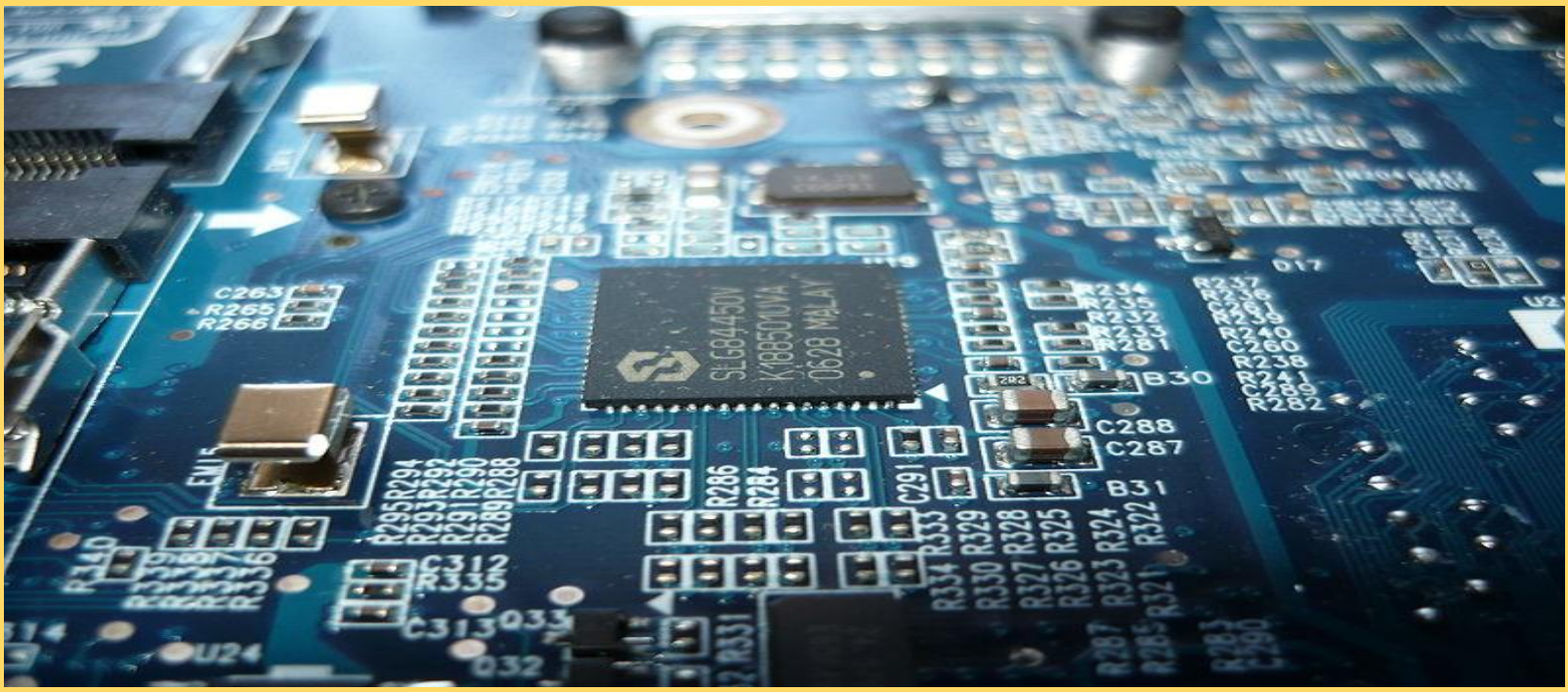

# DHANEKULA INSTITUTE OF ENGINEERING & TECHNOLOGY: GANGURU

## DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

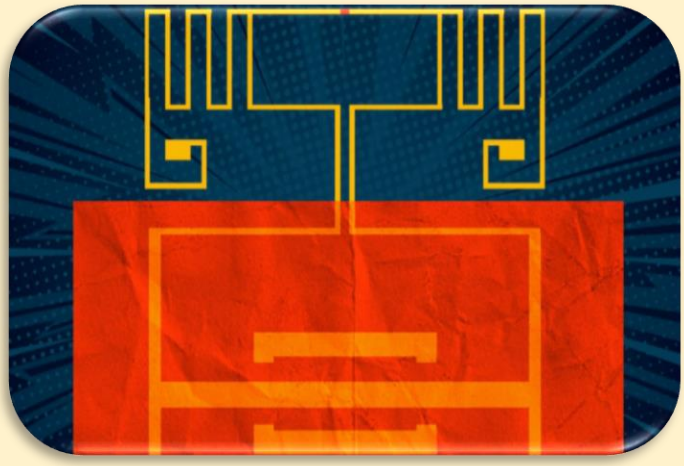


**Bi-Monthly Newsletter**

# TELE-ELECTRO

Vol No:5 Issue No:4 Dec2018-Jan 2019

# Flexible device made by MIT scientists converts Wi-Fi signals into electricity



*MIT scientists made a device from flexible, inexpensive materials which could power large-area electronics, wearables, medical devices, and more.*

MIT scientists have developed the first fully flexible device that can convert energy from Wi-Fi signals into electricity, paving the way for wirelessly powering everyday electronics without batteries.Devices that convert AC electromagnetic waves into DC electricity are known as "rectennas."The researchers demonstrate a new kind of rectenna, described in a study appearing in the journal Nature, that uses a flexible radio-frequency (RF) antenna that captures electromagnetic waves — including those carrying Wi-Fi — as AC waveforms.The antenna is then connected to a novel device made out of a two-dimensional semiconductor just a few atoms thick. The AC signal travels into the semiconductor, which converts it into a DC voltage that could be used to power electronic circuits or recharge batteries.In this way, the battery-free device passively captures and transforms ubiquitous Wi-Fi signals into useful DC power. Moreover, the device is flexible and can be fabricated in a roll-to-roll process to cover very large areas.

"What if we could develop electronic systems that we wrap around a bridge or cover an entire highway, or the walls of our office and bring electronic intelligence to everything around us? How do you provide energy for those electronics?" said Tomas Palacios, a professor at Massachusetts Institute of Technology (MIT) in the US."We have come up with a new way to power the electronics systems of the future — by harvesting Wi-Fi energy in a way that's easily integrated in large areas — to bring intelligence to every object around us," said Palacios.Promising early applications for the proposed rectenna include powering flexible and wearable electronics, medical devices, and sensors for the "internet of things."

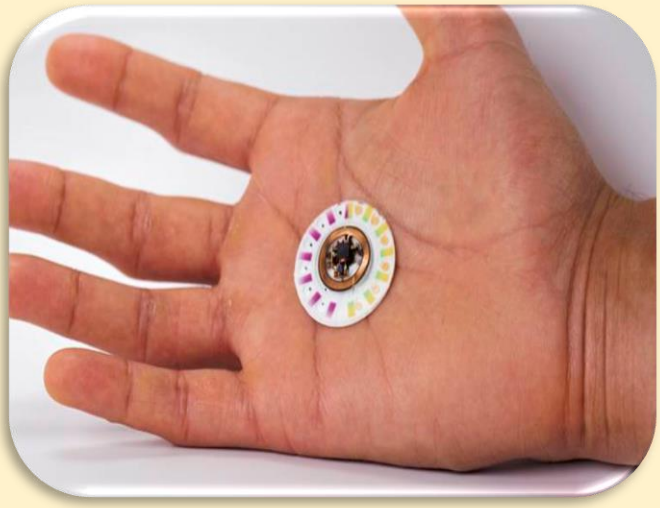
Flexible smartphones, for instance, are a hot new market for major tech firms. In experiments, the researchers' device can produce about 40 microwatts of power when exposed to the typical power levels of Wi-Fi signals (around 150 microwatts).That is more than enough power to light up a simple mobile display or silicon chips.Another possible application is powering the data communications of implantable medical devices, said Jesus Grajal, a researcher at the Technical University of Madrid.For example, researchers are beginning to develop pills that can be swallowed by patients and stream health data back to a computer for diagnostics.

"Ideally you don't want to use batteries to power these systems, because if they leak lithium, the patient could die," Grajal said.It is much better to harvest energy from the environment to power up these small labs inside the body and communicate data to external computers," he said.

The research provides blueprints for flexible Wi-Fi-to-electricity devices with substantial output and efficiency. The maximum output efficiency for the current device stands at 40 per cent, depending on the input power of the Wi-Fi input.At the typical Wi-Fi power level, the power efficiency of the rectifier is about 30 per cent. For reference, today's best silicon and gallium arsenide rectennas made from rigid, more expensive silicon or gallium arsenide achieve around 50 to 60 per cent.The team is now planning to build more complex systems and improve efficiency

**Mr.M.Tulasi Dasu**
**Assistant Professor, ECE**

## A patch reads sweat to tell you if you're dehydrated, or have diabetes



*The patch provides real-time information on the wearer's pH, sweat rate, and levels of chloride, glucose and lactate.*

An undated photo provided by John Rogers, a biomedical engineer at Northwestern University, shows a patch that provides real-time information on the wearer's pH, sweat rate, and levels of chloride, glucose and lactate — high levels of which could signal cystic fibrosis, diabetes or a lack of oxygen. (J. Rogers, Northwestern University via The New York Times)

Someday soon, perhaps within a year, you'll be able to slap a soft, stretchy patch on to your arm that tells you if you're dehydrated. Or that your electrolytes are dangerously out of balance. Or even that you have diabetes.Fitness trackers such as Fitbit and Apple Watch already track step counts, heart rate and sleep rhythms. But they tend to be rigid and bulky, and mostly gather mechanical metrics, rather than assess a person's underlying biology.new generation of devices instead aim to analyze sweat for many chemicals at once, producing a real-time snapshot of the wearer's health or fitness. These devices also fit intimately against the skin, and are comfortable for anyone, from premature babies to the elderly. One version is already being advertised by Gatorade.The latest advance in this technology, described Friday in the journal Science Advances, provides real-time information on the wearer's pH, sweat rate, and levels of chloride, glucose and lactate — high levels of which could signal cystic fibrosis, diabetes or a lack of oxygen."It fits into a broader trend that you're seeing in medicine, which is personalized, tailored approaches to treatment and delivery of care," said John Rogers, a biomedical engineer at Northwestern University in Illinois and the key architect of the device.Technology like this has been anticipated for years, but the field has accelerated rapidly. Some similar devices in development are soft. Some use electric sensors to read chemicals. Others rely on colorimetrics, in which the intensity of the color in the readout matches the concentration of the chemical being monitored. The new device delivers all of that in a battery-free and wireless form."This looks like the first version in which they integrated all of it in one device," said Martin Kaltenbrunner, an engineering professor at Joannes Kepler University Linz, in Austria, who was not involved in the research. "The level of technology that is in this paper is very, very advanced."The new device has minuscule holes at its base into which sweat naturally flows. From there, a complex network of valves and microchannels, each roughly the width of a human hair, route the sweat into tiny reservoirs. Each reservoir contains a sensor that reacts with a chemical in the sweat, such as glucose or lactate.

"That's basically it," Rogers said. "There's nothing that penetrates the skin, and there's no power supply that's driving flow."The device relies on the same technology that smartphones use to send wireless payments; the phone can both deliver power through this wireless coupling,and receives data back. Alternatively, the data could be sent to a reader attached to a treadmill or elsewhere in a fitness room.The system is versatile and could be set up to track the same chemical, or several chemicals, over time, such as the level of lactate in a runner as a marathon progresses. Because the device is waterproof and molded to the body, it also could be used by swimmers.Eventually, the device would fill up with sweat — not so hygienic — but the channel system can be easily separated from the electronics and swapped out, giving the device a longer life

span. “This approach is especially nice, this modular construction of sensors,” Kaltenbrunner said.To be marketed at large scale, any sweat-based sensor would need to be manufactured at a low cost. Many teams are focused on this goal because of the potential of the devices to transform health care, Kaltenbrunner said. “If I have to go to the clinic once a day to have my data collected, I wouldn’t really do it,” Kaltenbrunner said. “But it just means wearing a patch and being able to self-monitor myself, then eventually this barrier will be reduced.”Rogers’ team has begun testing the technology as a way to screen for cystic fibrosis, a rare genetic condition. Doctors already look at chloride concentrations in sweat to identify children with the condition, but they typically use a rigid, uncomfortable device that straps tightly onto the child’s arm for a one-time measurement.

In 2017, another team described a flexible, wearable sensor that also analyzes chloride in sweat to screen for cystic fibrosis. But that sensor is battery-powered,and does not capture separate volumes of sweat as Rogers’ device does.“Really what is needed is big data for human health,” said Ali Javey, a member of the team that proposed the earlier sensor and a professor of electrical engineering and computer science at the University of California, Berkeley. The device invented by Rogers “is really important,” Javey said, because it is “comfortable to wear, has different sensing modalities and is robust.”Rogers’ team has been testing their device with children who have cystic fibrosis at Lurie Children’s Hospital of Chicago. It is in the late stages of a clinical trial,and plans to apply for approval from the Food and Drug Administration.A much bigger market for sensors lies in helping the approximately 30 million people with diabetes in the United States track their glucose levels. The most advanced diabetes sensor, approved by the FDA in 2017, is a soft skin patch coupled to a small reader, and relies on tiny needles that pierce the skin to monitor blood glucose.The ideal device would not involve needles or draw blood. To use sweat instead, however, scientists first need to learn more about it — how sweat rates vary among individuals, how different biochemicals make their way into sweat, and how well those levels reflect blood glucose.“We need to take a step back and be careful to think about how we can make sense of what we’re measuring,” said Carlos Milla, Javey’s collaborator and a professor of pediatrics at Stanford University.The new study underscores Milla’s concern. The device measured glucose in sweat, but the results suggested that this was not a good proxy for glucose in the blood. The sweat glucose levels reflect blood glucose from 30 to 60 minutes earlier, too long of a delay to help diabetics.“It’s indicating this might not be as simple as one might have initially hoped,” Rogers said. He added that sweat glucose might be more helpful as a metric in screening for diabetes rather than for real-time monitoring of glucose levels.

**Mr.S.Chandrasekhar , Asst.Professor, ECE.**

## Biodegradable sensor can monitor blood flow in arteries

*Researchers first tested the sensor in an artificial setting where they pumped air through an artery-sized tube to mimic pulsing blood flow.*

This new sensor could let doctors keep tabs on a healing vessel from afar, creating opportunities for earlier interventions. (Representational Image Stanford scientists have developed a biodegradable, battery-free sensor that can monitor the flow of blood through an artery, helping doctors assess the success of blood vessel surgery.The device does not need to be removed and can warn a patient’s **doctor**

if there is a blockage, researchers said.“Measurement of blood flow is critical in many medical specialties, so a wireless biodegradable sensor could impact multiple fields including vascular, transplant, reconstructive and cardiac surgery,” said Paige Fox, assistant professor at Stanford University in the US.“As we attempt to care for patients throughout the Bay Area, Central Valley, California and beyond, this is a technology that will allow us to extend our care without requiring face-to-face visits or tests,” said Fox.Monitoring the success of surgery on blood vessels is challenging as the first sign of trouble often comes too late. By that time, the patient often needs additional surgery that carries risks similar to the original procedure. This new sensor could let doctors keep tabs on a healing vessel from afar, creating opportunities for earlier interventions.The sensor wraps snugly around the healing vessel, where blood pulsing past pushes on its inner surface. As the shape of that surface changes, it alters the sensor’s capacity to store electric charge, which doctors can detect remotely from a device located near the skin but outside the body.That device solicits a reading by pinging the antenna of the sensor, similar to an ID card scanner. In the future, this device could come in the form of a stick-on patch or be integrated into other technology, like a wearable device or smartphone.The researchers first tested the sensor in an artificial setting where they pumped air through an artery-sized tube to mimic pulsing blood flow.Surgeon Yukitoshi Kaizawa, a former postdoctoral scholar at Stanford, also implanted the sensor around an artery in a rat. Even at such a small scale, the sensor successfully reported blood flow to the wireless reader.The researchers are now finding the best way to affix the sensors to the vessels and refining their sensitivity. They are also looking forward to what other ideas will come as interest grows in this interdisciplinary area.

**Mr.P.Krishna Reddy,Asst.Professor,ECE.**

## 5G Mobile Wireless Technology


The 5G mobile cellular communications system provides a far higher level of performance than the previous generations of mobile communications systems.

The new 5G technology is not just the next version of mobile communications, evolving from 1G to 2G, 3G, 4G and now 5G.

Instead 5G technology is very different. Previous systems had evolved driven more by what could be done with the latest technology. The new 5G technology has been driven by specific uses ad applications.

5G has been driven by the need to provide ubiquitous connectivity for applications as diverse as automotive communications, remote control with haptic style feedback, huge video downloads, as well as the very low data rate applications like remote sensors and what is being termed the IoT, Internet of Things.

### 5G standardisation

The current status of the 5G technology for cellular systems is very much in the early development stages. Very many companies are looking into the technologies that could be used to become part of the system. In addition to this a number of universities have set up 5G research units focussed on developing the technologies for 5G

In addition to this the standards bodies, particularly 3GPP are aware of the development but are not actively planning the 5G systems yet.

Many of the technologies to be used for 5G will start to appear in the systems used for 4G and then as the new 5G cellular system starts to formulate in a more concrete manner, they will be incorporated into the new 5G cellular system.

The major issue with 5G technology is that there is such an enormously wide variation in the requirements: superfast downloads to small data requirements for IoT than any one system will not be able to meet these needs. Accordingly a layer approach is likely to be adopted. As one commentator stated: 5G is not just a mobile technology. It is ubiquitous access to high & low data rate services.

## 5G cellular systems overview

As the different generations of cellular telecommunications have evolved, each one has brought its own improvements. The same will be true of 5G technology.

- ***First generation, 1G:*** These phones were analogue and were the first mobile or cellular phones to be used. Although revolutionary in their time they offered very low levels of spectrum efficiency and security.
- ***Second generation, 2G:*** These were based around digital technology and offered much better spectrum efficiency, security and new features such as text messages and low data rate communications.
- ***Third generation, 3G:*** The aim of this technology was to provide high speed data. The original technology was enhanced to allow data up to 14 Mbps and more.
- ***Fourth generation, 4G:*** This was an all-IP based technology capable of providing data rates up to 1 Gbps.

Any new 5th generation, 5G cellular technology needs to provide significant gains over previous systems to provide an adequate business case for mobile operators to invest in any new system.

Facilities that might be seen with 5G technology include far better levels of connectivity and coverage. The term World Wide Wireless Web, or WWWW is being coined for this.

For 5G technology to be able to achieve this, new methods of connecting will be required as one of the main drawbacks with previous generations is lack of coverage, dropped calls and low performance at cell edges. 5G technology will need to address this.

## 5G requirements

As work moves forwards in the standards bodies the over-riding specifications for the mobile communications system have been defined by the ITU as part of IMT2020.The currently agreed standards for 5G are summarised below:

| **Suggested 5G Wireless Performance** | |
|---|---|
| **Parameter** | **Suggested Performance** |
| Peak data rate | At least 20Gbps downlink and 10Gbps uplink per mobile base station. This represents a 20 fold increase on the downlink over LTE. |
| 5G connection density | At least 1 million connected devices per square kilometre (to enable IoT support). |
| 5G mobility | 0km/h to "500km/h high speed vehicular" access. |
| 5G energy efficiency | The 5G spec calls for radio interfaces that are energy efficient when under load, but also drop into a low energy mode quickly when not in use. |
| 5G spectral efficiency | 30bits/Hz downlink and 15 bits/Hz uplink. This assumes 8x4 MIMO (8 spatial layers down, 4 spatial layers up). |
| 5G real-world data rate | The spec "only" calls for a per-user download speed of 100Mbps and upload speed of 50Mbps. |
| 5G latency | Under ideal circumstances, 5G networks should offer users a maximum latency of just 4ms (compared to 20ms for LTE). |

## 5G communications system

The 5G mobile cellular communications system will be a major shift in the way mobile communications networks operate. To achieve this a totally new radio access network and a new core network are required to provide the performance required.

- ***5G New Radio, 5G NR:*** 5G new radio is the new name for the 5G radio access network. It consists of the different elements needed for the new radio access network. Using a far more flexible technology the system is able to respond to the different and changing needs of mobile users whether they be a small IoT node, or a high data user, stationary or mobile.
- ***5G NextGen Core Network:*** Although initial deployments of 5G will utilise the core network of LTE or possibly even 3G networks, the ultimate aim is to have a new network that is able to handle the much higher data volumes whilst also being able to provide a much lower level of latency.

## 5G technologies

There are many new 5G technologies and techniques that are being discussed and being developed for inclusion in the 5G standards.

These new technologies and techniques will enable 5G to provide a more flexible and dynamic service.

The technologies being developed for 5G include:

- ***Millimetre-Wave communications:*** Using frequencies much higher in the frequency spectrum opens up more spectrum and also provides the possibility of having much wide channel bandwidth - possibly 1 - 2 GHz. However this poses new challenges for handset development where maximum frequencies of around 2 GHz and bandwidths of 10 - 20 MHz are currently in use. For 5G, frequencies of above 50GHz are being considered and this will present some real challenges in terms of the circuit design, the technology, and also the way the system is used as these frequencies do not travel as far and are absorbed almost completely by obstacles. Different countries are allocating different spectrum for 5G.
- ***Waveforms :*** One key area of interest is that of the new waveforms that may be seen. OFDM has been used very successfully in 4G LTE as well as a number of other high data rate systems, but it does have some limitations in some circumstances. Other waveform formats that are being discussed include: GFDM, Generalised Frequency Division Multiplexing, as well as FBMC, Filter Bank Multi-Carrier, UFMC, Universal Filtered MultiCarrier. There is no perfect waveform, and it is possible that OFDM in the form of OFDMA is used as this provides excellent overall performance without being too heavy on the level of processing required.
- ***Multiple Access:*** Again a variety of new access schemes are being investigated for 5G technology. Techniques including OFDMA, SCMA, NOMA, PDMA, MUSA and IDMA have all been mentioned. As mentioned above it appears that the most likely format could be OFDMA
- ***Massive MIMO with beamsteering:*** Although MIMO is being used in many applications from LTE to Wi-Fi, etc, the numbers of antennas is fairly limited. Using microwave frequencies opens up the possibility of using many tens of antennas on a single equipment becomes a real possibility because of the antenna sizes and spacings in terms of a wavelength. This would enable beams to be steered to provide enhanced performance.
- ***Dense networks:*** Reducing the size of cells provides a much more overall effective use of the available spectrum. Techniques to ensure that small cells in the macro-network and deployed as femtocells can operate satisfactorily are required. There is a significant challenge in adding huge numbers of additional cells to a network, and techniques are being developed to enable this.

These are a few of the main techniques being developed and discuss for use within 5G.

## 5G timeline & dates

5G is developoing rapidly and it needs to meet some demanding timelines. Some trial deployments have

occurred and some of the first real deploymets are anticipayed in 2020.

Many countries are rushing to deply 5G as effective communications enable economimc growth and are seen as an essential element of modern day life and industry.

M.Jyothsna Sai Lakshmi, 168T1A0475, III ECE-B


ANDHRAJYOTHI

ఆంధ్రజ్యోతి Vijayawada విజయవాడ

16 పేజీలు

19.12.2018 P.G N0:05

## ప్రాంగణ ఎంపికల్లో 50 మందికి ఉద్యోగాలు

పెనమలూరు, డిసెంబరు 18: గంగూరు ధనేకుల ఇంజనీరింగ్ కళాశాలలో 2018-19 విద్యా సంవత్సరానికి గాను మంగళవారం పలు బహుళ జాతీయ సంస్థలు జరిగిన ప్రాంగణ ఎంపికలో 50 మంది విద్యార్థులు ఎంపికయ్యారని కళాశాల ప్రిన్సిపాల్ కడియాల రవికుమార్ తెల్పారు. ఈ మేరకు ఆయన వివరాలు తెల్పుతూ జాతీయ సంస్థలకు చెందిన విప్రో, ఇన్ఫోసిస్, టిసిఎస్ వంటి తదితర కంపెనీల ప్రతినిధులు నిర్వహించిన ప్రాంగణ ఎంపికల్లో ఇంజనీరింగ్ ఫైనల్ ఇయర్ విద్యార్థులు 50 మంది నియమితులయ్యారు. ఈ సందర్భంగా కళాశాల చైర్మన్ ధనేకుల రవీంద్రనాథ్ ఠాగూర్, సెక్రటరీ ధనేకుల భవానీ ప్రసాద్ విద్యార్థులను అభినందించారు.



ప్రాంగణ ఎంపికల్లో ఉద్యోగాలు పొందిన విద్యార్థులు

## PLACEMENTS IN ECE DEPARTMENT

**List of Selected students in Department of Electronics & Communication Engineering**

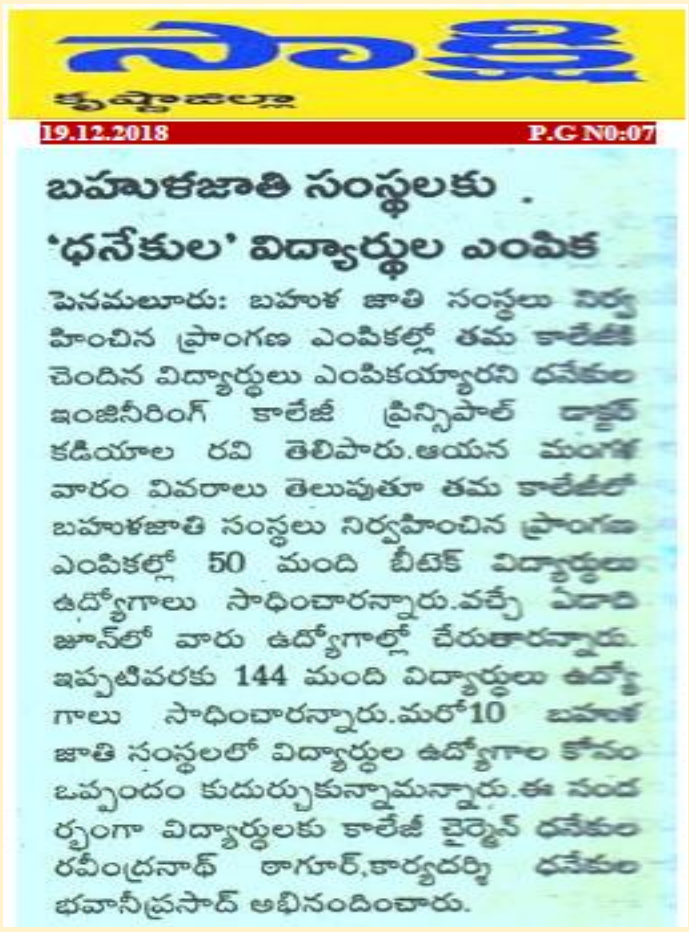
A. Name of Company: Vee Technologies

Date of Drive: 17-12-2018

Package: 2.16 LPA

Number of candidates selected: 7

| S.No | Roll No | Name of the Student |
|---|---|---|
| 1 | 158T1A0460 | T.N.S CHANDRIKA |
| 2 | 158T1A0444 | L.KAIVALYA |
| 3 | 158T1A0487 | CH.SARANYA |
| 4 | 158T1A0475 | K.ROOPA |
| 5 | 168T5A0411 | M.ANIRUDH |
| 6 | 158T1A0427 | HARIKA |
| 7 | 158T1A0407 | ANUSHA |


నాడి

కృష్ణాజిల్లా

19.12.2018 P.G N0:07

## బహుళజాతి సంస్థలకు 'ధనేకుల' విద్యార్థుల ఎంపిక

పెనమలూరు: బహుళ జాతి సంస్థలు నిర్వహించిన ప్రాంగణ ఎంపికల్లో తమ కాలేజీకి చెందిన విద్యార్థులు ఎంపికయ్యారని ధనేకుల ఇంజినీరింగ్ కాలేజీ ప్రిన్సిపాల్ డాక్టర్ కడియాల రవి తెలిపారు.ఆయన మంగళవారం వివరాలు తెలుపుతూ తమ కాలేజీలో బహుళజాతి సంస్థలు నిర్వహించిన ప్రాంగణ ఎంపికల్లో 50 మంది బీటెక్ విద్యార్థులు ఉద్యోగాలు సాధించారన్నారు.వచ్చే ఏడాది జూన్‌లో వారు ఉద్యోగాల్లో చేరుతారన్నారు. ఇప్పటివరకు 144 మంది విద్యార్థులు ఉద్యోగాలు సాధించారన్నారు.మరో10 బహుళ జాతి సంస్థలలో విద్యార్థుల ఉద్యోగాల కోసం ఒప్పందం కుదుర్చుకున్నామన్నారు.ఈ సందర్భంగా విద్యార్థులకు కాలేజీ చైర్మన్ ధనేకుల రవీంద్రనాథ్ ఠాగూర్,కార్యదర్శి ధనేకుల భవానీప్రసాద్ అభినందించారు.

B. Name of Company: HCL

Date of Drive: 09.01.2019

Package: 3.50 LPA

Number of candidates selected: 01

| S.No | Roll No | Name of the Student |
|---|---|---|
| 1 | 158T1A0427 | Ch.Harika |

# Dhanush 2K18

Dhanush 2K18 has conducted on 14th and 15 th of December 2018. The department of ECE has conducted poster presentation, technical Quiz, Project exhibition and circuit hunt along with the college level events. The technical fest gives the opportunity to students to exhibit their academi9c and circular talents.



You cannot change your future. But you can change your habits. And surely your habits will change your future.

*Dr.APJ Abdul Kalam*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