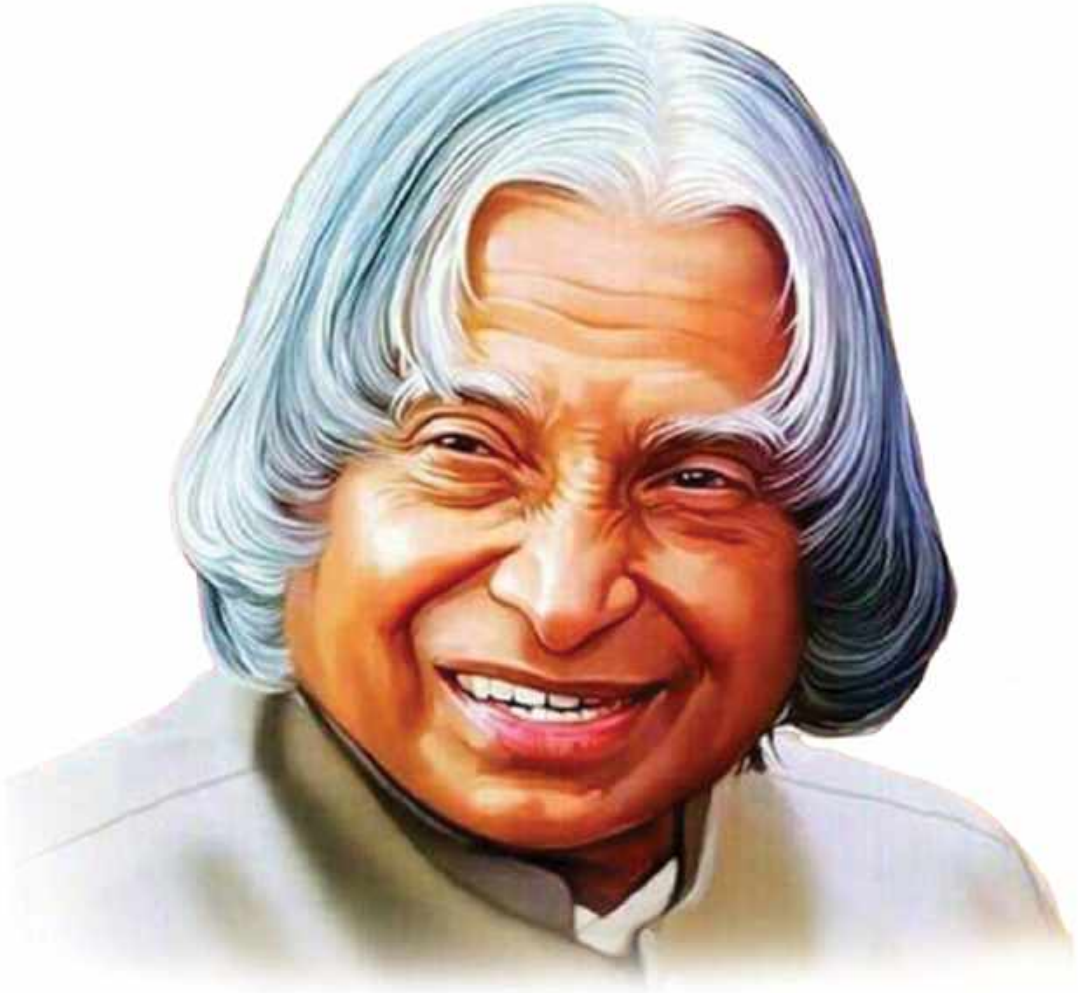
MARIAN ENGINEERING COLLEGE

Meraki

THE SOUL OF CREATIVITY

COLLEGE SENATE 2019-20



"LIFE and TIME are the world's best Teachers.
Life teaches us to make good use of TIME and
TIME teaches us the value of LIFE"

Dr. A. P. J. Abdul Kalam

സമർപ്പണം

ഇന്നിത്.....മഹാമാരിയുടെ...വിളയാട്ടഭൂമി.....
ഭൂമി അടക്കിവാണ ഞാനെന്ന യജമാനനോളം
വരില്ല ആരും എന്ന മനുഷ്യന്റെ അഹങ്കാര ചിന്ത,
കേവലമൊരു അണുവിനാൽ തകർത്തെറിയപ്പെട്ട
കാലം.....
അണുവോളം വരുമോ അണുബോംബ് എന്ന്
മാനവനെ ചിന്തിപ്പിച്ച...
കൊവിഡ് കാലം...
മഹാമാരിയുടെ വിഷമേഘം ഒഴിഞ്ഞ്
ശുഭസുന്ദരമായ ചക്രവാളത്തിനായി നമുക്ക്
അണിചേരാം...
കരുത്തോടെ....കരുതലോടെ.....
കൊവിഡിന്റെ കരിനിഴലിനാൽ വെളിച്ചം
മൂടപ്പെട്ടവർക്കും.....
അകാലത്തിൽ പൊലിഞ്ഞുപോയവർക്കുമായി
'മെറാക്കി' എന്ന ഈ ഓർമ്മ പുസ്തകം
സമർപ്പിക്കുന്നു.....

Magazine Editor
Gokul V. S
S6 Mechanical, MEC

Staff Editors
Ms. Sini S. S
Asst. Professor,
Dept. of Basic Science

Ms. Sowmya K.P
Asst. Professor,
Dept. of Basic Science

Magazine Designing/Copy Editor
Abhinanth J
Chairman, College Union 2019-20 MEC

Art Editor
Manjunathan Potty
Arts Secretary, College Union 2019-20 MEC

Front Cover Design
Al-Shifan S. H
S6, Computer Science, MEC

DTP Malayalam
Suneeda J
Well-Print DTP Centre Pothencode

AT A GLANCE

അകം താളുകൾക്ക് പറയാനുള്ളത്...

സന്ദേശം

പിണറായി വിജയൻ
മുഖ്യമന്ത്രി

സെക്രട്ടേറിയറ്റ്
തിരുവനന്തപുരം
20 – 08 – 2020

നം. 1005 / പ്രസ് / സി.എം.ഒ / 2020

കഴക്കൂട്ടം മരിയൻ എഞ്ചിനീയറിംഗ് കോളേജിലെ 2019 – 20 കോളേജ് യൂണിയൻ ഒരു സുവനീർ പ്രസിദ്ധീകരിക്കുന്നു എന്നറിഞ്ഞതിൽ സന്തോഷം. സുവനീറിന് എല്ലാവിധ ഭാവുകങ്ങളും നേരുന്നു.

സ്നേഹപൂർവ്വം

പിണറായി വിജയൻ

Break the chain

സന്ദേശം

കടകംപള്ളി സുരേന്ദ്രൻ
സഹകരണം ടൂറിസം
ദേവസ്വം വകുപ്പ് മന്ത്രി

തിരുവനന്തപുരം
20 – 08 – 2020

നം. 111 / 2020 / എം (സഹകരണം – ടൂറിസം – ദേവസ്വം)

കഴക്കൂട്ടം മരിയൻ എഞ്ചിനീയറിംഗ് കോളേജിലെ 2019 – 20 സ്റ്റുഡന്റ്സ് യൂണിയൻ മാഗസിനായ 'മെറാക്കി' – ക്ക് എന്റെ ആശംസകൾ. ഈ മാഗസിന് പിന്നിലെ എല്ലാ പ്രിയ സുഹൃത്തുകൾക്കും കോളേജിനും എല്ലാവിധ ഭാവുകങ്ങളും നേരുന്നു.

സ്നേഹപൂർവ്വം

കടകംപള്ളി സുരേന്ദ്രൻ

Break the chain

MESSAGE

Loknath Behera
DIRECTOR GENERAL OF POLICE &
STATE POLICE CHIEF, KERALA

Police Head Quarters
Thiruvananthapuram
Kerala
24-08-2020

I am happy to know that Marian Engineering College, Kazhakuttom, Thiruvananthapuram, has put forth a platform to showcase creativity in these trying times with the help of "MERAKI", the college magazine. I am sure that this venture would instill inspiration and motivation to all its readers.

I believe this Magazine would turn out to be a precious document that would preserve the creative talents and vision of the academics/students.

I would like to wish the very best for all those who are behind this endeavor.

(Loknath Behera)

Break the chain

സന്ദേശം

ഭരത് സുരാജ് വെഞ്ഞാറമൂട്
പ്രശസ്ത സിനിമാതാരം

തിരുവനന്തപുരം
22 – 08 – 2020

തിരുവനന്തപുരം കഴക്കൂട്ടം മരിയൻ എഞ്ചിനീയറിംഗ് കോളേജിലെ 2019 – 20 വിദ്യാർത്ഥി യൂണിയൻ ഒരു കോളേജ് മാഗസിൻ പ്രസിദ്ധീകരിക്കുന്നു എന്നറിഞ്ഞതിൽ അതിയായ സന്തോഷമുണ്ട്. ഇതേ കോളേജിലെ 2020 വർഷത്തെ 'തേജസ്വി' എന്ന ആഘോഷ പരിപാടിയിൽ പങ്കെടുക്കാൻ എന്നെ ക്ഷണിച്ചതിൽ ചാരിതാർത്ഥ്യമുണ്ട്. എന്നാൽ കോവിഡ് – 19 മഹാമാരി കാരണം തടസ്സപ്പെട്ട ഈ പരിപാടി വരും വർഷങ്ങളിൽ ഏറെ ഊർജ്ജസ്വലതയോടെ നടത്താൻ കഴിയട്ടെ എന്നാശംസിക്കുന്നു. കോളേജിലെ 2019 – 20 സ്റ്റുഡന്റ്സ് യൂണിയനും , വിദ്യാർത്ഥികൾക്കും , അധ്യാപക – മാനേജ്മെന്റ് സുഹൃത്തുക്കൾക്കും എന്റെ എല്ലാവിധ ഭാവുകങ്ങളും നേരുന്നു.

സ്നേഹപൂർവ്വം

സുരാജ് വെഞ്ഞാറമൂട്

Break the chain

MESSAGE

Rev. Fr. Msgr. Wilfred E
Manager

Dear All ,

I am very happy that Marian Engineering College is bringing out an annual to present the yearly review of college events and estimably project the annual progress of our college to the society.It also manifest the noval ideas and views of our staff and students on technology and other subjects from their class room and social experiences.

Congratulating the Magazine team and contributors I wish the best for all.

Rev. Fr. Msgr. Wilfred E

MESSAGE

Rev. Fr. Sudheesh. A
Bursar

I am extremely glad to know that Marian Engineering College is coming up with the new edition of our in-house magazine. Marian Engineering College has always been remarkable in its approach to education and in its pedagogies. The steps and initiatives taken by the college management, the outstanding contribution of the faculty and the positive response and enthusiastic participation of my dear students in the recent college activities opened the way for creative ideas and thinking. The wide range of articles in various sections of the magazine proves that the Marianites possess creative potential and innovative thinking in abundance.

I congratulate all the contributors and specially the editorial board for the commendable job in planning, and for taking up the responsibility for the arduous task most effectively.

I take hold of this opportunity to bid a warm adieu to the outgoing batches of students on their successful journey at this campus. I pray wherever our students are placed shall work with atmost passion, sincerity and dedication. I hope that this literary work shall not only enlarge the taste for reading but also develop a sense of belonging to the college as well.

I wish all the very best in your efforts and upcoming ventures.

Rev. Fr. Sudheesh. A

MESSAGE

Prof. Tomy Michael
Director

Meraki our College Magazine kindles the imagination of our learners. I congratulate the staff and students of all faculties who used various mediums of expression to present their ideas. As long as our ideas are expressed and thoughts kindled we can be sure of learning, as everything begins with an idea.

I appreciate every student who shared the joy of participation in co-curricular and extracurricular activities along with their commitment to curriculum. That little extra we do, is the icing on the cake. 'Do more than belong – participate. Do more than care – help. Do more than believe – practice. Do more than be fair – be kind. Do more than forgive – forget. Do more than dream – work.'

Prof. Tomy Michael

MESSAGE

Dr. Ruby Abraham
Principal

Our education system faces a number of constraints and challenges—quality research is one of them. Barring few prestigious institutes, most display a dismal picture in terms of quality and quantity research. Universities across the country are part of the urgent effort to research the virus SARS-CoV-2 and the disease it causes, COVID-19. Globally, the virus has infected nearly thirty lakh people and resulted in over two lakh deaths. Researchers across the University of Oxford are at the forefront of global efforts to understand the coronavirus and protect our communities. This is an example of how Universities and Institutions should work for the society. It is high time for us also to think of converting Institutions to Research centres.

I am quite pleased to learn about the forthcoming issue of the college magazine, 'MERAKI' No doubt this creative endeavour will bring out an array of artistic and scientific expressions with distinct individual signatures. I do appreciate and applaud the editorial team for their successful completion of this tedious task of putting together the myriad thoughts and dreams of our students and faculty into a meaningful and delightful visual fest, which in itself is an achievement considering the effort and time required. Dear students, you can change the world.

Never Give-up, Today is Hard
Tomorrow may be Worse
But Day after Tomorrow will be sunshine.

Dr. RUBY ABRAHAM

STAFF - EDITOR MESSAGE

Ms. Sini S. S
Asst. Professor,
Dept: of Basic Science

The days when the tenderness of love,the emptiness of frustration,the shouts of joy and the silence of woes shrinks to the emotion of fear.....;something of a still ground breaking expectation....

The days when there is no playground laughs .....there is no bell ringing sound.....classroom shrinks to a monitor ..,the arc of memories have something of a still ground breaking expectation...

Yes!!! "**മെറാക്കി**"

വിജയിച്ചവന്റെ മൂല്യബോധത്തിൽ നിന്നും പരാജയപ്പെട്ടവന്റെ തത്വചിന്തകളിലേയ്ക്കുള്ള മടങ്ങി പോക്കിൽ ബാക്കിയായ എന്തോ ഒന്ന്.....

The ground breaking expectation.....

STAFF - EDITOR

Ms. Sowmya K. P
Asst. Professor,
Dept: of Basic Science

Thy guide the move where thoughts and hands append in designing the creative investiture of concerted aspirations. A strenuous team work only can effectively grease an endeavour for glorious accomplishiment.Today the mankind is in an arduous path.But we can't tire out.Our resurrection would be history. Miracles may happen in tough times as"Meraki" now became a reality on our collective effort.

Formalistic gratitude with in our family is embarrassing. But efforts and hard work should always be admired. So perceive it to be our obligation we are pleased to thank and acknowledge each and everyone who stood by our side to make our retrospection into solidity. Thank you all..

"No night is eternal as the fos of theos is not far.."

MESSAGE

Gokul V S
Magazine Editor
S6 M2

It is a great privilege and pleasure for me to be a part of the college magazine 2020 MERAKI. Meraki which directly translates to ' doing something from the soul' taken from the classical Greek used by the pioneers of literature such as Homer and Sophocles is a deliberate and humble attempt at sparking the artistry, inventiveness and creativity of the students, facilitated by an extensive number of support from both the faculty and the students alike, overcoming hurdles even wider. The conceptualisation of the idea behind Meraki's birth aroused out of an astute resolution by a handful of free thinkers whose primary intent was to transcend the notions of academia as we know it and stroll into a more holistic and inclusive realm of learning which encompasses the diverse assortment of talents present in our institution, encouraging each individual to embark on a creative pursuit all the while giving a stage for their voices.

We hope to make it a cooler, more inviting and well-known medium where creativity can thrive and students are eager to read and contribute. To everyone who wrote an article for the magazine, thank you for taking the time to contribute and entertain so many others with your insight and experiences.

I thank all faculty members, and the students for their contribution in successful publication of the magazine.To all the readers, we hope you enjoy this magazine and that some of you fell inspired to contribute to next.

Gokul V S

Condolences

George Pancgracious
Lab Instructor, E E E

Murukan N
Driver

Aromal S R
Student, E C E

"Remembering their wonderful and gentle soul will forever remain in our hearts. May them rest in peace!"

Tony Vimalan
Student, M E

Bobby Tom
Student, C E

ADVISORY BOARD

Rev. Fr. Msgr. Wilfred E
Manager

Rev. Fr. Sudheesh A
Bursar

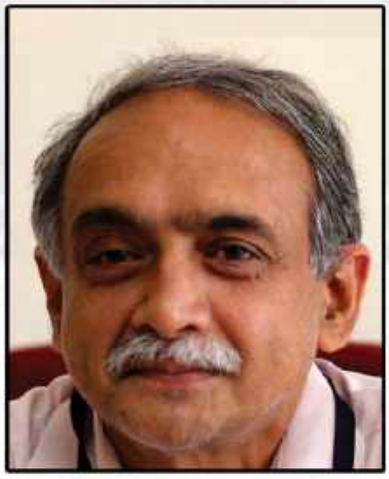
Prof. Tomy Michael
Director

Dr. Ruby Abraham
Principal

Dr. Sabu K
H O D, Dept of M E

Dr. Vijayalekshmy S
H O D, Dept of E E E

Dr. P Jayaprakash
H O D, Dept of C S E



Dr. Narayanan S
H O D, Dept of C E

Prof. Vinitha B Elza
H O D, Dept of E C E

COLLEGE SENATE 2019-20

Prof. AMJITH L. R
Senate Co-ordinator
M E

HITESH A. H
SPORTS SECRETARY
E C E

LEKSHMI GOPINATH
CHAIRPERSON
E E E

ABHINANTH. J
CHAIRMAN
M E

GOKUL RAJ. R
GEN: SECRETARY
C S E

MANJUNATHAN POTTY
ARTS SECRETARY
C E

DEPARTMENT REPRESENTATIVES

NIHITHA
E C E

ANISH A. KUMAR
E E E

NEBIN MAHESH
M E

VIPIN RAJ
C S E

ASWIN CHAND
C E

SUB EDITORS


SRUTHI SAVITHRI VIJAYAKUMAR
MARVIN CLEMENT
ANGELA SAJI
GAYATHRI DEVAN B
NAVEEN
AL SHIFAN
ANOOPA D. S


VIVEK MANGALASSERIYIL
AJINA. A
TRIPTI S.MOHAN
ABBINSTON ROX MICHAEL
SHENI NEVIL
SHINCY
AARCHA M. S

EDITORIAL BOARD



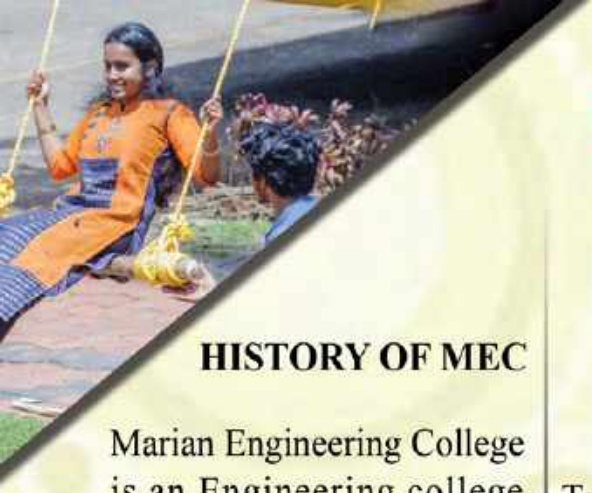
ANNUAL REPORT 2020

BY

Abhinanth J

CHAIRMAN

S8 MECHANICAL



THE STORY SO FAR

HISTORY OF MEC

Marian Engineering College is an Engineering college situated in Trivandrum, India. The college was established in 2001, and is affiliated to University of Kerala and Kerala Technological University. And the college is managed by the Trivandrum Social Service Society under the Trivandrum Latin Catholic Archdiocese.

The college is a pioneer institute for engineering studies in Kerala among the Self Financing colleges. It facilitates the growth of 5 different branches of engineering such as Computer Science, Civil, Mechanical, Electronics and Communication and Electrical Engineering and also basic sciences such as Maths, Physics, Chemistry and Humanities.

VISION OF MEC

To be an institution offering quality technical education and promoting research with strong ethical values for public good.

MISSION OF MEC

To mould the young men and women into technologically up to date, socially conscious and morally sound individuals by providing an inspiring environment of learning for the welfare of the society.

The institute puts a substantial amount of effort towards aiding in spreading knowledge and providing an opportunity to every student who enrolled, to learn everything they need to know about the stream that they've chosen to complete their degree in. Expanding their point of view in the process, and to empower and train them to see the world as how engineers of the modern society should.

SENATE REPORT FOR 2019-2020

The College Union is a student elected board of members that consist of the College Chairman, Chairperson, General Secretary, Arts Secretary, Sports Secretary.

The Senate election for 2019-20 was held on 16 August 2019 and revealed the following results: **Abhinanth J** from **ME** dept as the **College Chairman, LekshmiGopinath** from the **EEE** department as the **College Chairperson, Gokul Raj** from **CSE** department as **General Secretary, Manjunathan Potty** from the **CE** dept as the **Arts Secretary, Hitesh A.H** from the **ECE** dept as the **Sports Secretary**, **Gokul V S** from the **ME** dept as **Magazine Editor.**

THE STORY SO FAR

SENATE REPORT FOR 2019-2020

All activities brought forth by the college union were under the mindful guidance and positive influence of the Senate Coordinator Prof. Amjith L.R from the ME department. This year's activities also began with much enthusiasm as usual. The positivity or the optimism is likely to extend well beyond this one year of office.

The IEEE PES student Branch Chapter and VIDYUTH 2019 inauguration was held on 22 August 2019 Trivandrum. It is a platform for sharing the latest technological developments in the electric power industry, educating members of the industry and the general public and developing standards that guide the development and construction of equipment and systems led by professional leaders who have expert knowledge in this field.

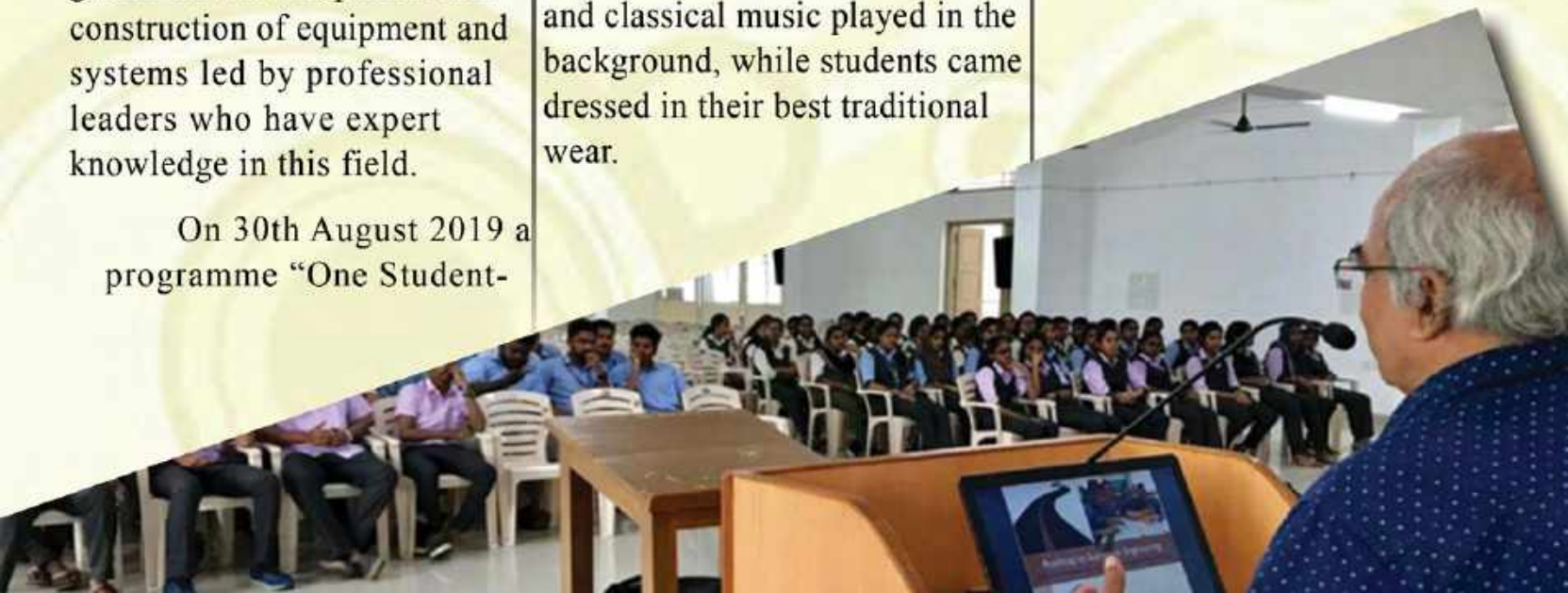
On 30th August 2019 a programme "One Student-One Tree" was organized by the Bhoo Mitra Sena Club to expose students to a sense of larger purpose and self-exploration. About 30 to35 trees were planted as part of the programme.

On the same day Shri.P.Prakash (IPS) did the honour of inaugurating the Student welfare committee for the academic year 2019-20 . He also gave students an insight on how to become successful in civil service exams.

Onam was celebrated with all its vigor at Marian campus on 7th September 2019.
The Students got a close look onto Kerala and its tradition, culture, food and clothing. Onam, all of us now know is a festival of children on swings 'Pookalam' on floor. The lobby was decorated with pookalam (a traditional flower arrangement) and classical music played in the background, while students came dressed in their best traditional wear.

Marian Association of Growing Mechanical Aspirants (MAGMA) was inaugurated on 5th November 2019 by Mr. C. R. Thomas, Former Deputy Director, VSSC, Thiruvananthapuram. It aims to impart a strong foundation in Mechanical Engineering through novel teaching and learning methods nurture skills and talents for innovative research to serve the needs of society with integrity.

IEEE Student Branch conducted its flagship event ENIGMA 3.0 from 8th to 10th November 2019 at Marian Engineering College. The event was inaugurated by Rina Vivekanandan, Managing Dirtector Solastra Global P Ltd. Students from different college as well as from our college attended the 3-day event.



THE STORY SO FAR

SENATE REPORT FOR 2019-2020

Annual Sports Day Celebration which was conducted on the 15th and 16th November 2019. Students came in the best of spirits, completely prepared to cheer and support all the athletes, and they were trained tediously for those days.

Sports and games events consisted of a total of 40 events with 2 referees to oversee the events. They ranged from race-walking, running to discus throw, all of which had everyone watching anxiously and at the end of their seats.

QURIO-19 was a collective initiative of college and senate conducted on26th November, 2019.Students from over 40 schools attended the event QURIO focused mainly on giving an opportunity to these high school students in learning a little bit more about engineering and the different branches of it. About 20 events including games and interactive sessions were arranged by various student clubs to entertain and engage the students during their visit.

A session on "Emerging trends in cyber security" was conducted on 19th February 2020 by CSI student chapter. Ms. Ananthalakshmi ammal, senior director and group head cyber security CDAC-Trivandrum inaugurated the function. Programme helped to inspire, nurture and assist students to integrate into the IT community and to percolate benefits of IT advancement to all sections of Society.

Mr. Gopalakrishnan Nair, Chairman, State Centre of IEI inaugurated the Civil Engineering student chapter of IEI on 27 January 2020. Er. Jose Kurian (Senior Advisor, KIIFB) delivered a technical talk on "Planning Design and Construction management of Signature Bridge, Delhi" on the same day. Finally for promoting the socio - cultral activities National Service Scheme of Marian provides a platform to take initiatives in the social activities.

The AYKYA Arts Fest conducted on March 6th 2020, was a grand program consisting of 70 different events. These events posed as a platform for students to step up and showcase their artistic talents to a wider and more public audience The event was made possible thanks to the hard work of the College Union and all of the staff and student volunteers. The event would also not have been a success without the help of the 25 judges who came to our college to finalize the results of the events.

Student achievements worthy of special mention include "Walker for Uneven Plane" developed by Akash R Nair final year student of Mechanical department was filed for patent through IEDC. A grant in aid of Rs.1,00,000 was awarded by IEDC to final year civil Students R U-Dhanusree, Nabeel, Lekshmi Karthik on the project "Desalination of sea water".

We thank the management, administration, teaching and non-teaching staff, as well as the student community of Marian for all the support and guidance we have received from them during this period. It has been a truly memorable and enjoyable learning experience which all of us will cherish forever. Thank you.

OUR ACHIEVEMENTS..

Akash R Nair S7 Mech
Selected on NIRPDPR RISC 2019 national startup conclave top 100 project

R. U. Dhanusree receiving award from Smt. Sadhvi Niranjan Jyothi, Hon'ble Minister for State Rural development,

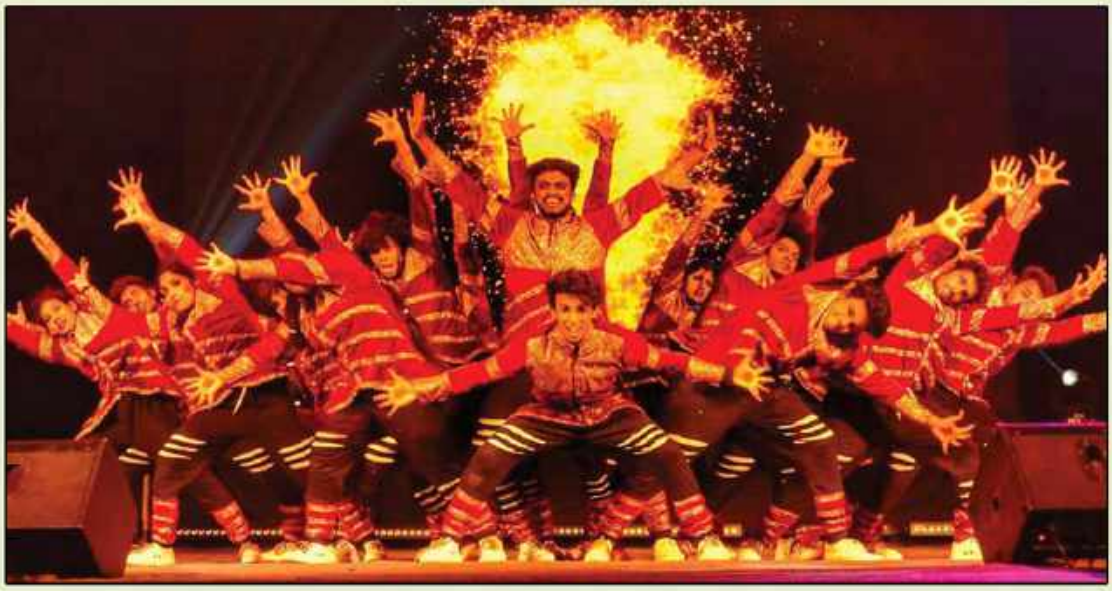
Award for Best NSS Unit of Voluntary Blood Donation

Hand Sanitizer developed by our Basic Science Dept.

Break the Chain Diary
"Break the Chain Diary" App by the students of the Department of Computer Science and Engineering

Automatic Sanitizer Dispensing Device
An initiative by the Mechanical Department

OUR ENTERTAINERS..



MARIAN CHOREO- DANCE TEAM

MARIAN FASHION SHOW TEAM

MARIAN COMEDY DANCE TEAM

OUR SPORTS ENTERTAINERS..

APJAKTU A-Zone Football Champions:
Marian Engineering College Football Team with Trophy.

Participated in APJAKTU A Zone Inter
Collegiate Cricket Tournament.

OUR SPORTS ENTERTAINERS..

Marian Badminton Team 2019-20 after A-zone Tournament at CET

Marian Basket Ball team

Gopika AM got selected to APJAKTU team
for Representing All India University Championship.

MARIAN FOOTBALL ACHIEVEMENTS..

University TVM zone winners

Reliance football tournament.
Tvm zone. Winners

Providence intercollege football tournament.
2nd Runners up

MeLiga football Tournament.
1st runner-up

SIBI
(Captain)

GODWIN
(Vice- Captain)

INTERVIEW

ME AS A SCIENTIST..

C R Thomas
Retired Scientist, VSSC

Question 1: Today many children dreams of flying a rocket. Have you ever had a thought of becoming a scientist in your childhood?

C.R. Thomas- I finished my Matriculation in 1975 and Pre–university in 1976 from Chennai, the then Madras The Indian Space programme was then in its infancy and hence exposure to rockets was virtually nil. TV was just in its early years and also we were not luckyto have the current social media and communication channels like the present generation. In fact, even career counselling was not in vogue, though I studied in one of the best school and college of Madras. My father (a general insurance professional) was not able to guide me in this regard. I am talking of about 45 years back in time. So, in plain terms, I had no dream/ thought of becoming a scientist in my childhood/schoo days.

Question 2: What were the major obstacles that you had to come across while enduring your vision of being a successful scientist?

C.R. Thomas- The major obstacles in being a successful scientist were:

- Academic qualifications should be in the specific area/ domain of research
- Failures are inevitable in research, and 'rising up from the grave' attitude is essential. One should be capable of adapting to the situation and come out with multiple options/ alternatives. Failure is the stepping stone to success.
- Non-availability of materials, components, etc. i.e. dependence on import content with no guaranteed future supplies.
- Very challenging time schedules and elaborate testing requirements for demonstration of very high product/system reliability.

Question 3: Were there any particular person to influence you into the career? What made you to choose science and space research as your career?

C.R. Thomas- Fate took me into first group in Pre-university and from there for B.E. (Hons.) Chemical engineering in BITS, Pilani, which I followed up with an M.E. Since, I took to M.E., I did not appear for campus recruitments or otherwise. In fact, most/ high percentage of my classmates and other branch mates took to placements or higher studies abroad. Those who took placements within the country went into private organisations. In short, here also the exposure to scientist as a profession did not emerge. After working for about a year in private industry, I was then on the lookout to be a scientist and I became one in the Central Electronics Engineering Research Institute (CEERI), CSIR. Being a Chemical engineer those days, research was not a popular/possible destination. I was lucky. From there, I got placed in Vikram Sarabhai Space Centre (VSSC), ISRO as a Scientist and continued till 2019, when I superannuated. VSSC is such a large organisation, wherein, it is an amalgamation of personnel, the cream of many universities. At every stage in the career, exemplary superiors lead the teams. The top hierarchy of VSSC was always inspiring and so also the persons at the helm of ISRO were role models. Space research and technology being multi-disciplinary, I find it difficult to mention a single name, probably due to lack of direct exposure also.

Question 4: What are the expectant opportunities for the younger generations of India in Science and Space research?

C.R. Thomas- ISRO has many Centres and Units across the country with a variety of specialisations and expertise. Most centres are having an Applied Research focus. Only a few have Basic Research activities e.g. Space Physics Laboratory (SPL), Thiruvananthapuram, Physical Research Laboratory, Ahmedabad and so on. These laboratories may have openings for B.Sc., M.Sc. and PhD levels as Junior Research Fellows, Senior Research Fellows and Scientists predominantly in Physics. Among the other major centres which are involved in launch vehicle systems development. satellite systems development, payloads development, openings may be available for B.Sc., M.Sc. and PhD levels as Junior Research Fellows, Senior Research Fellows and Scientists in Chemistry to support chemicals development, analysis, testing in laboratories etc. There may be openings for Mathematics post graduates involved in computer simulations of different processes. Centres developing and realising systems for launch vehicles, satellites, launch pads and services, may have openings for engineers in Mechanical, Electronics, Instrumentation, Chemical, Electrical, Civil, etc. The activities could focus design, development qualification, production, quality andsystems reliability, safety, etc. This is just an overview, which could best be understood by going through the authentic websites of the individual centres/ units and ISRO.

Across the country there are other science and technology organisations like CSIR, DRDO, DAE, etc. where similar options are likely to be available. In the private sector too, there are opportunities, particularly with the emerging concept of start-ups coming into the scene, even in Space technology.

Question 5: What are the major elements and necessities required to become a Scientist like you, for that would help the younger generations who aspire to become a scientist.?

→ Having a flair for research is a must i.e. being creative, innovative, thinking out of the box, etc.

→ Constant knowledge update is a must i.e. literature survey, acquiring higher qualifications, trainings, seminar and conference participations, etc. Otherwise, one will fall back in the R&D race.

→ A keen sense of data analysis and interpretation, along with computer skills and systems modelling.

→ A strong multi-disciplinary approach is a need of the hour, for applied research, in particular.

→ Research is generally visualised as a slow process. It is not so. Hence, it is imperative that you are schedule driven i.e. time is at a premium.

- Very powerful communication skills is a must i.e. oral/presentation and written
- Unlike basic research, which can be a one person endeavour, applied research is teamwork, hence, excellent inter-personal skills and teamwork is a must.
- Man management can become a great challenge, if one is not effective.
- One needs to evolve into a professional multi-faceted manager also during the career progression.

Questions 6: Sir, could you please explain the major milestones in your career?

C.R. Thomas- **Career progression:** Seven levels of promotion (Scientist/Engineer SC to Outstanding Scientist)

Functional designations: In an organisational hierarchy, starting with sections to divisions/facilities to groups to entities, six designations at four levels and ending up as Deputy Director on superannuation.

Committees/Teams: In addition to the routine functional activities, considering the other nature of activities, there were a large number of technical (design, production, failure analysis, quality, etc.) administrative (recruitment, promotion, disciplinary, etc.), budget, purchase, safety, training, security, civil works, in-house journal, welfare, sports, canteen services, event management, etc. committees, in which roles such as member, convenor/secretary, chairman/team leader, etc. were designated, totalling to about 850 odd assignments. This had given tremendous lateral exposure, providing a good insight into the functioning of a very large centre with over 4000 employees.

Question 7 .Sir, could you please let us know about your birth place and little about your private personal life?

C.R. Thomas- I was born in Bombay (Mumbai now) and studied till fourth standard there. Consequent to my father getting transferred to Madras (Chennai now), I continued from fifth standard to Pre-university in Madras.

While at school, I was generally in the top 10 of the class in academics. I used to win prizes in elocution, school sports, etc. I represented my school in the school cricket team. While at school, I was also a Bharat Scout (Air scout) and ultimately obtained the President's Scout certificate from the Hon. Chief Minister of Tamilnadu, Dr. M Karunanidhi.

I secured admission for B.E. (Hons.) Chemical Engineering in Birla Institute of Technology and Science (BITS), Pilani in 1976 and completed the same in 1981. During this period, I represented BITS in the North zone inter University cricket tournament. I was also very active in the National Service Scheme (NSS). During the five years at BITS, I was actively involved in organising a five day All India level Cultural festival every year.

I took up my M.E. also from BITS, (2 year collaborative course at GRASIM industries, Nagda M.P.) during which period; I served as a Teaching Assistant also. I passed out with the post graduation in 1983. Subsequently, I had a brief stint at JK Paper Mills, Rayagada, Orissa as Process Engineer before I got my placement as Scientist B at CEERI, CSIR, Pilani, Rajasthan, wherein I was the odd man out – Chemical engineer in an electronics research institute - doing sugar process instrumentation. Just as I had completed about a year and a half service in CEERI, I got my placement as Scientist C in VSSC and I joined in May 1985. I superannuated in July 2019.

Question 8: What is the future of India with regard to Science and Space Research?

C.R. Thomas- Keeping in mind the programmes that are lined up for ISRO, the good Government funding, the performances showcased so far by ISRO, the essentiality of Space based services for common man, etc., The future of ISRO and India in Space technology will always be top order, of course against very stiff international competition.

Question 09: What was the most difficult decision to take with regard to your career?

C.R. Thomas- While I got my placement as Scientist/ Engineer SC in VSSC, ISRO, I had been serving as Scientist B in CEERI, CSIR for a short time and hence taking a change of job with about the same scale was a tough decision to take but it proved to be the turning point in my life.

Question 10. Was there any instance where you thought you could fail but you overcame that, if so, could you share it with us?

C.R. Thomas- Failures during the development of sub systems and systems of launch vehicles were extremely demoralising and testing, and coming out from it was very strenuous. Perseverance leads you to success. In fact, to hit success after a failure is rejuvenating. There were a couple of such situations.

A Chemical engineer in those days had no exposure through the routine curriculum in propellants, pyrotechnics and explosives. Since I was placed in such a domain on appointment, accidents scenarios while handling propellants, pyrotechnics and explosives made one very diffident and cautious, and therefore safety had to be given top priority to provide the essential confidence.
The message is scientific awareness, self confidence and conviction will see you through the most difficult situations.

Question 11 .What was the greatest motivation of your life?

C.R. Thomas- While working at VSSC, the greatest motivation was that I was contributing to the country at large in a direct and big way. After retirement, the motivation is that my rich experience can be used to groom rural youth – my dream.

Question 12: Is there any particular rule that you follow in your life, or could there be a role model for you?

C.R. Thomas- Work with utmost passion and dedication, and laurels would come to you sooner than later. Don't work primarily for personal recognition; instead work for your organisational goals. Remember, you need to carry your family simultaneously amidst work pressure.

Question 13. Sir what could be your message to the younger generations of India, who aspires to become a scientist?

C.R. Thomas- The profession of a scientist is satisfying for those who wish to apply what they learnt during their academic pursuits in science, engineering and technology to become an inventor, innovator, patent holder, developer, etc. Being a scientist is truly challenging, particularly from the demand for quick and acceptable end results. Further, the job openings will always be relatively less in number and the remuneration might not be as attractive as other corporate jobs with the same qualifications. Prospective scientists should consider these aspects when they take the decision.

'മന്ദാരം'
എന്ന നാലുകെട്ട് വീട്.

കേരളീയ നിർമ്മാണരീതിയോട് വളരെക്കാലംകൊണ്ടേ വല്ലാത്തൊരിഷ്ടം തോന്നിയിരുന്നു. തിരുവനന്തപുരത്തെ കുതിരമാളികയും ,നെടുമങ്ങാട്ടെ കോയിക്കൽ കൊട്ടാരവും ,പത്മനാഭപുരം കൊട്ടാരവും ഒക്കെ ഒരുപാട് തവണപോയി കണ്ടിട്ടുണ്ട്. കേരളാ ആർക്കിടെക്ച്ചറോടുള്ള ആരാധന മൂത്ത് , മലയാള സിനിമയിലെ സ്ഥിരം തറവാടുവീടായ ഒറ്റപ്പാലം വരിക്കാശ്ശേരി മനയും, മലപ്പുറത്തെ പെരിന്തൽമണ്ണയിലെ പൂന്താനം ഇല്ലവുമൊക്കെ പോയി കണ്ടിട്ടുള്ളവയിൽ ചിലതുമാത്രം.. അതുപോലൊരു വീട് സ്വന്തമാക്കണമെന്ന അതിയായ ആഗ്രഹമാണ് മന്ദാരം എന്ന ഞങ്ങളുടെ ഈ സ്വപ്നഗൃഹത്തിലെത്തിച്ചത്.

കേരളാ ശൈലിയിൽ ഒരു വീട് പണിയുന്നതിനെപ്പറ്റി ചിന്തിച്ചുതുടങ്ങിയപ്പോൾ കുടുംബാംഗങ്ങളുടെ എതിർപ്പും , നൈപുണ്യമുള്ള വിദഗ്ദ്ധരുടെ അഭാവവും , അതിലേറെ ഭീമമായ ചെലവും മനസ്സിനെ പിന്തിരിപ്പിച്ചു. പക്ഷെ ഹൃദയത്തിലെ ആ വലിയ ആഗ്രഹം അതിൽ നിന്നും പിന്നോട്ടുപോകാൻ അനുവദിച്ചില്ല. അങ്ങനെയിരിക്കെ ഭാര്യയുടെ ഉന്നതപഠനത്തിനായി മൂന്നുവർഷക്കാലം കോഴിക്കോട് ഒരു പകുതി മലബാറിക്കാരനായി കഴിയാൻ അവസരം ലഭിച്ചു. കേരളാ ആർക്കിടെക്ച്ചറിനെ മറ്റു മലയാളികളേക്കാളും ഒരുപടി ഇഷ്ടക്കൂടുതലുള്ള വരാണ് മലബാറുകാർ. അവിടുത്തെ കുറേയേറെ പുതിയതും പുതുക്കിയതുമായ നാലുകെട്ടുവീടുകൾ പോയി കാണുകയും നിർമ്മാണരീതിയെക്കുറിച്ച് പഠിക്കുകയും ചെയ്തു.

കേരളീയ ശൈലിയിൽ വീടുകൾ ഡിസൈൻ ചെയ്തുകൊടുക്കുന്ന ചുരുക്കം ചിലരുങ്കിലും അവരുടെയൊക്കെത്തന്നെ ചിലവുകൾ ഞങ്ങളുടെ ബഡ്ജറ്റിൽ കവിയുന്നവയായിരുന്നു. പിന്നെ ഒന്നും നോക്കിയില്ല, ബി ടെക് മെക്കാനിക്കൽ എഞ്ചിനീയറിംഗിലെ മൂന്നാം സെമസ്റ്ററിൽ ബിന്ദു ബൈജു ടീച്ചർ പഠിപ്പിച്ച സിവിൽ എഞ്ചിനീയറിഗ് ആന്റ് എസ്റ്റിമേഷൻ പൊടിതട്ടിയെടുത്ത് സ്വന്തമായി ഡിസൈൻ തയ്യാറാക്കാൻ തീരുമാനിച്ചു.

ഒറ്റനിലയിൽ നടുമുറ്റമുള്ളൊരു വീട് എന്നതായിരുന്നു പ്രധാന ആവശ്യം. പതിനാറായിരം ചതുരശ്ര അടിയിലുള്ള വരിക്കാശ്ശേരി മനയും, അയ്യായിരത്തോളം ചതുരശ്ര അടി വിസ്തീർണമുള്ള നാലുകെട്ടുമെല്ലാം ഉൾക്കൊണ്ട് ആയിരം ചതുരശ്ര അടിയിൽ താഴെ നിർത്തുക എന്നത് ശ്രമകരം തന്നെയായിരുന്നു..

നടുമുറ്റം: വാസ്തുശാസ്ത്രത്തിന്റെ ഭാഷയിൽ പറഞ്ഞാൽ നടുമുറ്റമാണ് വീടിന്റെ ബ്രഹ്മസ്ഥാനം. നടുമുറ്റത്തിനു ചുറ്റിലുമാണ് വീട്ടിലെ ജീവിതം. മുൻഭാഗത്ത് ഡ്രോയിംഗ് റൂം, ഇടതുഭാഗത്ത് മറ്റുഭാഗങ്ങളേക്കാളും അല്പം ഉയർന്ന പ്രാർത്ഥനാസ്ഥലം, മുന്നിൽ ഇടവും വലവും സമാനമായ രണ്ടു കിടപ്പുമുറികൾ , പിൻഭാഗത്ത് അടുക്കളയും അതോട് ചേർന്ന് രണ്ടു കിടപ്പുമുറികൾ കൂടിയുണ്ട്. കുടുംബാംഗങ്ങൾ ഏറ്റവുമധികം സമയം ചെലവിടുന്നത് കോമൺ ഏര്യ ആയതുകൊണ്ട് കിടപ്പുമുറികളെല്ലാം സാമാന്യം ചെറുതാക്കി കൂടുതൽ സ്ഥലം കോമൺ സ്പേസുകൾക്കായി ഒരുക്കിയിരിക്കുന്നു. പഴയ കാല വീടുകളിൽ വീടിന്റെ തറയ്ക്ക പല ലെവലുകൾ നൽകിയിരുന്നു. ഏറ്റവും ഉയർന്നിടത്തു കാരണവന്മാരും താഴേയ്ക്ക് ഇളമുറക്കാരും ഇരുന്നിരുന്നു. ഇത്തരത്തിൽ തറഭാഗം ഭൂമിയിൽ നിന്നും ഉയരുന്നതനുസരിച്ച് നേരിട്ട് സൂര്യപ്രകാശം വീടിനുള്ളിലേയ്ക്കു കടക്കാതെ ഉള്ളിലെപ്പോഴും കുളിർമ നിലനിർത്താൻ കഴിഞ്ഞിരുന്നു. പാരമ്പര്യ ശൈലിയിൽ നിന്നും അകന്നു പോയപ്പോൾ വീടിലെ കുളിർമയും എങ്ങോ മറഞ്ഞുപോയി..

'മന്ദാരം'
എന്ന നാലുകെട്ട് വീട്.

പൂമുഖം: കുടുംബാംഗങ്ങൾക്കും അതിഥികൾക്കും ഒരുമിച്ചിരിക്കാവുന്ന തരത്തിലാണ് പൂമുഖം നിർമ്മിച്ചിരിക്കുന്നത്. ചുറ്റിലും തടികൊണ്ട് ചാരുപടികൾ തീർത്തു, മുകളിൽ മനോഹരമായി വീട്ടുപേരും , പണികഴിപ്പിച്ച വർഷവും കൊത്തിയിട്ടുണ്ട്. വായുസഞ്ചാരമുറപ്പിച്ച് കുളിർമ ലഭിക്കുന്നതിനായി മുകളിൽ സുഷിരങ്ങൾ നൽകിയിട്ടുണ്ട്.

മേൽക്കൂര: നടുമുറ്റത്തിനു ചുറ്റിലുമുള്ള ഭാഗം കോൺക്രീറ്റിൽ വാർത്തു, അതിനു മുകളിൽ സ്റ്റീൽ ട്രസ്സ് ചെയ്ത് ഓടുപാകിയാണ് രൂപകൽപ്പന. ഡബിൾ റൂഫ് ആയതുകൊണ്ട് വീടിനുള്ളിൽ ചൂട് വളരെ കുറവാണ്. കോൺക്രീറ്റ് ചെയ്തതിനാൽ ഫോൾസീലിങ്ങ് ഒഴിവാക്കാൻ കഴിഞ്ഞു. അതോടൊപ്പം സുരക്ഷിതത്വവും ഉറപ്പാക്കാൻ സാധിച്ചു. ഓടിന്റെ പ്രകൃതിദത്തമായ ഗുണങ്ങൾ ലഭിക്കുന്നതിനായി പെയിന്റ് ചെയ്യാതെയാണ് അവ പാകിയിരിക്കുന്നത്. ഞങ്ങളുടെ സ്വപ്നഗൃഹം പരിമിതമായ ബഡ്ജറ്റിൽ യാഥാർത്ഥ്യമാക്കിത്തന്നതിൽ, കുടുംബസുഹൃത്തായ ബി.ആർ കൺസ്ട്രക്ഷനിലെ ശ്രീ. ഭുവനചന്ദ്രൻ അങ്കിളിനെ ഒരിക്കലും വിസ്മരിക്കാൻ കഴിയില്ല.

ശ്രീ അഭിരൂപ് വി.എം
അസിസ്റ്റന്റ് പ്രഫസർ
മെക്കാനിക്കൽ എഞ്ചിനീയറിങ്ങ് വിഭാഗം

അതിജീവന ഗാനം

പ്രൊഫ. രജനീഷ്. ആർ ചന്ദ്രൻ
അസിസ്റ്റന്റ് പ്രഫസർ
മെക്കാനിക്കൽ എഞ്ചിനീയറിങ്ങ് വിഭാഗം

പൊരുതി നമ്മൾ നേടിടും...
വരുതിയിൽ വരുത്തിടും

നാളെ നമ്മളൊത്തുചേർന്ന്
ജീവിതം തുടർന്നിടാൻ
ഇന്നൊരൽപമേകനായിരുന്നിടാം
രണ്ടു ചുവട് മുന്നിലേക്ക് മെല്ലെ
നാം നടന്നാലും
പിന്നെ മൂന്നു ചുവട് മുന്നിലേറിടാം
ഉറ്റ തോഴരാണു
നമ്മളെന്നതെന്നുമോർക്കണം
ഒറ്റയൊറ്റയായി പൊരുതി നേടണം
അറ്റുപോകുകില്ല നമ്മൾ കണ്ട
സ്വപ്നമോരോന്നും
വറ്റിടാതെ കരുതണം കരുത്തിനെ

കരതലങ്ങൾ കഴുകി നമ്മൾ
കരുതലോടിരിക്കണം
ഹൃത്തടങ്ങൾ മെഴുകി നമ്മൾ
വൃത്തിയോടിരിക്കണം
കൈ പിടിച്ചുയർത്തി നമ്മെ
കാത്തിടുന്ന ധീരരെ
ചിത്ത ശുദ്ധിയോടെ നമ്മൾ
എന്നുമേ വണങ്ങണം
എന്റെ വീട് കാക്കണം...
എന്റെ നാട് കാക്കണം..
ശാന്തി മന്ത്ര ഗീതമെന്റെ
ഭൂമി മാറിൽ പടരണം.

പൊരുതി നമ്മൾ നേടിടും...
വരുതിയിൽ വരുത്തിടും

Dr. M. Manoj
Associate Professor, Dept. Of ECE
HoD – Basic Science Department &
Nodal Officer, Innovation & Entrepreneurship Development Centre (IEDC)

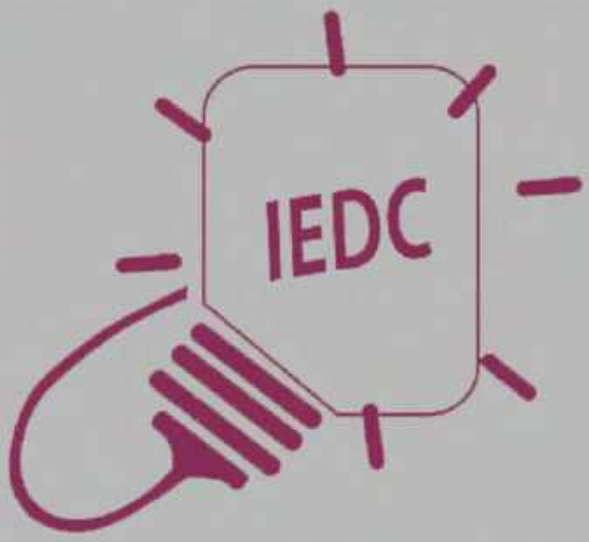
SURVIVING IN POST COVID WORLD – CHALLENGES & OPPORTUNITIES FOR ENGINEERING STUDENTS

The world is facing an unprecedented crisis of Covid -19 virus. Almost all countries, including developed ones are worst affected due to this pandemic. None of the experts and technology is able to control the wide spread of disease. Around 75% of world population is staying at home desperatly trying to avoid the extensive outbreak. The most significant concern which arises in the situation is that, unlike a world war or natural disaster, whose calamities will end once the situation improves, here nobody is able to predict a timeframe which will be taken for the issues to settle down.

Education field, just like all other sectors, is also affected in the current scenario. Almost all academic and non academic activities which was carried out in education institutions are stopped, including conduction of examinations. The damage caused to this system is having a wider dimension and needs more time to recover. Most of the industry will come up with in a lesser time span once it become operational and if the situations are favourable, that sectors will cover up the damages caused due to lockdown.

The major difference of such industries with educational field is that here the system deals with a product; or rather we can call process, which spreads over a year span. For this reason, this sector will take more time to revive from the damages caused due to the lockdown.

Let us analyse how the current situation affects the students those who are pursing engineering studies, especially those who are in their final and pre final year of studies. The opportunities available to students are mainly of three types. Majority of students will settle down in a job, which needs technical skills. The process will happen through on campus and off campus placement drives. A second group will opt for higher studies. Another one group will migrate to foreign countries, but again for the job or study opportunity.



A start up company, TRYSRA TECH SOLUTIONS PVT LTD, incubated in Marian Technology Business Incubator (M- TBI) shifted their focus on production and marketing of Face Shield Mask which can be used by medical professionals when they are exposed to potential danger. This helped them to develop a new business model, which they achieved by exploiting what situation demands.

Multinational giants may find it difficult to survive; at the same time start up companies will be performing better. With low operating cost and vibrant man power, start up companies will break all benchmarks in the market. It is predicted that India will emerge as new destination for investors to establish their new ventures and will be a hub of industrial revolution in the post covid world. All this factors will enhance the emerging job market from which engineering graduates will be benefitted.

The world will shrink into local market rather than global. Local manufacturers, agriculturist, farmers etc will find more significance in the coming future. This has to be thought in line with the policy declared by Government for promoting upliftment of local vendors for achieving self sufficiency.

IEDC's or similar technical organisations will find a major role in building and maintaining a path way between them and market.The main issues faced by local vendors may be the non availability of technical support which is essential for the establishment of business. This will be applicable from achieving quantitative and qualitative bench marks, branding, marketing etc.

Students with entrepreneurial skills or those who are already into the ecosystem will identify this as a potential market, which they can utilize to establish using their expertise. Society needs such student groups those who are willing to support them in the mentioned sectors for a long run. New start up companies those who are aware of local demand and production will find their way to success. Extensive support from Government also will help them to establish their ventures.

Students should be ready to accept the challenges and explore the opportunities that await in the post covid world. Definitely the current ways and methods which we are familiar will not help out in that beyond an extend. The changed world demands new skill sets to survive. Innovative mind set should be nurtured in a more extensive pace in technical education sector which will foster and enhance the process.

Habit of innovation and entrepreneurship should be taught and students should be allowed to practice. Universities and technical institutions need to update curriculum, giving more importance to entrepreneurship and innovation and to cultivate a new culture among stake holders. If we are well equipped in all senses, no hurdle will prevent us in achieving an exciting future. Success will be with those who adapt to the changed world that awaits us.

A CHIT-CHAT WITH MISS KERALA 2k19

1. When did you start preparing for this title?

Honestly,I had no idea / plan to participate for Miss Kerala. It all just happened. Auditions were on a weekend and I guess I was the last person to reach for the audition.

2. What was your motive and who was your role model?

I didn't have a particular person as a role model. I believe in drawing good things from all people who come and go cross your life.

3. As an only girl child in a Muslim family what was their opinion for this?

There was a push and pull. Many people couldn't accept the fact, a girl being on a spotlight in front of a large crowd especially when there comes the terms- Beauty, pageant, fashion, modelling. So yes, not at all could accept and we can never please everyone in our life. But I'm happy that most of the people I value are happy for what and how I am, and that's what matter I guess. Life is too short to be depressed/ disappointed for satisfying everyone in your life. I just saidit in general apart from my family

4. When did you start dreaming about this title?

As I already said, I din't have such a dream. It all started back in college, when my seniors compelled me to join the Fashion Show Team. Back then I had no idea that years later I would hold a prestigious title like this. After college I had around 6-7 months gap before joining Infosys where I got campus placed. That was when I tried my interest on pageants and may be the motivation I got from people you met there, pushed me till the Miss Kerala stage.

5. How are you managing your profession and passion?

If you have a passion for what you do, then definitely you will have time or you will somehow find time for doing what you like in your life. Ofcourse my colleagues are supportive, but more than that I think we ourselves have to find time for what we love to do in our life.

6. Were you passionate about this since your childhood?

No. Back in school days I remember myself as a stage fearing kid who always sits in the front bench and mug up all the syllabus given. So all those were not planned at all.

7. What all preparations did you do to win this title ?

I have not prepared particularly for Miss Kerala. I think the biggest preparation to any success is the failures that you have faced before. Before Miss Kerala I had been to couple other pageants in the state itself. Grihalakshmi Face Of Kerala 2018 was my first ever try and I still think I was a failure there. After that I had been a part of Miss Malabar 2018 and Lulu Beauty Fest 2018 where in both I came First runner up position. Some factor was missing that refrained me to the title instead always ending up me in the final 3's. All those experiences and motivations and interactions and definitely the failures were the preparations I had.

8. And what were the various lifestyle changes you made ?

Nothing. Lifestyle is not what you are being judged on , is what i think. You as a person , your personality is what is being judged.

9. How did your various family members help you in achieving this title ?

All the love showered by all of whom I consider my family is more than enough. Even a persons 'all the best' message with love and hope can make wonders and make you confident

10. Are you interested in acting ?

I really don't know .I really like experiencing and exploring new things. You never know what is waiting for you and where. So I would love to give it a try.

11. Did you ever come across a situation where you felt like this is too hard for me and I can't do this ?

I was already at a saturation point when I reached Miss Kerala stage. But after the audition I was pretty much confident. I really had in my mind that I definitely made it to the final three at least. There is definitely a luck factor too. Some days are meant for you while some other days even if you had worked hard wouldn't show a green signal. So keep trying. Winning is not the real success, trying is!

World Class Manufacturing versus Agile Manufacturing

Prof.(Dr.) Sabu K.,
Professor& Head,
Department of
Mechanical Engineering.

Until 1970s there was a widely accepted view of best practice in manufacturing. Firms had sold their products and services into a stable and relatively un-demanded markets. As long as firms could provide the products at a reasonable price and quality, they would continuously thrive. Given these stable and favourable market condition the firms generally strived to achieve following characteristics.

Logistics were organised around the principle of mass production. Low cost was achieved through high volume production. Machinery was thus designed to produce specialised products, machine changeover were minimised. This led firm to hold large raw, in-process and finished inventories. Quality inspection was placed at the end of the production line. Higher skilled workers concentrate management, design, quality, marketing and supervision and unskilled workers followed the instructions they were given.

These principle of mass production were appropriate as long as the market were stable and undemanding. When the final market were heterogeneous, changeable and demanding, new principle of production had to be established. After 1970, customers wanted increasing variety and quality and were unwilling to trade-off quality against price.

The new principle of production called world class manufacturing are in sharp contrast to mass production. Producing small batches to satisfy varied and volatile markets. Inventories are organised on a just-in-time basis and the production flows through the plant as a single unit rather than large batches. Rapid change over and simpler and more flexible machinery is often used. Instead of checking the quality at the end of the line, called quality control (QC), quality is assured each stage of the production, called quality assurance (QA). So no defects were allowed to pass through the plant. Work organisation becomes more flexible and key task is to develop multi-tasking and multi skilling human resource which forms on learning and continuous improvement.

World class manufacturing are those that demonstrate best practice. To achieve this companies should attempt to the best in the field of quality, price, delivery speed, delivery reliability, flexibility and innovation. Agile manufacturing is the idea that a successful company should be adaptable and flexible enough to respond rapidly to change in demand and bring highly customer –targeted products to market faster (Ashley, 1998). Thus world class manufacturing and agile manufacturing philosophies are go hand to hand and closely connected.

My Status's

"I scribble few words which all can write,
but the difference between you and me is that,
I write but you keep quiet"

Ms. Vinitha B.Elza (Asso.Prof, ECE)
HoD,
Department of Electronics & Communication.

Dear all,

In this long life of my 41 years, filled with small experiences I would like to share some thought provoking quotes and imaginations that may surely touch your lives in one way or the other. These are the daily and lively matters which have been happening in one of 24hrs of few years since whatsapp had conquered everyone's moments, and I used to be updating my statuses. These are few of them:

1. Always in life..
Your feelings are the ones which inspire you..
May be someone or something will be reason behind that feel..
Create the feel with no-one or no-thing..
That's your success factor ..
Else you will lose when you lost the one or the thing.

2. Its true that friends make our world..Small or big ones
Old or young ones, Good or bad ones
Irrespective of age , caste ,creed..
The only relation which is thicker than
blood is this relation of friendship..
Let it be few or a handful..
Every drop of friends are precious..Never loose them.

3. Life is an open book..
Sometimes you may write perfect and neat..
Sometimes you may scribble some things..
But you never write anything bad for
yourself in your own book..
That's the most important part..
Just the way you never spoil your book
by demotivated writings..
Never let anyone scribble unwanted and
negative words in your book..
Your book may be open to all..
But its yours and not for anybody else
to play with..

4. God adds some to your life and
subtracts some from your life..
At the right time at the right place..
Its all for the Good.
Some to add positives for your
betterment and
some to minus your negatives,
to hold you when its time for a fall,
In every way God's great.

5. If every life story would be as
loving as a 2hr romantic movie..
If every tasty dish would be as tasty
at the last bite as it was in the first bite..
If every husbands and wives would be
same the same as teenage lovers even
at their 20th year of anniversary..
If your mind remains as stable as a
rock and as disciplined as a clock ..
Then ofcourse you would'nt have been
living in earth..
May be at some planet near to paradise.

My Status's

6. The two sides of life .. like the two sides of a coin..
For every richness in your life you will face the poor side one day..
For every lack-of-love in your life you will face the love-overfilled life one day..
For every greed in your life you will face the feel of saturation one day..
For every cheat of life you will be paid back one day..
For every down – to-floor you were put , you will be raised- to- heights one day.

7. Smile..
The power of a smile is so magical..
It can take you to the top level, at the same time pull you down to the ground..
It can open up a heart till every cells are relaxed, at the same time shut the doors of your heart forever..
It can twist and turn to mock as well as to soothe..
It make the ugly beautiful and for the beauty a curse too.

8. Repeated advises are boring
For the mouth to say as well as
For the ears who turn deaf to you..
Tell once or twice .. the stop it..
If they want to do the right let them..
Remember whatever they do for themselves is much effective than what you make them do..
Let the world understand and take responsibilities by themselves.

9. The space above makes you float to the breathless unseen universe..
The space below makes you float to the breathless unseen deep blue sea..
The only place where you can place your feet boldly bravely breathfully is this lovely sand of yours ..
Enjoy the days of your Earth existence..
Your home.. Sweet home..

10. Memories keep you alive and hopes keep you creating memories for the next...

NATIONAL SERVICE SCHEME

START WHERE YOU ARE..
USE WHAT YOU HAVE.....
DO WHAT YOU CAN.....

"Manassu Nannavatte.."

National Service Scheme (NSS) is an Indian government-sponsored public service program conducted by the Ministry of Youth Affairs and Sports of the Government of India, launched in Gandhi's Centenary year in 1969. Aimed at developing student's personality through community service, NSS is a voluntary association of young people in Colleges, Universities and at +2 level working for a campus-community (especially Villages) linkage. The program aims to instill the idea of social welfare in students and to provide service to society without bias. NSS volunteers work to ensure that everyone who is needy gets help to enhance their standard of living and lead a life of dignity.In doing so, volunteers learn from people in villages how to lead a good life despite a scarcity of resources. It also provides help in natural and man-made disasters by providing food, clothing and first aid to the disaster's victim. NSS resembles the Bharat Scouts and Guides, National Cadet Corps (NCC) and other programs developed for national welfare.

There are two types of activities to complete compulsorily, they are Regular Activities (120 hours) and Annual Special Camp (120 hours). All the NSS Volunteers who have served NSS for at least 2 years and have performed 240 hours of work under NSS are entitled to a certificate from the university under the signature of the Vice-Chancellor and the Program Coordinator. The Annual camps are known as Special Camps. Camps are held annually, funded by the government of India, and are usually located in a rural village or a city suburb. Volunteers may be involved in such activities as:

1. Cleaning
2. Afforestation
3. Stage shows or a procession creating awareness of such issues as social problems, education and cleanliness
4. Awareness Rallies
5. Inviting doctors for health camps

There are no predefined or preassigned tasks; it is left up to the volunteers to provide service in any way that is feasible. Camps typically last between a week and 10 days and it is one of the most cherished moments in the life of a NSS volunteer.
Volunteers are involved in regular blood donation and traffic control (regulating queues in temples and preventing stampedes at functions) etc. and National conferences are held regularly to conduct white-paper and project presentations.
To recognize the voluntary service rendered by NSS volunteers, Program Officers (PO's), NSS Units and the University NSS Cells, it has been proposed to provide suitable incentives/ awards under the scheme. Awards include:

- NSS National Award
- State level awards
- University level awards
- District level awards
- College level awards

MARIAN NSS (UNIT 522)

Marian NSS is carried under the leadership of Program officer, Associate Program Officer and Volunteer secretaries (student representatives).Our unit comprises of 100 volunteers with equal representation from 2nd and 3rd year students. It is one of the best socio-cultural group in Marian engineering college that students can indulge keeping apart their academics and portray their skills and talents to enhance their personality and character .Activities are approved by the college and is proud of its influence on both the society and students ,Some of them include:

- Flood Relief Campaign at Azhur
- Flood Relief at Ayiroor ,Pathanamthitta
- Organic Farming
- Participation in state government programmes and schemes
- Oppurtunity to attend State level and National level camps
- Motivational and Personality development classes
- Socio-Economic survey at corporation wards
- Stem cell Donation Registry drive
- Special school ,Orphanage and Old age home visits
- Orientation programs
- Blood donation
- Beach cleanup
- Volunteering in Attukal Pongala
- Community Orientation in adopted village
- Mask distribution
- Online competition on Photography ,Gaming Troll making,Quiz etc
- Volnteering in College level programs.

NSS opens a wide door to students who wish to improve themselves and to create an impact in their society .These opportunities helps to construct one's communication ,personality and leadership skills along with problem solving to deal with real life situations .Active participation aids to build a skilful resume and wonderful memories to cherish with for the rest of your life .Being the recipient of all the above I conclude my words by thanking Marian NSS and my dear volunteers for letting me to be a part of NSS family. Family it is where all the 100 warriors work side to side by the one same motto

"Not me but you"

Article by

_ Fathima Sulfikar

Former Volunteer Secretary

JESUS CHRIST- The Perfect NSS Programme Officer

- Prof. Ullas Innocent Raj
Department of Mechanical Engineering

Long before the development of National Service Scheme(NSS) and its motto 'Not me, but you', Jesus Christ taught and practiced this message. The life of Jesus Christ was a life of humility ,selfless service and self sacrifice. While I was NSS Programme Officer, the life and teachings of Jesus Christ had been a great encouragement and His grace helped me to carry out my duties successfully.He is the perfect example to be emulated for NSS volunteers. The second most important commandment taught by Jesus was "to love thy neighbour as you love thyself" (Holy Bible –Mark 12:31). He not only taught this commandment but also demonstrated this by taking our sins upon himself and dying a shameful death on the cross. By resurrection he defeated death and hell.

It is not possible to move from self centeredness to selflessness without the help of Jesus Christ. The good news is that irrespective of caste, creed or religion, Jesus Christ is ever willing to help you and dwell in your heart. Jesus said "If anyone loves Me, he will keep My word ; and My father will love him and We will come to him and make Our home in him (Holy Bible -John14:23). This verse became my experience 20 years back. Dear reader friend, you are not reading this by mere coincidence, but by the divine plan of God. Jesus Christ is not a respecter of persons. The same Jesus who transformed my life will transform yours too.

Jesus Christ is real, wonderful, more sweeter than the finest honey, more fairer than ten thousands and is the answer to everything. Once you have an encounter with Jesus, you will begin to live a life of excitement, adventure and purpose.Jesus Christ will guide you in all your ways and give you wonderful counsel and empower you to reach your full potential and to fulfill Gods plan in your life. Eventually you will inherit the gift of eternal life offered by Jesus Christ. Will you open the door of your heart for Jesus?

A Note for you...

Even though I was born in a religious Christian family, I never had a personal relationship with Jesus Christ. In the year 2000, after a series of bitter experiences, I happened to read the Holy Bible with all my heart to check its truthfulness. The Bible told me about Jesus Christ who transformed my whole life and has given me assurance of everlasting life with a deep joy and abiding peace. I also found solutions to all my life's problems in the Bible. If you put your trust in Jesus as I did 20 years ago, you too will experience this abundant life and peace. Jesus is alive and is so real to me. If you have any questions concerning Jesus Christ and how to have a personal relationship with Him, please feel free to approach me or mail at ullasir@gmail.com

- Prof.Ullas Innocent Raj
Associate Professor, Department of Mechanical Engg &
Former, NSS Programme Officer

STUDENT WELFARE COMMITTEE 2019-20

OVERVIEW

Students Welfare Committee of Marian Engineering College was constituted in Oct 2018 for the general and specific well-being of students. Student Welfare Committee endeavours to help a student's educational process to advance their academic as well as personal abilities. The committee works for the overall welfare of the student in terms of student development which consist of student development program ,student publication, counselling of the students, co curricular activities and many more. The committee organises various events and workshops to enhance the skill set of students like Talk Show, Workshops, Debate Competition, Quiz Competition, Painting competition and Photography competitions.

OBJECTIVES

- Listening to student's problems and understanding what is required for their development in any manner.
- Assisting the students in their learning process which includes not just academics but also the practical learning experience.
- Conducting periodic meetings to talk over student welfare. Various co curriculum activities, facilitating student interests are organized for personality development of students.
- Building a true entrepreneur in students and making them fit enough to coordinate events in both college and inter-college levels.

MEMBERS OF SWC

• Academic Year 2018-19

Staff Coordinators

Prof Sumitra.k, Assistant Professor , EEE Dept (Convener)
Prof Minnu Jayan , Assistant Professor , ECE Dept
Prof Twinkle Vinu, Assistant Professor, Civil Dept
Prof Rahul.R.S , Assistant Professor, Mechanical Dept
Prof Nishley Joseph, Assistant Professor ,Computer Science Dept

Student Coordinators

Mr Pranav P , S8 M2, Chairman
Mr Hari Krishnan, S8 R1, General Secretary
Ms Namitha B, S8C1, Foreign students welfare Coordinator
Ms Gopika, S8 EE, Academic Coordinator
Ms Akhila A S, S8T1, Event Coordinator

• Academic Year 2019-20

Staff coordinators

Ms. Sumitra.k, Assistant Professor , EEE Dept (Convener)
Ms. Minnu Jayan , Assistant Professor , ECE Dept
Ms. Sanobia, Assistant Professor, Civil Dept
Mr. Rahul.R.S , Assistant Professor, Mechanical Dept
Ms. Nishley Joseph, Assistant Professor ,CS Dept
Ms. Ananswara Johny, Assistant Professor ,Maths Dept
Sr. Mercy Mathew
Sr. Celine Joseph, Counselor
Ms. Marykutty R., Counselor

Student Coordinators

Mr. Daniel A Pereira, EEE Dept (Chairman)
Mr. Nandha Gopal,MECH Dept (Secretary)
Mr. Al Shifan SH, CS Dept (Media coordinator)
Mr. Mohammed Sajin Salim,Civil Dept (Academic/Quiz Coordinator)
Mr. Pangaj Madhu,EC Dept (Event Coordinator)
Mr. Brightson Basil, EEE Dept (Debate club Secretary)

ORGANISED EVENTS

• Academic Year 2018-19

1. Inaugration Of Students Welfare Committee

The Chief Guest E. Shereefudeen I.P.S. has officially inaugurated the Marian Students Welfare Committee and has awarded the office bearers with their duty badges on 5 October, 2018. He further talked about the various Cyber Crimes as well as Vigilance case that he has been seeing frequently during his whole service and has given the awareness to the students of Marian Engineering College.

2.Higher Education and Career Oppurtunities in European Countries

Mr Rajesh Waidyar has addressed 60 students from S4,S6 and S8 to make them understand the various career opportunities in European Countries especially in Germany on 23 November, 2018. He also detailed about the scope of higher education that could be done in Germany and the various ways for attaining the VISA.

3.Higher Education and Career Oppurtunities in Australia

Mr Achu has addressed 60 students from S4,S6 and S8 to make them understand the various career opportunities in Australia 7 February, 2019. The company IDP has also organised an International Conference in Hotel Hycinth on 09-Feb-2019 wherein our students were invited as volunteers as well as participants and we able to discuss the scope of higher education with various officials from foreign universities.

4. Higher Education in Management and Importance of Aptitude Tests

The seminar was conducted by officials from T.I.M.E. institute for giving the students an awareness of higher education in management especially for the pre-final year students and has given the importance of aptitude test at the time of interview on February 2019.

5. Inaugration of Debate and Quiz Club

The Marian Debate club and Quiz club was being inaugurated followed by a friendly debate on the same date. The friendly debate was among the students of Marian Engineering College based on the topic "Surgical Strike". The event concluded by declaring Mr Prasidh and Mr Tom Boban from CIVIL Department as the winners and Mr Anish from EEE Department along with Ms Sneha Tomy from Mechanical Department as the first runner up, followed by Mr Gokul from EEE Department and Ms Leah Morris from CSE Department as second runners up.

6. Debate Competition

The Marian Debate club has conducted a debate competition based on the topic "Is Women Day Necessary". The competition went with great enthusiasm and Mr Abbin from EEE Department was declared as the winner, Mr Tom Boban from CIVIL department and Mr Daniel from EEE department was the first runner up followed by Mr Prasidh from Civil department, Aishwarya suresh from EC department along with Ms Agfa from CSE department shared the third position.

7. Photography Exhibition

Students welfare committee conducted a photography competition to boost photography skills of students. Samuel James of S8EEE emerged as the winner of the event, followed by Abhiraj of S8CS as runner up and S Nikhil of S4ME as second runner up.

8. Quiz Competition

The Marian quiz club conducted a general quiz competition on 21st and 22nd of March. The prelims were held on the first day and finals on second day. Students from all the four years actively participated and five teams qualified to the finals. Sruthi savithri vijayakumar & Sneha s Christopher of 4T bagged the first prize. C Nirupama & Devi Saranya of S4T bagged the seconds prize. Mohammed akshay & Sam Issac of S4E along with Gayathri Devan B of S6ME emerged as the third prize winners.

9. Student Welfare Committee Valedictory function

IAS topper,Ms.shilpa distributed certificates to the winners of the various competitions conducted by Student Welfare Committee. She also gave students a session on how to Prepare for civil service exams from her own experience on 9 May, 2019.

• Academic Year 2019-20

1. Session on "Higher Education in European countries" by IDP

Free Counceling was given by IDP for interested students from all streams regarding the opportunities of higher education in European countries on 26 August,2019.

2. Inauguration of Student Welfare Welfare Committee by Sri.P.Prakash (IPS)

Shri.P.Prakash(IPS) did the honour of inaugurating the Student welfare committee for the academic year 2019-20 . He awarded the office bearers with their duty badges .He also gave students an insight on how to become successful in civil service exams on 30 August, 2019.

3. Essay writing competition on Gandhi Jayanthi

An Essay writing competition was conducted on 04/10/2019.The theme for the competition was 'India without Gandhi'.There were a total of 47 participants of which four winners were selected. First place : Karthik SK S5T and Brightson Basil S5E,Second Place : Akshay Gopan S5C1 & Third Place : Abhinand S3E.

4. Debate in Malayalam

The topic for the debate was 'Are uniforms necessary in schools and colleges'.The competition was held at Benzinger Hall. First place secured by Pooja Ajin S3C, Second place secured by Sooraj.s.B S5R1 and third place secured by Arjun.B.G S5R1.

5. Qurio2019

Competition was conducted for school students in three categories Debate(War of talks), Best Orator and Conzentra(mobile photography) on 11 October, 2019. For debate first prize was shared between holy angels school and saint Thomas. Second prize was secured by Loyola schools. For Mr and Ms Orator, first prize was secured by Loyola school and second prize secured by Sree Gokulum public school. For photography first prize was secured by St.Joseph school and second prize was secured by Loyola school.

6. Civil Service Preparation Programme

A session on "How to prepare for Civil service exams" was delivered by Shankar academy. Students from various stream attended the session on 20 January, 2020.

7. Visit to exhibition at Nishagandhi organised by Haritha Kerala Mission

Selected Students from all departments of Marian engineering College attended Haritha kerala Fest at Nishagandhi on 21 January, 2020. The students got innovative ideas as to how to make products from biodegradable waste. The students were accompanied by Ms.Surya of civil department and Mr.Deepu of electrical Department. The students gave a very good feedback about the Programme.

8. Asthra-Quiz competition for school students on Republic day

Quiz competition was conducted for School students on Republic day (26 January, 2020) by college chairman Mr.Abhinand. Topic of the Quiz was " Looking back into Indian Politics)

9. Debate in English

This event was especially conducted for women-to express their views and ideas about the topic provided by student welfare committee. The debate competition conducted in two phases, with two different topics. The first topic was –"Are women safe in India" and the second topic was "Entry for women in shabarimala". The second phase had no language barrier.

10. Idea Presentation

Idea presentation on the topic "Climate change " was conducted for the academically brilliant students in order to boost their confidence in doing presentations on 20 February, 2020. Students from EEE and ECE participated)

11. A session by Mr.Gokul Ramanan(Alumni of Marian EEE Dept)

Mr.Gokul Ramanan, Alumni of Marian EEE Dept had an interactive session with the students of Marian from all streams about how to tackle national level management exams and about life in IIM on 5 March, 2020.

12. Save life serve humanity----Covid 19 lets fight together, an initiative by Marian students welfare committee

This event was Save life serve humanity - Covid 19 lets fight together, an initiative by Marian students welfare committee on 7 June, 2020. Mohammed Sajin Salim coordinated the event.

ACADAMIC YEAR 2020-21 FUTURE EVENTS

Inter-College Debate

Photography

Quiz Competition

Student Conference

and More.

KNOW YOUR FOOT PRINT

Prof. Joisy M. B
DEPARTMENT OF
CIVIL ENGINEERING

The concept of water footprint introduced by UNESCO in 2002, was developed to improve water management at the global level. Your water footprint is an indicator of direct and indirect consumption of water; defined as the total volume of fresh water you consume in your daily life, including the water used to grow the food you eat, to produce the energy you use and for all of the products in your daily life like, your books, house, car, furniture and the clothes you wear.

The water footprint of a product is divided into three fractions, each of which is identified by a different color: green, blue and gray.

The green element refers to the consumption of water contained in plants and soil in the form of moisture, without being part of any surface or body of groundwater. One example is rain water.

The blue element refers to the consumption of surface water resources and ground water throughout the production chain of a particular product.

The gray element refers to the pollution of water resources and is defined as the volume of fresh water needed to dilute the pollutant load generated by a given process, so as to maintain the quality standards of the water from its original source.

Water Footprint Assessment is a process that quantifies and maps green, blue and grey water footprints. As the world population expands, so does the need for fresh water. Measures to keep water footprint level low are needed to conserve fresh water supply. As consumers, we should be able to make informed choices to purchase goods and services that have a lower water footprint.

Water footprint of some products

Ignoring the water footprint of many products causes citizens to consume an excessive volume of water. These are just some examples of products and water consumed to manufacture them:

- **One kilo of beef = 16,000 liters of water**
- **One cup of coffee = 140 liters of water**
- **One litre of wine = 870 liters of water**
- **One kilo of potatoes = 287 liters of water**
- **One kilo of tobacco = 2,925 liters of water**

This data itself shows the need to lower your water footprint by cutting back on your water use

Measures to reduce direct water footprint :

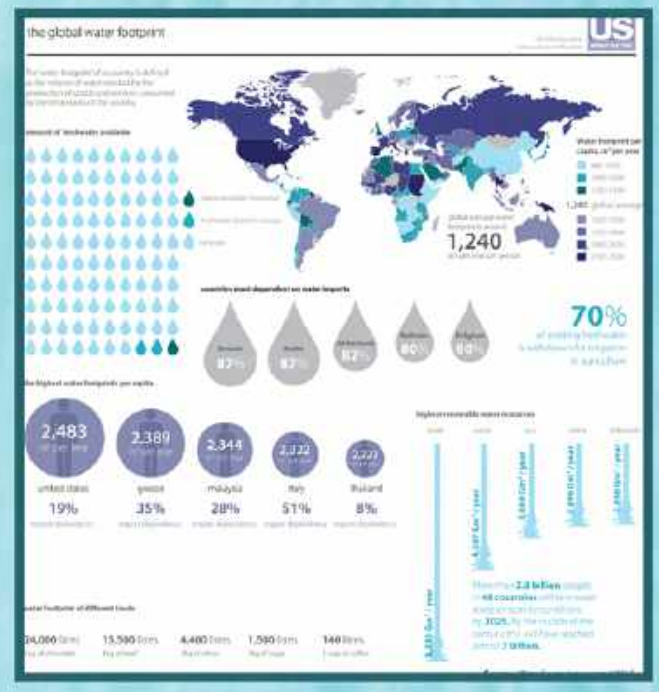
- Turning off the tap while brushing your teeth.
- Using water-saving toilets.
- Installing a water-saving shower head.
- Taking shorter showers.
- Washing your clothes only when necessary.
- Fixing household leaks.
- Using less water in the garden and for cleaning.

Measures to reduce indirect water footprint :

- **Eating less meat:** Beef is one of the most water-intensive proteins, needing 15,000 litres of water per kg, followed by red meats in general. Other, less water-intensive proteins include pulses like beans, lentils and peas. Chicken has a much lower water footprint than beef, so if you're not ready to become vegetarian, giving up or just cutting back on red meat can help.
- **Reducing Food Waste:** Because it takes so much water to produce food, food waste has some pretty big implications. Wasted food means wasted resources, including water.
- **Switching coffee for tea:** Cups of tea and coffee may look like they contain the same amounts of liquid, but producing coffee beans requires far more water than growing tea leaves, around 140 litres for a cup of coffee and around 34 litres for tea.
- **Cutting down on sugar:** Drinking a bottle of cola actually consumes around two or three bathtubs full of water. Growing sugar cane uses a lot of water , not to mention the water that goes into producing plastic packaging.
- **Consuming more local produce:** Producing a tank of petrol requires a lot of water, so reducing the amount of miles your food has to cover from farm to plate will also help to save water.

- **Buying quality, not quantity:** The clothes we wear use huge amounts of freshwater. Cotton fabrics and denim jeans are particularly greedy. Buy well-made clothes that are intended to last, rather than huge amounts of cheaply produced items that will need to be replaced. The same goes for any other consumer products as practically all manufactured products - from electronics to books and cosmetics - consume water in the production process. Buying less will protect the world's water supply .

To conclude it can be stated that when information is available on the impacts of certain products on the water system, consumers can make conscious choices about what they should buy. If we want to stabilize our total water footprint and prevent its further increase, average annual consumption per person will have to decrease from 1,385 cubic metres in 2000 to 835 cubic metres by 2100, due to the projected population growth. While we can certainly survive with that amount of water, many of us will have to adjust our consumption patterns in order to reduce our direct and indirect water usage.



MARIAN ASSOCIATION OF GROWING MECHANICAL ASPIRANTS

MAGMA

The Mechanical Engineering Department of Marian Engineering College called the, "Evergreen Branch". The department has kept itself up to date with the latest developments and trends in the field and has become the mainstay of the institution.
The mechanical engineering department association for the academic year 2019 - 2020 was elected on 20th September 2019. The Executive committee consists of:

- ☒ Staff coordinator - Amjith L R
- ☒ Staff coordinator - Sonia S Raj
- ☒ President - Gayathri Devan B
- ☒ Secretary - Abhimanyu
- ☒ Vice President - Abhinanth J
- ☒ Joint Secretary - Muhzin

The official inauguration of MAGMA was conducted on 5th November 2019. The chief guest for the day was Mr. C R Thomas, Former Deputy Director of VSSC.

As part of Qurio 2020 a quiz program on Complete Mechanical aspects were conducted for higher secondary school students, which was a great success with about 18 teams registering for the event and 5 teams were selected for the finals out of which, the team representing Sree Gokulam Public School won the first prize. The quiz master for the event was Mr. Abhinanth J, S7 Mechanical Engineering student, an executive member of MAGMA for the academic year 2019 – 2020 and college chairman for the academic year 2019 – 2020. On 22nd November 2019, a talk on the future scope of MEP and its opportunities on various countries were conducted with assistance from Mr. Nithin, who is a staff of Capitol Group, which specializes in providing professional training for students such as in MEP, NEBOSH and HVAC etc

On 24th January 2020, a talk on 'how to prepare an effective project and its presentation' was conducted by Akash R Nair of S8 Mechanical Engineering Dept to educate the students to prepare projects and learn by experimentation.

This academic year MAGMA had planned out various activities but couldn't carryout the plan as such due to the pandemic that has gripped the whole wide world and its repurcussions. Even then, MAGMA has conducted many activities and ensured the development of the department as a whole by instilling various virtues in the student community.

Solar Energy 135 (2016) 92–102

Contents lists available at ScienceDirect

Solar Energy

journal homepage: www.elsevier.com/locate/solener

A novel Zig-Zag scheme for power enhancement of partially shaded solar arrays

S. Vijayalekshmy [a,*], G.R. Bindu [a], S. Rama Iyer [b]

[a] Department of Electrical Engineering, College of Engineering Trivandrum, Trivandrum, Kerala, India
[b] College of Engineering Trivandrum, Trivandrum, Kerala, India

ARTICLE INFO

Article history:
Received 1 March 2016
Received in revised form 17 May 2016
Accepted 25 May 2016

Keywords:
Array configuration
Mismatch loss
Partial shading
Irradiation mismatch index
Performance ratio
Total cross tied configuration

ABSTRACT

This paper proposes a novel Zig-Zag scheme of arrangement for the total cross tied interconnection of photovoltaic modules for reducing partial shading losses and thus enhancing power generation. The performance improvement over classical total-cross-tied connection has been validated by extensive simulation results. The novel scheme of arrangement is also compared with the optimal total cross tied configuration and results show that the new scheme of arrangement showed very similar operational characteristics. The rearrangement of modules is performed without varying the electrical connection of the modules in the array. Simulation results shows that the new scheme of rearrangement lessens the number of multiple local maxima in power–voltage (*P–V*) characteristics which further simplifies the Global Maximum Power Point (GMPP) tracking algorithm. The performance of the system is investigated for five different shading patterns.

1. Introduction

SOLAR power is achieving much importance due to fast declining cost of photovoltaic (PV) cells and enormous technological developments in the area of power electronics. PV generators convert the energy of solar radiation directly to electrical energy without any moving parts. The electric grids, commercial and domestic utilities have specific voltage levels. They are much higher than the maximum voltage of single silicon based PV cell. The PV cells are connected in series to form PV modules. The individual voltage level of a PV module is normally too low to be conveniently used in grid connected PV power generator. Hence the generators are built by connecting PV modules in series and parallel in order to acquire the appropriate voltage level and also to increase the nominal output power of the generator.

1.1. Present state of the art

Photo voltaic systems for power generation convey many challenges. The short circuit (SC) current of the PV cell varies due to several technical and environmental reasons. The major environmental reason for uneven SC current is the partial shading of the PV array due to dust and dirt on the panels, shadows imposed on the array due to passing clouds, nearby trees, buildings, etc. Recently there is an increasing trend to incorporate the PV arrays at the design level of a building itself. In those circumstances, it is a challenging task to avoid partial shading of array due to nearby buildings during the day at all seasons. This makes the study of partial shading of modules a key issue. In recent years, the impact of partial shading on the PV array performance has been extensively discussed.

1.2. Literature review

Research work in this field took shape after several instances on solar cell failure were reported due to unexpected shading sources. When the series connected cells do not operate under uniform conditions, the electrical characteristics of the cells are not similar and are exposed to mismatch losses (Lashway, 1988). Hot spot regions are developed in the shaded cells which result in the localized shading, lower power output and a hastening of the material degradation in the affected area. In 1979, damage due to hot spot heating was observed at test sites at Mead, Nebraska and Arlington, Texas (Forman and Themelis, 1980). To mitigate this phenomenon Green et al. (1984), Sheperd and Shigimura (1984) proposed to integrate bypass diodes into solar cells (Green et al., 1984). The power output of the shadowed solar cell arrays were substantially improved when each row of parallel cell strings (series blocks) is shunted by the bypass diode (Swaleh and

* Corresponding author.
E-mail address: 73viji@gmail.com (S. Vijayalekshmy).

http://dx.doi.org/10.1016/j.solener.2016.05.045
0038-092X/

Green, 1982). The prospective on the design of bypass diodes configuration integrated in a PV module and also on the study of PV generators working under partial shading conditions was carried out in Sheperd and Shigimura (1984). Experimental analysis on the impact of reverse biasing due to shading on amorphous silicon modules and crystalline silicon modules made by different manufacturers are evident in Molenbroek et al. (1991). Amorphous silicon modules were lesser prone to crystalline silicon modules. Also, for the crystalline and amorphous silicon PV modules investigated, failures due to hot spot heating are unlikely to occur when bypass diodes were employed. PV modules with bypass diodes do not generate any useful power when the diodes are ON. Further, these diodes produce surplus power loss due to their ON resistances (Silvestre et al., 2009). In Acciari et al. (2011), a novel circuit was suggested to avoid bypass diode ON resistance losses. But, this circuit does not recuperate the power that is lost due to bypassing of the modules.

PV modules that are connected in parallel can cause reverse currents under partial shading. These reverse currents lead the modules to absorb power rather than generating it, which reduces the generation and increases the thermal losses. Thus PV arrays are equipped with reverse current blocking diodes to inhibit reverse currents. The operation of these series reverse blocking diodes which are used to prevent current imbalance in series parallel circuits is detailed in Bishop (1988). The impact of reverse currents under different operating conditions on the Current–Voltage (I–V) characteristics is studied in Spertino and Akilimali (2009). The simulation results showed that the impact of the I–V mismatch is insignificant with normal tolerance and the inclusion of blocking diodes against reverse currents can be avoided with crystalline silicon technology.

Comprehensive research on partial shading progressed from 1995, after Volker Quaschning et al. projected huge loss in photovoltaic generators due to partial shading. They proposed an appropriate scheme for computing the irradiance of the solar cells of a shaded photovoltaic generator (Quaschning and Hanitsch, 1995). The influence of module shading on its performance was reported by the same authors Quaschning and Hanitsch (1996). The performance loss was found to be reduced by 70% when only 2% of the module area was shaded. The mismatch losses and the power losses due to tracking of local MPP instead of the global one for long string, parallel string and multi string configurations has been studied in Maki and Valkealahti (2012). Results showed that long series connection of modules and parallel connections of strings through a single inverter to the electrical grid should be curtailed to avoid losses under partial shading conditions.

The power loss due to partial shading is not proportional to the shaded area alone but depends on the shading pattern, array configuration and the position of shaded module in the array. Different array configurations have been proposed in literature to reduce the mismatch losses in the array. The modules were Series-Paralleled in which a branch circuit was divided into series blocks to reduce the effects of electrical mismatches (Boronat and Chouder, 2009; Gonzalez and Weaver, 1980; Ross, 1982). Similar interconnection schemes have been proposed and tested in Appelbaum et al. (1977) and Brandstetter, 1983. In (Kaushika et al., 1988), three suitable configurations schemes viz., Series-Parallel (SP), Total Cross Tied (TCT) and Bridge Linked (BL) are compared for their losses, maximum power, fill factor, reliability and energy yield due to mismatch loss caused by the partial shading and manufacturer's tolerances in cell characteristics. Study shows that changing the interconnection schemes of the modules from SP to TCT increases the power by more than 5% and the TCT configuration is considered as the best solution to lessen the mismatch losses under partially shaded conditions. An analysis based on probability theory indicates that introduction of cross ties (TCT or BL schemes) in the array almost doubles the life time of the array (Kaushika and Gautam, 2003). SP, TCT, BL, Simple Series (SS) and Honey Comb (HC) configurations have been compared in terms of maximum power and fill factor in Gautamand and Kaushika (2002). The TCT configuration has maximum power compared to other configurations under the same conditions of partial shading. The investigation shows that there is no additional cost for TCT-connected modules than SP-connected modules in large solar parks.

The solar PV system can also be extensively used in many small scale consumer applications, such as PV vests for cell phones and music players. In (Silvestre et al., 2009), a configuration is proposed which consists of an array of parallel-connected PV cells, a low-input-voltage step-up power converter, and a simple wide bandwidth MPP tracker. Parallel-configured PV systems are compared to traditional series-configured PV systems through both computer simulations and hardware experiments. Study shows that, under complex irradiance conditions, the power generated by the new configuration is approximately twice that of the traditional configuration.

One of the thrust areas of research recently in the field of partial shading is the implementation of modified classical MPPT techniques. When the bypass diodes conduct during non-uniform condition, P–V curve of the solar array shows multiple maxima. Thus the extraction of maximum power from the PV array becomes complex since there exist several local maximum power point (MPP) at low voltages and at higher voltages. Hence classical MPPT techniques which track the unique singular MPP in array characteristics under uniform irradiance conditions cannot be implemented. Under partial shading, the MPPT will identify a local optimal point as the global maximum point, thus leading to power losses. Approaches to track the global maximum power point (GMPP) have been demonstrated as in Wang and Hsu (2011), Patel and Agarwal (2008a,b), Esram and Chapman (2007), Safari and Mekhilef (2011), but they tend to be complicated and many of them are unable to track the GMPP under changing illumination conditions. The development of different MPPT techniques to determine GMPP involving modified heuristic techniques is another recent area of research work. In Huynh et al. (2013), a new GMPP tracking strategy for PV array under partial shading using a dynamic particle swarm optimisation (PSO) algorithm was proposed. A deterministic PSO to improve the maximum power point tracking capability for PV system to address the rapid movement of the passing cloud is evident in Ishaque and Salam (2013). The analyses carried out in Ishaque et al. (2012) using synthetic current–voltage data set showed that the proposed penalty based differential evolution (P-DE) outperforms other evolutionary algorithm methods, namely the simulated annealing (SA), genetic algorithm (GA), and PSO. P-DE consistently converges to the global optimum values very rapidly. A method using Lambert W-function facilitating a direct tie between current and voltage of modules which significantly reduced calculation time has been proposed in Picault et al. (2010) to forecast the maximum power production from the existing PV systems. In Batzelis et al. (2013), an explicit PV string model using the Lambert W function was introduced, showed the accuracy provided by the one-diode model with faster and more robust execution, intended to be used for energy yield calculations and PV system analysis and optimization. But the model is unable to track the GMPP under changing illumination conditions. A new design method for distributed maximum power point tracking (DMPPT) synchronous boost converter is proposed in Adinolfi et al. (2015). Method is centered on non-dominated genetic algorithm with the purpose to obtain the finest synchronous rectification (SR) boost topology. A new method to track the GMPP under partial shading conditions using Radial Movement Optimization Technique (RMO) was adopted in Seyedmahmoudian

et al. (2016). The proposed method involved low computational cost and output stability than other evolutionary methods.

A new mathematical formulation for the optimal reconfiguration of PV arrays to minimize partial shading losses has been developed in Velasco-Quesada et al. (2009). In the reconfigured array, the connections of the modules are dynamically changed in accordance with a switching matrix so as to maximize the current of the single string in the event of shading. The power loss is reduced under severe partial shaded conditions, but technique implicates higher cost and increased complexity. In adaptive reconfiguration arrangement (Nguyen and Lehman, 2008), a switching matrix connects a solar adaptive bank to a fixed part of the array so that less shaded modules of the adaptive part are in parallel with more shaded rows of fixed part. A large number of switches and sensors are required to implement the technique. To optimize the performance of PV powered volumetric pump under different insolation levels, an Electrical Array Reconfiguration (EAR) controller is proposed in Salameh and Dagher (1990). The EAR controller chooses a suitable configuration for different operating conditions of the pump based on the irradiance level. The reconfiguration strategy in Patnaik et al. (2011) ensures a minimum deviation from the PV operating voltage and the approach is based on eliminating the shaded modules from the array by detecting the current through the bypass diode. A switching network is required to connect and disconnect the modules and individual current sensors are required to sense the current through each bypass diode which increases the complexity of the system. A novel mathematical formulation for the optimal reconfiguration of photovoltaic arrays as a mixed integer quadratic programming problem which can be utilized for fully reconfigurable or partially reconfigurable arrays with equal or unequal modules per row was projected in Shams El-Dein et al. (2013). Here the reconfiguration is achieved through double pole switches which results in increased switching losses and the reconfigurable array need to be connected only under partial shading conditions. Most of the PV arrays in real time are larger in size. So, it is difficult to monitor the individual temperature and irradiance for each module. The importance of selecting the proper size of the PV array and batteries of such systems has been discussed in Jaboori et al. (1991). Groups of modules have been considered based on shading pattern. A new method for estimating the irradiance on a partially shaded PV generator by employing a survey of the surroundings based on topographic co-ordinates of the relevant shading obstacle was implemented in Drifa et al. (2008). The obstacle's outline was approximated by a set of linear functions and an algorithm for approximating the irradiance and the shading factor at any point and any time on the PV array was established. The parallel configuration of a portable PV power system that produced maximum power under rapidly changing illumination condition is projected in Gao et al. (2009). Under complex irradiance condition, the proposed scheme generated twice the power output than conventionally configured series array.

The partial shading losses are dependent on the location of shaded modules in the array. A method to configure the physical placement of the modules based on Su Do Ku puzzle pattern in a TCT connected PV array has been proposed to enhance the PV power generation under partial shaded conditions (InduRani et al., 2013). The performance of the system was studied for different shading patterns and the proposed method of arrangement of panels showed enhanced power generation. A similar approach to arrange the physical position of modules in TCT configuration, without changing the electrical connection of the modules in the array, so as to increase power generation of array under partial shading condition is presented in Sahu and Nayak (2014). But this approach is inferior to Shams El-Dein et al. (2013) as the rearrangement does not increase the shade dispersion as in the "Su Do Ku" puzzle pattern. Su Do Ku puzzle pattern is not appropriate for arrays with unequal number of rows and columns. In Shams El-Dein et al. (2013), an optimal reconfiguration scheme has been proposed which has been validated in a TCT configured array of dimension 4×3. This reconfiguration scheme changes the position of the modules in different columns which complicates the interconnection scheme. Also, for an array of larger dimension, number of constraints in the optimization problem rises exponentially which further complicates the design problem.

1.3. Innovative contribution

The major contributions of the proposed method are emphasized as follows.

(1) A simpler Zig-Zag arrangement of modules in TCT configuration is proposed here such that this scheme of arrangement of panels distributes the effect of partial shading over the array and reduces the effect of localized shading. The impact of partial shading is the reduction in net power output thereby decreasing the efficiency and reliability. Also it is worth noting that in the present scenario, in order to further motivate the widespread use of PV generation, an essential aspect is the economic viability.
(2) The proposed scheme of arrangement can be applied to arrays of any dimension. As mentioned in the literature review the present state of the art techniques is applied to arrays of smaller dimensions and arrays with equal number of modules in rows and columns. Therefore the goal is not only to improve the performance index but also on implementation of the proposed technique to all arrays irrespective of the dimensions.
(3) In order to verify the effectiveness of the method, the proposed scheme is compared with the optimized scheme of configuration and classical TCT for five different shading patterns. The conceivable states under all physical and natural static conditions of partial shading are analyzed in the five shading patterns.

The proposed method overcomes the problems associated with the previous approaches. The optimized array in Shams El-Dein et al. (2013) involved umpteen numbers of constraints and needed more memory for processing larger number of rows and columns. The reconfiguration in Shams El-Dein et al. (2013) is restricted to arrays of equal number of rows and columns.

1.4. Paper organisation

This paper is structured in four sections. Section 2 describes the modelling and description of the equivalent circuit model, TCT configuration, the novel scheme of arrangement of panels and the parameters to be estimated and compared for a partially shaded array. Comparison of performance between the optimized model and the novel configuration for various static shading conditions and the analysis on the performance of normal TCT, optimal TCT and Novel TCT arrangement under the various partial shading conditions is presented in Section 3. Section 4 lists the conclusions from the study.

2. Modelling and description

Modelling strategies adopted in the proposed work is detailed in this section.

2.1. PV cell with bypass diode

The equivalent circuit of the PV considered here is built on the single diode model projected by Villalva et al. (2009). PV cell is considered as varying current source, I_{ph} parallel with the photo diode. Photo current I_{ph} can be expressed by the relation,

$$I_{ph} = (I_{sc} + K_i \Delta T) \cdot \left(\frac{G}{G_{ST}}\right) \cdot \frac{(R_{sh} + R_{se})}{R_{sh}} \tag{1}$$

R_{se} and R_{sh} are the PV cell shunt and series resistance respectively, I_{sc} – cell SC current, G – insolation reaching panel surface, K_i – temperature coefficient of SC current. under ST Standard Test conditions: Insolation 1000 W/m^2 and cell surface temperature 25 °C. $\Delta T = (T - T_{ST})$, T – surface temperature of PV panel. Similar solar cells were linked in cascade to form PV module. To prevent the PV cells from damaging due to hot spots under partial shading; manufacturers of PV modules have connected bypass diodes in anti-parallel with PV cells. A typical PV module with bypass diode is shown in Fig. 1. the expression for module current with bypass diode is as in (2).

$$I_{module} = \left[I_{ph} - I_o\left(e^{\frac{q(V_{module} + R_s I_{pv})}{AKN_s}} - 1\right) - \frac{(V_{module} + R_s I_{pv})}{R_{sh} N_s}\right] + \left[I_{O_{bypass}}\left(e^{\frac{-q(V_{module})}{A_{bypass} KT}} - 1\right)\right] \tag{2}$$

A – dimensionless material quantity, I_o – reverse saturation current, K – Boltzmann's constant (1.38×10^{-23} J/K), T – temperature in Kelvin and q – electron charge (1.6×10^{-23} C), V_{module} – output voltage of the module, N_s – solar cells which are connected in cascade to constitute a PV panel, R_{sM} – series resistance of module and R_{shM} – shunt resistance of module respectively.

2.2. Total Cross Tied (TCT) configuration

TCT configuration is realized from the series parallel configuration by connecting cross ties across each row of the junctions. The PV array opted in this work consists of twelve modules in TCT configuration arranged in 4 × 3 order (Fig. 2a).

The voltage of the array is given by the sum of the voltages of the 'r' rows. Thus applying the KVL, the voltage of the array,

$$V_{array} = \sum_{j=1}^{r} V_{(j)} \tag{3}$$

Applying KCL, the current at each node can be expressed as,

$$I_{array} = \sum_{j=1}^{3} I_{(i,j)} - I_{(i+1,j)} = 0 \quad \text{where } i = 1, 2, 3 \tag{4}$$

From (4) the current generated by a module depends on the irradiance G and is given by (5)

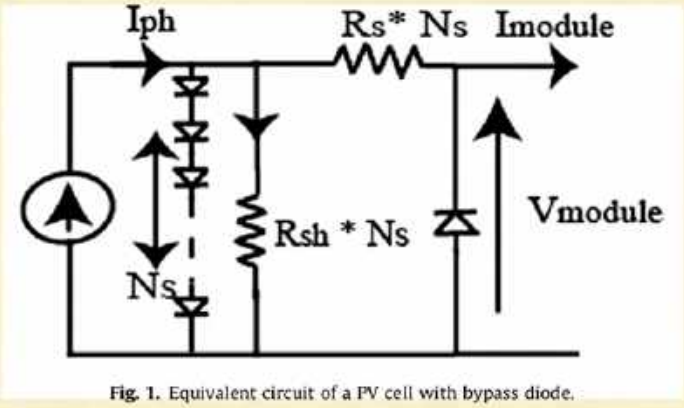


Fig. 1. Equivalent circuit of a PV cell with bypass diode.

$$I = \frac{G}{G_{ST}} I_n \tag{5}$$

I_n is the current generated by the module at standard irradiance G_{ST} = 1000 W/°C. Therefore the current generated by the module is directly proportional to the solar insolation on the panel.

2.3. Optimal Total Cross Tied (OTCT) configuration

During partial shading, if the modules from the same row are connected into different parallel circuits, the consistency between array's MPP and modules' MPP could be improved. Further, the possibility of turning ON of bypass diodes could be decreased. This is achieved by re-joining the modules from the same row into different parallel circuits in such a way that Irradiance level Mismatch Index (IMI) is minimized (Shams El-Dein et al., 2013). IMI is defined as the sum of the squares of differences between normalized total irradiance levels of rows, and is given by (6).

$$\text{IMI} = 0.5 \sum_{i=1}^{r} \sum_{j=1}^{r} \left[\frac{IR_i}{G_{ST}} - \frac{IR_j}{G_{ST}}\right]^2 \tag{6}$$

In (6), IR_i and IR_j are the net irradiance levels of rows i and j, respectively. For Optimal Total Cross Tied (OTCT) interconnection, all the rows of PV array have equal or near to equal insolation levels. The objective of reconnecting the modules is such that that, the array's IMI is minimized. This requires defining an existence of binary variable 'b_{ik}' such that

$$b_{ik} = \begin{cases} 1 & \text{if module exist in row } i \\ 0 & \text{otherwise} \end{cases} \tag{7}$$

Thus from (6) the objective function for determining the optimal TCT interconnection can be formulated as follows,

$$\text{Minimize}\left\{\text{IMI} = 0.5 \sum_{i=1}^{r} \sum_{j=1}^{r} \left(\sum_{k=1}^{rc} \frac{IR_k b_{ik}}{G_{ST}} - \sum_{k=1}^{rc} \frac{IR_k b_{jk}}{G_{ST}}\right)^2\right\} \tag{8}$$

This optimization problem has two constraints. One constraint states that each row i will have c modules as depicted in (9).

$$\sum_{k=1}^{rc} b_{ik} = c \quad \forall i \tag{9}$$

This constraint is repeated r times. The next constraint states that all modules should exist and they must be interconnected as defined by (10) and are repeated $r \times c$ times.

$$\sum_{i=1}^{r} b_{ik} = 1 \quad \forall k \tag{10}$$

The above optimization problem is a Mixed Integer Quadratic Programming (MIQP) problem which needs to be solved by Branch and Bound (BB) algorithm. It is based on solving the continuous quadratic model at each node, then branching on integer variables (Rosen et al., 1999). The solution of the above optimization problem gives the optimal TCT configuration as shown in Fig. 2b.

The solution of the above optimization problem gives the optimal TCT configuration as shown in Fig. 4.

2.4. Novel Total Cross Tied (NTCT) configuration

The simulation results of the optimized model involve rearrangement of individual modules in a single column into parallel branches which complicates the interconnection of modules in arrays having larger number of rows and columns. Henceforth a new and simpler technique of reconnecting the modules in TCT is proposed here such that the modules are subjected to increased

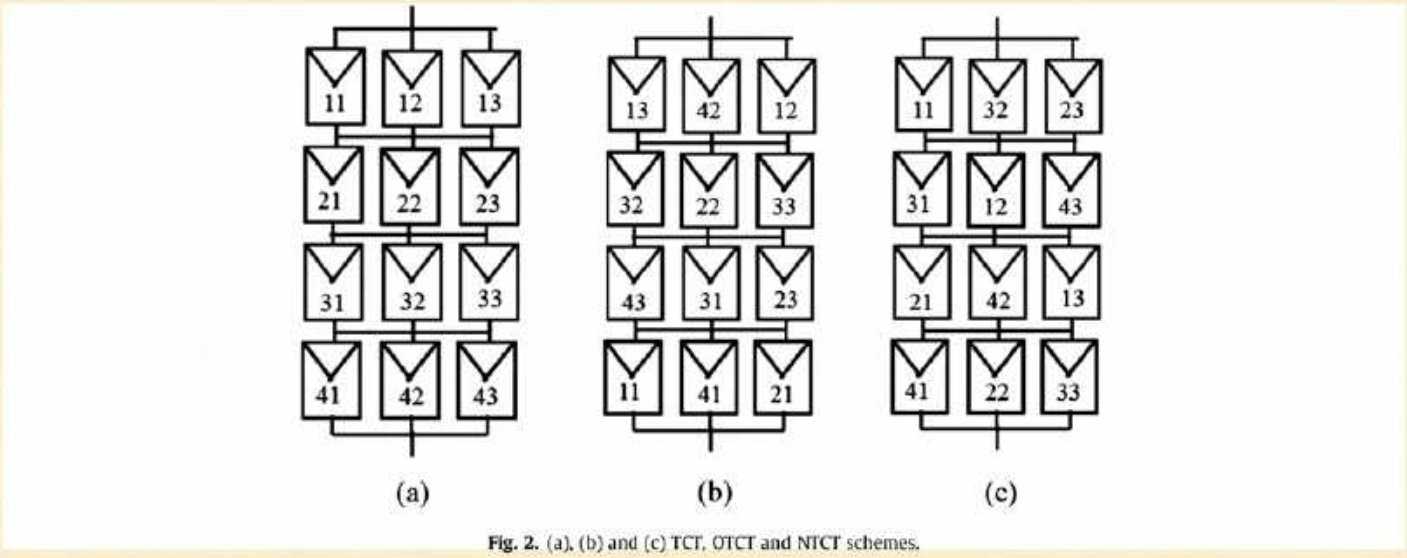


Fig. 2. (a), (b) and (c) TCT, OTCT and NTCT schemes.

shade dispersion during partial shading conditions (Fig. 3). The proposed scheme of reconnection of modules can be easily adopted in arrays of any dimension.

The elements in one column in TCT configuration are retained in the same column in the proposed NTCT scheme of arrangement. This simplifies the interconnection between the modules. In the proposed scheme, the modules in the first row in the conventional TCT arrangement are reconnected as the diagonal element. The remaining modules are reconnected in a row wise manner. The modules are reconnected such that modules in alternate columns are arranged in the same direction as in a Zig-Zag pattern The scheme of arrangement for the 4×3 array is as per the proposed scheme. Here the modules in 1st and 3rd column are reconnected in clockwise direction while the modules in second column in anticlockwise direction. The modules which were connected in succession in conventional TCT configuration now occupy alternate cells in NTCT. In the process of reconnection, if any one cell is pre-occupied the succeeding cell is occupied. After placing module 22, as per the scheme of arrangement module 32 has to be in location 12 which has been pre occupied. Hence it is placed in the next succeeding location. The proposed scheme of arrangement is as in Fig. 2(c).

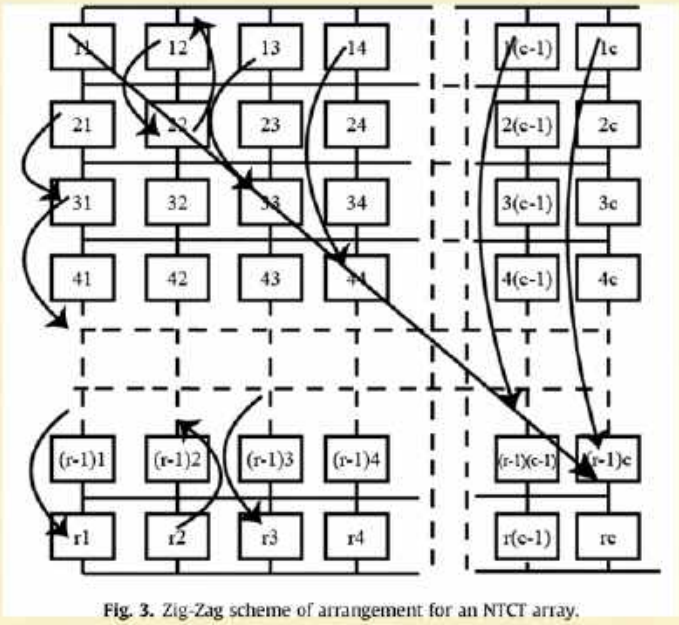


Fig. 3. Zig-Zag scheme of arrangement for an NTCT array.

2.5. Partial shading losses

During partial shading, the MPP of the array does not coincide with the MPP of the individual modules this causes power losses through different mechanisms (Shams El-Dein et al., 2013). When the bypass diode is turned on, the power generated by partially shaded modules is bypassed. Partial shading also leads to the mal operation of the MPP tracker which is misled to operate at the local maxima instead of the global maxima. Different losses due to partial shading are illustrated in Fig. 4. The maximum possible power under partial shading is the sum of maximum powers of the individual modules when operating independently under the same irradiance level. The array maximum power without shading is always more than the maximum possible power under partial shading. The difference between array maximum power without shading and maximum possible power under shading are the shading losses. Here MML represents the lost power due to the fact that every block of PV cells do not operate at its own MPP, although the whole PV generator operates in its global MPP. It is given by (11).

$$P_{mismatch\ losses} = P_{max_{illuminated\ modules}} - P_{MPP_{global}} \tag{11}$$

In addition to mismatch losses, there are other losses under partial shading conditions caused by the interconnection of PV modules. These losses are due to the fact that under partial shading

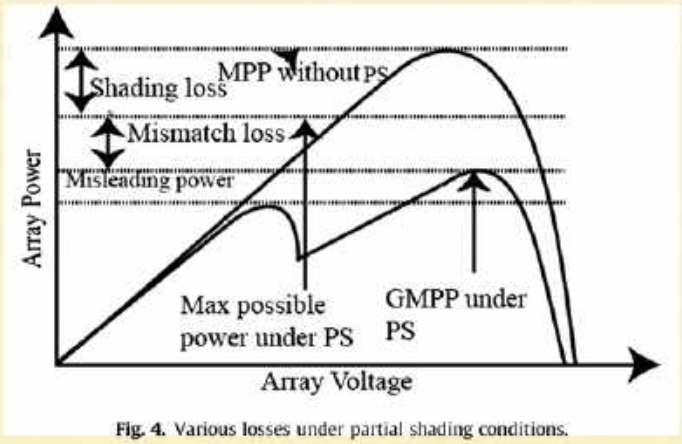


Fig. 4. Various losses under partial shading conditions.

conditions the *P–V* curves of the PV generators has typically multiple MPP and the generator may operate in the local MPP of low power instead of global MPP. Multiple MPP are upsetting, since the conventional MPP tracking algorithms based on Perturb and Observe method or Incremental Conductance method track the closest local MPP. Hence the power difference of the local MPP under partial shading conditions is important while choosing the configuration for the PV power generator if a conventional MPP algorithm is implemented. The relative power difference is calculated by using the absolute value of power difference of two local MPP, P_{MPP1} and P_{MPP2} . The power difference is zero in case of only one MPP and when the powers of the local MPP are equal.

2.6. Fill factor

The SC current and the OC voltage are the maximum current and voltage respectively from a solar cell. At both of these operating points, the net power from the solar cell is zero. The "fill factor", abbreviated as "FF", is a parameter which, in concurrence with V_{oc} and I_{sc}, defines the maximum power from a solar cell. The FF is defined as the ratio of the maximum power from the solar cell to the product of V_{oc} and I_{sc}. Explicitly, the FF is also the area of the largest rectangle which will fit in the *I–V* curve. Essentially, FF will be lower due to the presence of parasitic resistive losses. Losses due to PS also reduce the FF as there is considerable decay in the GMPP under PS. The expression for FF is as in (12).

$$FF = \frac{GMPP}{V_{OC} I_{SC}} \tag{12}$$

2.7. Performance Ratio (PR)

The Performance Ratio (PR) normalizes the effect of partial shading losses based on the rated output dc power P_{dc}, and allows comparison between arrays of different sizes under different annual array's in plane irradiance level (W h/m^2) (AR) Shams El-Dein et al., 2013. PR is represented in (13) where AE is the annual array's energy output (W h).

$$PR = \frac{AE}{AR} \times \frac{G_{ST}}{P_{dc}} \tag{13}$$

AE and AR used in (16) can be found from (14) and (15).

$$AE = \sum_{g=1}^{N} GMPP_g t_g \tag{14}$$

In (14), g is the time segment index, N is the total number of time segments, $GMPP_g$ the array's global maximum power point at time index g (W) and t_g is the time segment.

$$AR = \sum_{g=1}^{N} IRA_g t_g \tag{15}$$

IRA_g is array's average irradiance level at time t_g.

Hence the array's PR for each time segment PR_g can be found as in (16)

$$PR_g = \frac{GMPP_g t_g}{IRA_g t_g} \times \frac{G_{ST}}{P_{dc}} = \frac{GMPP_g}{IRA_g} \times \frac{G_{ST}}{P_{dc}} \tag{16}$$

2.8. Shading patterns considered

In this work, five easy to forecast short-term sources of partial shading are considered. Fig. 5 shows five shading patterns which are more relevant and likely to occur in a 4 × 3 PV array, where the modules' irradiance levels are in W/m^2. Each state has a time segment g such that t_g denotes the total time period of each partial shading condition during the year. Here, this total time period is assumed to be same under all partial shading conditions. In the simulation model, shading patterns of TCT, OTCT and NTCT configurations are perceived though the irradiance level of each module as detailed in Fig. 5.

The datasheet specifications of GENERIC POLY 60Wp module is used in the simulation model here. The OC voltage, SC current, nominal voltage and current of the module under standard test conditions are 21.1 V, 3.8 A, 17.1 V and 3.5 A respectively.

3. Results and discussion

The performance of the proposed method is evaluated by exposing the array considered to five different shading patterns as discussed in Section 2. The location of GMPP in the TCT, OTCT and NTCT schemes are calculated theoretically. It specifies the number of rows that are bypassed to extract the maximum power. The theoretical results are verified using simulation studies in MATLAB/Simulink environment.

The approximate location of GMPP can be identified by finding the current in each row of the array. This is expressed as

$$I_{r(i)} = \sum_{j=1}^{4} K_{i,j} \cdot I_{i,j} \tag{17}$$

where $K_{i,j}$ is the solar irradiance of the panel numbered (i, j).

$$K_{i,j} = \frac{G_{ij}}{G_{ST}} \tag{18}$$

where $G_{i,j}$ is the solar irradiance of the panel numbered ij and $I_{i,j}$ is the current generated by the (i, j)th panel. The current generated by all the panels under STC is assumed to be I_n. Accordingly, the row currents in TCT configuration under Case I condition of partial shading are

$$I_{r1} = I_{r2} = I_n + I_n + I_n = 3I_n \tag{19}$$

$$I_{r3} = I_{r4} = 0.5I_n + 0.5I_n + 0.5I_n = 1.5I_n \tag{20}$$

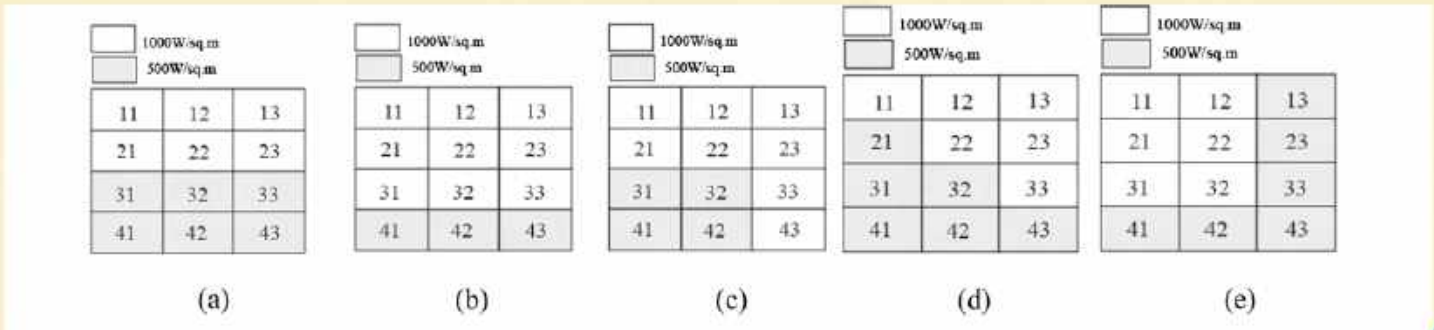


Fig. 5. (a) Case I – Double row shading. (b) Case II – Single row shading. (c) Case III – Corner shading. (d) Case IV – Oblique shading. (e) Case V – Single row–Column shading.

Thus the current generated in different rows are not equal. Hence there exist multiple peaks on the PV characteristics. Neglecting the small variations in voltage across each row, the voltage of the array is $V_{array} = 4 \times V_n$, if one of the panels are bypassed and $V_{array} = 3 \times V_n + V_d$, where V_d is the voltage across the diode if a single row is bypassed. V_d is much smaller compared to V_n and hence it is neglected. The power produced by the array is

$$P_{array} = V_{array} \times 4I_n \tag{21}$$

If none of the rows are bypassed and all the panels receive uniform solar insolation. In OTCT configuration, for case I condition of partial shading, the current in each row is calculated as follows,

$$I_{r1} = I_{r4} = I_n + 0.5I_n + I_n = 2.5I_n \tag{22}$$

$$I_{r2} = I_{r3} = 0.5I_n + I_n + 0.5I_n = 2.0I_n \tag{23}$$

For NTCT configuration, under the same condition of partial shading, the current in each row is calculated as in (24) and (25).

$$I_{r1} = I_{r3} = I_n + 0.5I_n + I_n = 2.5I_n \tag{24}$$

$$I_{r2} = I_{r4} = 0.5I_n + I_n + 0.5I_n = 2.0I_n \tag{25}$$

It is be noted that the row currents for OTCT and NTCT schemes are unique which result in equal GMPP for both the arrangements and similar results are obtained under all shading patterns as shown in Table 1. The panel currents and voltage under all five cases of partial shading for TCT, OTCT and NTCT schemes of interconnection are noted in Table 1 according to the order in which panels are bypassed.Power enhancement is validated in all the five cases of partial shading conditions for OTCT and NTCT configurations. Further, the location of GMPP is matching for OTCT and NTCT configurations under all considered conditions of partial shading. The theoretical calculations are verified by the simulation results carried out in MATLAB/Simulink environment.

3.1. Electrical characteristics

The electrical characteristics are obtained for considered TCT, OTCT and NTCT schemes are discussed in this section. The *P–V* characteristics of mentioned three schemes of arrangement of modules for the considered five shading patterns are shown in Fig. 6.

The TCT interconnection has more partial shading losses due to lack of coherence between the modules MPPs and the array's GMPP. In Case I condition of partial shading, the array's GMPP for TCT configuration is 362.9 W and it occurs when the modules are not at their MPPs. The MPP for the 1000 W/m^2 module and 500 W/m^2 are 56 W and 27.57 W respectively. In OTCT interconnection, the array's GMPP (466 W) has more coherence with the module's MPP. The arrays GMPP for NTCT connection is also 466 W. Fig. 5(a) shows that the *P–V* characteristic of NTCT and OTCT interconnections, coincide with one another and also is smoother than that of TCT, which reduces the probability of the false tracking of MPP. This has been validated by theoretical solution for OTCT and NTCT schemes as shown in Table 1.

When compared to TCT interconnection, the array's GMPP for OTCT and NTCT configurations increases for all considered conditions of partial shading. Moreover the *P–V* characteristics of OTCT and NTCT configurations coincide with each other for all considered cases of partial shading. This can be validated by an approximate theoretical solution for determining the GMPP.

The current–voltage (*I–V*) characteristics of TCT, OTCT and NTCT configurations at five instants of partial shading are shown in Fig. 7. The *I–V* characteristics of OTCT and NTCT configuration also have lesser undulations than TCT. At all considered partial shading conditions, the SC current of TCT is higher than OTCT and NTCT scheme of interconnection. On the contrary, the array current of RTCT configuration has a prominently higher value near to GMPP than TCT in OTCT and NTCT scheme.

3.2. Estimated parameters

The estimated parameters of the partially shaded solar array are detailed in this subsection. These parameters have been estimated from the electrical characteristics in Section 3.1. GMPP, V_{oc}, I_{sc} and P_{loss} are estimated from the electrical characteristics of the three

Table 1
Position of GMPP in TCT, OTCT and NTCT configurations under the five partial shading conditions.

Time instant	TCT				OTCT				NTCT			
	Row current in the order in which the panels are bypassed		Voltage V_{array}	Power P_{array}	Row current in the order in which the panels are bypassed		Voltage V_{array}	Power P_{array}	Row current in the order in which the panels are bypassed		Voltage V_{array}	Power P_{array}
Case I	I_{r3}	1.5 I_n	4 V_n	6 V_n I_n	I_{r2}	2.0 I_n	4 V_n	8.0 V_n I_n	I_{r1}	2.0 I_n	4 V_n	8.0 V_n I_n
	I_{r4}	1.5 I_n	3 V_n	4.5 V_n I_n	I_{r3}	2.0 I_n	3 V_n	6.0 V_n I_n	I_{r3}	2.0 I_n	3 V_n	6.0 V_n I_n
	I_{r1}	3 I_n	2 V_n	6 V_n I_n	I_{r1}	2.5 I_n	2 V_n	5.0 V_n I_n	I_{r2}	2.5 I_n	2 V_n	5.0 V_n I_n
	I_{r2}	3 I_n	1 V_n	3 V_n I_n	I_{r4}	2.5 I_n	1 V_n	2.5 V_n I_n	I_{r4}	2.5 I_n	1 V_n	2.5 V_n I_n
Case II	I_{r4}	1.5 I_n	4 V_n	6.0 V_n I_n	I_{r1}	2.5 I_n	4 V_n	10 V_n I_n	I_{r2}	2.5 I_n	4 V_n	10 V_n I_n
	I_{r3}	3.0 I_n	3 Vn	9.0 Vn In	I_{r3}	2.5 I_n	3 V_n	7.5 V_n I_n	I_{r3}	2.5 I_n	3 V_n	7.5 V_n I_n
	I_{r2}	3.0 I_n	2 V_n	6.0 V_n I_n	I_{r4}	2.5 I_n	2 V_n	5.0 V_n I_n	I_{r4}	2.5 I_n	2 V_n	5.0 V_n I_n
	I_{r1}	3.0 I_n	1 V_n	3.0 V_n I_n	I_{r2}	3.0 I_n	1 V_n	3.0 V_n I_n	I_{r1}	3.0 I_n	1 V_n	3.0 V_n I_n
Case III	I_{r3}	2.0 I_n	4 V_n	8.0 V_n I_n	I_{r1}	2.5 I_n	4 V_n	10 V_n I_n	I_{r1}	2.5 I_n	4 V_n	10 V_n I_n
	I_{r4}	2.0 I_n	3 V_n	6.0 V_n I_n	I_{r2}	2.5 I_n	3 V_n	7.5 V_n I_n	I_{r2}	2.5 I_n	3 V_n	7.5 V_n I_n
	I_{r1}	3.0 I_n	2 V_n	6.0 V_n I_n	I_{r3}	2.5 I_n	2.V_n	5.0 V_n I_n	I_{r3}	2.5 I_n	2.V_n	5.0 V_n I_n
	I_{r2}	3.0 I_n	1 V_n	3.0 V_n I_n	I_{r41}	2.5 I_n	1 V_n	2.5 V_n I_n	I_{r41}	2.5 I_n	1 V_n	2.5 V_n I_n
Case IV	I_{r4}	1.5 I_n	4 V_n	6.0 V_n I_n	I_{r3}	2.0 I_n	4 V_n	8.0 V_n I_n	I_{r2}	2.0 I_n	4 V_n	8.0 V_n I_n
	I_{r3}	2 I_n	3 V_n	6.0 V_n I_n	I_{r4}	2.0 I_n	3 V_n	6.0 V_n I_n	I_{r3}	2.0 I_n	3 V_n	6.0 V_n I_n
	I_{r2}	2.5 I_n	2 V_n	5.0 V_n I_n	I_{r1}	2.5 I_n	2 V_n	5.0 V_n I_n	I_{r1}	2.5 I_n	2 V_n	5.0 V_n I_n
	I_{r1}	3.0 I_n	1 V_n	3.0 V_n I_n	I_{r2}	2.5 I_n	1.V_n	2.5 V_n I_n	I_{r4}	2.5 I_n	1.V_n	2.5 V_n I_n
Case V	I_{r4}	1.5 I_n	4 V_n	6.0 V_n I_n	I_{r1}	2.0 I_n	4 V_n	8.0 V_n I_n	I_{r3}	2.0 I_n	4 V_n	8.0 V_n I_n
	I_{r3}	2.5 I_n	3 V_n	7.5 V_n I_n	I_{r3}	2.0 I_n	3 V_n	6.0 V_n I_n	I_{r4}	2.0 I_n	3 V_n	6.0 V_n I_n
	I_{r2}	2.5 I_n	2 V_n	5.0 V_n I_n	I_{r2}	2.5 I_n	2 V_n	5.0 V_n I_n	I_{r1}	2.5 I_n	2 V_n	5.0 V_n I_n
	I_{r1}	2.5 I_n	1 V_n	2.5 V_n I_n	I_{r4}	2.5 I_n	1 V_n	2.5 V_n I_n	I_{r2}	2.5 I_n	1 V_n	2.5 V_n I_n

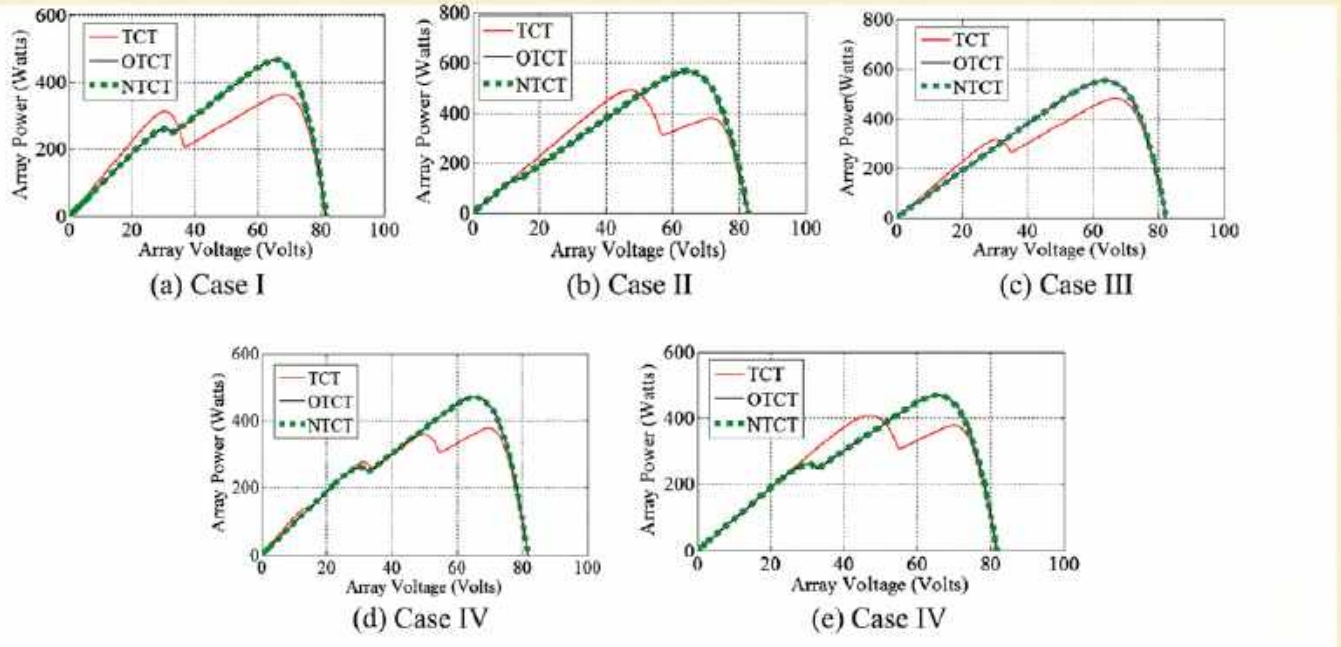


Fig. 6. (a), (b), (c), (d) and (e) *P–V* characteristics under the five considered shading patterns.

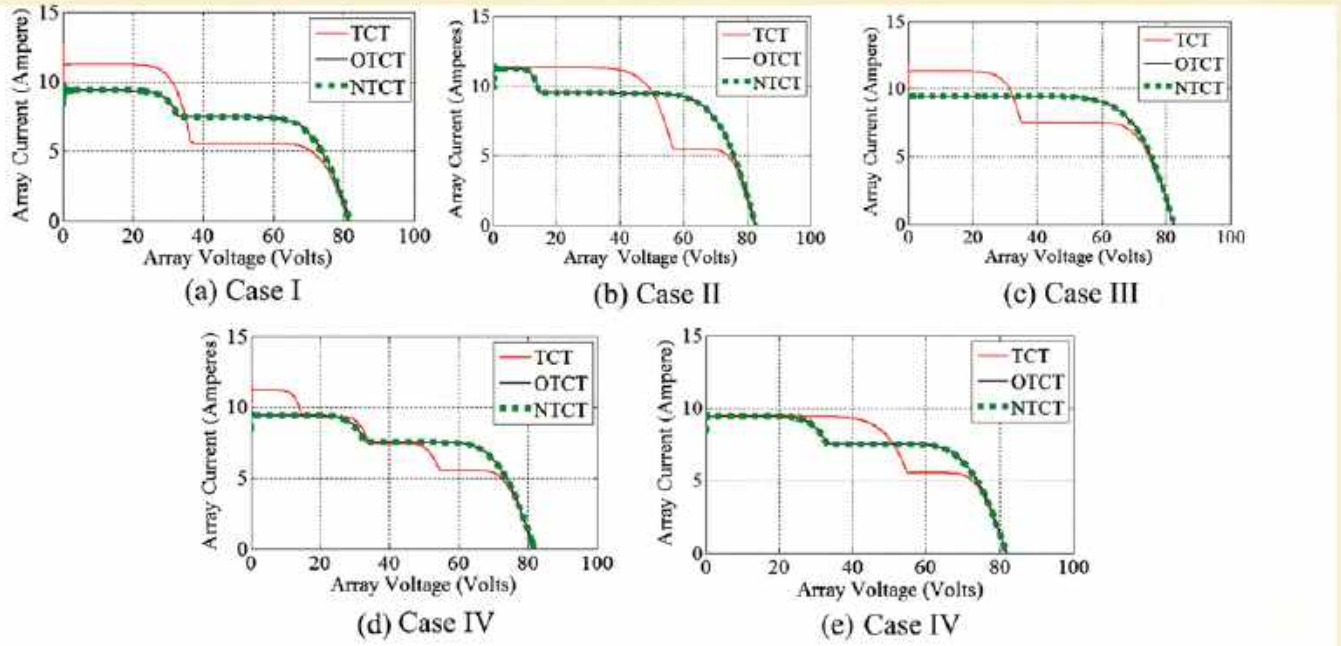


Fig. 7. (a), (b), (c), (d) and (e) *I–V* characteristics under the five considered shading patterns.

configurations for five shading patterns as discussed in Section 3.1. Mismatch Loss and Fill Factor are estimated from individual maximum powers and GMMP for the modules for each shading pattern. IMI and PR are estimated from Eqs. (6) and (13) respectively as explained in Section 1. The estimated parameters are represented in Table 2.

3.2.1. Power Loss due to partial shading

Power loss due to partial shading is the difference in array GMPP under ST condition without partial shading and the array GMPP under partial shading. The array GMPP without partial shading is 667.92 W. The percentage loss in power due to partial shading in TCT, OTCT and NTCT is shown in Table 2 and is compared using a bar chart as in Fig. 8. The power loss due to partial shading for all the shading patterns considered are the same for OTCT and NTCT configurations since the GMPP for the two schemes of interconnection are the same for all shading patterns.

3.2.2. Mismatch loss

Mismatch loss is the difference between the sum of individual maximum power of the modules under partial shading conditions and GMMP of partially shaded array (Section 2.5). The sum of individual maximum powers under considered shading conditions are 499.38 W, 583.65 W, 555.56 W, 499.38 W and 499.38 W respectively, irrespective of the configuration under consideration. Percentage mismatch loss of TCT, OTCT and NTCT configurations is

Table 2
Consolidated table indicating the GMPP, OC voltage (V_{OC}), SC current (I_{SC}), Power loss due to shading (P_{loss}), Mismatch losses (MML), Fill Factor (FF), Irradiance level Mismatch Index (IMI) and Performance Ratio (PR) for considered five shading conditions for TCT, OTCT and NTCT scheme of arrangement.

PS conditions estimated parameters	Case I			Case II			Case III			Case IV			Case V		
	TCT	OTCT	NTCT	TCT	OTCT	NTCT	TCT	OTCT	NTCT	TCT	OTCT	NTCT	TCT	OTCT	NTCT
GMPP (W)	362.9	466	466	487.8	567.7	567.7	480.7	552.6	552.6	377.2	468.9	468.9	406.8	468.9	468.9
V_{OC} (V)	81.66	81.88	81.88	82.59	82.74	82.74	82.4	82.48	82.48	81.77	81.88	81.88	81.81	81.88	81.88
I_{SC} (A)	11.4	9.5	9.5	11.4	11.4	11.4	11.4	9.5	9.5	11.4	9.5	9.5	9.5	9.5	9.5
P_{loss} (%)	45.67	30.23	30.23	26.97	15.0	15.0	28.03	17.27	17.27	43.53	29.8	29.8	39.09	29.8	29.8
MML (%)	20.43	5.0	5.0	14.35	2.39	2.39	11.21	0.44	0.44	18.29	4.56	4.56	13.86	4.56	4.56
FF (%)	38.98	59.91	59.91	51.81	60.19	60.19	51.17	70.52	70.52	40.46	60.28	60.28	52.34	60.28	60.28
IMI	9.0	1.0	1.0	6.75	0.75	0.75	4.0	0	0	5.0	1.0	1.0	3.0	1.0	1.0
PR	0.672	0.863	0.863	0.774	0.901	0.901	0.801	0.921	0.921	0.699	0.868	0.868	0.753	0.868	0.868

shown in Table 2 and is compared using a bar chart as in Fig. 9. Mismatch loss is also the same for OTCT and NTCT schemes under the considered conditions of partial shading.

3.2.3. Fill Factor (FF)

Losses due to partial shading cause discrepancies in the Fill Factor (Section 2.6). Percentage fill factor FF under various shading patterns considered for TCT, OTCT and NTCT schemes of arrangement shown in Table 2 is compared using a bar chart as in Fig. 10. There is considerable improvement in fill factor for OTCT and NTCT configurations under all shading patterns since there is increase in GMPP for the these schemes of arrangement.

3.2.4. Power enhancement

Power Enhancement (PE) is the increase in power generated in the rearranged scheme due to shade dispersion.

$$\%(\mathrm{PE}) = \frac{\mathrm{GMPP}_{\mathrm{RTCT}} - \mathrm{GMPP}_{\mathrm{TCT}}}{\mathrm{GMPP}_{\mathrm{RTCT}}} \times 100 \tag{26}$$

Since the GMPP under all cases of PS are equal, the power enhancement is the same for OTCT and NTCT configurations. This is represented in Fig. 11.

3.2.5. Irradiation level mismatch index

Interconnection the modules from the same row into different parallel circuits minimize the IMI. The irradiance level mismatch index in case I condition of partial shading (IMI) is reduced from 9 in TCT to 1 in OTCT and NTCT. In case III condition of partial shading, the OTCT and NTCT interconnection has zero IMI. Moreover, its *P–V* characteristic has only one peak as shown in Fig. 6(c), thus simplifying the algorithm of MPPT. IMI for all considered shading patterns have improved significantly in OTCT and NTCT schemes. The IMI for various shading patterns for TCT, OTCT and NTCT configurations is shown in Fig. 12.

3.2.6. Performance ratio

The increase in GMPP is reflected in the array's performance ratio for all considered conditions of partial shading. In case I the performance ratio have increased from 0.672 in TCT to 0.863 in OTCT and NTCT schemes. In case of Case III condition of partial shading, the OTCT and NTCT interconnection has maximum performance ratio of 0.921 since it has zero IMI. The PR for various shading patterns for the three array configurations is shown in Table 2 and presented graphically in Fig. 13.

4. Conclusion

This paper proposed and analyzed a novel Total Cross Tied configuration for performance improvement under partial shading conditions. The method employs a simpler technique of reconnection and can be employed to arrays of any dimensions. Loss in power, mismatch loss, power enhancement, fill factor, performance ratio and irradiation mismatch index has been compared for classical TCT, OTCT and NTCT schemes. The estimated parameters showed that the proposed scheme of interconnection showed equal improved performance par with Optimal Total Cross Tied configuration. Approximate location of GMPP and nominal voltage of the partially shaded array are validated for the three schemes by Kirchoffs laws. The OTCT scheme of connection becomes complex as the array size increases and involves larger number of constraints. Thus, the proposed scheme of arrangement is helpful in the design of PV arrays, and is especially useful for huge photovoltaic farms. The NTCT interconnection also results in a smoother array Power -Voltage (*P–V*) characteristics with lesser number of

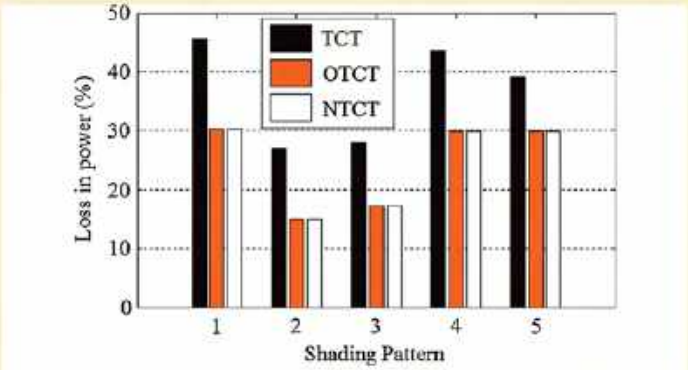


Fig. 8. Loss in power for TCT, OTCT and NTCT schemes for five shading patterns.

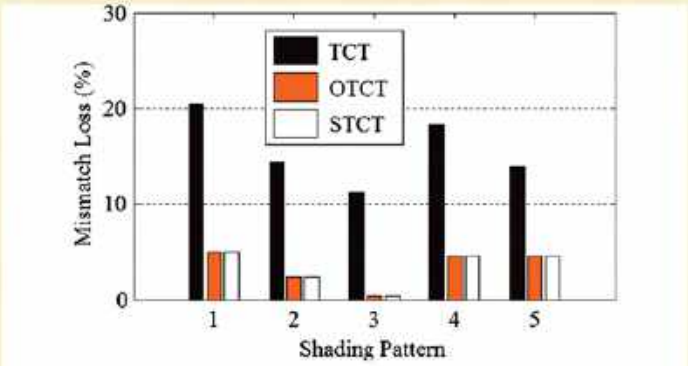


Fig. 9. Mismatch loss (%) for TCT, OTCT and NTCT schemes under five shading conditions.

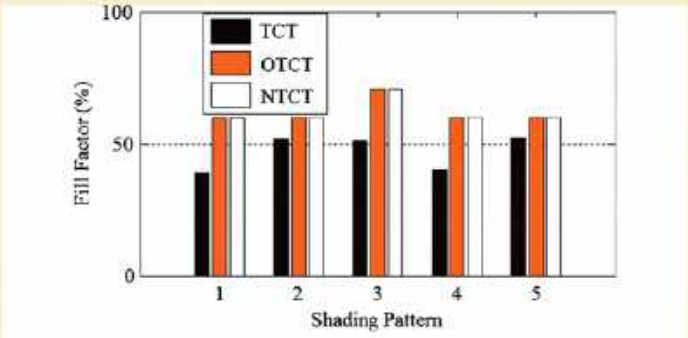


Fig. 10. Fill factor (%) for TCT, OTCT and NTCT schemes.

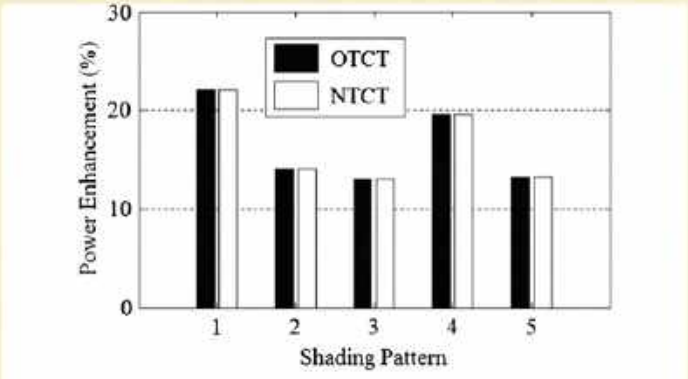


Fig. 11. PE for the for TCT, OTCT and NTCT schemes under various shading patterns.

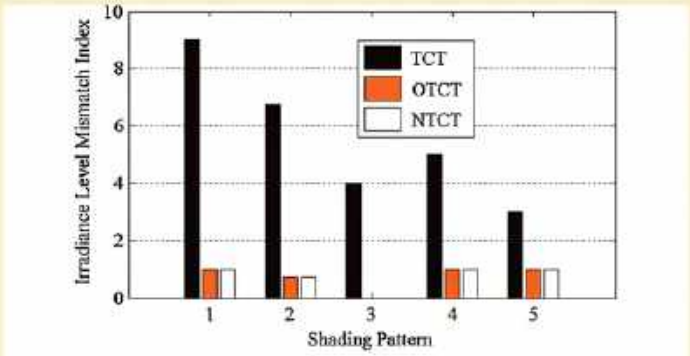


Fig. 12. IMI for TCT, OTCT and NTCT schemes under five shading conditions.

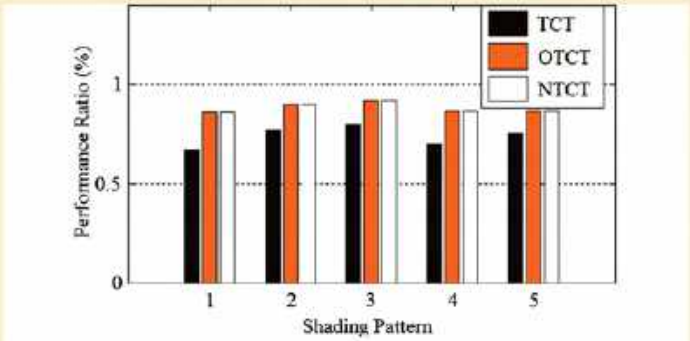


Fig. 13. PR for TCT, OTCT and NTCT schemes under five shading conditions.

local maxima, thus simplifying Maximum Power Point Tracker (MPPT) algorithm.

Acknowledgement

The first author is thankful to the IT Department, Ministry of Kerala for providing facilities under the 'SPEED IT' Programme for undertaking research.

References

Acciari, G., Graci, D., La Scala, A., 2011. Higher PV module efficiency by a novel CBS bypass. Power Electron. IEEE Trans. 26 (5), 1333–1336.

Adinolfi, Giovanna, Graditi, Giorgio, Siano, Pierluigi, Piccolo, Antonio, 2015. Multiobjective optimal design of photovoltaic synchronous boost converters assessing efficiency, reliability, and cost savings. IEEE Trans. Industr. Inf. 11 (5), 1038–1048.

Appelbaum, J.J., Bani, J., Braunstein, A., 1977. Array power output of non-identical cells. In: Proc. 12th Intersoc. Energy Conv. Eng. Conf., pp. 1686–1692.

Batzelis, Efstratios I., Routsolias, Iason A., Papathanassiou, Stavros A., 2013. An explicit PV string model based on the lambert function and simplified MPP expressions for operation under partial shading. IEEE Trans. Sustain. Energy 5 (1), 301–312.

Bishop, J.W., 1988. Computer simulation of the effects of electrical mismatches in photovoltaic cell interconnection circuits. Elsevier - Solar Cells 25 (1), 73–89.

Boronat, Chouder, A., 2009. Study of bypass diodes configuration on PV modules. Appl. Energy 86 (9), 1632–1640.

Brandstetter, A., 1983. Solar cell array studies. In: Proc. Solar World Congr., pp. 1549–1553.

Drifa, M., Pèreza, P.J., Aguileraa, J., Aguilara, J.D., 2008. A new estimation method of irradiance on a partially shaded PV generator in grid-connected photovoltaic systems. Renew. Energy 33 (9), 2048–2056.

Esram, T., Chapman, P.L., 2007. Comparison of photovoltaic array maximum power point tracking techniques. IEEE Trans. Energy Convers. 22 (2), 439–449.

Forman, S.E., Themelis, M.P., 1980. Performance and reliability of photovoltaic modules at various MIT LL test sites. In: Proc. 14th IEEE Photovoltaic Specialist Conference, San Diego, CA. IEEE, New York, p. 1284.

Gao, Lijun, Dougal, Roger A., Liu, Shengyi, Iotova, Albena P., 2009. Parallel-connected solar PV system to address partial and rapidly fluctuating shadow conditions. IEEE Trans. Industr. Electron. 56 (5), 1548–1556.

Gautamand, N.K., Kaushika, N.D., 2002. Reliability evaluation of solar photovoltaic arrays. Sol. Energy 72 (2), 129–141.

Gonzalez, C., Weaver, R., 1980. Circuit design considerations for photovoltaic modules and systems. In: Proc. 14th IEEE Photovolt. Spec. Conf., pp. 528–535.
Green, M.A., Hasyim, H.S., Wenham, S.R., Willison, M.R., 1984. Silicon solar cells with integrated bypass diodes. In: 17th IEEE Photovoltaic Specialists Conference, pp. 513–517.
Huynh, Duy C., Nguyen, Tuong M., Dunnigan, Matthew W., Mueller, Markus A., 2013. Global MPPT of solar PV modules using a dynamic PSO algorithm under partial shading conditions. In: Proceedings of IEEE Conference on Clean Energy and Technology (CEAT), pp. 134–139.
InduRani, B., Sarava Ilango, G., Nagamani, Chlilakapati, 2013. Enhanced power generation from PV array under partial shading conditions by Shade dispersion using Su Do Ku configuration. IEEE Trans. Sustain. Energy 4, 594–601.
Ishaque, Kashif, Salam, Zainal, 2013. A deterministic particle swarm optimization maximum powerpoint tracker for photovoltaic system under partial shading condition. IEEE Trans. Ind. Electron. 60 (8), 3195–3206.
Ishaque, Kashif, Salam, Zainal, Mekhilef, Saad, Shamsudin, Amir, 2012. Parameter extraction of solar photovoltaic modules using penalty-based differential evolution. Appl. Energy 99, 297–308.
Jaboori, M.G., Saied, M.M., Hanafy, A.R., 1991. A contribution to the simulation and design optimization of photovoltaic systems. IEEE Trans. Energy Syst. 6 (3), 401–406.
Kaushika, Narendra D., Gautam, Nalin K., 2003. Energy yield simulations of interconnected solar arrays. IEEE Trans. Energy Convers. 18, 127–133.
Kaushika, N.D., Gera, R., Kaushika, K., 1988. Hot spot protection in solar PV modules and arrays. In: Proc. Nat. Conf. Solar Energy Syst., pp. 113–117.
Lashway, C., 1988. Photovoltaic system testing techniques and results. IEEE Trans. Energy Convers. 3 (3), 503–506.
Maki, Anssi, Valkealahti, Seppo, 2012. Power losses in long string and parallel-connected short strings of series-connected silicon-based photovoltaic modules due to partial shading conditions. IEEE Trans. Energy Convers. 27 (1), 173–183.
Molenbroek, E., Waddington, D.W., Emery, K.A., 1991. Hot spot susceptibility and testing of PV modules. Proc. Conf. Rec. 22nd IEEE Photovoltaic Spec. Conf., vol. 1, pp. 547–552.
Nguyen, D., Lehman, B., 2008. An adaptive solar photovoltaic array using model-based reconfiguration algorithm. IEEE Trans. Ind. Electron. 55 (7), 2644–2654.
Patel, H., Agarwal, V., 2008a. MATLAB-based modeling to study the effects of partial shading on PV array characteristics. Energy Convers. IEEE Trans. 23 (1), 302–310.
Patel, H., Agarwal, V., 2008b. Maximum power point tracking scheme for PV systems operating under partially shaded conditions. IEEE Trans. Ind. Electron. 55 (4), 1689–1698.
Patnaik, B., Sharma, P., Trimurthulu, E., Duttagupta, S.P., Agarwal, V., 2011. Reconfiguration strategy for optimization of solar photovoltaic array under non-uniform illumination conditions. Proc. Photovoltaic. Special. Conf. (PVSC), vol. 56, pp. 1859–1864, Jun. 19–24.
Picault, D., Raison, B., Bacha, S., de la Casa, J., Aguilera, J., 2010. Forecasting photovoltaic array power production subject to mismatch losses. Sol. Energy 84 (7), 1301–1309.
Quaschning, Volker, Hanitsch, Rolf, 1995. Shade calculations in photovoltaic systems. In: ISES Solar World Conference – Harare/Zimbabwe – September 11–15.
Quaschning, Volker, Hanitsch, Rolf, 1996. Numerical simulation of current–voltage characteristics of photovoltaic systems with shaded solar cells. Sol. Energy 56 (6), 513–520.
Rosen, Kenneth H., Michales, John G., Gross, Jonathan L., Grossman, Jerrold W., Shier, Douglas R., 1999. Handbook of Discrete and Combinatorial Mathematics, first ed. CRC Press, Florida, USA.
Ross Jr., R.G., 1982. Reliability and performance experience with flat-plate photovoltaic modules. In: Proc. 4th E.C. Photovoltaic Solar Energy Conference, p. 10.
Safari, Mekhilef, S., 2011. Simulation and hardware implementation of incremental conductance MPPT with direct control method using Cuk converter. IEEE Trans. Ind. Electron. 58 (4), 1154–1161.
Himanshu Sekhar, Sahu, Nayak, Sisir Kumar, 2014. Power enhancement of partially shaded PV array by using a novel approach for shade dispersion. In: IEEE Conference on Innovative Smart Grid Technologies – Asia (ISGT ASIA), pp. 498–503.
Salameh, Z.M., Dagher, F., 1990. The effect of electrical array reconfiguration on the performance of a PV-powered volumetric water pump. IEEE Trans. Energy Convers. 5 (4), 653–658.
Seyedmahmoudian, Mehdi, Horan, Ben, Rahmani, Rasoul, Maung Than Oo, Aman, Stojcevski, Alex, 2016. Efficient photovoltaic system maximum power point tracking using a new technique. Energies, 1–18.
Shams El-Dein, M.Z., Kazerani, Mehrdad, Salama, M.M.A., 2013. Optimal photovoltaic array reconfiguration to reduce partial shading losses. IEEE Trans. Sustain. Energy 4 (1), 145–153.
Sheperd, N.F., Shigimura, R.F., 1984. The integration of bypass diodes with terrestrial photovoltaic modules and arrays. In: Proceedings of the 17th IEEE Photovoltaic Specialists Conference Orlando, Florida, pp. 676–681.
Silvestre, S., Lijun, A.G., Dougal, R.A., Shengyi, L., Iotova, A.P., 2009. Parallel-connected solar PV system to address partial and rapidly fluctuating shadow conditions. IEEE Trans. Ind. Electron. 56 (5), 1548–1556.
Silvestre, S., Boronat, A., Choudar, A., 2009. Study of bypass diodes configuration on PV modules. Appl. Energy 86 (9), 1632–1640.
Spertino, F., Akilimali, J.S., 2009. Are manufacturing *I–V* mismatch and reverse currents key factors in large photovoltaic arrays? IEEE Trans. Industr. Electron. 56 (11), 4520–4531.
Swaleh, M.S., Green, M.A., 1982. Effect of shunt resistance and bypass diode on the shadow tolerance of solar cell modules. Solar Cells 5 (2), 183–198.
Velasco-Quesada, G., Guinjoan-Gispert, F., Pique-Lopez, R., Roman-Lumbreras, M., Conesa-Roca, A., 2009. Electrical PV array reconfiguration strategy for energy extraction improvement in grid-connected PV systems. IEEE Trans. Ind. Electron. 56 (11), 4319–4331.
Villalva, M., Gazoli, J.R., Filho, E.R., 2009. Comprehensive approach to modeling and simulation of photovoltaic arrays. IEEE Trans. Power Electron. 24 (5), 1198–1208.
Wang, Y.-J., Hsu, P.-C., 2011. An investigation on partial shading of PV modules with different connection configurations of PV cells. Energy 36 (5), 3069–3078.

UNIQUE CHOICES REFLECT UNIQUE CHARACTER

"Our character is always our identity.... " Good character makes us a person of value. The choices that we make reflects our character. In order to make a good choice one must overcome the fear to make choices.Fear arises due to the lack of knowledge .If we have enough knowledge about the consequences of our choice ,it will always be the best !

"The past is history ,future is a mystery .So the only reality is the Present ,so just live in it ".Its not always necessary that the choices that we make may be right ,it might seem wrong for some.It need not stop you from making the choice.You can learn from your mistakes."A person who has not made any mistake has not tried anything new".

Yes!Always people who does not know much about us analyse us by all the decisions and choices that we made in our life "If you are waiting for the rain ,just prepare to face the mud "'

Hard times don't make up a choice but a calm mind will!

Surya S S
S4 C2 2019-20

HEIGHTS

Amidst the bright sky , a dark cloud roved,
The more the rain that filled you
The more stifled you were
All you fancied was the heights

At heights you distaste
Lonlier than an outcast .
You were never to be stifled ,
Be the goddess you ought to be

Adored by the mountains
All you were was an enchantress
Who placed her dark arts through my heart
Never dying coldness was swayed .

The time came they met atlast ,
She could not hold in any longer
A burst of rain showered in over the alps ,
The roaring thunders shook the planes.

Eluded from the darkness
The cloud was once again free ,
Amidst the sky ,it once again flew heights
It had attained what it was yearning !

And that was left for him
The remains of her tears !
Deep down into the veins ,
Sorrow filled his eyes to the brim .

Amal Vijayakumar
S8 ECE

നരകാളി

ദേവിക രാജേഷ്
S4 E 2019-20

എവിടേയ്ക്ക് എന്നൊരു ചോദ്യം അന്നും എന്റെ മുമ്പിലുണ്ടായിരുന്നു. ലക്ഷ്യമില്ലാത്ത ഈ യാത്ര തുടങ്ങിയിട്ട് ഏറെ നാളായി. എന്തുകൊണ്ടെന്ന് അറിയില്ല എവിടെയോ എനിക്കായി എന്തോ കാത്തിരിക്കുന്നതുപോലെ ഒരു തോന്നൽ. എത്ര രാത്രികളും പകലും കടന്നുപോയി എന്നൊരു നിശ്ചയവുമില്ലായിരുന്നു. എങ്കിലും എന്റെ മനസ്സ് എന്തോ ഒരു ദൃഢനിശ്ചയം എടുത്തിരുന്നു. എന്താണെന്ന് മാത്രം അറിയാൻ കഴിയാതെ ഞാൻ വിഷമിക്കുകയാണ്.

എത്ര ദൂരം താണ്ടി എന്ന ഒരു ഏകദേശ നിശ്ചയം എനിക്കുണ്ടായിരുന്നു. എന്നോ കണ്ട ഒരു സ്വപ്നം സത്യമാണെന്നു വിശ്വസിച്ച് , കണ്ടുപിടിക്കാൻ ഇറങ്ങിയതാണ്....

മഞ്ഞ്മൂടി കിടക്കുന്ന സ്ഥലം , വിജനമായ വീഥികൾ, ഉച്ചതിരിഞ്ഞ് ഏകദേശം ഒരു മൂന്നുമണി ആയിരുന്നായിരിക്കും. നേരിയ സൂര്യപ്രകാശം അവിടെയിവിടെ തട്ടി മറയുന്നു. മുമ്പിലോട്ട് വഴിയുണ്ടോ എന്ന് ഒരു നിശ്ചയവുമില്ല, എങ്കിലും ആരോ എന്നോട് ധൈര്യമായി മുമ്പിലോട്ട് പോകാൻ ആവശ്യപ്പെട്ടുകൊണ്ടിരുന്നു. ആ ഉൾവിളി എന്നും എനിക്ക് നല്ലതെ വരുത്തുകയുള്ളു എന്ന വിശ്വാസത്തിൽ ഞാൻ എന്റെ യാത്ര തുടർന്നു. നിശബ്ദമായ സ്ഥലം . എന്റെ കാൽനട ശബ്ദം എന്റെ ശ്വാസത്തിന്റെയും , എന്റെ കയ്യിൽകിടക്കുന്ന വാച്ചിന്റെയും പിന്നെ എന്റെ ചുറ്റും നിർത്താതെ വീശുന്ന കാറ്റും മാത്രമായിരുന്നു അന്നു എന്റെ കാതുകൾക്കാശ്വാസം നൽകിയത്. ആത്മധൈര്യം സംഭരിച്ച് എന്തുവന്നാലും നേരിടാം എന്ന ആത്മവിശ്വാസത്തോടെ എന്റെ യാത്ര ഞാൻ തുടരുകയായിരുന്നു. അല്പസമയത്തിനുശേഷം ദൂരെനിന്ന് എവിടെയോ ഒരു സൈക്കിളിന്റെ ബെല്ലിന്റെ ശബ്ദം ഞാൻ കേട്ടു. ആരോ വരുകയാണ് എന്ന ആശ്വാസത്തോടെ ഞാൻ ചുറ്റും നോക്കി. സൈക്കിൾ ഒന്നും കണ്ടില്ല. പക്ഷെ ഞാൻ അവിടെ ഒരു സൈൻബോർഡ് കണ്ടു. എവിടേയ്ക്കുള്ള വഴിയാണ് അത് കാണിച്ചിരുന്നത് എന്ന് എനിക്കറിയില്ല. പക്ഷെ അതിൽ വലത്തോട്ട് പോകുവാൻ മാർഗദർശനം ചെയ്തിരുന്നു. എന്റെ മനസ്സും അതുതന്നെ എന്നോട് പറഞ്ഞു. കുറേ ദൂരത്തേയ്ക്ക് ഒന്നും വ്യക്തമല്ലായിരുന്നു. എന്നാലും ഞാൻ അങ്ങോട്ട് തിരിഞ്ഞു. കുറച്ചു കഴിഞ്ഞപ്പോൾ ഞാൻ അവിടെ എത്തി, പക്ഷെ എവിടെ ? അത് എന്റെ മനസ്സിനു മാത്രമേ അറിയുമായിരുന്നുള്ളൂ.

നേരേ നോക്കിയാൽ ഒരു ആർച്ചുപോലെ എന്തോ കാണാൻ കഴിയുന്നുണ്ട്. അതിന്റെ പിന്നിലേയ്ക്ക് എന്താണെന്ന് വ്യക്തമല്ല. ആ ആർച്ച് കല്ലുകൊണ്ടായിരുന്നു നിർമ്മിച്ചിരുന്നത്. അത് മനുഷ്യർ നിർമ്മിച്ചതല്ലായിരുന്നു. കാലാകാലങ്ങളായി അത് അവിടെ ഉണ്ടായിരുന്നതുപോലെയാണ് എനിക്കു തോന്നിയത്.

അപ്പോൾ എന്റെ അടുത്ത് ആരോ നിൽക്കുന്നതായി എനിക്ക് തോന്നി. തിരിഞ്ഞപ്പോൾ ഒരു മുത്തശ്ശി, അവർ എന്നെ അടുത്തേയ്ക്ക് വിളിച്ചു.. "മോളേ, ഇതാണ് നരകക്കൊല്ലി ഇതിനകത്തേയ്ക്ക് പോയവരാരും ഇതുവരെ തിരിച്ചുവന്നിട്ടില്ല". പെട്ടെന്ന് ഞാൻ അങ്ങോട്ടു തിരിഞ്ഞു, എവിടെനിന്നാണ് ഇത്രയും മഞ്ഞുവന്നത് എന്ന് ഒരു നിശ്ചയവുമില്ലായിരുന്നു... ആ മുത്തശ്ശി ആ മഞ്ഞിൽ നടന്നുമറയുന്നതു ഞാൻ കണ്ടു. പെട്ടെന്നു ഞാൻ എന്റെ കണ്ണുകൾ അടച്ചു. പിന്നീട് ഞാൻ കണ്ണു തുറക്കുമ്പോൾ , ഞാൻ എങ്ങോ ലക്ഷ്യമില്ലാതെ യാത്ര ചെയ്യുവാൻ ഒരുങ്ങുകയാണ്. ഞാൻ കണ്ട ആ സ്വപ്നം സത്യമാക്കുവാൻ ഇറങ്ങിത്തിരിക്കുകയാണ്. ഈ തണുപ്പിൽ എന്തുചെയ്യണമെന്നറിയാതെ നിൽക്കുമ്പോഴാണ് എവിടെനിന്നോ ഞാൻ ഒരു മണിനാഥം കേട്ടത്. സൈക്കിളിന്റെ ശബ്ദമാണ്. വർഷങ്ങൾ പഴക്കമുള്ളതാണ് ആ സൈക്കിൾ. അതിന്റെ പെഡലിന്റെ ശബ്ദം എത്ര ദൂരത്തുനിന്ന് വേണമെങ്കിലും കേൾക്കാമായിരുന്നു. ബെല്ലും അടിക്കുന്നുണ്ട്. ഞാൻ, ആരെങ്കിലും വരുന്നുണ്ടാവും എന്ന് പ്രതീക്ഷിച്ച് തിരിഞ്ഞു.

എന്റെ വിശ്വാസം സത്യമായി ആരോ വരുന്നുണ്ട്. ഒരു പുരുഷനാണ്. ഒരു മധ്യവയസ്കൻ. ഏറിയാൽ ഒരു നാല്പതു വയസ്സു വരും. എന്നെ കണ്ടപ്പോൾ അയാൾ സൈക്കിൾ നിർത്തി. 'എങ്ങോട്ടാ മോളേ ഈ സമയത്ത് ?! വീട് ഇവിടെ അടുത്താണോ? ഞാനും വീട്ടിലേയ്ക്കാ വേണമെങ്കിൽ ഞാൻ കൊണ്ടുവിടാം. എവിടെയാമോളെ വീട് ?'എങ്ങോട്ടെന്നറിയാതെ ഞാൻ ഒരു ദിശയിലേയ്ക്ക് ചൂണ്ടി. "അങ്ങോട്ടാണോ പോകേതണ്ട്. ഞാനും അങ്ങോട്ടാ. മോള് കയറിക്കോ ഞാൻ കൊണ്ട് വിടാം". ഇത്രയും പറഞ്ഞ് അയാളുടെ മുഖത്ത് ഒരു കള്ള ചിരി തെളിഞ്ഞു. ഞാൻ ആ സൈക്കിളിൽ കയറി . നമ്മൾ യാത്ര തുടങ്ങി. ഏകദേശം ഒരു അര മണിക്കൂർ അയാൾ സൈക്കിൾ ചവിട്ടി. കുറച്ചുകഴിഞ്ഞപ്പോൾ ഒരു ആർച്ചുകണ്ടു. അയാൾ അതിനടുത്തേയ്ക്ക് വേഗത്തിൽ പോകാൻതുടങ്ങി. അതിനു കുറച്ചുമുമ്പായി സൈക്കിൾ നിർത്തി എന്നോട് ഇറങ്ങാൻ ആവശ്യപ്പെട്ടു. എനിക്ക് ഇവിടെ ഒരാളെ കാണാനുണ്ടായിരുന്നു.

മോളും എന്നോടൊപ്പം വന്നോളൂ. പെട്ടെന്നു കണ്ടിട്ടുവരാം. ഞാൻ ഒന്നും മിണ്ടിയില്ല. ഞാൻ അയാളോടൊപ്പം പോയി . അകത്തേയ്ക്ക് പോകുന്നതല്ലാതെ ഞാൻ ആരേയും അവിടെ കണ്ടില്ല. എന്റെ ഉള്ളിൽ ഭയം നിറഞ്ഞു തുടങ്ങി. ധൈര്യം സംഭരിച്ച് ഞാൻ അയാളോട് ചോദിച്ചു. "എന്താ ഇവിടെ ആരും ഇല്ലാത്തത്". കുറച്ച് ഉള്ളിലേയ്ക്ക് പോണം അവിടെയാണ് എല്ലാവരും താമസിക്കുന്നത്. "ഇനി ഇവിടെ നിന്ന് എത്ര ദൂരമുണ്ട്".. "കുറച്ചേ ഉള്ളു മോളേ, എന്താ കാൽ വേദനിക്കുന്നുണ്ടോ, അത് സാരമില്ല ഇനിതൊട്ട് ഒരു വേദനകളും ഉണ്ടാവില്ല"...

"ഇത് ഏതാ സ്ഥലം?"

കുറച്ചുനേരത്തേയ്ക്ക് ആ മധ്യവയസ്കൻ ഒന്നും മിണ്ടിയില്ല , അയാളുടെ കൈക്ക് മുകളിലൂടെ അയാൾ എന്നെ നോക്കി പറഞ്ഞു "നരകക്കൊല്ലി" .....

ARTS FEST 2019-20

"AYKYA 2020" an inter departmental arts and cultural fest was conducted on march 6th. Each student was allowed to participate in 3 individual and 2 group activities and they were asked to register online early. Each dept. score was based on the accumulated points secured by the students of respective dept and the highest scored dept. was awarded the overall champion of AYKYA 2020. Individual championship for both male and female were also selected based on their accumulated individual points. All students were given with participation certificates. Each event is supervised with an external judge and their decision was taken as final.

These are the list of events conducted:

- **LITERARY EVENTS**

  - ESSAY WRITING ENGLISH
  - VERSIFICATION (POEM WRITING) ENGLISH
  - SHORT STORY WRITING HINDI
  - SHORT STORY WRITING ENGLISH
  - ESSAY WRITING MALAYALAM
  - VERSIFICATION (POEM WRITING) MALAYALAM
  - SHORT STORY WRITING MALAYALAM
  - ESSAY WRITING HINDI

- **FINE ARTS**

  - PAINTING
  - CARTOONING
  - COLLAGE
  - RANGOLI
  - CLAY MODELLING
  - SPOT PHOTOGRAPHY

SONG EVENTS

- LIGHT MUSIC
- CLASSICAL MUSIC
- RECITATION
- MAPPILAPATU
- WESTERN VOCAL
- INSTRUMENTAL MUSIC

DANCE EVENTS

- BHARATANATIYAM
- MOHINIYATTOM

THEATRE EVENTS

- MIMICRY
- MONO ACT
- FANCY DRESS

GROUP EVENTS

- GROUP DANCE
- THIRUVATHIRA
- GROUP SONG
- VANDEMATHARAM
- GANAMELA
- FOLK SONG
- DUFFMUTT
- MIME

- **OTHER EVENTS**

  - ELOCUTION
  - DEBATE

AROMAL R P (S8ME)

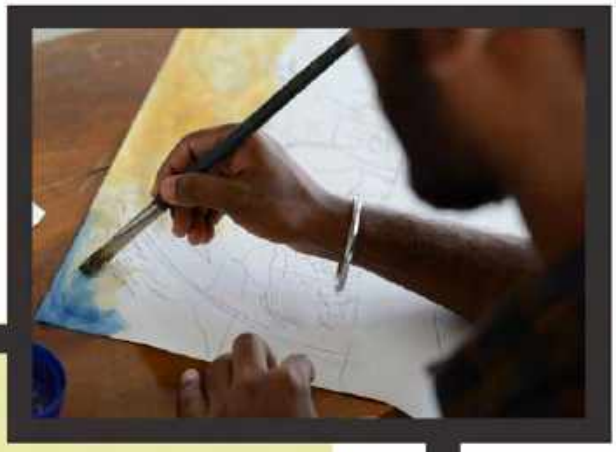
KALAPRATHIBHA
(AYKYA 2019-20)

JWALA RAJ (S8CE)

KALATHILAKAM
(AYKYA 2019-20)

AYKYA 2019-20 CHAMPIONS
CIVIL DEPARTMENT

➢ PHOTO GALLERY




aykya

1917 MOVIE REVIEW

Gokul Krishna S
S2 R2 2019-20

[Mild spoilers ahead]

Sam Mendes is back after a 4-year gap from his last movie Spectre. The film stars George MacKay and Dean Charles Chapman as the lead roles along with Mark Strong, Andrew Scott, Richard Madden, Claire Duburcq, Colin Firth and Benedict Cumberbatch. The film tells the story of two young British soldiers during the First World War who are ordered to deliver a message calling off an attack doomed to fail soon after the German retreat to the Hindenburg Line during Operation Alberich in 1917. This message is especially important to one of the young soldiers, as his brother is taking part in the pending attack.

The movie starts with Schofield (George MacKay) and Blake (Chapman) being summoned to see General Erinmore, who gives them a task to deliver a message to Colonel Mackenzie (Cumberbatch), to call off the attack against German in Hindenburg Line as the Germans were already plotting against them. If they fail to deliver on time, 1600 lives would be lost, including Blake's brother: Lieutenant Joseph Blake. After accepting the task, the two set on the course towards the Hindenburg Line where they have to undergo many obstacles as the area was a war field. After an unfortunate event, it's just Schofield, who had to carry the mission by himself.

For starters, the story is simple and not convoluted with a lot of subplots. The movie wastes no time in setting up the course. A high-quality performance was given by both MacKay and Chapman, the other actors, although had only a few minutes of screen time were also good, especially Cumberbatch. The best feel given by the movie is after the initial setup, you won't feel bored as you'll be immersed in the whole experience. There is a perfect balance between the action sequences and the conversations, so you won't feel too much of anything.

Sam Mendes is the real reason for this movie being a real success. This movie is made to be a two-shot movie and he succeeds in doing it. The cinematography is gorgeous; the color gradient, the use of green and brown was excellent. The soundtracks were exciting and "I am a poor wayfaring stranger" was a moving song. The editor is the second person to be praised; the accuracy in the movie makes the continuous shot successful. The small events happening after an action sequence was very good and had a calming effect. The next best aspect of this movie is the sound editing and mixing, it was perfect in every way, from the smallest footsteps to the explosions happening in the side, it gets you immersed in the movie and it isn't common most of the movies (happened in Endgame and Ford v Ferrari in 2019 for starters). In my opinion, this movie should've received the Sound Editing Award instead of the Mixing for the 92nd Academy Awards. And finally, this movie conveys the tension and emotion in a really good way, especially in the 3rd act.

So, in conclusion, 1917 is a must-watch for all movie lovers, try to watch it on the biggest screen and 119-minute run time will pass with ease.

SEASHORE

Beauty is all that fills my mind when I hear the word "beach". Probably the only time an ending fills happiness around the globe. We were all having fun punishing each other, the most beautiful moments, and that was when it all began. She walked towards us cutting the dim light apart. One glaze was all I could spare. She had a scarf covering her head and a bag that kept her alive. She closed in, one thing was all she asked and so did we reply. She was selling peanuts for a meal a day. No 19 year old kid would choose peanuts over fun, so did we, she walked away without telling a word, and for us that was nothing." For, too young we were to know her needs". She gave us some time and walked back to us, but this time she was too beautiful to be ignored. We bought some peanuts from her, for her. Her face gave a glow, her smile lit the shore, her smile was more to view that the sunset. Slowly, her smile turned into tears and I could see a lifetime in each of her eye. Her smile lit my world; her words touched my heart, and now, her tears flooded my feet and her eyes wounded my thoughts. She shared some words with me , she loved the beach that kept her alive and was proud not to beg. I could feel her tears on the sand, and the shore, I knew was no stranger to it. She walked into infinity and vanished into darkness. Her face is something that is not going to be easy to forget. She had a lot to tell me but her stomach cut short her speech to a single word, peanuts.

#ink_life
Arjun Vasudev

THE DARK AGES

-Vimal Vijayakumar

I look upon the darkness in fear :in fear
Those all we build will fall my dear
Even the Holy Ganges is dying .
Is this what we spent years waiting ?

Before our time
The reaper will come
To take the soul just
Before they see the worst

Be in fear of what your children will witness
For the mountain don't smile with bliss .
They are crying:all this tears will drown us
For those wicked money is all that matters .

The dark times have arrived my dear
Frightened to bones as death is near !
It became more clear
Even as they snort meth.

Mellow vibes have gone afar .
Yellow days happiness are no more .
Amidst this chaos we can all but smile
Cause that is the way of life .

All this saying has me in thought
Looking at my son ,I could only weep !
For what tomorrow holds os nothing bright
Praying we die before the apocalypse creep .

KID OF MY LAND.

From the day I was born,
Till the day I'm gone.
From the very first breath;
Till the moment of death.

In the middle of the facade,
Being the kid of my land.
Cease the moment and take a look
The land where my first step took.

Born to be the kid of my land,
And will live to be the pride of my land.
Life will take me through many paths,
But will never forget my soul path.

Stranded in the middle of my life,
But will never forget the land of my life.
And I will be the kid of my land,
From the first breath to the last breath.

Arunima Das
S8 R1

THE INFECTION THAT DISINVESTED THE GLOBE

Ms. Sowmya K. P
Asst. Professor,
Dept: of Basic Science

A Chinese proverb -"Good Economy makes men independent", but in reality economy actually evolves and exists upon man. Human activities is the base stone over which the economy is build upon and the debility of the same would eventually collapse the entire structure what is now happened due to a noval infection that had crunched the globe.

The world is now in a house arrest mode, totally armless before an invisible enemy. Across boundaries the world is lined up to fight against a common threat – the contagious Covid virus. As an infection the presence of Covid 19 first appeared in a Chinese town Wuhan and keeps on spreading globally. At first the world underestimated the infection only as a local issue, but within four months of time, it had stretched its arms to over 212 countries across the globe. The WHO has declared the infection as a pandemic. The viral infection had now affected more than 40 lakh people globally and over 3 lakhs deaths reported till date, with a mortality rate of 3.4 %. More than 90 % of the world population is either directly or indirectly affected by the ill effects of the pandemic.

As there is no prevention or cure available to this viral infection, world has selected self quarantine which is the only option available to tackle the situation. Almost all the countries affected by the infection had issued nation wide lockdown to arrest the spread of the infection. This had paused the human activity all over the world which resulted in the loss of demand, disruption of production, loss of job and income and a total global economic shutdown, Keynes postulated effective demand as a result of purchasing power, but there are other factors which decide effective demand: inevitable among them is the human bustle. If there is no economic activity, there would not be any effective demand.

The present crisis had directly or indirectly affected all the economic sectors. As per the reports of ILO (International Labor Organization) Covid-19 impact could cause an equivalent of 195 million job losses globally. Workers in 4 sectors would experience the most drastic effects of the disease namely food and accommodation sector retail and wholesale sector, business services and administration and manufacturing sector whichtogether amounts to 37.5% of global employment.

As per reports Covid 19 virus had put over 50 million jobs at risk in the Travel and tourism sector alone. The World travel and Tourism Council [WTTC], stated that global travel could be adversely impacted by over 25% in 2020 due to Covid19 infection and is calling for governments to implement strong policies for a prompt recovery. The Tourism industry currently accounts for 10% of global GDP, once the outbreak is over it is expected that it would take upto 10 months for the industry to recover. Out of the 50milion jobs that could be lost, the worst affected would be Asia with around 30 million followed by Europe with 7 million, America 5 million ad the rest in other continents. As per the report of UNWTO (World Tourism Organisation), the recession estimated a loss of 30 to 50 million USD internationally.

Due to the Covid 19 impact many countries had imposed travel ban or restrictions and thus majority flight schedules were cancelled globally which has negatively impacted the Aviation industry also. 53 Airline companies across the globe are suspending or drastically reducing flights as Corona virus related travel restrictions had shaked the industry. A reduction in demand for travel combined with government imposed travel restrictions had forced Airlines to temporarily suspend their operations. US, Poland, Denmark, Latvia and many of the European and Asian countries including India has restricted access for Non citizens hurting business for national and regional carriers alike. European Airline Air Valtie, Lot Polish Airlines, La-Compagnie and Scandinavian Airlines were among the first to suspend their operations.The International Air Travel Association [IATA] estimates a V-shaped impact on demand as the industry experienced during the 2003 SARS [Severe Accute Respirator Syndrome] outbreak, which is 6 months period sharp decline flowed by a quick recovery. The IATA had published an initial assessment of the Covid 19 which estimates a total global revenue loss of 29.3 billion USD. Airlines registered in Chine would be the most affected with a loss of 12.8 billion USD.

The outbreak of Covid 19 virus has hit almost every industry across the globe, especially the manufacturing industry. China, being the manufacturing hub for almost all the raw materials needed for the industries, the impact of the Covid 19 infection had disrupted the supply chains globally, and thus, rattled the global economy. China is the biggest exporter and second biggest importer of much merchandise, and thus, it acts as a hub of both demand and supply. Thus, disruption of demand supply chain had badly affected the industries including electrical components, non electric machinery, machine tools, metallic and non metallic products, organic and inorganic chemicals, pharmaceutical ingredients etc. This may increase prices consumer items like televisions, air conditioners, refrigerators, washing machines, sanitary items etc up to 5 to 10%.

The globally developing abeyance had also negatively impacted the consumerist mood of the world population very much. Automobile manufactures located especially in European countries like Italy and Spain and also in USA had announced work from home policies as the diminished demand had negatively impacted production and turnover. The Fiat Chrysler Automotive (FCA) has announced that it will close down all production houses in Europe. The OEM had closed all six Italian factories that built Fiat, Jeep, Maserati and Alpha Romeo products. The company is also closing down Fiat auto Poland (FAP) and its Serbian plant which built Fiat 500L the ford on March 15th 2020 that it will close its Valencia (Spain) auto assembly plant for one week after 3 employees become Covid 19 positive. The Ferrari has also issued statement on 14th march 2020 suspending production at Maranello and Modena (Italy) until 27th march 2020. The close down of Renault and Nissan's Spanish plant had directly affected about 3000 employees. Also the VolksWagen is also expected to close down it's following the spread of Covid 19. Tesla had ordered it's 30 US employees working in the Berlin factory in Germany to return to US. The GM, Ford and FCA CEO'S had issued work for home advisories for global salaried staffs form 16th march 2020. Thus, the automotive sector is estimating a negative trade impact of more than 5000 million USD in the year 2020 due to the pandemic covid 19.

Country	Estimated Loss in Automobile Industry (USD)
European Union	2543
Japan	974
USA	845
UK	669
South Korea	578
Total	**5609**

** figures as on April 2020*

The spread of Covid 19 had also impacted the offshore. The price of crude oil had fallen significantly in a short period of time adversely affecting the stock prices of major oil and gas companies. The global abeyance had led to decrease in demand so the OPEC countries agreed to cut another 1.5 million barrels from per day production. On 1st January 2020, a barrel of crude oil sold for 67.04 USDon NASDAQ exchange is now trading at around 30 USD per barrel or less. Also the International Energy Agency predicted an annual decrease in demand of 90,000 barrels per day due to the Covid 19 impact which is the largest fall in the decade.

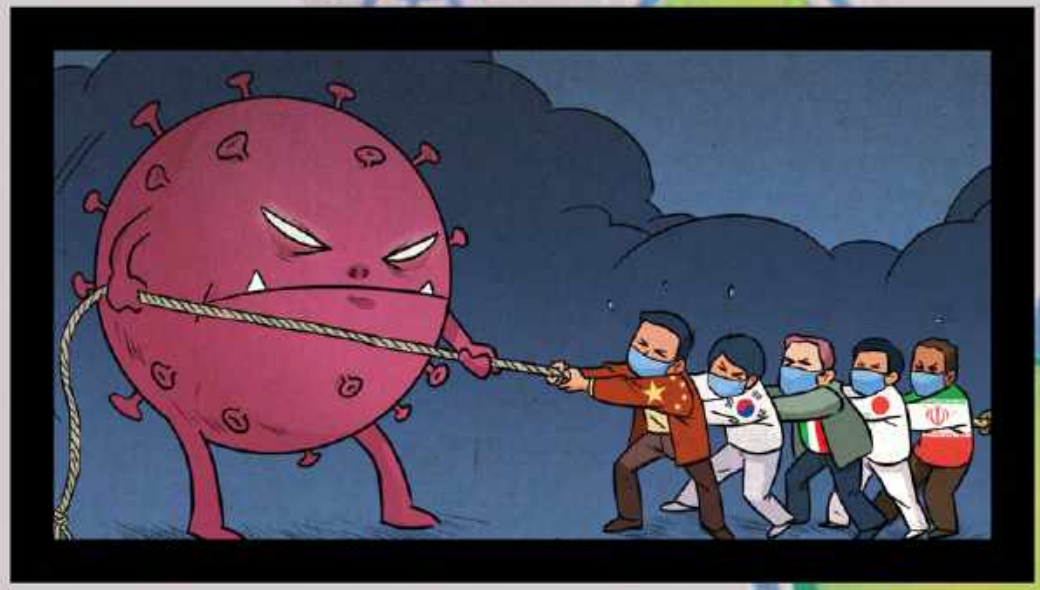
China, which is the epicenter of the global infection, would suffer even deeper economic damages from the pandemic than predicted. As per the figures released by the National Bureau of Statistic [NBS], factory production inside the country had dropped at the fastest pace seen in 3 decades. Industrial production shrunk to 21.1% , fixed assets investment fell to 24.5%, private sector investment feel to 26.4% and retail sale fell to 20.5%. The government had injected 14.5 billion USD into the financial system with the offer of 1 year medium term lending facility to loans to create demand and thus to revive the economy.

India announced nationwide lockdown from 25th March 2020 to crub the spread of the pandemic. Since then it causes mass layoffs and job losses. Over 122 million Indians had lost their jobs as of April 2020 alone. India's Unemployment rate has touched its recorded height of 27.1% according to CMIE (Centre for Monitoring Indian Economy). Out of 122 million who lost their jobs, 91.3 million were small traders and labourers.

Due to nation wide lockdown, Indian economy is now in the mouth front of an unpredictable disaster. It is now estimated that there will be a hit of .3 to .5 % on GDP in the current fiscal year (as estimated in April 2020). Growth in the first 2 quarters of the next fiscal would be as low as 4 to 4.5%. The economic survey had forecasted 6 to 6.5% rise in FY -21. But Covid 19 had hurt our recovery prospects. Sectors such as Tourism, Aviation, Hospitality, and Trade will face the first impact followed by other sectors as the economic activities stalls. Moody's has downgraded India's growth to 5.3% in 2020 due to the risk of Covid 19.

In 26th March 2020, Union Finance Minister had announced a 1.7 lakh Cr recovery package. India has released 57281 Cr to beneficiaries in cash and social security transfers in the first week of April to help the poor to survive the worlds biggest lockdown. The RBI also had announced long term Repos worth Rs fifty thousand Crore for Non banking financiers and Micro financial institutions to level up their liquidity amidst Covid 19 pandemic. The Reverse Repo cut to 3.75% is expected to retain sufficient liquidity at Indian banks. Special packages were also announced to NABARD, SIDBI, NHB which is expected to increase liquidity to agriculture, small scale business and low cost housings.

No one know exactly, what will be the real economic impact of the novel Covid 19 infection that had already crunched the globe. Quoting the words of our honorable Prime Minister Sri. Narendra Modi, it worst than the two World Wars taking into account the number of countries affected. We are facing the greatest medical economic crisis in the history. It had created a global recession. All over the world the share markets are at free fall. The actual impact of Covid 19 in the global economy will depend on how long the pandemic lasts. *As the number of infected is exploding day -by -day, mankind is now blindly batting, facing an invisible bowler from saving his inevitable wicket.*



MESSENGER

Arjun Vasudev
S8 Mechanical

Someone lost is actually gone.
All you can do then,
Is accept, pretend and move on.
None new would make it up,
Though it would seem like:
Someone new,
Who knocks the door to your life,
Is a messenger for you,
Like the previous one,
Who had left you a message.
Now all that you can do is
Realize the message,
Treasure the memory,
And accept:
"someone lost is actually gone"

"Every one, at some point of life, has to deal with a loss.
A loss in which you had to watch someone walk out of your life.
We deal with it by finding someone new to fill up the gap even though we know that the story is going to go on...."

WON THE BATTLE BUT LOST THE WAR

Christy Jose
S8 Mechanical

It was a warm summer day,the sun was up.I could hear the birds chirp.A good way to start a day.I took a kettle,warmed some water and added some coffee. Nescafe just hits off that warm pleasant feeling when poured to that cup written Nescafe'.I tsaid to myself "sooo good!

It was a nice morning when that doorbell rang, 'DING DONGGG'.

We were living in a remote secluded place so didn't have that many visitors and hence I was surprised.I opened the door to find the most important person in my life.It was my step dad!

He said,"long time didn't see darling,how are you?

I was having mixed feelings:happy ,shocked and my god what not! It has been years since I last saw him.He still has that stern look in his eyes as if a cat grabed his crotch.Not to say that gigantic, massive body of his with broad shoulders.But he was a soft guy.

It was 20 years ago in Kashmir when my family met with an accident.It was an explosion in a mall or something, I don't remember it clearly.I was small, 7 years old. All I remember is the sound of wall crashing and firing.I was scared when a hand snatched me away, it was him.

From that day forth, he has been my father and mother.

"Judy, its been so long since I saw you.You went hiding right after the mission failed,why?

Oh I fogot,he raised me to be an International spy working for the Indian Government.There is another story behind that question.

"Judy, a new mission is here for you",said my dad ,the Chief commanding officer of RAW(secret service of India).

It was a reconissance mission to collect data on a terrorist group that was active. And personally I have a grudge too since they were responsible for my families death, including my father,mother and my young sister.

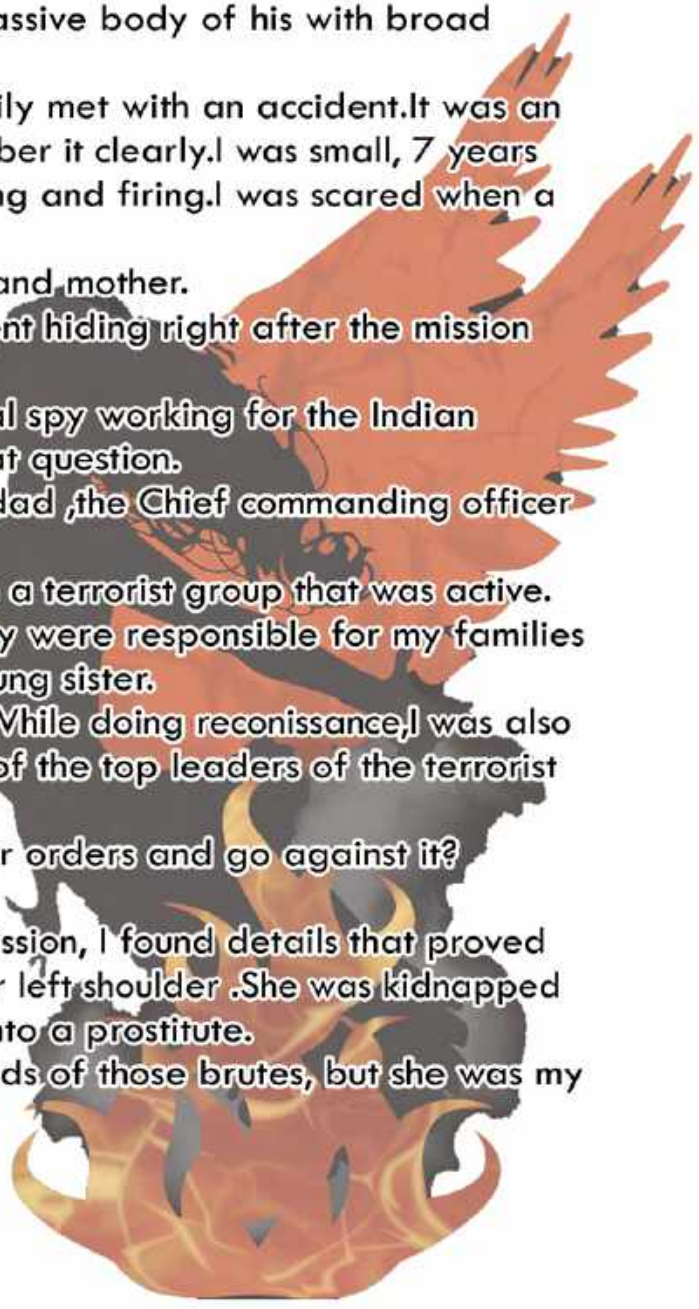
They were based in the Indo-Pakistan border.While doing reconissance,I was also given a secondary task of assassinating one of the top leaders of the terrorist organization.

Dad asked me,"Why did you revert from your orders and go against it?

And I replied, "Because she was my sister".

Did I go too fast? Well, in the middle of my mission, I found details that proved my sisters existence.She had a birth mark on her left shoulder .She was kidnapped at that time by the terrorists and was made into a prostitute.

It was not an easy life for my sister in the hands of those brutes, but she was my sister , I would not want to lose her again !



DEPARTMENT OF PHYSICAL EDUCATION

MARIAN ENGINEERING COLLEGE

MENAMKULAM, KAZHAKUTTAM- 695581

MARCH 2020

DEPARTMENT OF PHYSICAL EDUCATION

ANNUAL SPORTS DAY REPORT 2019-20

Physical Education is an integral part of the total education system. It helps in the attainment of the ultimate aim of education, i.e. the achievement of holistic development. Games and Sports play a vital role in the student's life. A Student should study hard to be successful in competitive examinations. But, he should also play games and sports to enjoy the health and vigour of life. Along with bookish learning, and technical practical, a student should spend his time on games and sports. Physical exercises help us to keep ourselves fit. Sports and games develop sportive spirit and lay the foundation for the future. It also helps us to be active both physically and mentally. **Therefore Marian Engineering College (MEC) curriculum gives distinct place sports and games.** We have many familiar games like Athletics, Badminton, Basketball, Caroms, Chess, Cricket, Football, Volleyball and Table Tennis.

Considering the concept of "**SPORTS FOR UNITY**" throughout the entire session we organized the **ANNUAL SPORTS MEET** on **9th and 15th November 2019**(Saturday & Friday). The Following Events have been organized for inter-department sports tournament team events for students: Cricket, Football, Basketball, Volleyball and Badminton on November 9th, followed by a friendly match of Cricket between Students and Staffs (Teaching and Non- teaching).

Marian Engineering College celebrated its Annual Sports Day on November 15th, 2019 on the sprawling grounds of the college. It was a day filled with fervour and exhilaration, amidst thrills and cheers. The event commenced with the felicitation of the venerable Chief Guest, the cricketer, **Mr. Seesan Selvan**; the Guest of Honour, Sathosh Trophy Manager **Mr. Samual Geevarghese**, College Principal, Manager Bursar and other distinguished guests. The ceremony began by a prayer song sung by the college choir followed by a well synchronized March Past of all the five Departments.The March pass performed by the students where saluted by the chief guests. The Manager, Rev. Fr Msgr Wilfred E welcomed the guests and the gathering. He laid emphasis on the importance of sports in a student's life in his welcome speech. The Principal, Dr. Ruby Abrahamaddressed the gathering with her remarkable speech, followed by a brief report of the sports activities and achievements of the college. The Chief Guest and Guest of Honour lit the ceremonial torch followed by the spectacular, impressive gymnastic fusion dance by the talented girls dance troop. Five exceptional students from each department were the torch bearers.The Principle hoisted the flag signalling the start of the Sports Meet. Director Prof Tomy Michael presented a memento of token to the guests, followed the oath taking ceremony of Students by sports Secretary, Mr Hitesh A H and that of staff's by Asst. Prof Vinod M S. The students and staff solemnly pledged to uphold the spirit of true sportsmanship.

Mr. Seesan Selvan, the Chief Guest in his address reminisced about his school days and how he always wanted to play for his country and declared the sports meet open. Mr.SamualGeevarghese, Guest of Honour addressed the crowd with enlightened words by his years of expertise and understanding for true sportsmanship in our country and from our own state.They felicitated and encouraged the young students who were part of the events in various fields of sports.Lastly, the college Union Chairman, Mr Abhinanth J delivered the vote of thanksand commenced the inauguration by playing the national anthem.The day'sevents started by the races were in the participants participated with full verve and vigour. It was a delight to see the excitement with which the students challenged themselves to attempt a variety of events such as race, relay, long jump, shot put,discus throw, etc.

The Games day for Annual Sports Meet 2019-20, was conducted on Saturday 9th November, 2019. It was a day of showcase for all the remarkable and breath taking leaders and team players of the college whom had produced an outstanding effort and play on their behalf in the field for best of its conduct. The Games day event was kicked offed by Rev. Fr. Sudheesh A. All the department had put in their best performance by bringing together the

best of their athletic students. There was a significant rise in the total number of women participation in team and field events. All the athletic events were guided and conducted by the aid of Mr Saji P, Physical Education Instructor and accompanied by Mr Bennet, who had being a helpful hand. There was several sports events such as the relay, shot put, discus throw etc, were in an enormous count of students participated with enthusiasm. The event held at the college ground saw an ensuring amount of participation from students and duly cooperation from respective faculties in charge. The medals to winners were given away by college's senior and head faculty, and non-teaching staff to the budding athletes. The trophy for the leading house was bagged by Mechanical and Civil Engineering Department for Men's and Women's Categories. Anand Sankar, Nikhil P Joseph and Meety Mickel were adjudged the Best athletes in their respective categories.

The day ended with a cheerful note, heralding this academic year 2019-20, also filled with promises for all the young sports enthusiasts by a key note from Manager Rev. Fr Msgr Wilfred E. Many new and unbeaten records of past year performers were refurnished by the students. The day was filled with exciting victories and near misses for all the departments.

Moment of Token presented to the distinguished guest, by Prof. Tomy Michael

MARIAN
ENGINEERING COLLEGE
Menamkulam, Kazhakuttom - 695 582

ANNUAL SPORTS MEET 2019-20

MEN CHAMPIONSHIP

MECHANICAL DEPT.

WOMEN CHAMPIONSHIP

CIVIL DEPT.

MARIAN
ENGINEERING COLLEGE
Menamkulam, Kazhakuttom - 695 582

ANNUAL SPORTS MEET 2019-20

INDIVIDUAL CHAMPIONSHIP

MEN

ANAND SANKAR
MECHANICAL ENGINEERING

NIKHIL JOSEPH
CIVIL ENGINEERING

WOMEN

MEETY MICHAEL
CIVIL ENGINEERING

save it...

-Bertila Mary
S6 R2 2019-20

Knife took me apart, out of greenish ball
Like an infant from mother
Freedom risen, calls out 'Yay'
Colorful world, in my eyes
No more darkness, no more silence
A mouth with sour smile, ahead of me
Five fingers bounded me to balcony,
I was taken and I watched the way
Nothing was known. Then I heard,
'Mom, throw or save it!?' A reply 'Save it';
I got released and was kept safe
Noon went, sun moved out, night arrived
Darkness at its extreme, like when in that ball
Getting dry, tends to be wet, this went so on
And so on, eventually took a snooze
Opened eyes, by a hot intense ray
Yellowish look, figured it as a sphere.
It's him, the sun, our initial meet up.
Days passed, I'm thriving for a drop
Each day, he appears at east, go to west
This ride, rotates a day from dawn to dusk
Still I'm not moved, jealous on him
Days passed, got released and taken away
I was thrown, a pit caught me and I fit onto it.
I queried, is my new prison? It happened though
Lonely in the pit, always night, resumed my initial days
Each day, I was showered. I realized
Am elongating. Some days, made my head
above the surface. Wow! a leaf from me.
Later, one to many. I'm out of identity.
Right, I'm heading to the fullest
I'm a shade, a distributor, a producer
Gonna give cold breeze, food and offsprings
I was a plant. But, later a mango tree.
Thanks, to the great one, who gave the word 'SAVE IT'.

PHONE

- Abhyshek R
S4 T 2019-20

It was a lazy afternoon as Susan or Sue as her friends called her was laying down for a nap. Even in her early forties she was quite an attractive woman but still quite single. He family had abandoned her as a lost cause and she lived alone . She was still recovering from the loss of both her parents after an accident at the retirement home.

As she lay in bed , her thoughts went to them as they always did and as she closed her eyes, the phone rang. Picking up the phone , quite offended she half shouted a " Yes" into the receiver . A deep voice on the other side started speaking. " I know what you did." Slightly shook , she asked , "What do you mean ? " " I have some important things to speak with you. Go to the phone booth outside right now and await further instructions." "Now why would I do that ?" As if to answer her question , a bullet struck the pillow next to her , making a clean hole in the window. Pale as she was , she listened in, " You get my drift ?" This was all she remembered as she waited next to the phone booth.

Soon enough , the phone started ringing. She picked it up and pressed it to her ear. " Good, you know to do as your told unlike back at the facility." Sue immediately knew what he was talking about and dropped the phone. She scrambled to pick it up.

"....very well what I'm talking about, don't you ?" A red dot moved in front of her and stopped between her eyes Anxiety had struck her fragile body and know she found herself frozen .

"Hey, hey, hey, get a hold of yourself.
You didn't feel so scared when you did the deed, so just do what you did then."
"The bill always comes due. Nothing we do is ever without consequence. Now it's time to pay."
" Did I ever do anything to you ? Did I hurt you ? If I did , I promise I can help. " " No you can't . Not me, but those people back the The innocent families you destroyed. You can't help them. But , they and the people all around have every right to know the truth. Now , I know you have contacts with the media. You call them here right now and confess. "No , I can't , I will be ruined. "
"Ruin those around you and ruin shall be fall you. Do you want me to shoot your limbs off and surgically remove your eyeballs to physicall ruin you or will you ruin your own so called status yourself ? "
Awash with guilt , she opened up her phone and keyed in the number. They owed her for a few favours and was able to call up a news crew. By the time they had reached Sue had worked up a sweat.
The head reporter walked up to her and told her that they were ready.
As the camera rolled , she walked forward and started talking. "To all the people of this nation I have a confession to make. If you remember the Terminal island Nuclear accident, then I have to say that I caused it. I constantly increased the fuel input to produce more power to such an extent that the reactor yielded and released toxic radiation throughout the facility. I killed off all those people..." Out of nowhere she hear a bang and fell to the ground.
She woke up in bed in the evening. "It was just a bad dream , huh. I hope not to have a dream lik that again." The phone started ringing .
She picked it up and felt a pain in her gut on he know what you did."

KITES

The evening sky got blessed by the sun,
In the sand I wasn't the only one.
Another day was on its way.
The end just began, the moon was the one to win.
The sea was waving good bye to the sun,
All I could see was joy and fun.
I looked up to the vacant sky,
Something took my eye,
Brighter than the stars and the sun itself
Flying high,
With the pride of the conquered sky.
Battling the wind and rustling with the birds,
Kites, all tied up to the joy of shore;
Tied to the other end of each of them
Was either happiness or hope.
They were guarding the smile on every single face.
I closed up; I wasn't the only one looking up
But the kite itself.
There were skies above but
were chained to the happiness down below.
Their wings were chained
By the smile the shore gained;
The world undiscovered was within the kites
That none maybe cared.
It was all about the battle,
But not with the wind,
But the happiness down below.
The rustling was not of cheer but of helplessness.
Still the kite flew with pride,
But not of the conquered sky
But of the happiness spread by.
The sadness of the unconquered sky
Died with sun in the ocean of kindness.
You say kite, I hear sacrifice.
Still the one to win the heart was the kid than the kite.

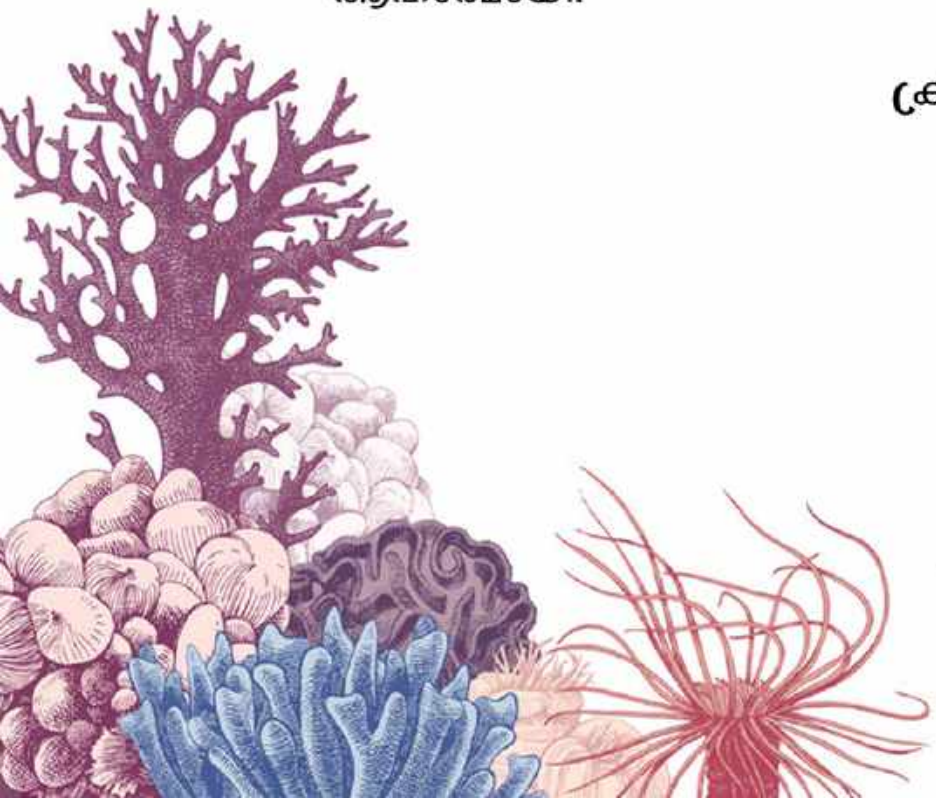
Arjun Vasudev
S8 MECHANICAL

സ്വർണദ്വീപ്

ചുവന്ന ആകാശം പിളർന്ന് അവൻ ഭൂമിയിലേയ്ക്ക് വീണു. പുതിയ ലോകത്ത് എന്ത് ചെയ്യണം ഏങ്ങോട്ട് പോകണമെന്നറിയാതെ അവൻ അങ്ങനെ നിന്നുപോയി. അപ്പോൾ ചെകുത്താൻ അവനോട് പറഞ്ഞു 'നിനക്ക് ഒന്നും നേടാനില്ല, എങ്ങോട്ടും പോകാനുമില്ല. നീ വേഗം എന്റെ മുന്നിൽ കീഴടങ്ങി , ആഹാരമാവുക'.

ചെകുത്താന്റെ മുന്നിൽ ഭയന്ന് നിന്നവനോട് കടൽ പറഞ്ഞു 'നിനക്ക് ഒരുപാട് ദൂരം പോകാനുണ്ട്, പല തീരങ്ങളും കാണാനുമുണ്ട്. സുവർണദ്വീപുകൾ ഞാൻ നിനക്ക് നേടിത്തരാം'. കടലിനോട് അവന് പ്രണയം തോന്നി. തോണിയെടുത്ത് വേഗം കടലിന്റെ അനന്തത യിലേയ്ക്ക് ആവേശത്തിൽ തുഴഞ്ഞു. കാലമേറെ കഴിഞ്ഞു,എങ്ങുമെത്തിയില്ല. തുഴയും തോണിയും ജീർണിച്ചു., തുഴച്ചിലിന്റെ വേഗം കുറഞ്ഞു. തിരമാല കളോട് പൊരുതാൻ കഴിയാതെ നിസ്സഹായനായി, ശക്തമായ തിരമാലയിലകപ്പെട്ട് തീരത്തേയ്ക്കടിഞ്ഞു. മന്ദഹാസത്തോടെ അവനെ കാത്തുനിന്ന ചെകുത്താന് ആഹാരമായി.

ക്രിസ്റ്റഫർ മോനു



INTERNET OF THINGS

THE FUTURE & BEYOND
AN OVERVIEW

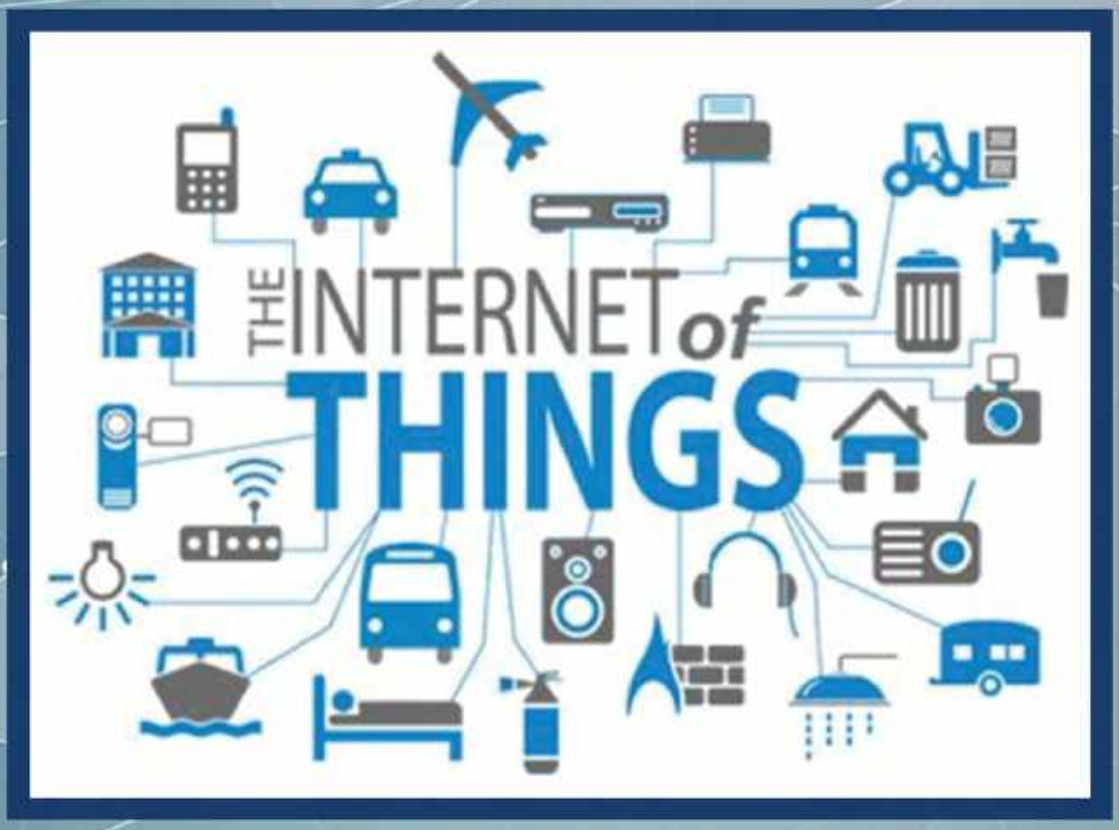
Dr. P.Jayaprakash
HOD, CSE

Let us first understand, what is IoT by giving a clear definition of IoT – "The Internet of Things (IoT) is the network of physical objects or "things" embedded with electronics, software, sensors, and network connectivity, which enables these objects to collect and exchange data."

"Things," in the IoT sense, can refer to a wide variety of devices such as heart monitoring implants, biochip transponders on farm animals, automobiles with built-in sensors, or field operation devices that assist fire-fighters in search and rescue operations, wearable (your watch, band). These devices collect useful data with the help of various existing technologies and then autonomously process the data between other devices.

"THINGS = HARDWARE + SOFTWARE + SERVICE"

Today data is everything and everywhere. Hence IoT can also be defined as the analysis of data to generate meaningful action, triggered subsequently after the interchange of data.



"IoT refers to the interconnection via the Internet of computing devices embedded in everyday objects, enabling them to send and receive data"

So, what IOT is?

"IoT enables the objects (which eventually are the things) to be sensed, while also controlling it remotely, which enables better nteraction of physical world to the computers. This would improve the efficiency, accuracy with limited human intervention."

Any Time – Any device

Any One

Any Service – Any Business

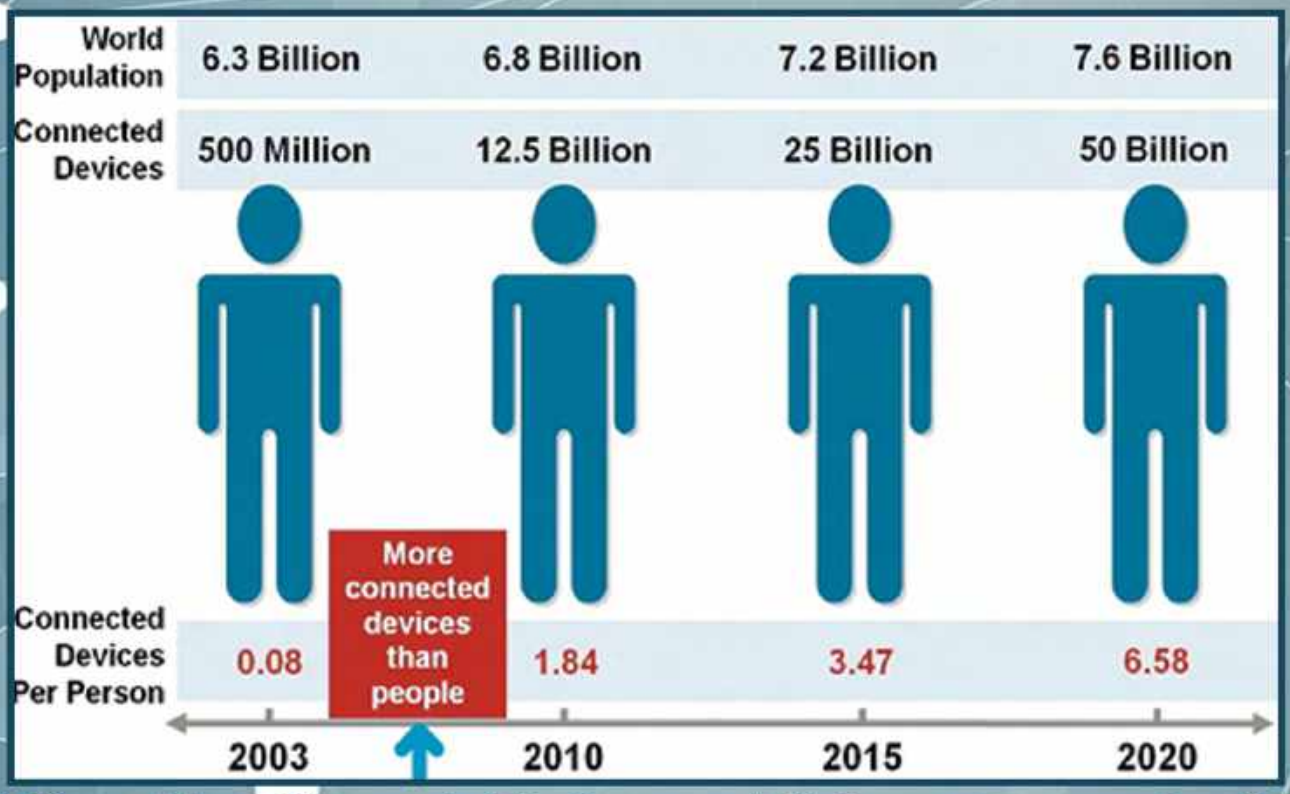
Any Network (Non-homogenous)

IOT Design Goals

Anywhere - Any location

Characteristics of IOT

1. Connectivity : Connectivity is an important aspect/requirement of the IoT infrastructure. Things in IoT should be connected to the IoT infrastructure. Any one, any where, any time connectivity should be guaranteed at all times. Without connectivity, nothing make sense.
2. Intelligence & Identity: The extraction of knowledge (ie what is to be inferred from the generated data is very important. For example, the data generated by sensors will only be useful if it is interpreted properly. Also each IoT device has a unique identity (something like an IP address) which is helpful in tracking the device and at times for querying it's status.
3. Scalability: The number of elements (devices) connected to IoT zone is increasing day by day. Hence IoT setup should be capable of handling the massive expansion. Also the data generated as outcome is enormous and should be able to handle appropriately.
4. Dynamic and Self-Adapting (complexity): IoT devices should dynamically adapt themselves to the changing context or scenarios For example , assume a camera meant for surveillance. It should be adaptable to work in different conditions and different light situations (morning, afternoon, night).
5. Architecture: IoT architecture cannot be homogenous in nature. It should be hybrid, supporting different manufacturer's product to function in the IoT network.
6. Safety: There is a danger of sensitive personal details of a user getting compromised when all his/her devices are connected to the internet. This could cause a loss to the user. Hence data security is a major challenge. More over equipments involved in the huge IoT network may also be at risk. Therefore equipment safety is also critical.



IoT Growth - Current Status and Future prospect of IOT (A statistical view)

From the "CISCO BSG 2011" presentation (Figure above) one can see that IoT has a prodigious growth and it has been predicted that by 2020 people all over the world will be using 50 billion smart objects which is more than 6 times the world population. Also it is a surprising fact that each person would have six objects connected to the internet.

Structure of IOT

Internet of Things (IoT) is not the result of a single novel technology, but rather a combination of technologies and domain knowledge which provide capabilities that taken together help to bridge the gap between the virtual and physical world. A mechanical engineer has to work with Electrical and Electronics Engineer and Computer science Engineer to build a complete IoT product.

"IoT is not owned by any one engineering branch. IoT is a reality when multiple domains come together"

The technologies that support IOT to be a reality are generally known as "Enabling Technologies", fall under one of the following sections.

1. Technologies that help acquiring data/sensing data.
2. Technologies that help analysing data/Processing data.
3. Technologies that help taking control action
4. Technologies that help enhancing the security/privacy.

Sensors: Sensors which come under the first section of the enabling technology, are the heart of any IoT application. They sense the environment and retrieve the data and are the starting point of any IoT application. For example, a temperature sensor used for temperature monitoring applications. Sensors could be analog or digital.

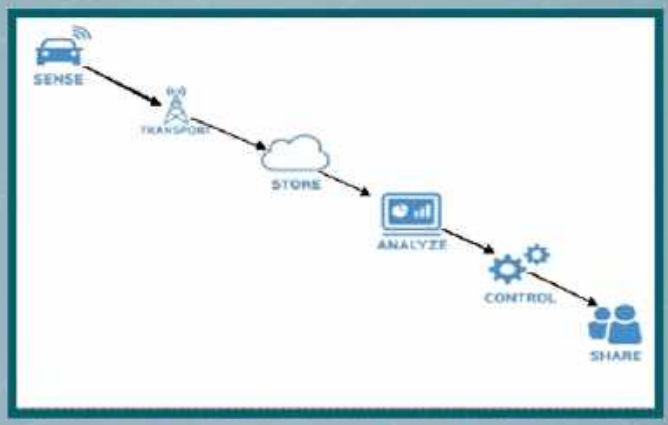
Cloud Computing : The next enabling technology that is highly important for IoT is Cloud Computing. Data storage plays a major role in IoT. Since there is no provision at the sensor node to store the data retrieved even temporarily, there must some provision for storing the data before it is processed. As an option cloud has now come up as affordable, effective and efficient medium for data storage.

Big Data Analytics: The next enabling Technology for IoT is Big Data Analytics. IoT is al about collecting data from various sensory nodes and handling the huge data is cardinal to build the application fruitful. The biggest challenge with big data is it's volume, the variety it has, The speed (velocity) at which it comes and finally the veracity (4 Vs)

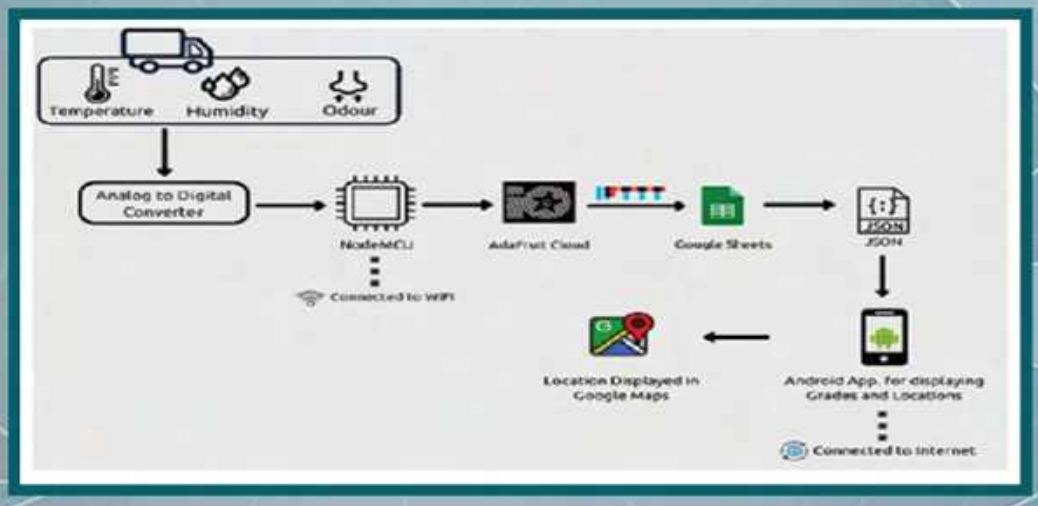
Embedded Computing Boards: The next enabling technology that is very important to bring the IoT design a reality is embedded computing boards. From the proof of concept to prototyping, all these happen with the computing boards. Most of the computing boards used and are available in the market are driven by microcontrollers or processors. Some of the familiar boards are Raspberry Pie, Arduino, Node MCU, Intel Edison etc.

Communication Protocols: Communication Protocols are the pillars of good IoT infrastructure and hence are very important for hassle free communication in the IoT network. Data exchange happens through these protocols. Protocols take care of addressing format of message, message security (encryption and decryption), routing, flow control, error monitoring, sequencing, segmentation of data packets, retransmission guidelines etc.

User Interfaces: All devices should have an intuitive user interface. IoT devices/services should be designed in such a way that accessing and handling the services are easier and comfortable for the end user. In most cases the end user shall be provided with "mobile applications or Web app".



IOT in a Nutshell.



Architecture of a smart vegetable quality tracking system using IoT

Technological challenges of IOT

While building an IoT application, one faces many challenges both technical and non- technical. Some of the technical challenges are:

1. Security/Personal safety: One of the prominent very highly rated challenges to confront. Since a number of devices are used in IoT zone, user data becomes more vulnerable to theft. So it becomes necessary to make sure that the data is safe. Poor security features can let the attackers damage the whole network.

People's personal safety is also a concern and challenge. The devices like implants and wearable used by the users in the IoT infra should be safe, and should not cause any physical damage to the person using it.

2. Privacy: In IoT network, one could be tracked/monitored by any one, as you are connected 24x7 to the Internet, at times even without the host's permission. So there is a threat on user data and a question of user privacy.

3. Data Extraction with Consistency from Complex /Environment It is a huge challenge to sense/extract data from complex environments. For instance to sense data input (temperature/humidity) during commute from a vehicle.

4. Connectivity: Connectivity is a serious challenge that IoT world must acknowledge. Requirement of wired and wireless connectivity is heart and soul of IoT.

5. Power requirements: All IoT devices need power. Most of them are battery operated. Hence the use of long lasting batteries along with green power sources like solar and wind should be considered.

Future scenario

- Internet of Things is the next stage of the information revolution and referenced the inter- connectivity of everything from urban transport to medical devices to household appliances.
- Integration with the Internet implies that devices will use an IP address as a unique identifier. However, due to the limited address space of IPv4 (which allows for 4.3 billion unique objects in the IoT will have to use IPv6 to accommodate the extremely large address space required.

- Internet of Things is the next stage of the information revolution and referenced the inter- connectivity of everything from urban transport to medical devices to household appliances.
- Integration with the Internet implies that devices will use an IP address as a unique identifier. However, due to the limited address space of IPv4 (which allows for 4.3 billion unique addresses), objects in the IoT will have to use IPv6 to accommodate the extremely large address space required.

Thought Controlled Computing

The flagship product, MindWave, is a headset that can log into your computer using just your thoughts. Researchers recently used the EEG headset to develop a toy car that can be driven forward with thought.

NeuroSky's smart sensors can also track your heart rate and other bodily metrics and can be embedded in the next generation of wearable devices.

"We make it possible for millions of consumers to capture and quantify critical health and wellness data," Yang (CEO of Softbank) said. Softbank is the funder.

Skills set required to become an IOT professional

As Gartner predicts, there will be 50 billion Internet of Things devices by 2020. Such intense IoT-ization will require the talent of IoT developers with the relevant set of skills to power these devices with functional software. So if you are thinking about starting a career as an IoT engineer, the following are the technical skills you should hone,

As you've probably realized, IoT is multilingual — it speaks many programming languages and requires experience with a range of frameworks. However, an IoT engineer is not necessarily a Jack-Of-All-Trades. Being able to work at just one layer of an IoT architecture is already enough to start a successful career in IoT. Here is a short recap of what skills you can choose to hone:

For developing embedded software for end-point IoT devices, start mastering C and C++ and Embedded C. Java SE Embedded, Java ME Embedded are also popular with embedded engineers.

For cloud development, concentrate on:

Gaining experience in design, implementation, and maintenance of data management solutions. For that, a good command of Java is must.

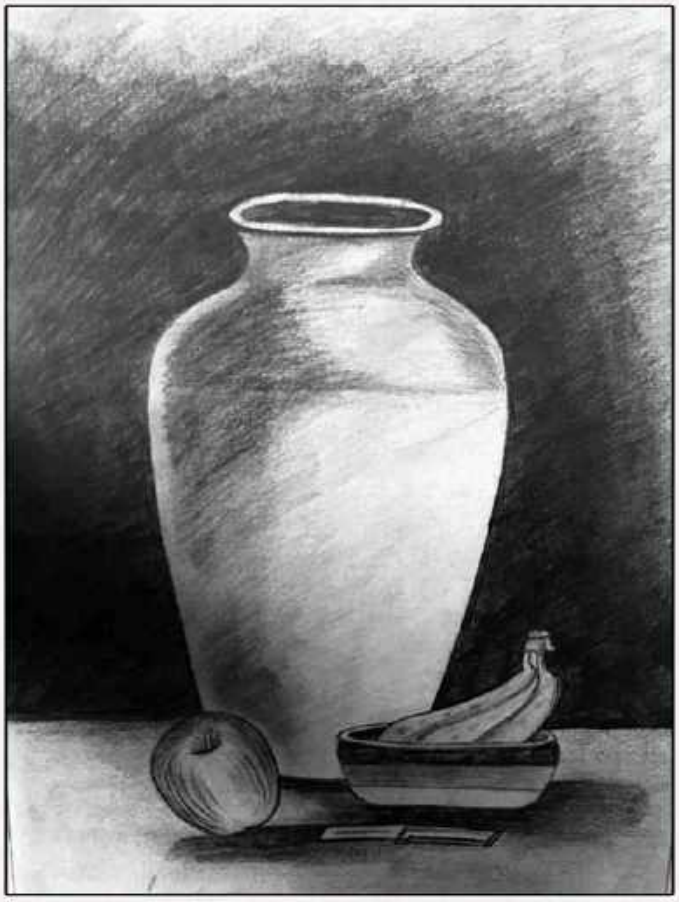
Mastering stream and batch processing. Get used to working with such frameworks as Azure Stream Analytics, Spark Streaming and Apache Hadoop (Java, SCALA, and Python).

Learning how to extract insights from big data by implementing machine learning and visualizing these insights. The prevalent language for that are Python and R.

REMINISCENCE OF PAST

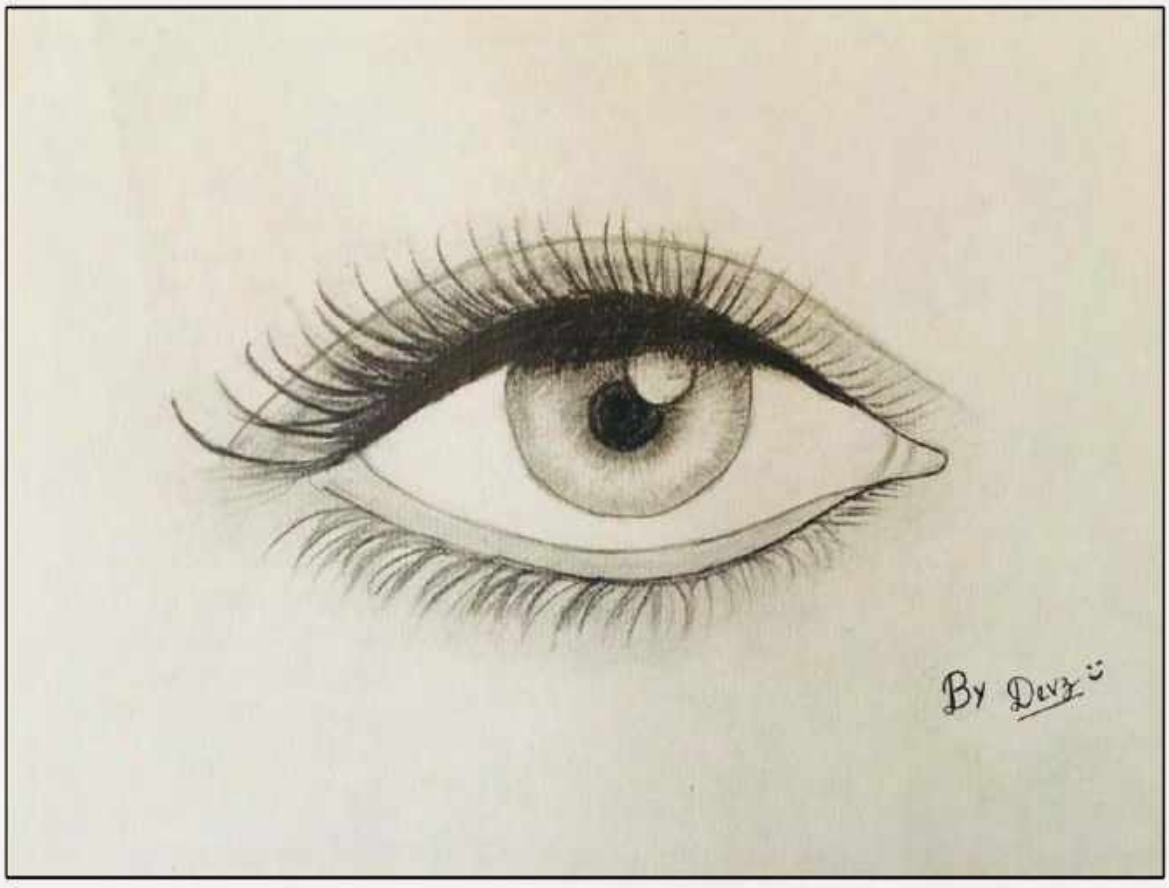
-Sruthi Savithri Vijayakumar

Somewhere
between those smiles..
Somewhere between those
Endless talks...
A wide gap of loneliness grew!
Yet , nothing changed,
But a gap of fakeness grew.....



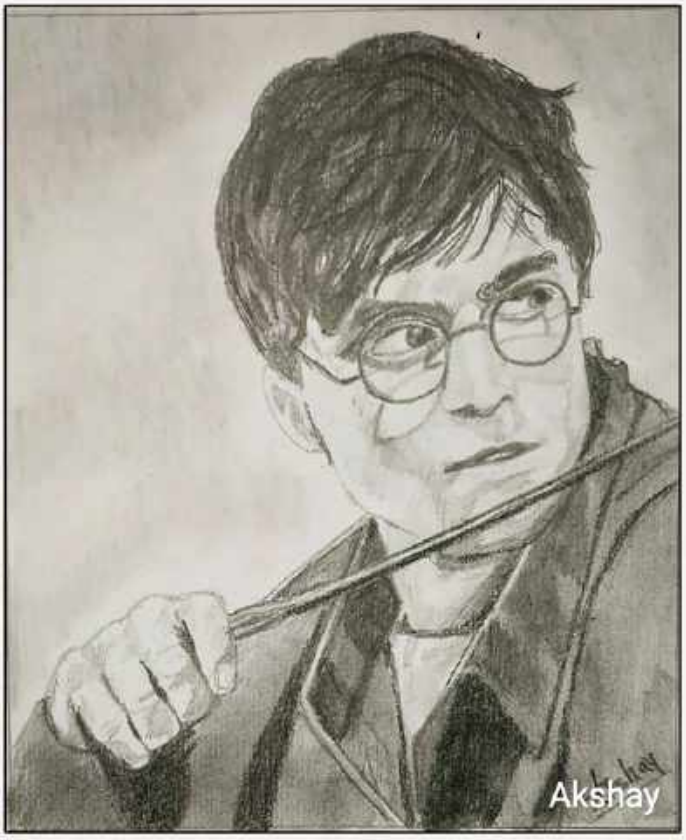
DEVU B S
S2 CSE

NIKHIL PRAKASH
S2 MECH

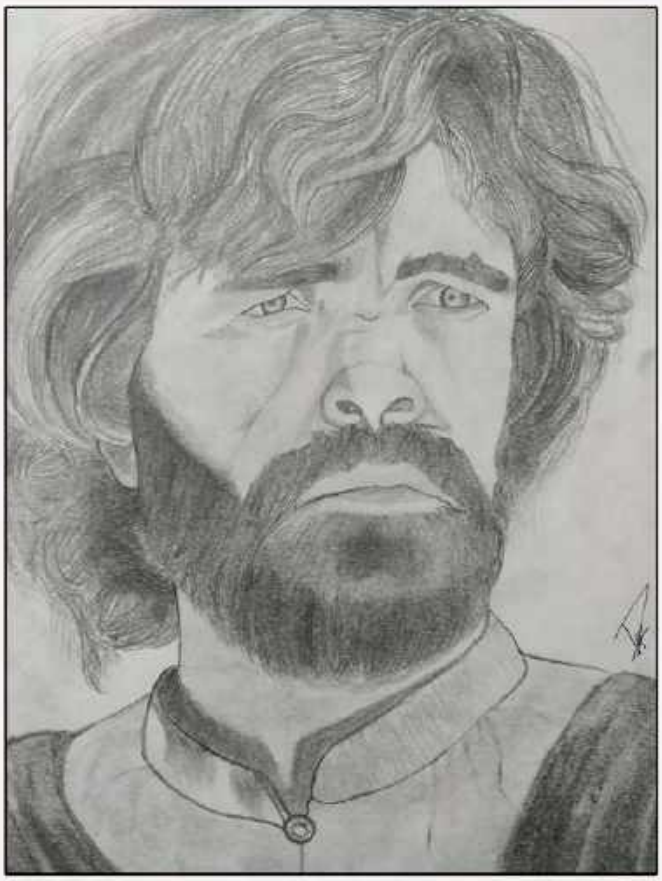


DEVU B S
S2 CSE

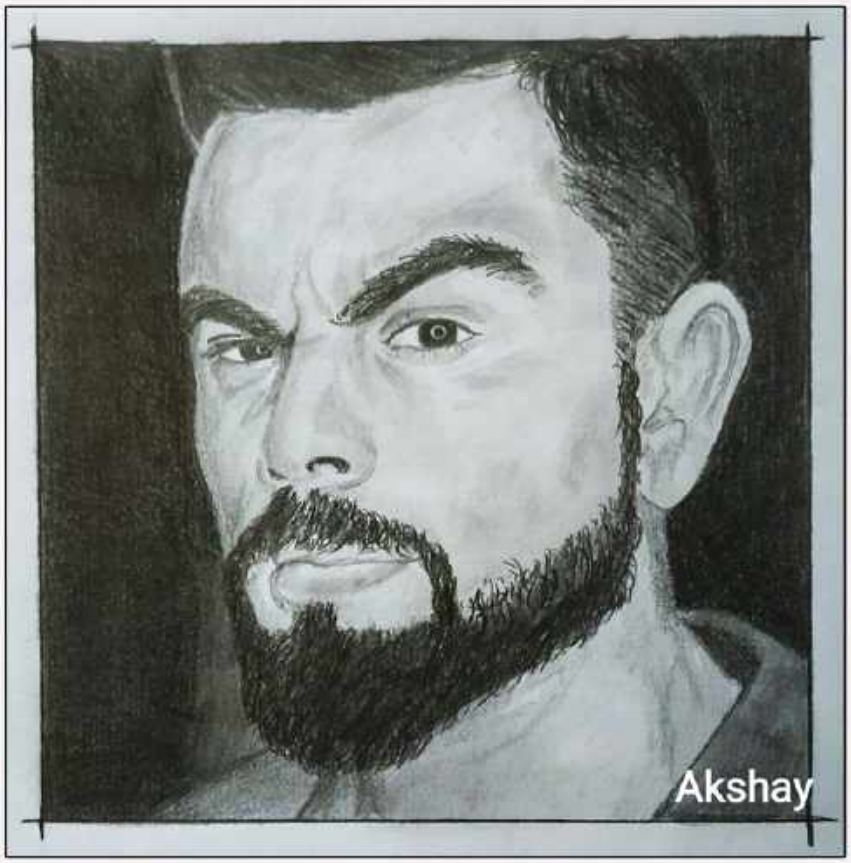
NIKHIL PRAKASH
S2 MECH



AKSHAY
S6 EEE

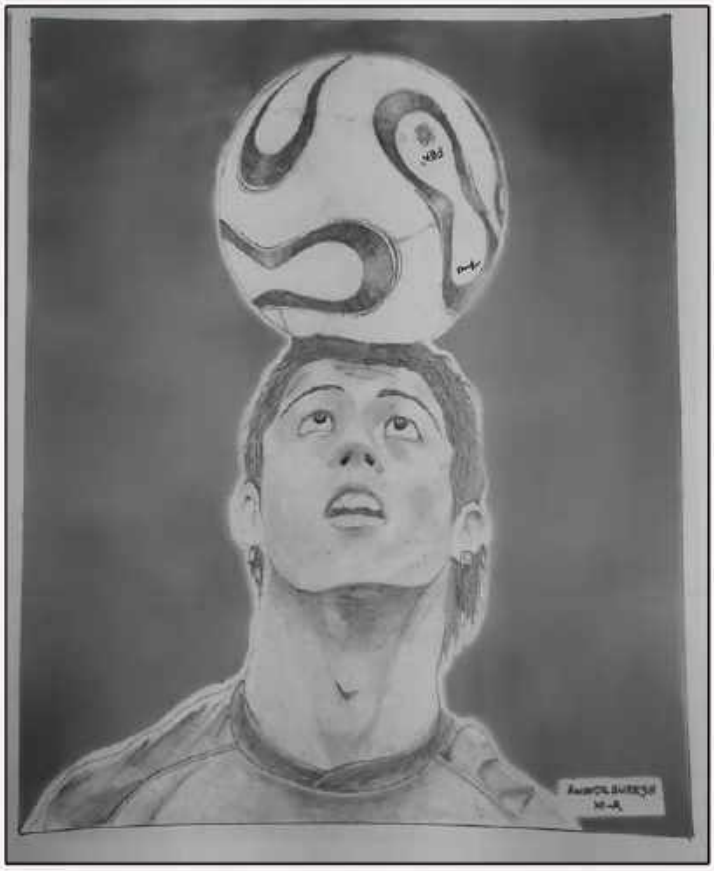


DEV DARSHAN
S2 MECH



AKSHAY
S6 EEE

DEV DARSHAN
S2 MECH



ANANDHU SURESH
S6 MECH

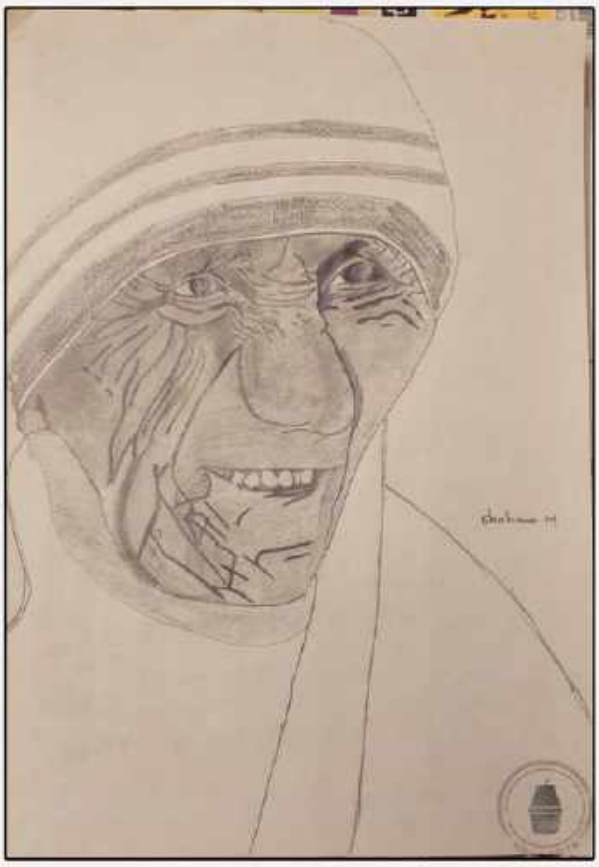
ANANDHU SURESH
S6 MECH

GOPIKA V G
S6 CIVIL

SHENI NEVIL
S4 CS

GOPIKA V G
S6 CIVIL

SWATHI SUNILKUMAR
S2 CIVIL



SHAHNAS M
S2 CIVIL

SHENI NEVIL
S4 CS

Acknowledgment

It was always taught that dreams are never to be given upon.. but some dreams end up unpursued , though a never ending one in our hearts, making it even more beautiful...

We were almost on the verge of achieving our biggest dream, but the depth of the dream in our hearts doesn't change the fact that the dream was and will ever be a reality, maybe some dreams are better off this way, may be the dream was too big for the rest of the world to fathom.... We dreamt of it, we worked for it, we fought for it and the fact still remains, it was and it will forever be a dream....

We know how big the loss is simply because we were the ones who saw the dream .We knew the width and depth of it ,and now we know the depth of the loss.I would like to thank everyone who stayed with us and dreamt with us making it a beautiful one.

With a heavy heart I wish the best for all the future dreamers, I wish them the luck we were denied..

Obliged by
Marian Students
Senate 2019-20

Dear juniors,
The fire within... can never be perished.....
It burns brighter and fiercer...
Let this energy carry you forward...

will return....

Best Wishes to all..

TEJASVI 2020

എന്നും ഓർമ്മയ്ക്കായ്...

"മെറാക്കി" എന്ന അക്ഷരായനം
ഇവിടെ പൂർണ്ണമാകുമ്പോൾ ...
വിയർപ്പും കണ്ണുനീരും ഇഴുകിയ
ഒരുവർഷ കാലത്തെ യൂണിയൻ
പ്രവർത്തനവീഥികളിൽ
തുണയായവർക്കും....
തണലായവർക്കും നന്ദി...
സ്വപ്നങ്ങളെ യാഥാർത്ഥ്യമാക്കാൻ
സഹായിച്ച ഗുരുനാഥന്മാർക്കും,
സഹനത്തിൻ തോൾ ചേർന്ന
സതീർത്ഥ്യർക്കുമെല്ലാം
ഒരായിരം നന്ദീ....

മരിയൻ എഞ്ചിനീയറിംഗ് കോളേജ് എന്ന
കലാലയത്തിന്റെ ഹൃദയചിത്രം കാലമാകുന്ന
പുസ്തകത്തിന്റെ ഒരേടിൽ സ്ഥാനം
പിടിക്കട്ടെ എന്ന പ്രാർത്ഥനയോടെ...
നന്ദീ...

ഹൃദയപൂർവ്വം
അഭിനന്ദ്. ജെ
ചെയർമാൻ
കോളേജ് സെനറ്റ് 2019 – 20

www.marian.ac.in

"Start with a DREAM Finish with a FUTURE"

MARIAN
ENGINEERING COLLEGE

(Accredited by NBA & ISO 9001:2015 Certified Institution)

Online Applications are invited for Management & NRI Admissions

Kazhakuttom, Thiruvananthapuram
Kerala -685582
Tel : +91 471 2707111, 222
+91 8281377111, +91 9188447588
mail@marian.ac.in | www.marian.ac.in

Managed by the Latin Archdiocese of Trivandrum
Approved by AICTE & Affiliated to KTU