COVER STORY
INDUSTRY 4.0

TRONICALS

VOLUME 4 | ISSUE 2

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY

CONTENTS

MESSAGE FROM THE HOD

Dr. S. SUDHA
HoD, EEE

I welcome all the students to the Department of Electrical and Electronics Engineering. The objective of department is to prepare students for successful career in Industry, Research and Academics to meet the needs of growing technology.

We provide opportunity for students to work as members of a team on multidisciplinary projects. The department provides students with sound foundation in the mathematical, scientific and engineering fundamentals necessary to formulate, solve and analyse engineering problems and to prepare them for higher studies as well as research. We are committed to providing not only the technical education to our students but also the leadership qualities through which they can create employment to others.

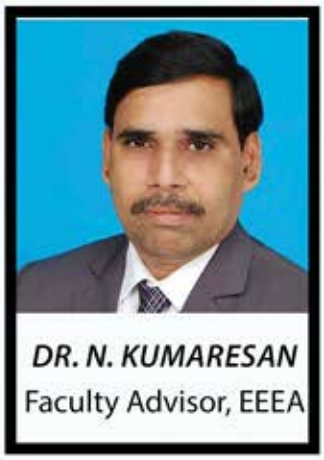
The Department has a team of highly experienced and motivated faculty members who are in the process of tuning the young minds to make them globally competitive. Innovative methods of teaching and learning process are adopted to achieve learning abilities through practice, exposure and motivation. Department has an excellent infrastructural and computing facilities and provides a conducive environment to promote academic and research excellence. Above all, the entire teaching fraternity of the Department of Electrical and Electronics Engineering look forward to the holistic growth of the department and they aim at doing something extraordinarily remarkable in the academic arena of Electrical.

Students of our department have bagged prizes in academics as well in co-curricular activities. Students showcase their talent in various sports and intercollegiate technical events. Our graduates are working in Multinational Companies, Indian Services and Academic Institutions in India and abroad.

I congratulate the team of faculty members and the students for their brilliant and original efforts.

- Dr. S. SUDHA
HoD, EEE

MESSAGE FROM THE FACULTY ADVISOR



DR. N. KUMARESAN
Faculty Advisor, EEEA

With the untiring efforts of the members of the editorial board, the EEE Newsletter steps into the seventh year and provides a wide coverage of all the activities of our department. I congratulate the editorial team for putting up this newsletter in a professional and timely manner. We aim to reach further heights through this edition and I hope that this would instill a sense of accomplishment in each and every one of us. The content has been formulated to spread the knowledge of various avenues offered to students and highlight possible career opportunities and research activities of the department.

Over the past years, National Power Systems Conference (NPSC) has been organized majorly by the IITs. For the first time in its long and prestigious history, our department successfully organised the 20th edition of National Power Systems Conference (NPSC 2018) during December 2018. It was a great learning experience and pleasure hosting NPSC 2018 which turned out a grand success! The valuable advice and encouragement from each and every one of you is deeply appreciated. On behalf of the entire organizing team at NIT Tiruchirappalli, I thank you all for the wonderful support extended for the success of NPSC 2018. Similarly, our department is going to organize the 9th edition of National Power Electronics Conference (NPEC 2019) in December 2019. For more details, please visit npec2019.nitt.edu. At this juncture, I solicit the unstinted support from the faculty members, students and staff for the success of NPEC 2019.

Electrical and Electronics Engineering Association (EEEA) has been very successfully organizing its national level technical symposium called CURRENTS from the year 1993. I am happy that the EEEA has organized this year edition of CURRENTS well in advance. The team has gone through extreme efforts to bring about a wide variety of events in the course of the present academic year 2018-19. They have organized a series of outreach events termed 'Volts' with the sole notion of bringing a change in the society through various social initiatives. On behalf of the faculty, staff and students and on my own behalf, I wish all the activities of EEEA are continued with meticulous planning, vigour and enthusiasm. All the best FOR THE SUCCESS OF currents 2019.

- DR. N. KUMARESAN
Faculty Advisor, EEEA

EDITORIAL

Four years, eight semesters of learning is the normal college life for most engineering students across the world. However, the Electrical and Electronics Department, NIT Trichy can't be summed up the same. Innovation and Creativity with countless times of breakthroughs and sleepless nights are what make the graduates of NIT Trichy. This comes purely from the research based learning practiced in the campus.

To spread this knowledge that we gain, we the content and design teams of the EEE Association proudly present to you Tronicals, the bilineal intra-college technical magazine of Electrical and Electronics Engineering, NIT Trichy. In Tronicals, we bring forth the current trends across the globe, with Industry 4.0 being the cover story for the current edition. We also list various achievements of our esteemed faculty, and EEE Association.

Hope this edition of Tronicals is an enjoyable read to one and all, brings a smile to all as we experienced in creating it.

-Blissinth Vino John
Chief Editor

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 transformation from REC to 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

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 (PEOs):

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 (POs):

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.

M.TECH IN POWER SYSTEMS

Programme Educational Objectives (PEOs):

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 (POs):

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.

M.TECH IN POWER ELECTRONICS

Programme Educational Objectives (PEOs):

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 (POs):

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.

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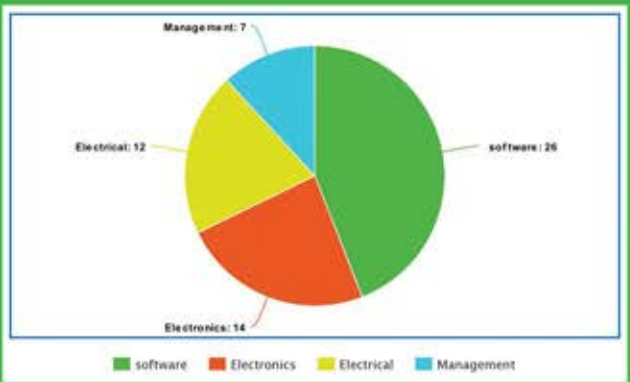
STATISTICS

PLACEMENTS



Software: 26

Electronics: 14

Electrical: 12

Management: 7

Number of Registered students

69

Number of Placed students

59

INTERNS

NVIDIA - Amritha SB

Texas Instruments - Pramod Gopinath

Western Digital - Praneetha, Bhavya Krishna, Aishwarya R, Shreyashee

P&G - Esha

Samsung Semiconductor India R&D - Vijay Singh, Ganesh Mandal, Surya Narayan Acharya, Sreeja J

RBS - KaviyaShree

VISA - Sashank Ramachandran

Fidelity Investments-Subham Pharande

ITC - Navya V, Kiran Krishnan

Microland - Harsh Mahajan

Ford - Kailash

L&T Ltd - Chandan Moteka

AIESEC INTERNSHIP EXPERIENCE

A Journey through Turkey

My AIESEC journey began on 24th of December, at 4:20 am. I left from Chennai for Izmir, Turkey. In Turkey, I met up with Henis, a member of AIESEC in Izmir, who came to pick me up from the airport. We then met my host, Abdel Rehman who lived in outskirts of the city.

I lived with Abdel and Femi for the next 3 weeks. Femi hails from Nigeria and works as an English teacher at Elchin Tun high school while Abdel was a former AIESECer from Egypt who was offered a full time job to teach English at the same high school.

Although my project duration was for 4 weeks, I missed one week due to exams. However, the remaining 3 weeks were some of the most memorable of my life. I was an English teacher in the same high school as Abdel and Femi and I was also tasked with conducting workshops for the kids where I spoke about Indian Education system, religion, culture, etc.

I enjoyed the working environment as the students and teachers were very friendly, and I got to interact with many AIESECers from across the world and got to know more about their culture and traditions. One way we got to do this was through the Global Village, where AIESECers from various projects gathered and showcased their culture by way of singing, dancing, food and music. My project brought together people from Pakistan, Colombia and Canada. Also, I got to meet people from England, USA and Spain.

One of the best parts of my AIESEC experience were the weekends, when I let loose and traveled across Turkey. On the first weekend, I visited the ruins of Ephesus. On my second, I went around Konak and discovered Izmir. Finally on my third, I visited the beautiful city of Istanbul. They were all amazing, but Istanbul truly blew me away. Cradled between Asia and Europe, there were tons of places to visit; from the Roman-era Hippodrome that had been the site of chariot races, to the iconic Byzantine Hagia Sophia featuring a soaring 6th-century dome and rare Christian mosaics. Three days were certainly not enough to explore what the city has to offer.

Honestly, my biggest takeaway from my experience were the misconceptions that I had had of Turkey. I had thought that Turkey, like many other Middle East countries would be very stringent. I discovered however, that I was wrong. The country may have been cold but the people definitely were not. They were very lovely and welcoming and although many did not know English, they tried their best to help me throughout my journey. Learning the history of Ottoman empire and the exploits of Ataturk were thought provoking. On the other hand, their rich culture and food were simply amazing. Moreover, when I spoke about India, I got to learn more about myself and my country. I grew as a person from this experience and can't wait to go to Egypt this summer.

Riba Bagra
EEE 1st Year

WIRELESS POWER TRANSFER

Over the last few decades, we have reached a point where mobility and connectivity are taken for granted. This very reason is why fields like IoT and smart-devices have become so commonplace. However, one thing that stands in the way of us going truly wireless, is power transmission. The technology to transmit power wirelessly is still at its infancy, and here, we look at some of the major innovations in this sphere.

Inductive Charging:

Inductive charging, more popularly known as Qi wireless charging, is the most common form of wireless charging that is being used today.

Almost all flagship phones ship with Qi Charging built-in. This technology uses near field magnetic resonance, which is achieved using a pair of transmitter and receiver coils. With the current power delivery requirements, the two coils are spaced at a distance of about 5 mm and go upto 40 mm.

The Qi standard is most commonly found in smartphones, as the power required is relatively low. New 'medium' and 'high' power standards are being devised to facilitate the use of appliances that demand a higher power draw. This standard is also adopted by many companies that manufacture power banks and even computer peripherals. Multiple portable chargers and even some mouse mats come with a Qi charging pad built in, for simultaneous charging of compatible devices.

The main drawback of this technology is the power wastage through heat. The efficiency of power transfer takes a huge toll due to this wastage. With the advent of Quick Charge, Dash Charging and other competing technologies to improve the speed of wired charging, the Qi standard has quite some catching up to do. Another major shortcoming is the fact that the phones have to be placed on a charging pad, connected to the wall. This takes away from the 'truly wireless' experience, as the charging pad itself is chained. This popular technology needs some augmentation and advancement to be able to be of use for power applications and to realize a future that is truly wireless.

Wi-Charge (Wireless Charge)

Wi-Charge is a company based in Israel whose fundamental idea is to power objects through light. Now, by 'light' they do not mean the visible light that we all know and love. Wi-Charge uses an IR transmitter-receiver pair to transmit power to multiple devices at the same time. Recipients of multiple Innovation Awards from CES, Computex and more, they have patented a way to use photovoltaic cells to convert the incident IR rays into power.

Original Equipment Manufacturers (OEMs) can purchase the IP to make products of their own. Many such OEMs have made their own products that utilise this novel technology. The most notable ones are the LIGHTS transmitter and the wire-free Qi charger. In CES 2018, Wi-Charge showcased a demo with electric train models that were powered only via the LIGHTS transmitter. The fact that the IP is accessible to OEMs for integration and development opens the doors for creative applications of this technology.

The most immediate concern for this kind of technology is the ill effects of radiation. However, this technology has been FDA approved in USA, making it safe from any such risks. Furthermore, the IR nature of the signals means that there is little to no interference with WiFi signals, leading to a peaceful coexistence of these two technologies.

With more and more OEMs adopting this technology, the scope of Wi-Charge remains to be seen, and as of now, this is as close as we've gotten to having commercially available, long-range wireless power transmission.

Po-WiFi (Power over WiFi)

This novel technology was conceptualized and lab-tested by a group of scientists from the University of Washington, in 2015. They aimed to power devices using an ubiquitous piece of hardware - the WiFi Router. The objective was to take a technology found pretty much everywhere these days, and use it for both, power and communication purposes.
Through careful manipulation/application of the TCP and UDP protocols, the group of researchers were able to achieve power transmission with minimal effect on the communications aspect of the WiFi signals. For the purpose of research, the group powered small appliances like a few IoT based sensors, a tiny camera and the like. As this technology uses, what is an already well established RF communication protocol, integration into devices becomes easy.

As a technology, Po-WiFi is more theoretical than practical. It goes to show, the future potential of harnessing WiFi signals for power transmission. As mentioned in the research paper, it took nearly 35 minutes to charge up a capacitor, used to power the flash of the camera. It is obvious that this rate is too slow to be of any use in any real-world scenario. Hence, more work needs to be done on this front before making this into a commercially viable product.

At the face of it, this technology embodies the true spirit of a wireless future. With the increase in the amount of public WiFi access points, this technology could be why our devices never run out of charge.

This list is no way, a comprehensive list of all available technologies of wireless power transfer. Rather, these novel technologies have something unique that differentiates them from the rest. With IoT and Industry 4.0 being at the helm of innovation and future progress, the implications of wireless power transmission cannot be understated.

POWER GENERATION ON MARS

It's fair to say that the planetary neighbour that we have long espied, going so far as to fantasize about it in various discourses in science-fiction, seems likely to be our next home. Colonising Mars is no longer a pipe dream, but a viable frontier of research and development that many space agencies and private companies are willing to see to fruition. But, putting aside questions of logistical maneuvering and biological sustenance, the elephant in the room looms overhead: how do we power our

What follows below is an account that is part speculation, part extrapolation and part possibility. There are proposed solutions to solving this conundrum, but discerning to what extent they're optimal, is a challenge.

Solar power is the easiest to tackle, and has a lot of public goodwill behind it. Almost all the rovers sent to Mars utilise solar power, which means we have ample experience when it comes to it. But, there is the matter of scale. Rovers are designed to be minimal power drains, hence their power architecture is built to accommodate sporadic demands for short bursts of exploration. Constructing a solar power grid that is stable throughout its active hours while being resilient to Mars' unpredictable surface dust storms feels insurmountable at the moment.

The easiest second consideration would be harnessing the winds on Mars, and it is believed to be a likely candidate for implementation. But it also falls afoul to the dread of scale. It's also left to the whimsy of the surface currents on Mars, hence pushing it to be the main power generation method is a bit too much. It is probably the most effective supplementary method of power, though.

Hydro power and fossil fuels are distant aspirations, as they would require much probing into the planet's crust, which is a venture that is advisable after we've colonised Mars effectively enough. That leads us to the last option.

Nuclear energy is still a very divisive topic, and nuclear power generation enjoys both a scientific community pushing it forward and a very vocal minority who proclaim its inevitable failure and negative consequences. But, when Mars is thrust into the equation, nuclear power makes a lot of sense, from a multitude of perspectives. For one, it is definitely independent of any factors that are contributed by Mars, meaning it's a completely human-controlled process of generation. Fission reactors are already built in isolated geographic regions, which sums up Mars in a nutshell. There's also the fact that the nuclear waste generated is of no danger to anyone, seeing as the entire landmass of Mars is uninhibited and not every region can be turned hospitable.

In short, nuclear power generation might be the way to go, but many question the morality of setting up our new colony, one that will surely be a last resort if Earth fails to sustain us, with what is abjectly believed by the general public consciousness to be a volatile and double-edged source of power. Only time will tell.

AI & INTERNET OF THINGS

With the ever-evolving technology, the Internet of things is the future of the interrelated computer networks, and to make it more effective, we will need the help of Artificial Intelligence.

'INTERNET OF THINGS' (IoT) continues to be one of the most popular technology in the present day scenario. With the aim of an interconnected network of various computing devices and mechanical and digital machines, an intricate web of data flow is created among various networks. It's an understatement to say we have reached the pinnacle of its potential. We have but scratched the surface of this novel technology.

With the exponential increase of devices interconnected through IoT, the amount of data collected by these devices is massive, bringing forward endless possibilities such as prevention of accidents, providing real-time insight to doctors into health conditions of their patients or applications in the creation of smart homes.

The above-mentioned possibilities sound exhilarating but the amount of data to be analysed and pinpointed is beyond human capacity. Application of traditional methods would simply take too much time, resulting in devices malfunctioning such as numerous self-driven cars getting stuck into traffic forever.To get past this limitation, we need to find ways to increase the speed and accuracy of big data analysis and finding the patterns, to effectively use the data obtained. To get those desired results, we need to take the help of another rapidly growing technology - Artificial Intelligence.

The value that AI has in this context is its ability to quickly find insights in the data given. Machine learning, a part of AI, has the ability to reveal patterns and detect anomalies in real time. In IoT, machine learning can help companies take the billions of data points and pinpoint the data that's really meaningful. The general idea is to analyse the data in regard to finding similarities to learn better for future decisions and increase the speed of analysing new data to benefit. This process is 20 times faster than the traditional process of analysing everything.

Let's have a look at what lies ahead with the merger of AI and IoT!

As we can see around, there are many applications that require the use of both innovations from the implementation of smart homes to the virtual assistants or the real-time health devices, the market scope is endless. But one of the foremost and upcoming usage for the industries is to avoid unplanned downtime, increase operating efficiency, spawn new products and services, and enhance risk management with the use of both the technologies.

Avoiding Costly malfunctions

Predicting the future failure of machines beforehand can avoid a huge loss of money and resources in many offshore industries like oil and coal mining. With, machine learning, it's possible to identify the patterns in the data obtained from the current working machines to predict the equipment failure and save a lot on the maintenance costs.

New products and services

With the increase in overall pattern detection, Natural language processing (NLP) has improved over the years at letting humans communicate with machines without any human intermediator. The fleet management industry has improved, with the arrival of AI controlled drones and robots, it's possible to discover places where humans can't travel, which has a huge application in space exploration and archaeology.

Also, the navigation industries can monitor every measurable data point in a fleet of planes, trains, trucks or automobiles to find more efficient routing and scheduling, which is proving to be a very effective way of navigation, saving a huge amount of money and time.

As we go further the line between AI and IoT will get blurred, both being interdependent on each other. It would be rare to find an IoT device which won't use machine learning or AI in any aspect. The realisation of IoT requires us to incorporate it with the AI, and we shouldn't let our limitations stop us from achieving that.

"The advance of technology is based on making it fit in so that you don't really even notice it, so it's part of everyday life." - **Bill Gates**

INDUSTRY 4.0

HISTORY

The first industrialisation was the cornerstone for the entire human race. We have not looked back hence then, technology has been developed at a rapid pace. Since the advent of wheel and mechanization, industries have boomed into various facets. Since mechanization, industries have undergone further revolutions to the likes of mass production, automation and the current trend being cyber physical systems which is the heart of the concept Industry 4.0.

Industry 4.0 is the name of the current trend of of automation and data exchange in manufacturing technologies. It includes cyber-physical systems, the Internet of things, cloud computing and cognitive computing. Industry 4.0 is commonly referred to as the fourth industrial revolution.

Industry 4.0 fosters what has been called a "smart factory". Within modular structured smart factories, cyber-physical systems monitor physical processes, create a virtual copy of the physical world and make decentralized decisions. Over the Internet of Things, cyber-physical systems communicate and cooperate with each other and with humans in real-time both internally and across organizational services offered and used by participants of the value chain.

MEANING

Industry 4.0 strategy are: the strong customization of products under the conditions of highly flexible (mass) production. The required automation technology is improved by the introduction of methods of self-optimization, self-configuration, self-diagnosis, cognition and intelligent support of workers in their increasingly complex work.

DESIGN PRINCIPLES

There are four design principles in Industry 4.0. These principles support companies in identifying and implementing Industry 4.0 scenarios.

- **Interconnection:** The ability of machines, devices, sensors and people to connect, and communicate with each other via the Internet of Things (IoT) or the Internet of People (IoP).

- **Information transparency:** The transparency afforded by Industry 4.0 technology provides operators with vast amounts of useful information needed to make appropriate decisions. Interconnectivity allows operators to collect immense amounts of data and information from all points in the manufacturing process, thus aiding functionality and identifying key areas that can benefit from innovation and improvement.

- **Technical assistance:** First, the ability of assistance systems to support humans by aggregating and visualizing information comprehensively for making informed decisions and solving urgent problems on short notice. Second, the ability of cyber physical systems to physically support humans by conducting a range of tasks that are unpleasant, too exhausting, or unsafe for their human co-workers.

- **Decentralized decisions:** The ability of cyber physical systems to make decisions on their own and to perform their tasks as autonomously as possible. Only in the case of exceptions, interferences, or conflicting goals, are tasks delegated to a higher level.

ROLE OF BIG DATA AND ANALYTICS

Modern information and communication technologies like cyber-physical system, big data analytics and cloud computing, will help early detection of defects and production failures, thus enabling their prevention and increasing productivity, quality, and agility benefits that have significant competitive value.
Big data analytics consists of 6Cs in the integrated Industry 4.0 and cyber physical systems environment.

The 6C system comprises:

- Connection (sensor and networks)
- Cloud (computing and data on demand)
- Cyber (model & memory)
- Content/context (meaning and correlation)
- Community (sharing & collaboration)
- Customization (personalization and value)

IMPACT OF INDUSTRY 4.0

The impact of Industry 4.0 will affect many areas, most notably services, IT security, machine safety, sales and so on. Services and business models need to be revamped to accommodate the changes due to I4. The reliability and productivity may increase or decrease depending on the operation and management. IT security and machine safety will have to be ensured while maintaining the machine life cycles and industry value chain. This may affect workers' education and skill set. Also depending on the socio-economic factors the level of automation and intelligent decision making systems have to be designed.

PROS

- **Ease of backend integration:** A "back-end" application or program serves indirectly in support of the front-end services (application interacting directly with user), usually by being closer to the required resource or having the capability to communicate with the required resource. With the rise of IoT and cloud computing it's possible to send data to the cloud where it arrives at services running on servers that allow you to store, view, and/or perform computation on your data at near real-time basis.

- **Hosting micro-servers:** The recent revolution in the IT industry brought forth the innovation of micro-servers. A microserver (micro-server) is a small form-factor system-on-a-chip (SoC) server. Being less expensive and having less processing power than traditional enterprise-class rack servers, these are grouped into clusters and used in application that don't require multiple CPUs. Micro-servers are a boon for small to medium sized businesses and data centers which work more based on data logging by IoT and processing out results with minimal or no human intervention.

- **Transaction at soft real time:** Industry 4.0 runs on the principle of soft real-time. In this type, Systems are allowed to miss out on data but must be able to pull out a relatively accurate mapping of the inputs. The main target of soft real-time is timely execution of valuable results for the tasks run by it. Completed tasks may have increasing value up to the deadline and decreasing value past it.

- **Distribution of Functionalities:** With the facility of cloud storage, once the data is logged, processes happen simultaneously, processed in various loops to reduce the time required and overloading of the system. For this multiple nodes are implemented in the processes to effectively manage the data flow.

- **Ease of Modification:** The entire system of industry 4.0 is to go wireless by utilising IoT devices which log in data directly into cloud and the data processed sent to respective receivers. The wireless flow of data are controlled by central set of codes that define the origin, processing and sending points of all data.

- **Set up efficient communication:** With the dawn of microservers and distribution of functionalities by nodes, it's become possible to create systems that run at an optimum condition thereby producing the required results with high efficiency. While the world moves into an automated tomorrow fast and efficient systems become a high necessity. That's what industry 4.0 is talking about, a road to the future tomorrow.

CONS

- **Security:** With great power comes great responsibility and with greater virtual data logs comes greater risks of hacking. IoTs have shown over the years various instances were they were hacked and the data in them was stolen from the cloud. This was normally done either by tapping directly into the cloud storage or by changing the path for the files to be logged into from the IoT device. While researchers continue to plug in all the holes used by hackers to enter in and steal information, IoT is not 100% safety assured.

- **Drastic switch in workforce:** With the advent of automation, the requirement of labour in industries drastically reduced. In this age of the 4th Industrial Revolution, it's deemed necessary for workers to be skilled a wide range hardware and software skills. Newly inducted employees are now screened to check if they possess both aspects before being brought into the company. However, current employees face a crisis during the switch in industries from manual to IoT based systems of the Industry 4.0. Huge amount of time and capital gets spent in training the current workers to survive in the new industry. The switch to the new standards also can create a disturbance among the stakeholders who may need time to accept such a drastic proposal.

- **Stability and Reliability of Systems:** Like any other ordinary system, the efficiency and time keep up of these systems is key to better capital for such organisations. Being soft real-time, systems miss out on few data points. This causes the chance of error that could have been avoided with human intervention. There is also a problem of Machine to Machine communication issues that could rise from various factors such as difference in process time, defective product in one reaching the next Machine without being screened out and so on. Thus the integrity of the industry could be at risk.

CONCLUSION

The recent revolution in industries has left its mark on industries. The high production rates while at the same time decrease in required man power have made the industries more autonomous and energy efficient. The possibility of limitless data storage, ease in data management, superior processing speeds make life without it seem hectic.

However, the revolution isn't completely sound proof. The very idea of cloud storage and IoT data logging can cause an increased risk to security due to the numerous hacking possibilities. There are also cases where the processing times of different machines vary due to handling of exceptions that might occur. This causes a deadlock for which human intervention must be required. For this, it becomes essential to learn atleast a few topics on IoT based technologies, for the management of machines while hardware knowledge is still required to understand the work flow of the particular industry. This can trigger the loss of jobs for those who do not quickly grasp the change in industry.

With all said and done, the revolution is a necessary evil. Automation makes life easier but as we move into a world of Artificial intelligence and high-end robotics, the risks over security also increases. It is therefore important to keep improving on the problems and moving ahead till we reach the point of making the industrial revolution into a complete positive outlook to society.

EEEA INAUGURATION 2018

The Electrical and Electronics Engineering Association (EEEA) of NIT Trichy was inaugurated for the year 2018-19 on 24th August, 2018. The guests of honour were Dr. Jikku Venkat, Vice President, Kinvey Product Management at Progress, Boston, USA and Mr. Jayaram Sadasivan, Managing Partner, Sajas Electricals, Tiruchirapalli. The event started by 10 AM with a prayer and lighting of the lamp by the Acting Head of the Department, Dr. V. Sankaranarayanan who welcomed the guests and gathering to the inauguration. This was followed by the introduction of all the office bearers and executive members of the EEEA by the Faculty Advisor Dr. N. Kumaresan.

Then, the Overall Coordinator of EEEA, Mr. Vijay M announced the agenda for the year 2018-19. It consisted of year-long activities like workshops and guest lectures aimed at promoting research and bridging the gap between industry and academic curriculum. He also stressed on the main activity of EEEA, which is to host CURRENTS, the annual national level technical symposium of the EEE Department of NIT Trichy. This was then followed by the introduction of the guests, Dr. Jikku Venkat and Mr. Jayaram Sadasivan by the Chairman of EEEA, Mr. Jagannivashan.

Thereafter the inaugural address was delivered by the Dean of Institutional Development and Alumni Relations, Dr. S. Raman Sankaranarayanan.This was followed by the highlight of the evening, the release of the department magazine, 'TRONICALS' which includes technical and literary articles from the students as well as faculty.The presidential address was then delivered by Dr. Jikku Venkat on the future scope for electrical students like automated cars and the possibilities of cloud computing. He further complimented the Tronicals team for its engaging content and design and wished EEE-A continue in great strides. This was followed by the vote of thanks delivered by the Treasurer of EEEA, Mr. Ganesh.The ceremony concluded with the national anthem.

ONLINE CROSSWORD EVENT:

On 26th July 2018, an online crossword event was conducted to raise awareness on Drug Abuse and Illicit Trafficking. The event was scheduled and prize money was given the fastest and most accurate three.

GESTURE CONTROLLED ROBOTICS:

Wisdom grows and develops when shared and that's what we had aimed to achieve. To give the eager freshers of our campus a bird's eye view on what the environment around them could offer, this workshop took shape for a period of three days from 17th to 19th August 2018. The workshop received a turn around of about 250 freshers and a lot of positive reviews.

EEE ASSOCIATION ACTIVITIES

MATLAB WORKSHOP:

To help the juniors of our department, a MATLAB workshop was conducted for the students of Second year Electrical and Electronics Engineering. The aim of the workshop was to grasp the basics of coding and simulation in MATLAB which are essential for the life of a Electrical or Electronics Engineer as other higher forms of simulation prove to be easier once MATLAB holds a strong foundation.

VISIT TO MALARCHI ASHRAM:

On 6th October 2018, EEE Association with HumaNITTY visited the Malarchi Ashram. The members spent a valuable time with the kids. They later handed over a cheque to Mr. Mahalingam of Renaissance Trust for the development of Ashrams.

EUREKA:

"The building blocks of the nation are the children of today" is what we at EEE Association consider. To do our part and bring the innovative side in students of government schools, **EUREKA** was launched as an initiative of CURRENTS, NIT Trichy. For the event we invited students from various schools across Tamil Nadu for a science exhibition competition. The finals for the event are to be held during CURRENTS'19.

VOLTS

Considered as the flagship event for this year's **CURRENTS**, **VOLTS** is the culmination of various events reaching out to a jaw dropping number of 8 cities in nearly 2 weeks. VOLTS was aimed to not just canvas CURRENTS but also enrich aspiring engineers near and far. There was wide appreciation by students and faculty alike from the different centers for the well planned workshops and events.

The workshops and events conducted as part of VOLTS are:

- **INDUSTRIAL ROBOTIC ARM WORKSHOP:**

Conducted in Kochi by our team of inspiring and talented individuals who took on them the task to teach and create the prototype of a fully functional industrial robotic arm that worked based on hand gestures.

- **HOME AUTOMATION WORKSHOP:**

Conducted in Bengaluru by another set of talented students of the department, the participants learnt the construction of the IoT based automation using ESP8266 micro-controller. The microcontroller would form an interface between devices and a mobile application which was also taught to the participants.

- **MOCK GATE EXAM:**

As part of giving back to the community, CURRENTS organised a free mock GATE exam in 7 cities - Trichy, Madurai, Pondicherry, Coimbatore, Tirunelveli, Kochi and Salem. There was also a talk given in each of the cities regarding he importance of GATE and the requirement to apply to them to secure big goals.

RAJAGIRI SCHOOL OF ENGINEERING AND TECHNOLOGY, KOCHI

BMS COLLEGE OF ENGINEERING & TECHNOLOGY, BENGALURU

NIT PUDUCHERRY, KARAIKAL

MAHENDRA INSTITUTE OF TECHNOLOGY, SALEM

GOVERNMENT COLLEGE OF ENGINEERING, TIRUNELVELI

KARPAGAM ACADEMY OF HIGHER EDUCATION, COIMBATORE

INDIA INNOVATION CHALLENGE DESIGN CONTEST

Texas Instruments India Innovation Challenge Design Contest (IICDC) is a competition for the brightest minds of India to implement innovative ideas for helping society and building creative startups. It is organized by TI in collaboration with the department of Science and Technology (DST), anchored by NSRCEL, Indian Institute of Management, Bangalore and supported by MyGov. It gives a unique opportunity to undergraduate students like us to develop prototypes from any field and transform it into sustainable and marketable products. Texas Instruments is providing 20 lacs seed fund to top 10 start-ups in the competition as well as cash prizes of up to 50 lacs and 70 lacs worth of free tools to develop and implement your idea.

The objective of this competition is to unite students around the country who have the dream and aspire to create something new.
The first round consisted of the submission of an abstract where we were expected to explain our idea briefly and provide the details of our mentor, **Dr.N.Kumaresan.**

In the second round, we had to answer a questionnaire that tested novelty, feasibility and market value of our product. This was followed by a series of online tests called DrishTI which assessed our foundation in general electronics, MPMC, Linear integrated circuits, Analog electronics and TI products.

We were given a MOOC course on the basics of entrepreneurship which was conducted by IIM Bangalore. This was followed by the submission of a lean canvas and a video presentation giving a detailed overview of our product. From about **10,000** teams, **300** teams were selected for the quarter finals. Selected teams were eligible to procure funding of upto 200 dollars for developing the final prototype.

We thank Dr. N Kumaresan sir, for his valuable guidance and his mentorship that has helped take us to the final stages of the competition.
2 other teams have participated from the EEE department for the IICDC. The professors that have mentored these teams are **Dr. Ammasai Gounden** and **Dr. S. Moorthi.**

This competition has been a huge learning experience for all of us as it has incorporated fields of tech and entrepreneurship. We are proud to be a part of the movement to make a difference in society and we thank Texas Instrument to help us shape this dream to reality.

THE NATIONAL POWER SYSTEM CONFERENCE

The National Power System Conference (NPSC) is the biennial National level event organised by an academic or research institute. This premier conference sets a stage for talented Researchers and Engineers around India to exchange their ideas and experiences to those present thereby sparking the fire of innovation in the hearts of all present. The event allows the exchange of knowledge, expertise and experience on the latest developments in the electrical power area and other associated technical fields.

From its humble inception in 1981 when the NPSC hosted its first conference in the College of Engineering, Osmania University, Hyderabad, the event has progressed exponentially from National level recognition to an event recorded by IEEE. Hosting a wide range of 25 topics in the areas of Electrical power, various professionals come to showcase their work. There are awards given by the NPSC with respect to their work if they meet the requirements for the nominations to these awards.

From 14th - 16th December 2018, the 20th National Power Systems Conference, happened in our campus of NIT Tiruchchirappalli. With a wide array of sponsors and the offer of accepted full papers published in the conference proceedings to be submitted for inclusion in IEEE Xplore, a wide number of professionals emerged to grasp this occasion to showcase their work. After the series of presentations, the results for the various awards were announced as follows:

1. Malaviya Excellence Award in Power Systems (by IIT BHU) - Prof. S. C. Srivastava, IIT Kanpur
2. Academic Excellence Award - NPSC 2018 - Prof. Bhim Singh, IIT Delhi
3. Industry Excellence Award - NPSC 2018 - Dr. K. Rajamani, Chief Consultant, M/s. Adani Electricity Mumbai Ltd.
4. Dr. Ramamoorthy Best Paper Award in Power Systems - "A Generalised State-Space Approach for Studying EMTP Simulation Models" by T S Vinay Chindu and Anil Kulkarni (IIT Bombay)
5. Dr. Ramamoorthy Best Paper Award in Power Electronics and Drives - "Novel Non-isolated Modified interleaved DC-DC Converter to Integrate Ultracapacitor and Battery Sources for Electric Vehicle Application" by Kumaravel S, Gangavarapu Guru Kumar, Kuruva Veeranna, Karthikeyan V (NIT Calicut)

The Conference had been inspiring to all present by creative and innovative ideas discussed that would plant the seeds for further discoveries in the various areas of Electrical power. It had been a thought provoking time for all and an enjoyable moment for students, Researchers and Engineers alike.

POSOCO POWER SYSTEM AWARDS

The Power System Operation Corporation Limited (POSOCO) is an organisation formed in 2010 wholly owned Government of India Enterprise under the Ministry of Power. The organisation handle the power management functions of PGCIL. It is responsible to ensure the integrated operation of the Grid in a reliable, efficient, and secure manner over its 5 Regional Load Despatch Centres and a National Load Despatch Centre (NLDC).

Under its Corporate Social Responsibility (CSR), POSOCO initiated an award scheme, titled "POSOCO Power System Award (PPSA)". The award was to recognize emerging and innovative research accomplishments in power system and related fields, and is organized in collaboration of Foundation for Innovation & Technology Transfer (FITT), IIT Delhi.

In this regard, we with great pride would like to covet that the following from the department of Electrical and Electronics Engineering received this meritorious award.

PPSA 2019 AWARDEES IN MASTER CATEGORY FROM NIT TRICHY

Saggurthi Anil Kumar	**PMU Based Distance Protection Methodology to Avert Malfunction due to FACTS Controllers**
Paila Lakshmana Rao	**An Isolated Micro-Grid System Employing Renewable Energy Sources**

INDUSTRIAL VISIT

DC machines and Transformers is an enthralling course that serves as one of the stepping stones to the understanding of the Electrical core. With their first step to the department of Electrical and Electronics Engineering, the Industrial visit to Dindigul Transformer Industry became a launching pad for second years' flight to the endless skies of Electrical engineering. The enthusiastic second years were taken to an equally ecstatic industrial visit by our respected faculties, Dr. Raja sir, Dr. Moorthi sir, Dr. Venkatakrithiga ma'am accompanied by Mr. Arumugaraj. The trip began at around 7 am from the campus and was initiated with a holy sight to the Karuppaiah Swamy Temple on the Thanjavur highways.

At around 9:20 A.M. we took a short break from the bus journey for breakfast at Sarvana Bhavan restaurant. This was followed by a photo session and the journey restarted with a lot of dance and music in the bus. We reached our destination at 11 AM.

The industry manufactured transformers at distribution level. The students thoroughly enjoyed the whole making and assembling of transformers from the scratch. We were taken inside in batches and were escorted by the professors in parts. The whole process completed at around 1 PM and we took a last group photo with the whole team.

After the mind-blowing and exhausting trip, we headed towards lunch in our return from the industry at Dindigul Thalappakatti Biryani Hotel, an appetizing meal loved by everyone. We stopped at a tea shop at around 4 PM. The return journey became equally enjoyable after our fun loving professors – Raja sir and Moorthi sir joined us in the game called 'Mafia'. Everyone really adored this side of the professors who were also amazed to see the cheerful side of the class. The game went on for all three hours of the journey and was continuing inside the department building even after reaching to the campus.

Overall it was one of the most interesting, lively, informative and stupendous trip for all the students and we whole heartedly thank our revered and dynamic faculties for this!

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