

**DEPARTMENT OF ELECTRICAL AND ELECTRONICS
ENGINEERING
SPARKZ 2019
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MESSAGE FROM THE HOD'S DESK

Hearty welcome and best wishes to all the departments who receive this newsletter. It gives me great pleasure to present the first issue of "SPARKZ" for the academic year 2018-2019. I cheer the students to work hard and put in their best efforts towards their technical endeavors so that it may yield prolific results. I would like to thank all my colleagues for their diligent efforts to help the department progress at a very steady rate of knots.

We as a team strive hard to take the department to height of success, glory and to achieve our vision.



Dr.E.Kaliappan
Professor &HOD/EEE

VISION OF THE DEPARTMENT

To produce graduates with foundation in Electrical and Electronics Engineering who can cater to the dynamic needs of the industry and to provide a diverse and stimulating environment for quality research.

MISSION OF THE DEPARTMENT

- M1.** To align the teaching learning process and to provide basic foundation for the students to adapt to the changing industrial needs
- M2.** To enrich with the latest developments through seminars, guest lectures, workshop and paper presentations
- M3.** To awake young minds to acquire knowledge continuously and learn to apply it
- M4.** To attain multidisciplinary problem solving skills, social awareness and confidence required to excel in their chosen field
- M5.** To develop professional competency and technical expertise individually and through team effort thereby exhibit leadership in industry
- M6.** To create research oriented mindset and focus in fulfilling growing demands of society through mentoring and motivation

PROGRAM EDUCATIONAL OBJECTIVES (PEOS)

1. Graduates will have fundamental and broad knowledge in Electrical Sciences relating to industrial applications and research to design, analyze and synthesize information from various sources and think differently to provide solutions to their discipline
2. Graduates will become entrepreneurs, employees of reputed organizations, pursue higher studies and research for developing advanced skills in Electrical and Electronics Engineering
3. Graduates will exhibit technical and intellectual competency and will be amenable for life-long learning
4. Graduates will demonstrate technical knowledge and ethical values for professional development to meet the societal needs
5. Graduates will be able to work in multi-disciplinary environment by providing solutions to real time problems.

A REPORT ON WORKSHOP

One Day Hands on Training Programme on “Design and Installation of Solar PV systems”



The Department of Electrical and Electronics Engineering of Easwari Engineering College has started a **Centre for Renewable Energy Research (CRER)** in the year 2018 and has formed three working teams namely, Research Team, Technical team and Training team. The technical team has organized the **One**

Day Hands on Training Programme on “Design and Installation of Solar PV systems”, On 21.1.19 at the TRP auditorium at 9.30 am to 4.00 pm. A total of 162 internal participants (which includes 2nd, 3rd and final year of EEE department) and 25 external participants attended the Training programme. The Inauguration Program was conducted at 9.30 am after the registration process is completed. The participants were given with a Training Kit consisting of A Note book, Pen and data sheets. Dr.E.Kaliappan Prof. and HoD/EEE, and the Convener for the training programme welcomed the gathering and briefed the topics to be covered and the arrangements made for the training. **Er.K.Gokulakrishan, Director, Nestlives Pvt. Ltd inaugurated the FDP in the presence of Principal, Head of the Department the Coordinator and the participants.**Er.K.Gokulakrishan inaugurated the programme with a key note address on the Need for solar PV systems and the basic skill required for installing the panels. The Principal delivered the presidential address and motivated to participants to attend such skill development program to improve their skills. The traing coordinator Ms.B.Ponkarthika, introduced the Office bearers of CERE and Badges were distributed the members by the chief guest. The program coordinator Mr.Vijeesh briefed the program schedule and the training session started at 10.40 am after a tea break. Mr.G.Vignesh, AP/EEE conducted the first session on the basics of Solar PV systems. After the Lunch break the students had practical session consisting of Simulation of PV system models using PV Syst, hardware construction and testing of PV system and a demo on real time PV system in standalone by the industry experts from IPCS Pvt. Ltd.

The programme was successfully completed as per the schedule, which was given to the participants prior to the commencement of the programme, without any changes. The participants expressed their complete satisfaction during the valedictory programme which was held from 3.45pm to 4.00pm. During the Valedictory programme feedbacks were collected from the participants. Mr. G.Vignesh, Assitant Professor/EEE, delivered the vote of thanks and thanked all the staffs for extending their support in organizing this programme. The Programme ended with the National Anthem.

**Anna University Approved
Two – Week FDTP ON EE8401- ELECTRICAL MACHINES - II**

The Department of Electrical and Electronics Engineering of Easwari Engineering College has organized the Two weeks Faculty Development Programme on **“Electrical Machines-II from (13.12.2018 -18.12.2018)”**.A total of 25 participants (which includes 5 Internal participants) from various Anna University Affiliated colleges attended the programme. The Inauguration Program was conducted

at 9.30 am after the registration process is completed. The participants were given with a FDP Kit consisting of A Note book, Pen and a Bag. Dr.E.Kaliappan Prof. and HoD/EEE, and the Coordinator for the FDP welcomed the gathering and briefed the topics to be covered and the arrangements made for the FDP. **Dr.Balamurugan, Asst. Engineer, TANGEDCO, inaugurated the FDP in the presence of Principal, Head of the Department and the FDP Coordinator.**Dr.Balamurgugan inaugurated the FDP with a key note address on the Need for Electrical Machines in the Industries and also gave a special lecture session on the latest developments in the Special electrical machines and Drives. The Principal delivered the vote of thanks and thanked the Anna University for providing a chance to conduct the FDP in Easwari Engineering College.

Every day the FDP was conducted as given in the Programme schedule consisting of the external and Internal Participants. The Speakers for the FDP were from various Engineering Colleges in and around Chennai as given in the Program Schedule. Every day in the afternoon a Laboratory session was conducted to understand the Subject with practicals. Tutorial sessions were conducted for all the five units as given in the schedule. The speakers were given with certificates and Memento for delivering lecture session in the FDP

The programme was successfully completed as per the schedule, which was given to the participants prior to the commencement of the programme, without any changes. The participants expressed their complete satisfaction during the valedictory programme which was held from 4.00pm to 4.30pm. During the Valedictory programme feedbacks were collected in the formats given by Anna University. Ms. D.Chandrakala, Associate Professor/EEE, delivered the vote of thanks and thanked all the staffs for extending their support in organizing this FDP. The Programme ended with the National Anthem.

ELECTRONICS HOBBY CLUB

Electronics hobby club was started with a motive to encourage students to do projects and venture practical knowledge about the projects. This is a weekly club initiated by our HoD and this event will be conducted every week where the students can present their ideas. There will be a weekly challenge posted to the students where the interested people can find solutions for that challenge and present it in the upcoming events. This club was created to overcome the fear about projects among the students which encourages more projects and ideas.

OFFICE BEARERS

1. Shrivatsav. V. V. - IV B– President
2. Adhithyan. K. G - IV A– Secretary
3. Madhevan. P. R - III A– Project Head

FACULTY COORDINATOR

Mr. Vignesh. G – Asst. Professor / EEE

MEMBERS OF THE CLUB : 110*

MEMBERS MEETING: 29th December 2018

After the reopen, the members were called on to discuss the future progress of the Electronics Hobby Club for the next semester.

Electronics Hobby Club has also planned to be a part of the **awareness program** for public on **Energy Conservation** during the month of **February**.

Electronics Hobby Club has introduced **Members Badges** and **Certificates** to the participants.

Few project challenges were also posted to the students so as to motivate them in doing the project.



SECOND DISPLAY: 5th January 2019

The second project display of the club was conducted on 5th January 2018 with students presenting their ideas as a hardware. Some students presented solutions for the challenges posted last week.

Batch 1:LDR Module (II EEE)

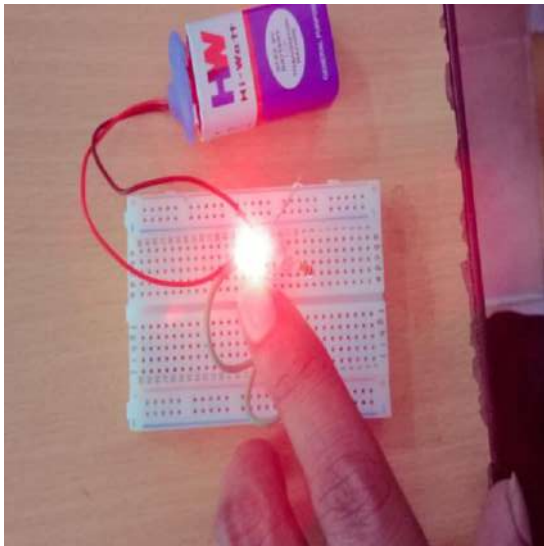
1. Kothandaraman
2. Harish
3. AkashHari

Batch 2: Potential Divider Circuit (II EEE)

1. Afrin
2. Ashwatha

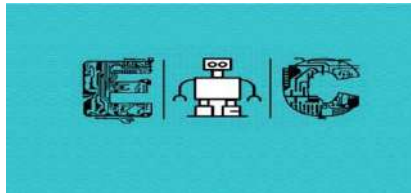
Presentation:

1. Ashwath Ram
2. Madhevan P.R
- 3.Vishal .P





Logo:



Inauguration & Third Display: 11th January 2019

The inauguration of the Hobby Club was held on 11th January 2019 with Vice Principal (Admin), Vice Principal (Academics), Dean (Academics) as the Guest of Honours along with HoD/EEE.

The office bearers were introduced and badges were given to both the office bearers and student members.

The student batches who participated in the last week's events were presented with the certificates issued by Vice Principal.

The Guest of Honours congratulated and wished the winners and also encouraged the students to participate in large. They also explained how the practical knowledge plays a vital role in an engineer's career.

It is to be noted that an Arduino was gifted to the Club for the students to work with.



THIRD DISPLAY:

Batch 1: Tesla coil

1. Pooja. R
2. RoshiniPriya. G
3. Vidhya Lakshmi

Batch 2: Line follower Robot

1. Sanjana. S
2. Shivani. A

Batch 3: Home automation using Bluetooth module

1. Vishal
2. Tejasri
3. Vignesh. V

Overview on Arduino programming (Presentation):19th January 2019

Madhevan. P. R of III year EEE, presented the overview on how to code with a Arduino so that the students can easily implement the use the kit for their projects. Students from II year and III year participated in the presentation.



Fourth display and Arduino programming presentation(continuation):

25th January 2019

Madhevan. P. R. continued up with the presentation on Arduino programming further more in detail.

Aswath Ram of III year presented a project on his own idea.


Fourth Display:


Aswath Ram-III year- Bluetooth based control of a servo

FACULTY ACHIVEMENTS

STAR – FACULTY OF THE DEPARTMENT

On Behalf of the Management, Principal, Vice Principals, head of the department and faculty members of the department we congratulate the Star faculty of the department.

S.No	Name of the faculty	Month	Designation	Photo
1.	Ms. D.CHANDRAKALA	Jan'19	Assoc. Prof	

2.	Ms. B.PONKARTHIKA	Dec'18	Asst. Prof	
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STAR – STUDENT OF THE DEPARTMENT

S.No	Name	Month	Register No.	Year/Sec	Photo
1.	ISHWARIYAA R	Jan'19	310618105024	I A sec	
2.	SUGAN T	Jan'19	310618105074	I B sec	
3.	MUKESH KUMAR R	Jan'19	310618105045	I B sec	
4.	BHARATHI KANNAN S S	Jan'19	310617105019	II A sec	

5.	SHIVANI A	Jan'19	310616105004	II B sec	
6.	S.ANIRUDH	Jan'19	310616105066	III A sec	
7.	RINI JOHN	Jan'19	310616105066	III B sec	
8.	MADHUMITHA MAHESHWARI S	Jan'19	310615105040	IV A sec	
9.	K.K SWETHA	Jan'19	310615105090	IV B sec	
10.	BHARATHI KANNAN S S	Dec'18	310617105019	II A sec	

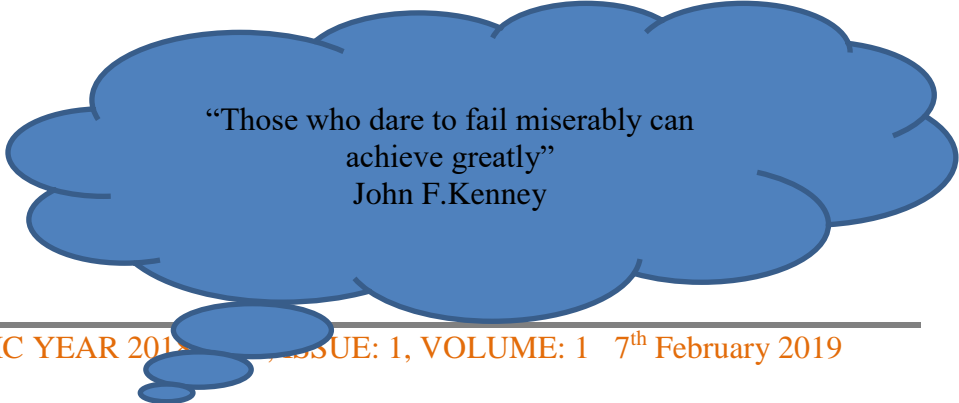
11.	SHIVANI A	Dec'18	310617105086	II B sec	
12.	R.APARNA	Dec'18	310616105005	III A sec	
13.	R.SWATHIKA	Dec'18	310616105083	III B sec	
14.	MADHUMITHA MAHESHWARI S	Dec'18	310615105040	IV A sec	
15.	V.V.SHRIVATSAV	Dec'18	310615105079	IV B sec	

PLACEMENT DETAILS:

On Behalf of the Management, Principal, Vice Principals, Head of the department and faculty members of the department we congratulate the below students of the Final year (2015-19 Batch) for getting placed. UG Students

S.No	Name of the students	Name of the company
1	MEENU BALIKA R	BYJUS LEARNING
2	P.SAPTHAGIRI	DATA PATTERNS
3	HARISH R	DEXTRASYS TECHNOLOGIES LTD.
4	NAVEEN KUMAR M	DEXTRASYS TECHNOLOGIES LTD.
5	HITHESH SANKARARAMAN.M	DEXTRASYS TECHNOLOGIES LTD.
6	ASWIN B Y	ECON SYSTEM
7	ASWIN B Y	EMBED UR SYSTEMS
8	MOULIESHWARAN R	EMBED UR SYSTEMS
9	THENMUGILAN E	INFOSYS
10	AISHWARYA SAI C N	L&T INFOTECH
11	ANISH PRASHANTH B	L&T INFOTECH
12	ARUN SUBBIAH M	L&T INFOTECH
13	DWARAKANATHAN S	L&T INFOTECH
14	MANI SHANKHAR V	L&T INFOTECH
15	MANOJ M	L&T INFOTECH
16	PRIYADHARSHINI K	L&T INFOTECH
17	VIGNESH M	L&T INFOTECH
18	PON NIROOBA V	MAINTEC TECHNOLOGY
19	SOWNDARYA K	MAINTEC TECHNOLOGY
20	AARRTHI S R	MPHASIS
21	NEELABALAN N	MPHASIS
22	PARVATHY G	MPHASIS
23	MADHUMITHA MAHESWARI S	SOSALEY TECHNOOGIES
24	ABINAYA R	SYRMA TECHNOLOGIES
25	MONICA B	SYRMA TECHNOLOGIES
26	PREETHI N	SYRMA TECHNOLOGIES
27	RAZIA APARNA R	SYRMA TECHNOLOGIES
28	SREEVARSHA U	SYRMA TECHNOLOGIES
29	AKKIL M B	TATA COMMUNICATIONS
30	BANUMATHI P	TATA COMMUNICATIONS
31	AMITHA S	TATAELXSI
32	ATSHAYA N	TATAELXSI
33	JANET J	TATAELXSI
34	POOJHA C	TATAELXSI
35	ADHITHYAN K G	TCS
36	EZHILMATHY J R	TCS
37	IBRAHIM PARVEZ T	TCS
38	JAYASURYA I	TCS
39	KEERTHANA V	TCS
40	KIRAN CHANDER R	TCS
41	KRISHNANANDANA U	TCS
42	PRARTHANA PILLAI	TCS
43	PRIYANKA S	TCS
44	RAGAVI E	TCS

45	RAJALAKSHMI A	TCS
46	RAJ GANESH N S	TCS
47	P.SAPTHAGIRI	TCS
48	SELVADURAI K	TCS
49	SHIVANI T	TCS
50	SHRIVATSAV V V	TCS
51	SHRUTHI T	TCS
52	SOWMIYA S	TCS
53	SujithGopi	TCS
54	SWETHA K K	TCS
55	VIJAYA VIGNESH S	TCS
56	VISALAKSHI ABIRAMI M	TCS
57	Dinesh Kumar.T	WINDCARE ENERGY
58	SUMAN.S	WINDCARE ENERGY
59	J.THIRUPAL	WINDCARE ENERGY
60	HARINI GIRIDHAR	WIPRO
61	NISHANTH P	WIPRO



“Those who dare to fail miserably can
achieve greatly”
John F.Kenney

EXTRA CURRICULAR ACTIVITIES- SPORTS

SL.NO	NAME OF THE STUDENTS	YEAR	EVENT	VENUE	PRIZE
1	SOWMIYA S	IV B	AADUKALAM '18 THROW BALL	EEC	2ND PRIZE
2	MADHANKUMAR R	IV A	VOLLEY BALL VELS TROPHY	EEC	3RD PRIZE
3	RAGHAV E	III B	AADUKALAM '18 FOOTBALL	EEC	PARTICIPATE
4	SUKUMARAN M	III B	AADUKALAM '18 KABADI	EEC	3RD PRIZE
5	VARUN SEKAR V G	III B	AADUKALAM '18 KOKO	EEC	3RD PRIZE
6	VENKATESH R	III B	AADUKALAM '18 KABADI	EEC	3RD PRIZE
7	MOHAN M	III B	AADUKALAM '18 KABADI	EEC	3RD PRIZE
8	ABDULLAH YASIR S	II A	AADUKALAM '18 CARROM BOARD	EEC	1 ST PRZE
9	ABDULLAH YASIR S	II A	AADUKALAM '18 BADMINTON	EEC	PARTICIPATED
10	AKSHARA N	II A	AADUKALAM '18 BADMINTON	EEC	PARTICIPATED
11	AKSHARA N	II A	AADUKALAM '18 DISC THROW	EEC	3RD PRIZE
12	AKSHARA N	II A	AADUKALAM '18 THROW BALL	EEC	2 ND PRIZE
13	BALAMURALI KRISHNAN P	II A	AADUKALAM '18 KOKO	EEC	PARTICIPATED
14	BALAMURALI KRISHNAN P	II A	AADUKALAM '18 200 M	EEC	PARTICIPATED
15	BALAMURALI KRISHNAN P	II A	AADUKALAM '18 VOLLEY BALL	EEC	3 RD PRIZE

16	CLINTON K	II A	AADUKALAM '18 VOLLEY BALL	EEC	3 RD PRIZE
17	FAIZUL RAHMAN A R	II A	AADUKALAM '18 VOLLEY BALL	EEC	3 RD PRIZE
18	HARIHARAN M	II A	AADUKALAM '18 VOLLEY BALL	EEC	3 RD PRIZE
19	HARISH R	II A	AADUKALAM '18 100 M	EEC	PARTICIPATED
20	HARISH R	II A	AADUKALAM '18 KOKO	EEC	PARTICIPATED

EXTRA CURRICULAR ACTIVITIES

CULTURALS

SL.NO	NAME OF THE STUDENTS	YEAR	EVENT	VENUE	PRIZE
1	POOJHA C	IV B	DANCE TALENTZIA '18	EEC	3RD PRIZE
2	SOWMIYA S	IV B	DANCE TALENTZIA '18	EEC	3RD PRIZE
3	SOWNDARYA K	IV B	DANCE TALENTZIA '18	EEC	3RD PRIZE
4	SUJITH GOPI K	IV B	DANCE TALENTZIA '18	EEC	3RD PRIZE
5	RAGHAV E	III B	GITAR TALENTZIA '18	EEC	3RD PRIZE
6	SUKUMARAN M	III B	VARIETY DANCE TALENTZIA '18	EEC	3RD PRIZE
7	VARUN SEKAR V G	III B	VARIETY DANCE TALENTZIA '18	EEC	3RD PRIZE
8	VENKATESH R	III B	VARIETY DANCE TALENTZIA '18	EEC	3RD PRIZE
9	MOHAN M	III B	DANCE TALENTZIA '18	EEC	3RD PRIZE

10	RAVI R	II B	MUSICAL DANCE TALENZTIA '18	EEC	3RD PRIZE
11	SHIVANI A	II B	DANCE TALENZTIA '18	EEC	3RD PRIZE
12	TEJASRI B	II B	MUSICAL DANCE TALENZTIA '18	EEC	3RD PRIZE
13	VIGNESH V	II B	MUSICAL DANCE TALENZTIA '18	EEC	3RD PRIZE
14	CHANDRU G	II A	DANCE TALENZTIA '18	EEC	3RD PRIZE
15	INDUJA U	II A	DANCE TALENZTIA '18	EEC	3RD PRIZE
16	INDUJA U	II A	DANCE INSTINCTS '18	SSN	3RD PRIZE
17	Monish V	III A	NATIONAL LEVEL KHO-KHO	PUNJAB	1ST PRIZE
18	Varun Shankar	IIIA	NATIONAL LEVEL KHO-KHO	PUNJAB	PARTICIPATED

CO CURRICULAR ACTIVITIES

SL.NO	NAME OF THE STUDENTS	Year /Sem/Se c	EVENT	Organized By	PRIZE
1	ADITHYA P	II A	IET PAPER PRESENTATION	EEC	PARTICIPATED
2	KOTHANDARA MAN P	II A	IET PAPER PRESENTATION	EEC	PARTICIPATED
3	AKASH HARI B	II A	IET PAPER PRESENTATION	EEC	PARTICIPATED
4	AKASH HARI B	II A	PAPER PRESENTATION VRONTIX'18	SAIRAM ENGG COLLEGE	PARTICIPATED
6	PRASHANTH M	III B	WORKSHOP ON EMBEDDED SYSTEMS	IIT MADRAS	PARTICIPATED
7	PAVITHRA R K	III B	WORKSHOP ON EMBEDDED SYSTEMS	IIT MADRAS	PARTICIPATED

8	VARUN SEKAR V G	III B	WORKSHOP ON ARDUINO - MATLAB PROGHRAMMING	CENTER FOR TOTLIZATION & COMPUTING, RAMAPURAM	PARTICIPATED
SL.NO	NAME OF THE STUDENTS	Year /Sem/Se c	EVENT	Organized By	PRIZE
9	KOTHANDARA MAN P	II A	PAPER PRESENTATION VRONTIX'18	SAIRAM ENGG COLLEGE	PARTICIPATED
12	KISHORE M	II A	QUIZ VRONTIX'18	SAIRAM ENGG COLLEGE	PARTICIPATED
13	AKASH HARI B	II A	QUIZ VRONTIX'18	SAIRAM ENGG COLLEGE	PARTICIPATED
14	KISHORE M	II A	ENERGY CLUB	EEC	4 TH PRIZE
15	AKASH HARI B	II A	ENERGY CLUB	EEC	4 TH PRIZE
16	KISHORE M	II A	BATTLE OF BRAINS VRONTIX'18	SAIRAM ENGG COLLEGE	PARTICIPATED
17	AKASH HARI B	II A	BATTLE OF BRAINS VRONTIX'18	SAIRAM ENGG COLLEGE	PARTICIPATED
18	ASHWATHA M	II A	SCHNIEDER GO GREEN IN THE CITY	ONLINE EVENT	PARTICIPATED
19	KISHORE KUMAR	III A	ROTARACT CLUB	EEC	PARTICIPATED
20	RAGHU RAM B	II B	WORKSHOP - VIT CHENNAI	VIT, Chennai	PARTICIPATED
21	PREMSHANKA R	II B	IET SPONSORED WORKSHOP ON HYBRID ELECTRIC VECHILES	TOP ENGINEERS, EGMORE	PARTICIPATED

22	MUBURQA K RAJA	II B	IET SPONSORED WORKSHOP ON HYBRID ELECTRIC VECHILES	TOP ENGINEERS, EGMORE	PARTICIPATED
23	SIVANESAN	II B	IET SPONSORED WORKSHOP ON HYBRID ELECTRIC VECHILES	TOP ENGINEERS, EGMORE	PARTICIPATED
SL.NO	NAME OF THE STUDENTS	Year /Sem/Se c	EVENT	Organized By	PRIZE
24	SREERAM M	II B	IET SPONSORED WORKSHOP ON HYBRID ELECTRIC VECHILES	TOP ENGINEERS, EGMORE	PARTICIPATED
25	SANTHOSE C	II B	IET SPONSORED WORKSHOP ON HYBRID ELECTRIC VECHILES	TOP ENGINEERS, EGMORE	PARTICIPATED
26	SWETHA S	III B	WORKSHOP ON IOT USING ARDUINO	EEC	PARTICIPATED
27	N YASHIKA	III B	WORKSHOP ON IOT USING ARDUINO	EEC	PARTICIPATED
28	M. RITHU PRIYANKA	III B	WORKSHOP ON IOT USING ARDUINO	EEC	PARTICIPATED
29	ASWATH	III A	WORKSHOP ON IOT USING ARDUINO	EEC	PARTICIPATED
30	RAVEENA	II B	WORKSHOP ON IOT USING ARDUINO	EEC	PARTICIPATED
31	YUVASHRI N	II B	WORKSHOP ON IOT USING ARDUINO	EEC	PARTICIPATED
32	SHIVANI	II B	WORKSHOP ON IOT USING ARDUINO	EEC	PARTICIPATED
33	ROSHINI PRIYA	II B	WORKSHOP ON IOT USING ARDUINO	EEC	PARTICIPATED

TECHNOLOGY INNOVATIONS

Graphene:

As electrical engineers reach the performance constraints caused by the fundamental properties of matter, advances in materials science become essential. Graphene is perhaps the most important recent innovation. Graphene consists of a single layer of carbon atoms one million times thinner than paper. It'ssothinthatitisactuallyconsideredt two-dimensional.

Graphene's unique characteristics make it the strongest known material on Earth. It can stretch by 20%,

making it as pliable as rubber. It will provide immense gains in battery life for portable devices and is uniquely well-suited for wearable technology that collects biometric information from the user. In short, it may be essential to the future of electrical engineering.

How graphene is made

The quality of graphene plays a crucial role as the presence of defects, impurities, grain boundaries, multiple domains, structural disorders, wrinkles in the graphene sheet can have an adverse effect on its electronic and optical properties.

In electronic applications, the major bottleneck is the requirement of large size samples, which is possible only in the case of CVD process, but it is difficult to produce high quality and single crystalline graphene thin films possessing very high electrical and thermal conductivities along with excellent optical transparency.

Another issue of concern in the synthesis of graphene by conventional methods involves the use of toxic chemicals and these methods usually result in the generation hazardous waste and poisonous gases. Therefore, there is a need to develop green methods to produce graphene by following environmentally friendly approaches.

The preparation methods for graphene should also allow for *in situ* fabrication and integration of graphene-based devices with complex architecture that would enable eliminating the multi step and laborious fabrication methods at a lower production cost (read more: "[Mass production of high quality graphene: An analysis of worldwide patents](#)").

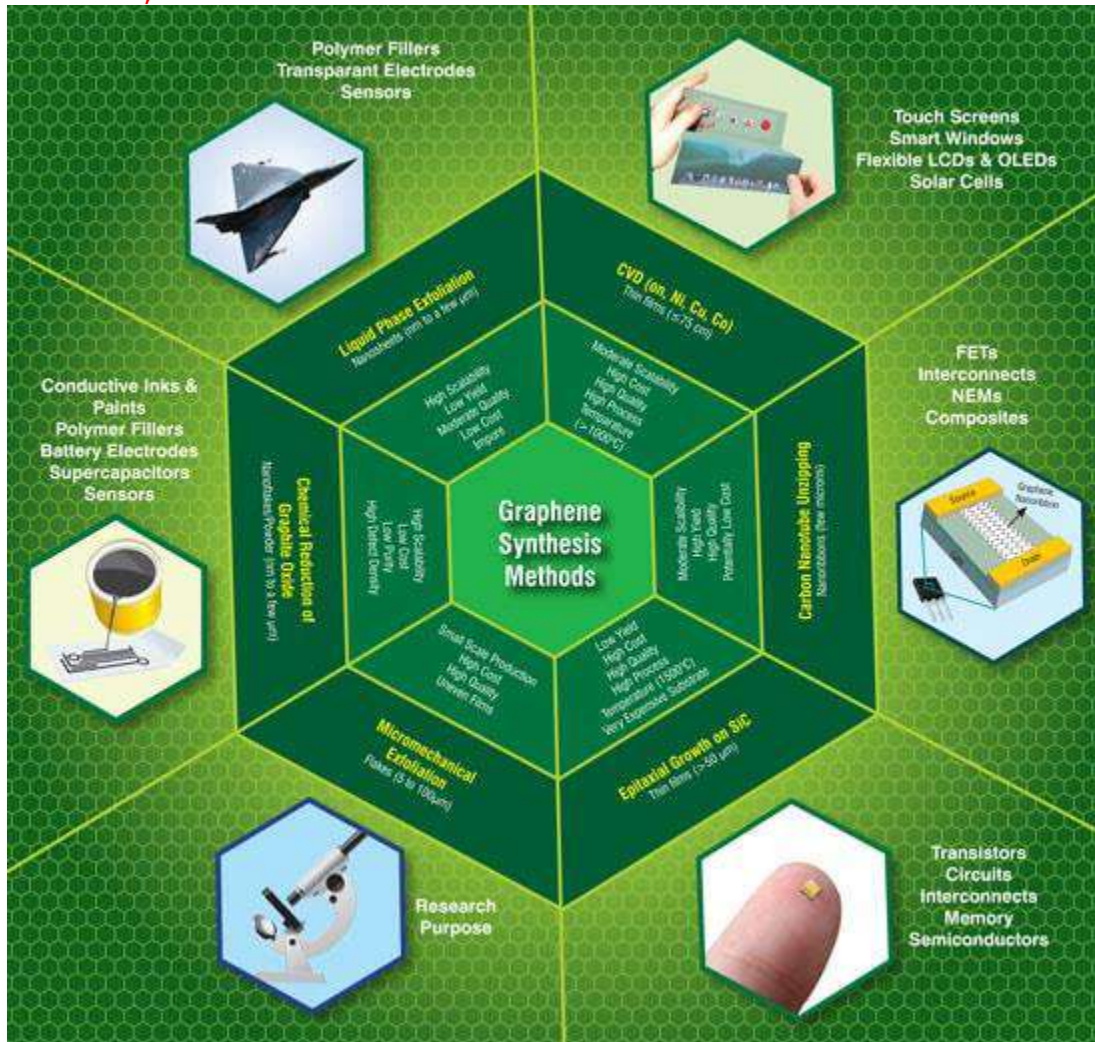
Currently, the most common techniques available for the production of graphene are shown schematically below, which includes micromechanical cleavage, chemical vapor deposition, epitaxial growth on SiC substrates, chemical reduction of exfoliated graphene oxide, liquid phase exfoliation (LPE) of graphite and unzipping of carbon nanotubes.

However, each of these methods can have its own advantages as well as limitations depending on its target application(s). In order to surmount these barriers in commercializing graphene, concerted efforts are being made by researchers at various R&D institutes, universities and companies from all over the globe to develop new methods for large scale production of low-cost and high quality graphene via simple and eco-friendly approaches.

Already, researchers have managed to produce large, single-crystal-like [graphene films more than a foot long](#) on virtually any flat surface – a step towards commercialization.

However – a big word of caution here: The global graphene production appears to suffer from serious quality issues and it appears that there is almost no high quality graphene, as defined by ISO, in the market yet

“It is hard to fail, but it is worse never to have tried to succeed.”-Theodore Roosevelt



A schematic showing the conventional methods commonly used for the synthesis of graphene along with their key features, and the current and future applications. (Image: CKMNT) (click image to enlarge)

Graphene properties:

Electronic properties

One of the reasons [nanotechnology](#) researchers working towards molecular electronics are so excited about graphene is its electronic properties – it is one of the best electrical conductors on Earth. The unique atomic arrangement of the carbon atoms in graphene allows its electrons to easily travel at extremely high velocity without the significant chance of scattering, saving precious energy typically lost in other conductors.

Scientists have found that graphene remains capable of conducting electricity even at the limit of nominally zero carrier concentration because the electrons don't seem to slow down or localize. The

electrons moving around carbon atoms interact with the periodic potential of graphene's honeycomb lattice, which gives rise to new quasiparticles that have lost their mass, or *rest mass* (so-called *massless Dirac fermions*). That means that graphene never stops conducting. It was also found that they travel far faster than electrons in other semiconductors.

Graphene uses and applications

Energy storage and solar cells

Graphene-based nanomaterials have many promising applications in [energy-related areas](#). Just some recent examples: Graphene [improves both energy capacity and charge rate](#) in rechargeable batteries; activated graphene makes [superior supercapacitors for energy storage](#); graphene electrodes may lead to a [promising approach for making solar cells](#) that are inexpensive, lightweight and flexible; and multifunctional graphene mats are [promising substrates for catalytic systems](#).

These examples highlight the four major energy-related areas where graphene will have an impact: solar cells, supercapacitors, [graphene batteries](#), and catalysis for fuel cells.

Due to their excellent electron-transport properties and extremely high carrier mobility, graphene and other other direct bandgap monolayer materials such as transition-metal dichalcogenides (TMDCs) and black phosphorus show great potential to be used for low-cost, flexible, and highly efficient photovoltaic devices. They are the most promising materials for [advanced solar cells](#).

An excellent review paper ("[Chemical Approaches toward Graphene-Based Nanomaterials and their Applications in Energy-Related Areas](#)") gives a brief overview of the recent research concerning chemical and thermal approaches toward the production of well-defined graphene-based nanomaterials and their applications in energy-related areas.

The authors note, however, that before graphene-based nanomaterials and devices find widespread commercial use, two important problems have to be solved: one is the preparation of graphene-based nanomaterials with well-defined structures, and the other is the controllable fabrication of these materials into functional devices.

ART GALLERY



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