED panel realized a lifetime of over 100,000 hours, which led to The development of the OLEDs implemented as luminescent wallpapers, enabling OLEDs as a whole new invention of artificial lighting. We see that everything about OLEDs seems too good to be true, with only advantages and no particular disadvantages. This has driven many scientists to dig deep into the health hazards of OLEDs. Although scientists claim that long term exposure to OLED screens can cause retinal pressure, none of these claims have been proven right till date, genetically.

Shortly, however, we may witness a new era of transparent, flexible, and extremely low energy consuming OLEDs. The flexibility of OLEDs enables manufacturers to produce OLEDs using roll-to-roll manufacturing processes and allows for the production of a flexible display and lighting products. OLEDs are commercially grown on rigid glass substrates mainly. However, first applications like watches or bent displays using flexible OLEDs have entered the market lately.

Another domain that has been highly interested in OLEDs is the medical electronics industry. Flexible OLED arrays are being used to detect blood-oxygen, glucose, and cholesterol levels, that highly comes in handy during the COVID-19 crisis. Further, the industry has been focusing on developing a range of different measurement devices that can be highly plausible using flexible OLEDs.

J.Soundarya, Year II
Venkat Subramanian, Year III

SNIFFER MOBILE PHONES

The Sniffer is a technology which is used in detecting lost phones. Each and every day thousands of mobiles get misplaced or lost. An effective way to block the lost mobile is with the help of International Mobile Equipment Identifier (IMEI). It has been done to prevent unauthorized persons from making and receiving the calls by the manufacturers of the mobile. But however there has been no development or very little progress for the detection of the misplaced mobile phone. So, for the detection of lost mobile sniffer plays a vital role.

The sniffer is a small base station that includes a transceiver section. It should operate at a frequency that is different from the frequency of the current cell in which the operation of detection is being carried out. One of the main things is that the frequency generated by the transceiver section is around 900MHz range which is a VHF range and it is necessary to design an oscillator circuit for that frequency range. The sniffer device has to be designed precisely and size should be reduced for easy mobility for the purpose of detection. The device can be called as a mobile base station that includes the following important components:

- Sniffer base station
- Unidirectional antenna
- Tracking software

The software plays the major role in the tracking of the lost mobile phone. The mobile phone that is lost has a certain IMEI number that is embedded in the chip. The software is to be designed in such a way that it has the input as the IMEI number of the lost mobile phone. After getting the input of the lost mobile phone IMEI number it checks for getting the information. It checks whether it obtains any signalling information from the lost device that might respond to the signal sent by the sniffer.

The working of sniffers can be seen in two parts:

· Before sniffer increases the frequency: In this a base station is used that works as a middle point between the mobile phone and MSC (Mobile Switching Centre). There is a two way communication between devices. Before the communication establishment, the authentication of SIM card (using IMEI) and handset (using EIR) is done. The EIR is located at MSC and contains the IMEI of the lost mobile.

· After sniffer increases the frequency: The information from this communication is fed to sniffer device and it starts to locate the mobile phones. The connection between BTS and device is lost due to EIR request. The lost device searches for the device to get locked and sends the signal which is received by sniffer device and connection between them is established. Now the IMEI of the lost device is validated with the stored IMEI and then connection is established. After that the location is traced. During this process, if another device tries to connect with sniffer then the connection is denied. This can't be done with the GPS because the sniffer can work with frequency only used with operators. Now the antennas are used to track different positions of the lost device.

Since the boom of the mobile phone industry for the purpose of communication there has been a large number of complaints regarding the mobile phone that is being lost and there has been no effective method developed for detecting the lost device. The process of detection is yet to be developed through the software and demo has been developed.

Akash M.R,Year II

DECENTRALISE and VIRTUALIZATION of ELECTRICITY

Virtualization of micro-grids

A decentralised Grid is a grid structure where the energy is produced close to the place of consumption instead of a large centralised plant providing power to a wide area. This means that production of power is in the hands of many dispersed smaller energy plants instead of a singular large one.

Many things can be considered for decentralised power generation, varying from biomass and solar energy to the geothermal power stations widely used in Scandinavian countries.There are many benefits in adopting decentralised grid systems: -

• More efficient transmission- Transmission distances are much shorter as a power source is very close to the place of consumption.

• Long term cost-effectiveness- Initial cost of the investment may be much higher due to the cost of implementing decentralised infrastructural requirements. However, long term costs get cut down massively.

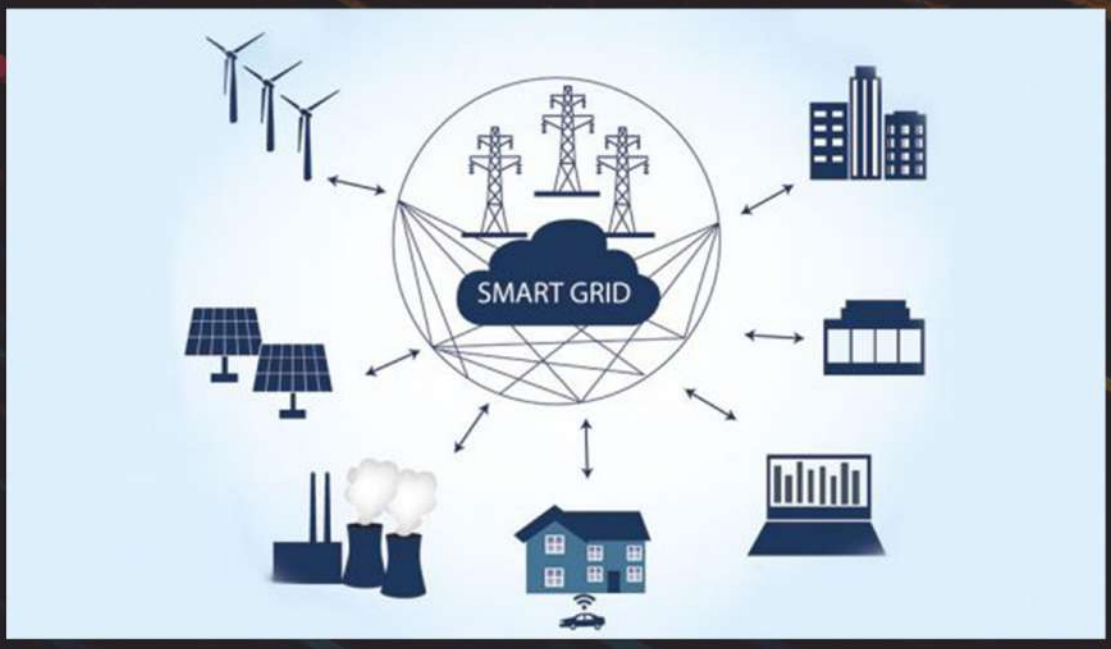
• More eco-friendly and carbon-neutral- Centralised systems usually generate a lot of power. This means that most centralised power sources tend to be thermal power plants. On the contrary, many decentralised systems do not have the burden to produce large amounts of power akin to Thermal

Power Plants. This means that renewable sources are viable for decentralised systems. These include Solar and Geothermal sources of energy.

•Reliability of supply- This is an advantage of localised systems. Failure of a single plant only denies the power supply to the local area. Moreover, the ability to micromanage according to localised needs and requirements really helps in overall efficiency.

Smart grids:

A Smart grid is a grid which has the means for bilateral communication in between users and producers. The smart grid systems consist of technologies which assist in providing a digital response to the electrical grid at questions based on live requirements. These technologies not only include usual automation, but also smart computer technology capable of delivering live feedback.



Benefits of adopting smart grids:

• Efficiency & responsive security- In these Smart Grid systems, the efficiency of power transmission is much improved. This means that these systems will prove to be profitable over extensive periods.

• Better suited for renewable power systems: Smart Grids have access to state of the art technology which can significantly help improve the efficiency of the power systems involved. This proves to be quite helpful for renewable sources of energy, which have often been plagued by issues of lack of efficiency.

• Flexibility: These systems have a reliable feedback mechanism. This means that they are more responsive to issues that affect the system. If there is a reduction of power usage in an area, Smart grids can accordingly alter power generation to keep things as efficient as possible.

• Resilience against natural disasters: Natural disasters can have a lasting effect on standard grid systems. This can lead to blackouts for long periods. Smart Grids don't precisely reduce the impact of natural disasters on electrical systems, but they drastically help in minimising the aftermath of the issue, with problem identification and supply management.

• Security: In a modern age of technology, relying on traditional electrical grids can have serious security issues. This is especially true when countries have sometimes induced artificial blackouts in other countries through unethical means. Smart Grid systems much help reduce the issue of

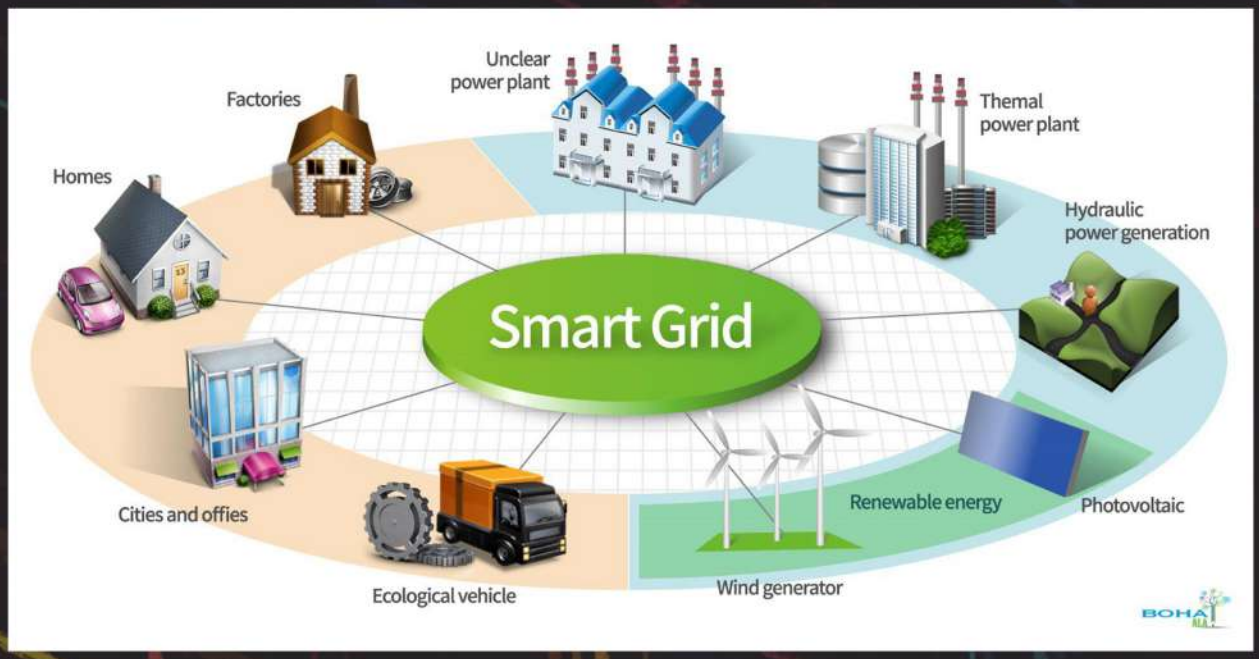
Block chain:

Blockchain is a Distributed LedgerTechnology for data storage. It works off of peer to peer topology, that is, multiple systems connected to each other via a network like internet. It allows the storage of data to be done globally on numerous servers at the same time. Due to the decentralised nature of blockchain, they are incredibly secure, although some have been hacked in a few publicised events before

Implementation of smart grids using block chain:

With the crude idea of how blockchain forms, scientists and researchers from across the globe saw the potential this idea had beyond the purpose it was created for. Apart from the use it has in the transaction of cryptocurrency from one country to another without involving actual currency exchange and thereby removing the third party. The concept of decentralisation that a Blockchain platform offers attracted its usage in several fields.

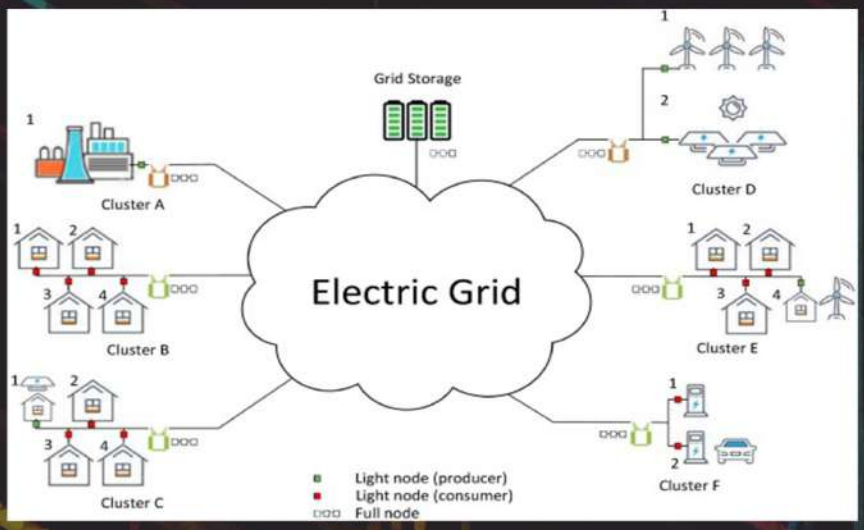
Now, people from different industries use it for a multitude of purposes, like document verification, certification, sharing secure medical data, supply chain and logistics monitoring, and most importantly to this cover story, peer to peer energy transactions.



The entire concept of having decentralised ledgers that ensure security from the breach in the authenticity of data rests in the process they use to validate each data entry. Each blockchain platform uses a different method to make sure that the data entered is approved by someone within the system, which eliminates the need for the third party system which supervises data in other conventional systems.

When it comes to the application of Blockchain for peer-to-peer energy transactions, the important aspects that need to be covered are trust among the peers in the network, the willingness of these nodes in the network, and also above all, should have means to choose the best price for the transaction based on the supply and demand of energy in the microgrid in question.

There are many ways to ensure that each transaction made is validated by someone, and this is implemented through a variety of consensus algorithms.



Proof of Work:

Here, to validate a transaction, a node has to work and solve problems that require a lot of effort. This method prevents all spam entries which is important in systems in the professional fields of work.

Proof of Stake:

In this consensus algorithm, the node which validates each entry is selected by various combinations of random selection, the stake they hold, time of usage, and so on.

Proof of Authority:

This is a reputation-based consensus algorithm that introduces a practical and efficient solution for blockchain networks (especially the private ones). This uses the identity of a node as a stake to validate transactions.

Proof of Knowledge/Zero-knowledge proof:

This is an algorithm in which one party (the prover) can prove to another party (the verifier) that they know a value x, without conveying any information apart from the fact that they know the value x. A protocol implementing zero-knowledge proofs of knowledge must necessarily require interactive input from the verifier. This interactive input is usually in the form of one or more challenges such that the responses from the prover will convince the verifier if and only if the statement is true, i.e., if the prover does possess the claimed knowledge. This method of consensus is planned to be used by the Government of Tamil Nadu for all their future Blockchain projects, according to the TN Blockchain Policy 2020, released in September 2020.

Apart from validation of each transaction, an additional feature that a blockchain platform promises for its users is the smart contract algorithms that can be coded into the network. The flexibility that this platform offers in this regard is endless. The algorithm that determines the price of the energy that is sold and bought can be set and customised by the entity that sets up the network. This ensures that each decentralised microgrid, each of which has different requirements and different resources, have algorithms that suit their own needs as well as available resources.

The sustainable growth of the smart grid is based on three important aspects, which include the development of a sound technological base, design of favorable regulatory policies, and preferential tariff designs.

Considering the increase in demand for power in India over the past few decades, which will only keep increasing with time because of rapid urbanisation and increase in the standard of living with respect to amenities that use power, Smart Grid systems will provide the welcome reprieve that will soon become a necessity. It handles many problems faced which cannot be handled by the outdated energy infrastructure that works against the ease of upgrades solution that Smart Grids provide. To promote new technologies for Renewable energy, policies such as the National Electricity Policy, National Tariff Policy, and Electricity Act 2003 have been put in place, promoting Smart Grids simultaneously.

Advanced metering infrastructure would be the primary Tariff related upgrade obtained from converting to Smart Grids, comprising smart meters, bilateral communication network, and control center instruments. The availability of Demand Response Technologies for Smart Grids also provides a strong incentive towards Smart Grids over our current outdated methods.

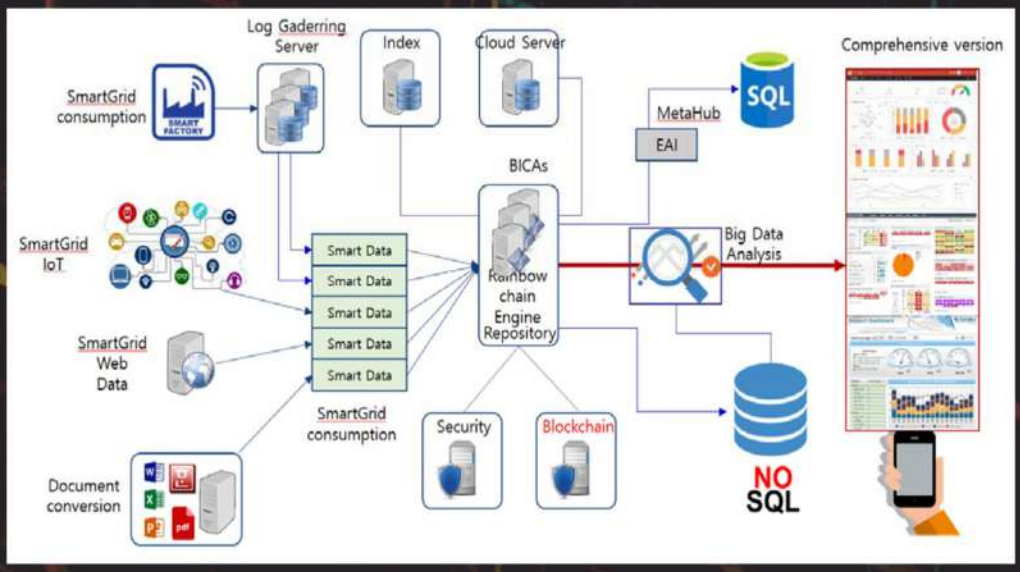
The renewable-based electricity transmission charges largely depend on the transmission pricing of the electricity market. The Public Utility Regulatory Policies Act (PURPA) has identified certain power generation facilities as the qualifying facilities (QFs) that can sell their energy to the local (host) utility. However, an open access electricity market will benefit the renewable energy.

generating companies in selling electricity to a better competitive market than a host utility. On the other hand, open access in transmission will also increase the number of customers and sellers of green energy. This will promote the participation of green energy retailers.

No matter how much we can speak for the decentralisation of grids, we run into a plethora of legal issues since all current policies have the old electricity infrastructure at their core. This creates major distress to projects since the true advantages of a decentralised grid can be seen only when it's a ubiquitous system with a fully fledged energy market, requiring rights and regulations for the new role of "prosumers" who will be consumers as well as suppliers of energy to the grid.

At the end of the day, smart grids aren't a flawless concept. Our existing problems in communication networks mean that crises and emergencies which could take down the network or create sudden network congestion are the bane to decentralisation. Our traditional power grid infrastructure is far more tailored for quick fixes than the smart grid system, posing a hurdle against this technology, irrespective of how revolutionary it may be.
The scale of cyber sabotage is also far greater than the power theft that occurs in the current system.Sometimes a change may create problems that will be seen for decades before we see any recuperation in investments,

making Smart Grids a debatable topic even in the current day and age. But the one certainty of the energy sector is the fact that new ideas will always come up even if they are dependent on niches, making driving toward change as the only way forward.



EYE-TRACKING AND SMART GLASSES

Did you ever want to be Ironman? The thing that fascinates me the most is his ability to check his notifications in front of his eyes without holding a smartphone, tablet, or computer. Tony Stark passes on his AI system & glasses to Peter Parker. We saw all this in 2019 & 2020 in movies, but Google has tried its best to provide us with this technology. Since 2014 they came up with Google Glasses which uses lasers and a glass prism fixed to the frame to show notifications, capture pictures and many other features which smartphones could barely keep up with. However, Google failed to impress the general public and show the world about the potential of this idea due to one core flaw: the hardware and software ecosystem weren't fleshed out enough back then.

Smart glasses come under the category of wearable tech. The main ideology behind smart glasses is to improve the user's experience without disconnecting them from the surroundings creating a technological ecosystem that melds with real life. It connects with your smartphone and other devices, either using Bluetooth or WiFi. Notifications and apps are projected onto the glass using in built lasers which are then used to cast an image on to the user's retina, displaying a virtual image that appears to be seen in real life rather than on a screen

Everyone thought that smart glasses ended with the failure of Google Glass, but the technology is making a comeback with North Smart Glasses, something that experts in the market believe to be a game-changer. With the help of a ring and the Smart Glasses, it replaces screens in the same way that Google Glasses promised, but with one crucial difference: Eye tracking. It plays a crucial role in these smart glasses to allow a more innovative method to completely eliminate using the handheld device by using gestures from eye movement to allow UI traversal. Eye tracking has improved drastically over the past decade, making it a more feasible solution to the flaws that Google Glasses were unable to remedy, making the industry look truly promising now

Eye-tracking plays a crucial role in making these smart glasses path-breaking. Eye-tracking is a sensor technology that makes it possible for a computer or other device to know where a person is looking. An eye tracker can detect the presence, attention, and focus of the user. It allows for unique insights into human behavior and facilitates natural user interfaces in a broad range of devices. Several eye-tracking technologies can help your computer know precisely what you're looking at, which has applications and feels from gaming to marketing to even psychology, but how exactly do they work?

The history of eyetracking goes back to 1908, when psychologist Edmund Huy developed a contraption that was similar to the modern contact lens with something similar to a needle attack to it that allowed you to measure the directional movement of the eye. However, it has obvious flaws with respect to comfort which would not be accepted well in today's world.

The next breakthrough happened in Chicago in 1937, when scientists developed a new method for eye tracking which involved shining light into a subject's eye. The reflections from this were caught on film to understand reading patterns of humans. This concept is held true even today, with most consumer eye trackers today. This camera takes infrared snapshots of the patterns on your eyes and process these images to determine where you're looking.

Eye-tracking has obvious applications for advertising companies. It has already been used in studies that have revealed which elements of an advertisement or a webpage best hold the viewers' attention and what things might just be taking up space or even turning the viewer off. Eye-tracking has plenty of applications in various other fields like medical research. The ability to control a computer using the eyes is also vital for people who cannot speak or use their hands.

As the world is running towards Augmented Reality, Mark Zukerberg has started working on this long back. Apple also started preparing

Apple Glasses to adapt itself to this new trend. The days aren't far where we can interact with holograms. The way video calls, gaming & bingeing are done right now will change. You can be in many different worlds at the same time. There is an assumption that smart people have glasses, but now these glasses actually make people, the technological ecosystem, and the world smarter.

From now, you can see the world in the way you want to see it.

Anushka Gupta, Year II
Rakesh Varma Rayapalli, Year III

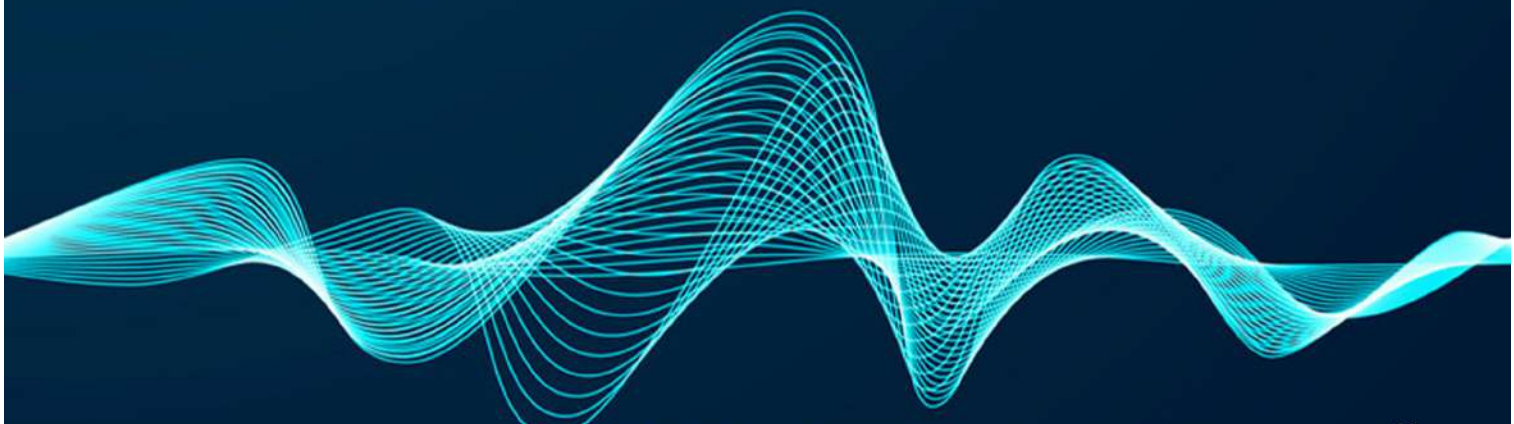
Wireless Power Transmission

Gone are the days when every electrical appliance has to be "connected" with a wire. The rapid progress we make in terms of the economy and technology is clearly being reflected in the number of wireless devices. Why the sudden shift? The conventional methods of powering devices were proving to be too limiting. The battery supply mode for charging limits the time of usage for electronic products. One may optimize these devices so as to use less energy, or increase the battery capacity, but these are not the most reliable solutions. Additionally, if the device in question has to have high mobility, wired connections aren't going to make the cut. This led to the advent of a different approach to charging, a way where wires no longer were a hindrance or a limiting rope for users.

There are four types of Wireless Power Transfer (WPT) techniques:

- magnetic induction coupling
- magnetic coupling resonance
- laser
- microwave

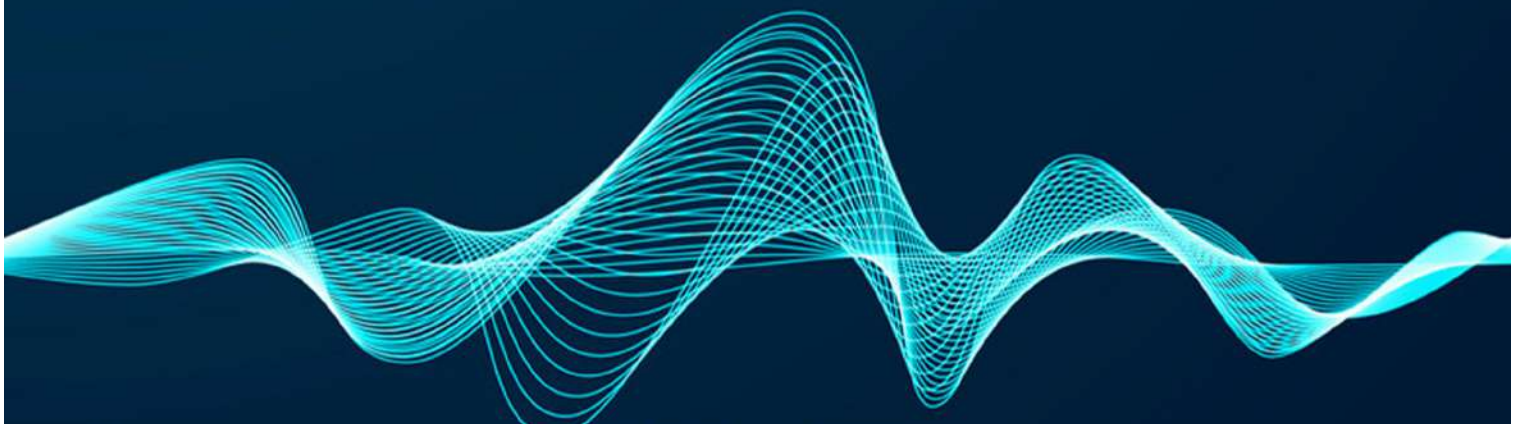
An important issue associated with all wireless power systems is limiting the exposure of people and other living things to potentially injurious electromagnetic fields. That is one of the major roadblocks to mind while researching about. Once these limitations of WPT are rectified, WPT would definitely gain popularity in the upcoming days.



In near field techniques, power is transferred over short distances by magnetic fields using inductive (because you know, magnets) coupling between coils of wire, or by electric fields using capacitive (because you know, electric fields) coupling between metal electrodes. Inductive coupling is the most widely used wireless technology. Its applications include charging handheld devices like phones and electric toothbrushes, RFID tags, induction cooking, and wirelessly charging or continuous wireless power transfer in implantable medical devices like artificial cardiac pacemakers. And sometimes in electric vehicles.

In far field or radiative techniques, also called power beaming, power is transferred by beams of electromagnetic radiation, like microwaves or laser beams. These techniques can transport energy longer distances but must be aimed at the receiver. Proposed applications for this type are solar power satellites, and wireless powered drone aircraft, where going long distances really matter.

Wireless power transfer using microwave irradiation can set humans free from the annoying wires. However, WPT has low energy efficiency due to electromagnetic wave diffraction in the case of indoor non-line-of-sight (NLOS) and causes electromagnetic radiation pollution around the room in the case of indoor line-of-sight (LOS). Time Reversal technique is one technique that can improve the efficiency and reduce the pollution due to its unique temporal–spatial effect focusing Wireless power transfer is a generic term for a number of different technologies for transmitting energy by means of electromagnetic fields. The technologies differ in the distance over which they can transfer power efficiently, whether the transmitter must be aimed at the receiver, and in the type of electromagnetic energy they use time varying electric fields, magnetic fields, radio waves, microwaves, infrared or visible light waves.



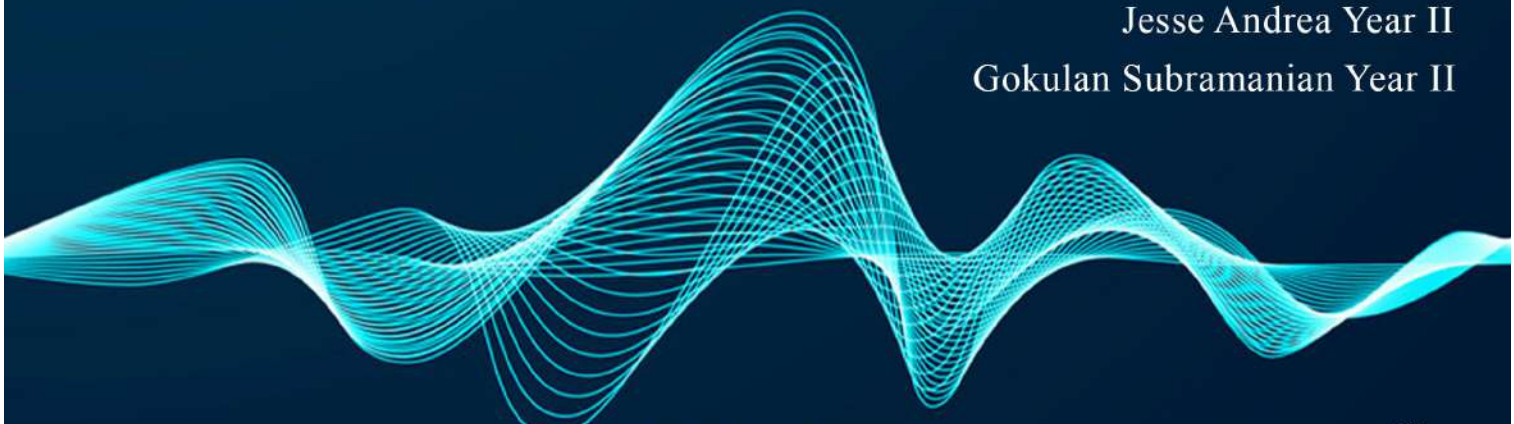
In general a wireless power system consists of a "transmitter" device connected to a source of power such as a mains power line, which converts the power to a time-varying EM field, and one or more "receiver" devices which receive the power and convert it back to DC or AC electric current which is used by an electrical load. At the transmitter the input power is converted to an oscillating electromagnetic field by some type of "antenna" device. A similar antenna or coupling device at the receiver converts the oscillating fields to an electric current. An important parameter that determines the type of waves is the frequency, which determines the wavelength.

Wireless power uses the same fields and waves as wireless communication devices like radio, another familiar technology that involves electrical energy transmitted without wires by electromagnetic fields, used in cellphones, radio and television broadcasting, and Wi-Fi. In radio communication the goal is the transmission of information, so the amount of power reaching the receiver is not so important, as long as it is sufficient that the information can be received intelligibly.

In wireless communication technologies only tiny amounts of power reach the receiver. In contrast, with wireless power transfer the amount of energy received is the important thing, so the efficiency (fraction of transmitted energy that is received) is the more significant parameter. For this reason, wireless power technologies are likely to be more limited by distance than wireless communication technologies

An important issue associated with all wireless power systems is limiting the exposure of people and other living things to potentially injurious electromagnetic fields. That is one of the major roadblocks to mind while researching about. Once these limitations of WPT are rectified, WPT would definitely gain popularity in the upcoming days..

Jesse Andrea Year II
Gokulan Subramanian Year II



COMPANY INTERNSHIPS

BAJAJ

I have done a six weeks intern at Bajaj Auto Ltd (BAL). My work was to quantify driver behavior and vehicle performance analytics. We had a two day orientation, where we got to know various departments of BAL. On third day, we were allotted our mentors and the work started. I started with benchmarking where I had to tabulate features avialable in various electric vehicles mobile applications like TVS, Ather etc.I did it to get an idea of the layout of the driver score page and the services provided by a typical EV mobile app. Also to get an idea of the layout of driver score page in the app. Then I searched for various parameters (called summary parameters) on which a driver's performance can be judged (like over speeding, wrong gear, efficiency, idling etc).

I developed various formulas (through literature survey and intuition) to give individual score to a driver on each summary parameter. And then found out the overall score. The more the score, the better the driver. Then I searched for various estimates on which a vehicle's performance can be tested like braking distance, clutch deterioration etc. I proposed a method to quantify them and hence to help in estimating vehicle's performance deterioration with time. The mentor allotted to me for the project was indeed a supportive and knowledgeable person. He kept a constant watch on my work and guided me throughout.

My work was not hardware related, so remote intern was not an issue. In my opinion, the company would look at the intern's ability to adapt to an unexpected situation in a project and how well they can tackle it. The level of sincerity you devoted to your work. My project was customer oriented. I had to think from a user point of view. Overall I can say that this intern was a nice learning experience for me.

Ayush Tiwari, Year IV

COMPANY INTERNSHIPS

P&G

P&G is the company that is behind billion-dollar brands such as Ariel, Oral-B, and Tide to name a few. P&G recruits the person for the fit and not for the role. The process involves a psychometric and aptitude test, resume shortlists, and two personal interviews. After clearing the online tests, the selection process revolves around getting to know you as a person rather than testing your technical skills.

I interned with P&G in the Summer of 2020. With the raging pandemic and a job description that isn't easily WFH compatible, I was skeptical about the internship taking place. However, I was pleasantly surprised when I got to know that it would be virtual. My projects were in P&G's Philippines plant, and I was associated with their Engineering department. I worked on two projects in parallel for the internship. My first project involved a market assessment of 3D printing technology and analyzing the feasibility of integrating a 3D printing facility in the plant. I had to develop a business case with the budget proposal and return on investment for the project. The facility had to cater to all Business Units at the plant, and P&G Philippines being one of P&G's more complex plants worldwide, made the project challenging. I was given complete autonomy over the project. I could reach out to multiple people across P&G globally to get their inputs for my project, and to vendors for their quotations on my project requirements. My second project involved creating an interactive dashboard to provide real-time status of all the projects ongoing at the plant. Although this required learning new software, P&G provided multiple resources and training sessions to help me deliver the results in time. The eight weeks of my internship were undoubtedly challenging with a steep learning curve, but they were my most productive eight weeks in a long time.

As an intern, you must ensure that you understand the expectations of your project's stakeholders. P&G values an intern just as much as a full-time employee. Interns are assigned live projects that are generally executed during shortly after the internship and has the potential to save money for the company. If you are interested in a techno-managerial role, P&G provides one of the best internship experiences available. Good luck!

Benjamin Premkumar, Year IV

COMPANY INTERNSHIPS

Standard Chartered

I was offered a 2-month internship from Standard Chartered GBS Pvt. Ltd., which was a software developer role, for the summer of 2020, through the on-campus hiring drive of our institute. Coming to the eligibility criteria and the selection procedure, the company was open for all B.Tech branches with 70% in 10th and 12th, current CGPA of 6.5 and above with no active backlogs. The selection procedure consisted of a logical reasoning and competency test, followed by a coding test and subsequent interviews. Each stage was eliminative, and we also had a GD round before getting shortlisted for the final one-on-one interviews. The difficulty level was medium-tough for the coding test, and the reasoning test had a cut-off of 40 percentile.

The general level of preparation required for any software-based profile would suffice to crack an SCB internship offer. It includes competitive coding, SQL, Operating Systems, Database Management Systems, and core software concepts like OOPs. The personal interviews were more resume based, on your projects and co-curricular activities along with a few HR questions. You can expect technical questions about the topics mentioned above, as well as a few puzzles.

All in all, it was an unanticipated experience as normalcy was disrupted due to the COVID 19 pandemic in 2020, and we had to settle for a virtual internship. In contrast, I wanted a holistic, in-office internship exposure. The overall experience was good, and the company gave us the best possible experience, virtually. I worked on a full-stack web development project using the MERN stack. There were some issues regarding our remote work environment relating to access permissions. Still, it is understandable as coming up with a remote system in a short period was challenging for everyone.

I was very excited and happy to get such an incredible opportunity to work in the development domain. Even though it wasn't nearly what I expected out of my internship, I'm still grateful that everyone did their best to make it happen. I learned a lot about corporate culture and professionalism. The work timings were very flexible even when my immediate manager and mentor were based in Singapore and has had time zone compatibility issues. Everything panned out well in the end, and I was pretty satisfied with my internship, the best part being I converted it to a Pre-Placement Offer!

Prakhar Singh, Year IV

COMPANY INTERNSHIPS

Reliance

I got interned at Reliance Industries Ltd., which is one of the significant core companies that come for the EEE department. Due to the pandemic conditions, we had one month accelerated virtual internship from July 1-31. During the training, I was allotted a project on power systems. I had to submit weekly reports to mentor, and a final presentation in front of the technical and HR team once every two weeks. It was a wonderful learning experience with proper guidance throughout the duration. The whole team was supportive, be it technical issues, connecting with the company portal or academic doubts. In addition to the project work, we had a virtual party with all interns to showcase individual talents.

The selection process consists of an online test followed by a technical interview. The online test had two sections. One was aptitude with time constraints which is vital for clearing the OT, and the other had basic electrical questions. The technical round was very straight forward, and the questions are directly from the resume and a few fundamental questions to know about our knowledge over the subject.

Arun Prasanna, Year IV

Microsoft

I did my internship at Microsoft as a software engineer intern. It was an amazing and one of a kind experience, it being a virtual internship. Microsoft's work culture is to have a growth mindset and empower others to learn too and this is the exact environment which I have always wished to thrive in. I primarily worked on ML and data Analytics. My mentor was very supportive and he was not just my technical mentor but also became one of my best friends. Everyday was fun and a new learning experience and I got to learn a lot, not just technical aspects but also the work scenario in an IT industry and the ups and downs in the everyday life of a software engineer. The company handled it very well though it being a virtual internship. They ensure to cater to all the needs of the interns and made sure it went smooth. The team as a whole was a collection of gems and I made the best of memories during the two months.

Arathi B, Year IV

Research Internship

IISC Banglore

As someone who has always been motivated to dive into the field of research rather than a corporate job, I looked forward to working in laboratories in India during the summer of 2020. I started contacting professors from February 2020, and within a week of mailing, I was permitted to work at IISc Bangalore. However, my happiness was short-lived due to the pandemic as the project couldn't accommodate remote work. Thereafter, from April, I started mailing professors, and towards the end of May, I started to work remotely under Dr Sukumar Mishra, Professor, IIT Delhi. The project is titled "Energy Blockchain enabling EV charging and discharging transactions". Initially, I commenced by reading journals from IEEE and Springer regarding the implementation of blockchain in energy trading systems. Within a week, I completed a course by the State University of New York to understand various aspects of blockchain, starting from the consensus protocol to the building of smart contracts using Solidity. Due to coursework in NITT, the workflow has been a bit bumpy because I had to take a break for end semester examinations. We are making great strides in our work, and we hope to complete it soon.

-Sandipan Roy, Year III

University of Victoria Canada

Modelling of RL circuit in FPGA for HIL applications:

I had the opportunity to do a 12-week internship in the field of FPGAs and its Hardware in Loop application, under Dr. T. Ilamparithi, University of Victoria, Canada. This project intrigued me because of the application of FPGAs in motors, a domain not widely explored. When machines are modeled in coupled circuit approach, they consist of multiple coupled RL circuits. Hence the technique of HIL was developed to test on an RL series circuit. The Backward Euler method was adopted to discretize the continuous time-based equations before implementing them into FPGAs. These were done in the System Generator (sysgen) platform of Matlab. The obtained results were compared with that of an LTspice simulation, and I was able to obtain an accuracy upto 2 decimal points (96%). Since it's a relatively new field of work, not many resources are available, hence an extensive amount of work was required to understand the available papers and to continue the work.And remote internship wasn't especially friendly, but with the support from Dr. Moorthi and Dr. Raja from our department, I successfully completed the project.

-Maria jomy, Year IV

Research Internship

Indian School of Business

Intro:

I did my 2nd-year summer internship at the Indian School of Business under a professor at the Dept. of Entrepreneurship. I worked on a couple of academic projects and one practical project.The Academic projects were about a working thesis on product-market fit and teaching notes for a course called Startup Regulation, which was presented to the Yonsei School of Business students. The practical project was about building an MVP of an alternative educational pathway for students to earn college credits while at high school.

Culture:

The work-culture was great. The HR team at ISB was warm, and there was also a virtual welcome party for the interns. The professor and I also had a very warm and cordial equation, we had a dynamic working style, switching between topics and projects as per the need. I also got a stipend of 25K in total.

Selection:

The selection process is relatively informal. I mailed the profs at ISB, whose areas of research aligned with my interests. Keeping an upper limit on the number of profs you mail helps make the cover letter more specific. I had a telephonic interview with my professor. He asked me questions such as "Where do you see yourself five years down the line" and "What is your objective out of the internship?", after which he accepted me.

What do they look for in candidates:

They look for relevant experiences and a key reason for why the candidate wants to do that internship. Apart from that, showing promise in terms of commitment and work ethic also helps.

Pro-tips:

- Keeping an intern journal of what you did on a specific day is helpful for various reasons,
mainly accountability.
- Try keeping your cover letter as specific as possible to the professor and their areas of research.
- Get as much info as possible about your role to ensure you do a meaningful internship.

-Sai Karthik, Year III

Research Internship

RWTH Aachen Germany

I was fortunate to do a remote research intern at the Institute for Automation of Complex Power Systems at RWTH Aachen. It provided me with a unique opportunity to explore the research and work culture abroad. The support I received from my guide and other researchers was truly humbling. I was assigned a personal remote desktop at the institute for 5 months, and I had the freedom to access this any time of the day via VPN connection. This was my workstation and it gave me direct access to the files, software and materials used by the research team at RWTH. I worked on energy packet based optimization of city districts with high penetration of renewable energy sources. This was a new topic for me, but my guide was always available to clarify the smallest doubts and his insights broadened my thinking. At the end of my project, I had to present my findings to the research group and they provided valuable feedback for my work. This project has huge scope for practical applications in the future and the scholars are extensively working on this. It gives me deep satisfaction knowing that my work may find practical use in our societies. If you are interested to purse a research intern at RWTH, send them an email along with your CV. They may schedule an interview and will let you know if they can accommodate you in their research group. I am truly grateful for having had this opportunity and I hope some of you can experience the same in the future. Good luck!

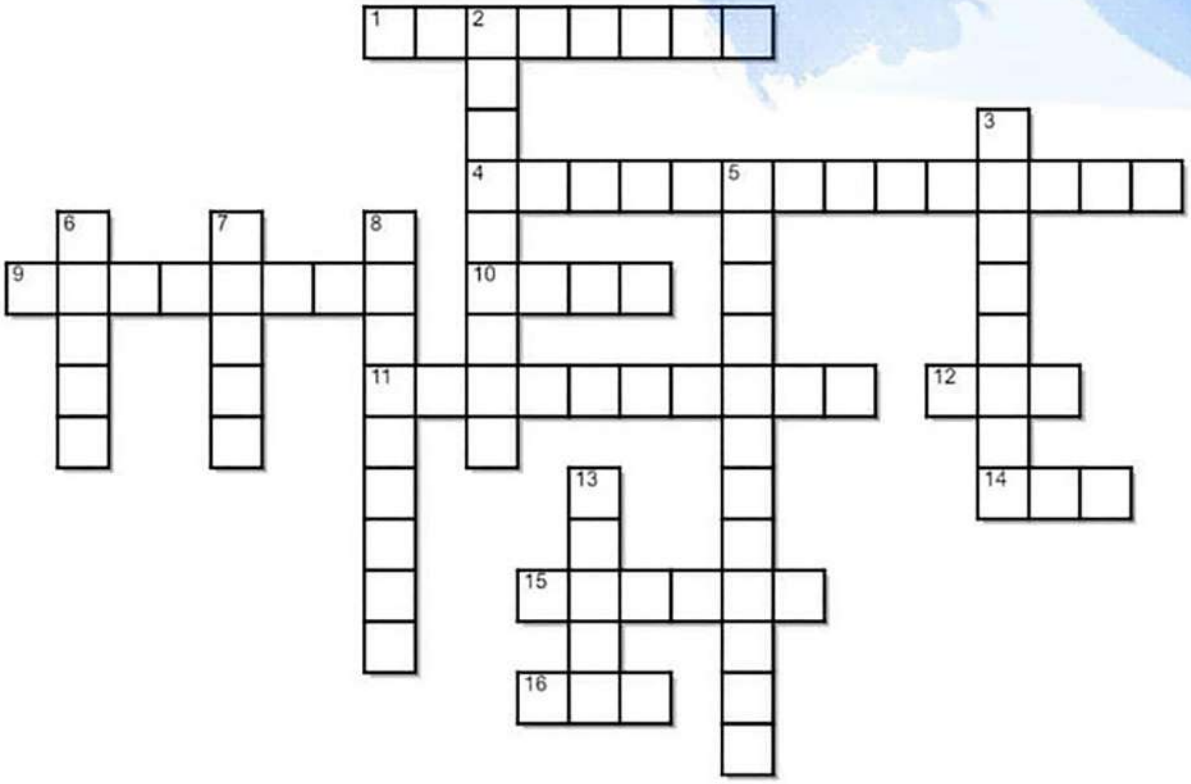
- Anjula Mary Antonis, Year IV

National Unversity of Singapore

I did my research intern in NUS under Prof. Hongliang Ren in the field of deep learning. There was extensive research in his lab related to the application of deep learning to biomedical robots. The objective of my research internship was to estimate the pose of non-rigid origami robots. The problem statement was unique, and there wasn't any research done in this area. Thus, many things were required to be developed from scratch, such as a multiphysics simulation of realistic bio-inspired origami robots to generate synthetic data for training the model. Thus, I started my internship early (April) and did a 6-month intern. Being an online internship, the work culture was very flexible. At the same time, it was highly organized, and there were regular meetings with all the co-interns, PhDs, and the professor. At the end of the internship, apart from deep learning, I had a very good exposure to a lot of interesting concepts in robotics and the research culture. As a result, I was able to submit two manuscripts to the flagship robotics conference, ICRA.

- Ruphan S, Year IV

Crossword



ACROSS

1. A 1-wire network (8)
4. High "capacity" storage (14)
9. Removes ripples from circuit (8)
10. Glowing pixels, without a backlight (4)
11. Changes its physical value when near a candle (10)
12.'Exclusive or' or Aryabhatta's discovery (3)
14. 3 terminal voltage controlled device (3)
15. A multi-paradigm programming language (6)
16. Also a delivery service (3)

DOWN

2. Opposites and Vice versa (9)
3. Physics:Newton :: Electrical:? (8)
5. Protecting the designs (12)
6. Backward flowing current (5)
7. Neither here nor there (5)
8. Correction (9)
13. Receive comments and magnify efforts (5)

ANSWERS:
1.Microlan 2.Crossover 3.kirchoff 4.supercapacitors 5.cryptography
6.Zener 7.Fuzzy 8.Rectifier 9.Debounce 10.Oled 1.1.Thermistor
12.Xor 13.Opamp 14.FET 15.Matlab 16.Ups

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