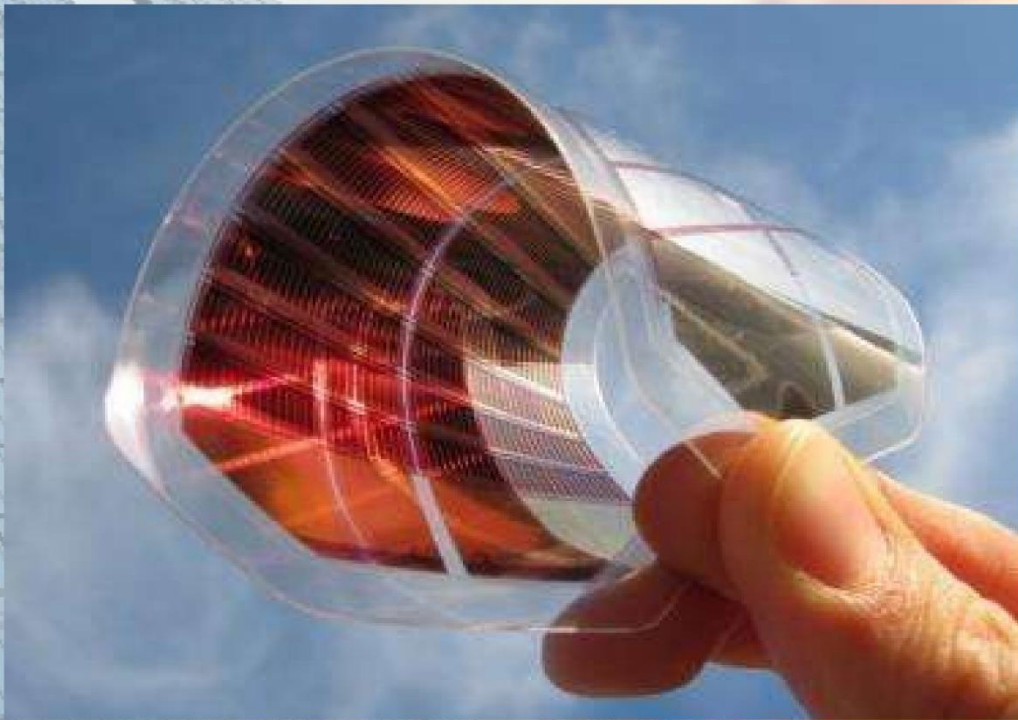


VIDYUT

Volume-1 | Issue-7 | July-2023

Department of Electrical and Electronics Engineering
Official Newsletter



THIRD GENERATION OF SOLAR CELL

TABLE OF CONTENTS

1

**THIRD GENERATION
SOLAR CELLS**

**STUDENTS
ACHIEVEMENTS**

2

3

FACULTY ACHIEVEMENTS

**EVENTS
CONDUCTED**

4

5

**RESEARCH CENTER
ACTIVITIES**

**PLACEMENT AND
INTERNSHIP DETAIL**

6

SRI VENKATESWARA COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Vision of the Institution

To be a leader in Higher Technical Education and Research by providing the state of the art facilities to transform the learners into global contributors and achievers.

Mission of the Institution

To develop SVCE as a "CENTRE OF EXCELLENCE" offering Engineering Education to men and women at undergraduate and postgraduate degree levels, bringing out their total personality, emphasizing ethical values and preparing them to meet the growing challenges of the industry and diverse societal needs of our nation.

Vision of the Department

The vision of Electrical and Electronics Engineering Department is to provide a high standard of education in Electrical and Electronics Engineering so as to meet the industry standards through domain.

Mission of the Department

M1: To create state of the art facilities such that the students excel in Electrical and Electronics Engineering education.

M2: To equip students with a well defined curriculum to meet the requirements of industries and society.

M3: To promote a culture of research, innovation and entrepreneurship in the thrust and allied areas of Electrical and Electronics Engineering.

M4: To inculcate soft skills and foster ethical values and shape the total personality of the students.

Program Educational Objectives (PEOs) UG-EEE

PEO1: Graduates of EEE transformed to engineering contributors in the fields of Electrical, Electronics and Computer Engineering.

PEO2: Succeed in becoming entrepreneurs through human centered design thinking and innovation.

PEO3: Become eligible to pursue higher studies in their chosen areas of engineering or management

PEO4: Effective, conscious and ethical team player in the field of green energy management and sustainability

Program Outcomes (POs) for UG-EEE

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. Design/development of solutions: Design solutions for complex engineering problems and design system components processes that meet the specified needs with appropriate consideration for

the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. Modern tool usage: Create, select and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write

effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and lead.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs) for UG-EEE

PSO1: The ability to build, implement, test and maintain analog and/or digital systems and implement Electronic control of Drives for Industrial automation and Electric Vehicle.

PSO2: The ability to analyze Power System network encompassing stability, control and protection and interconnection of Renewable Energy Sources with Micro and smart grid.

Program Outcomes (POs) for PG-PED

PO1: An ability to independently carry out research/investigation and development work to solve practical problems.

PO2: An ability to write and present a substantial technical report/document.

PO3: Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

Program Specific Outcomes (PSOs) for PG-PED

PSO1: The ability to design and analyze Power Electronic converters and control of Electric drives for Industrial applications.

PSO2: The ability to apply Power Electronic Circuits in Transmission and distribution network of Power System and interconnection of Renewable Energy.

An Article by Dr.E. NaveenKumar, Assistant Professor, on

“Third Generation solar cell”



Third Generation Solar Cells

The advantages of the third generation solar cells are that it can overcome the Shockley-Queisser limit of 31% to 41% power conversion efficiency (PCE), easy fabrication techniques, cheaper fabrication cost and also incorporation of some of the benefits of the first and second generation solar cells. There are several technologies categorized as third generation solar cells, namely, Dye sensitized solar cells (DSSC), Organic solar cells (OSC), Quantum dot solar cells (QDSC), Perovskite solar cells (PSC) and Tandem solar cell (TSC). The history of the third generation solar cells starts from the year 1990 when Michael Gratzel father of Dye Sensitized Solar Cell demonstrated the fabrication steps and working potential of DSSC. However, after decades of research efforts the power conversion efficiency of DSSC was achieved around 13% and similarly for Quantum dot solar cells the power conversion

efficiency was achieved in the range of 7-10 %. In the case of Organic solar cells, the efficiency achieved till date is in the range of 10-15 % but the potential findings of organic donor and acceptor molecules for OSC are still in the process of research. On the other side, Miyasaka first reported the $\text{CH}_3\text{NH}_3\text{PbI}_3$ based perovskite solar cell with PCE of 3.81 %. Later, in 2012, the power conversion efficiency achieved was above 9 % by optimizing the electron transport layer and 13.2 % in 2014; now there is a PCE of 25.2 % reported by the Korea Research Institute of Chemical Technology and MIT in 2019 and it was certified by the National Renewable Energy Laboratory. As a big step forward, the efficiency of perovskite/silicon based Tandem solar cell achieved was a maximum of 29.15 % which was developed by HZB teams and was certified by Fraunhofer Institute for Solar Energy. The most popular third-generation solar cells, namely OSC, DSSC, and PSC, are briefly discussed in this article.

1. Organic Solar Cells

One of the primary distinctions between inorganic and organic solar cells is that in the former a photon is absorbed by an organic substance, resulting in the formation of an electron-hole pair known as an exciton. Each exciton requires energy to be split into a free electron and a hole pair. Such a separation may occur as a result of the combination of two materials with a sufficient chemical potential difference, which creates the requisite electrical field to break the electron-hole

bond. In specifically, the material that donates an electron when separating the exciton is referred to as a donor of the lowest unoccupied molecular orbital (LUMO), while that receives an electron when separating the exciton is referred to as an acceptor of the highest occupied molecular orbital (HOMO). Figure 1 shows the energy level diagram and charge transportation that occurs in organic solar cells.

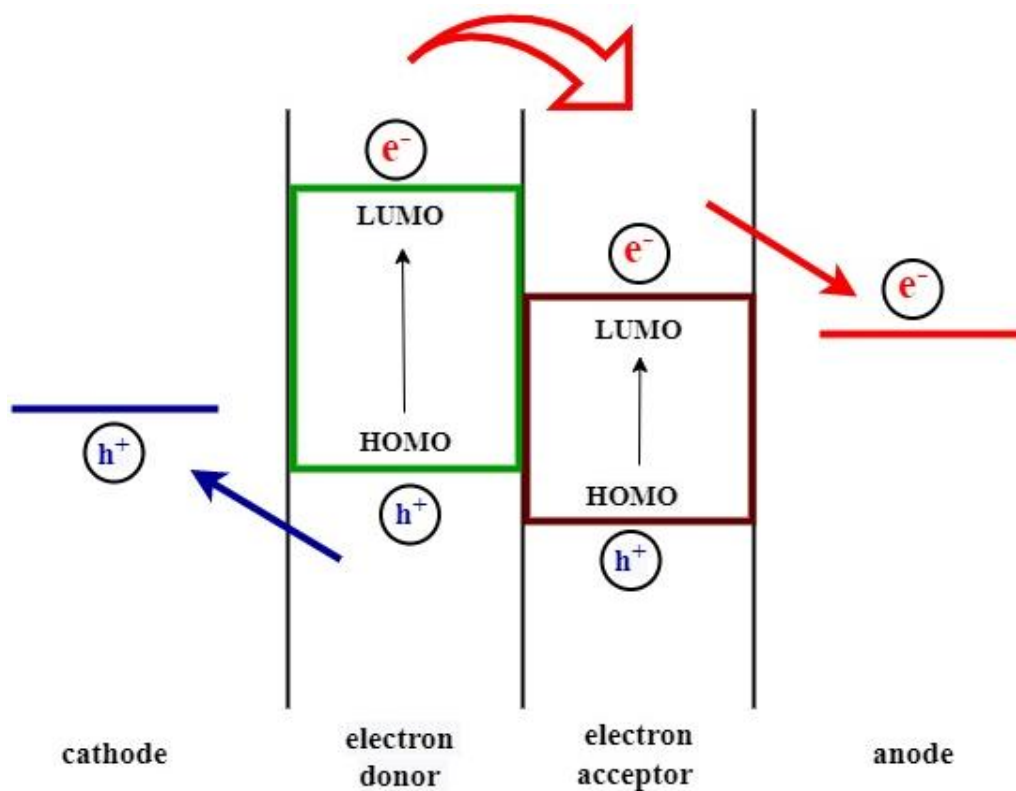


Figure1. Energy band diagram of organic solar cell

2. Dye Sensitized Solar Cells

It is one of the promising third generation solar cells. It mimics the same working principle of photosynthesis for generation of electricity from sunlight. Michael Gratzel and Brian O'Regan used low-cost manufacturing to build a solar cell made of low to medium-purity materials. In dye sensitized solar cells photo-generation of electron-hole pairs takes place when it is exposed to sunlight (fig2)the generated electrons from the valence band are injected into the conduction band of electron transport layer and are utilized at the external load before being collected at the cathode. These carriers react electrochemically with redox electrolyte and are injected into the hole transport layer.

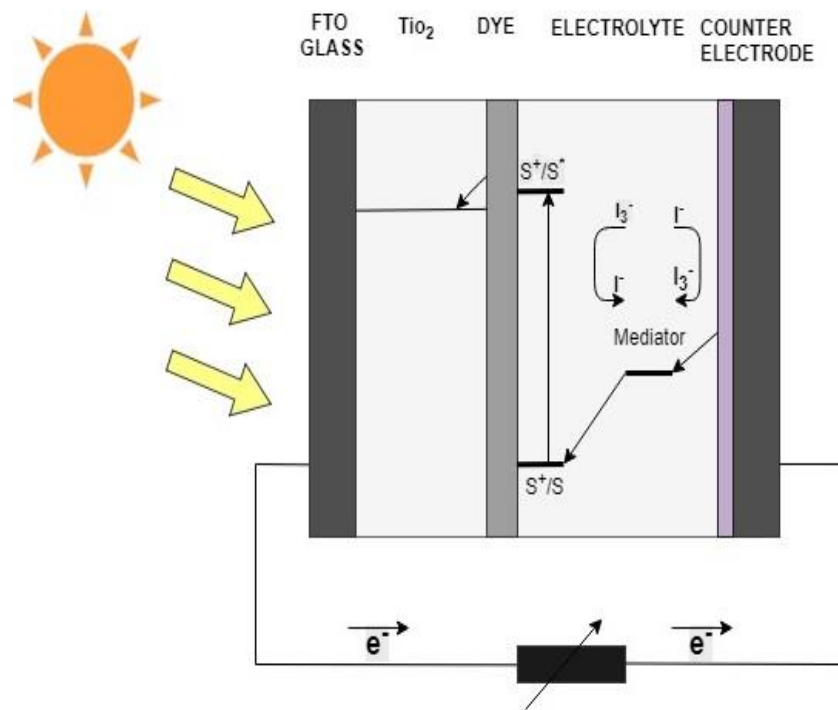


Figure 2. Cell Structure of Dye sensitized solar cell

3. Perovskite Solar Cells

Perovskite material traced back to 1839, when a German scientist called Gustav Rose discovered a novel calcium titanate (CaTiO_3) based mineral in the Ural Mountains and named it "perovskite" in tribute of the Russian mineralogist Lev von Perovski. The foundation for perovskite solar cells is based on Gratzel dye sensitised solid-state solar cells. Miyasaka and his team first used the perovskite material in dye sensitized solar cells as a sensitizer and demonstrated the use of first $\text{CH}_3\text{NH}_3\text{PbI}_3$ - perovskite solar cell in 2009 with PCE of 3.81%. Perovskite general formula ABX_3 , A = organic monovalent cation (eg, MA^+ , K^+ , FA^+ , NA^+), B = divalent metal cation (eg, Ge^{2+} , Pb^{2+} , Sn^{2+}), and X = halide anion (eg, F^- , Cl^- , Br^-). The structure of perovskite is shown in Figure 3 (a). Tolerance factor and octahedral factor are two important parameters in the assignment of perovskite using ABX_3 formula. Perovskite solar cell is a structured compound which is built using (i) an electron transport layer (ii) a perovskite layer (iii) a hole-transport layer. Based on the structure, perovskite solar cells are clamped as p-i-n (planer), p-i-n (mesoscopic), n-i-p (planer), n-i-p (mesoscopic).

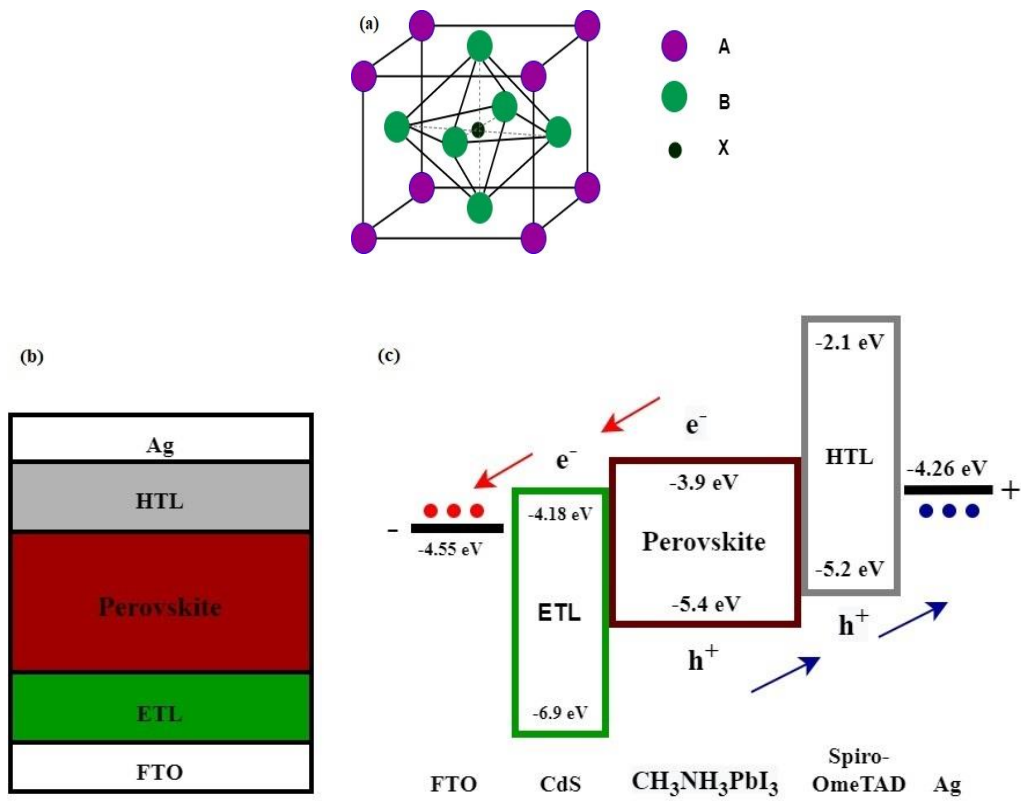


Figure 3(a) Schematic representation of perovskite structure ABX₃ (b) Device configuration of perovskite solar cells (c) Energy band diagram of perovskite solar cells

References

1. Naveen Kumar Elangovan, Sivaprakasam Arumugam., "Chayaver: Indian-traditional dye to modern dye-sensitized solar cells," *Mater. Res. Express*, vol. 6, no. 6, p. 066206, Mar. 2019, doi: 10.1088/2053-1591/ab0cad.
2. Naveen Kumar Elangovan, Sivaprakasam Arumugam., "Investigation of parameters affecting the performance of Perovskite solar cells," *Mol. Cryst. Liq. Cryst.*, vol. 0, no. 0, pp. 1-8,

doi: 10.1080/15421406.2020.1829425.

3. Naveen Kumar Elangovan, Sivaprakasam Arumugam., Effect of CdS thin film on the performance of methylammonium lead iodide perovskite solar cell (2021). *J Mater Sci: Mater Electron* 32, 17612–17619, <https://doi.org/10.1007/s10854-021-06294-7>.
4. I. Mesquita, L. Andrade, and A. Mendes, “Perovskite solar cells: Materials, configurations and stability,” *Renew. Sustain. Energy Rev.*, vol. 82, no. May, pp. 2471–2489, 2018, doi: 10.1016/j.rser.2017.09.011.
5. Pandiyarajan Mariyappan, T. H. Chowdhury, S. Subashchandran, I. Bedja, H. M. Ghaitan, and A. Islam, “Fabrication of Lead-free CsBi₃I₁₀ based compact perovskite thin films by employing solvent engineering and anti-solvent treatment techniques: An efficient photo-conversion efficiency up to 740nm,” *Sustain. Energy Fuels*, vol. 4, no. 10, pp. 5042–5049, 2020, doi: 10.1039/D0SE00786B.
6. Hasan, Inamul, Joshi Siddharth, Naveen Kumar Elangovan, “Developments in Perovskite materials based Solar Cells: In Pursuit of Hysteresis Effect, Stability issues and Lead-Free based perovskite materials”, “*Nanoscience & Nanotechnology Asia*” Volume 12, Number 3, 2022, pp. 46-61(16).
7. Y. Li *et al.*, “Wide Bandgap Interface Layer Induced Stabilized Perovskite/Silicon Tandem Solar Cells with Stability over Ten Thousand Hours,” *Adv. Energy Mater.*, vol. 11, no. 48, pp. 1–9, 2021, doi: 10.1002/aenm.202102046.

Student Achievements

Mr. Raghul, final year student received the certificate “ Meritorious sports persons for employment” from Secretary, Sports Board, Anna University, Chennai for the representation in the Anna University Hokey team and participated in the south zone Inter University / All India Inter University tournaments, held at Bengaluru City University, Bengaluru during the period 11th to 16th December, 2022.



FORM - III
(For representing University in anyone of the recognized Games / Sports)

Certificate No.	Aadhar Card No.	Game
2 2 0 3 1 7	3608 8444 3321	Hockey (M) SZ

Certificate Issued to Meritorious Sports Persons for Employment

Certified that Mr. / Miss RAGHUL R

Roll No. 2127200601056 Son / Daughter of RAJENDRAN P & SANTHI R

Year & Branch of Study III - BE (EEE) College Sri Venkateswara College of Engineering, Sriperumbudur

College Code 2127 was a Member of Anna University Hockey
(Men / Woman)

Team and Participated in South Zone / -All-India Inter - University Tournaments,
held at Bengaluru City University, Bengaluru during the period 11.12.2022 to 16.12.2022

Position obtained in the above Tournaments : NIL

The Certificate is being given on the basis of records available in the office of Anna University Sports Board,
Anna University, Chennai - 600 025.

Place : Chennai - 600 025 Signature : _____
Date : 7-12-23 Name : _____
Name of the University : Anna University, Chennai Designation & Seal : _____
Office Seal : _____

Dr. S. BALAGANESH
Secretary
Anna University, Chennai

Ms. Abinaya B, President, EWB-SVCE of (2019-23 batch), EEE and her teammates won 1st place in paper presentation on “Carbon Footprint Accounting in the Sustainable Development Goals” Track 2 event EWB-INDIA, in the Engineers Without Borders All India Meet (EWB AIM) at GITAM Deemed University, Hyderabad. The work dealt with clean water, air and sanitation-related projects. The team gained attention to detail and commendable presentation skills were applauded and received accolades in the form of this award.



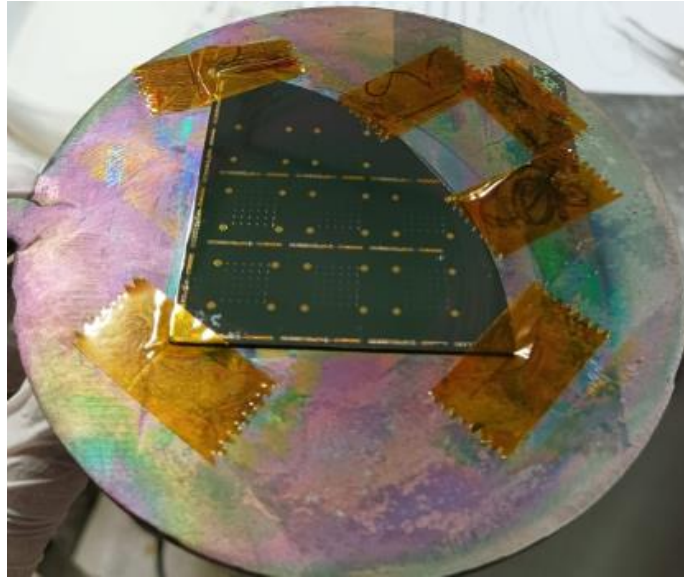
Faculty Achievements



Dr.KR. Santha, Professor & Head, acted as NBA - Mock Inspection Committee member,UG Programs (TIER-I) for Computer Science and Engineering Department , SVCE, on 27th & 28th July, 2023.



Ms.M.Sasikala, Assistant Professor, visited Centre for Nano Science and Engineering (CeNSE), IISc, Bangalore from 4th-14th July to execute a nanotechnology research project “Fabrication of monolithically integrated TFT driven UV detector” under the scheme of Indian Nanoelectronics Users Program (INUP), for accelerating research and development in nanoelectronics in India funded by the Ministry of Electronics and Information Technology (MeitY), Govt. of India.



Fabricated device (36 transistors in 1x2cm),Thin film transistor on Si/Sio₂ substrate



Dr.M.Sankar, Assistant Professor, participated in a workshop on Electrochemical Energy Storage Technologies:Current Research and Translational Trends held at Indian Institute of Technology Madras, Department of Metallurgical and Materials Engineering, from 7th-9th July, 2023.

Certificate of Participation

Online workshop EEST - 2023



*Indian Institute of Technology Madras
Department of Metallurgical and Materials Engineering*

This is to certify that Prof/Dr/Mr/Ms, Dr.M.Sankar, Asst. Prof., Dept. of EEE, Sri Venkateswara College of Eng. has attended the online workshop on "**Electrochemical Energy Storage Technologies: Current Research and Translational Trends**" held from July 7 to July 9, 2023.

Dr Tiju Thomas
Associate professor
Department of Metallurgical and
Materials Engineering
Indian Institute of Technology Madras

Official Meeting/Events Organized in the Department

External Academic and Administrative Audit

The Department of Electrical and Electronics Engineering completed the External Academic and Administrative Audit by the Auditor, Prof. Dr.R. Ramesh, EEE, , Anna University on 12th July 2023, as a requirement for NAAC under the attribute of Internal Quality Assurance Cell (IQAC).



NBA SAR for UG -EEE Submission

Department of Electrical Electronics Engineering accredited for highest number of years in the consecutive accreditation by National Board of Accreditation (NBA) under the able guidance of HOD/EEE and AHOD/EEE successfully submitted the e-NBA SAR for UG Program (Tier-I) on 21st July, 2023.

Indian Society for Training and Development Chennai Chapter – ISTD, SVCE

The ISTD Student Chapter SVCE organized a highly informative and engaging "One Day Hands-On Workshop on Professional Skills" on 27th July 2023. The Inaugural address was delivered by Vice principal of SVCE, Dr. K.R. Santha. A short introduction of the chief guest was given by Keerthana Ratheesan, executive member of ISTD Student Chapter. Followed by a diverse range of sessions, each focused on different aspects of professional development. The first session was articulated by the chief guest Dr. K. Raghavi Senthilkumar, Honorary Secretary of ISTD Chennai Chapter, addressed about her role on the ISTD Chennai chapter and an interactive session about the insight into the key professional skill required in an engineering industry. Followed by the address, the participants interacted with the chief guest to get advice on their queries.

The second session about Essential traits for job success was commenced by Mr. Narendran K, President of ISTD Student Chapter,

the participants gained valuable knowledge about the qualities and characteristics that employers seek in prospective employees.

The third session was an interactive session conducted by Ms. Harini N, Analytics Head of ISTD Student Chapter, on the theme Job Success Analysis and Sustainability, it was a well-spoken session to help the student understand about job analysis requirements and strategies for sustainable career growth.

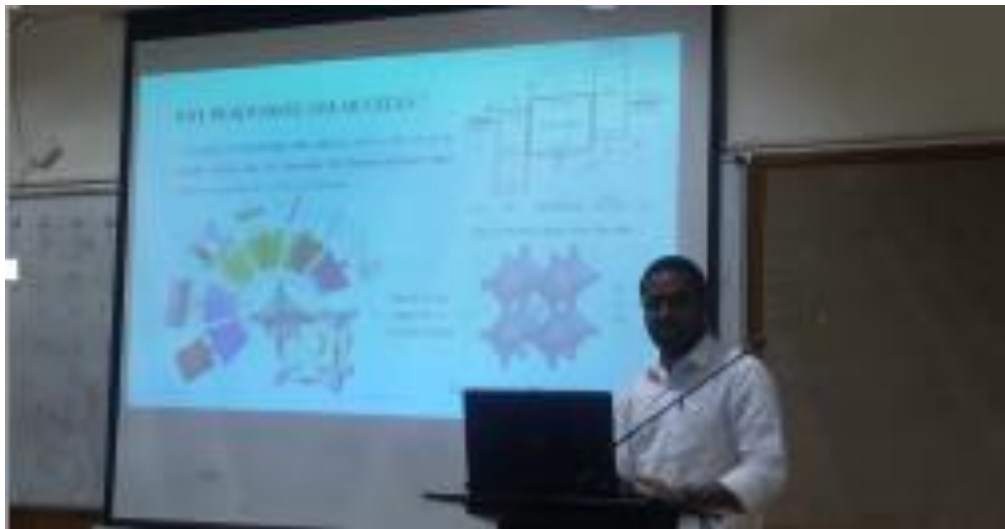




Research Center Activities



- Mr.E.Naveen Kumar, Assistant Professor, defended his Ph.D thesis titled “Certain Experimental Investigation on Methylammonium Lead Iodide Based Perovskite Solar cells on 7th July 2023, at 10:00 a.m under the supervision of Dr.A.Sivaprakasam, Assistant Professor, Department of Electrical and Electronics Engineering, CEG Campus, Anna University,Chennai .





- Ms. S. Arulmozhi, Assitant Professor, defended her thesis titled “A New Isolated Multiport Converter Topologies For Standalone PV Applications ” on 13th July,2023 (Thursday), 11:00 AM at Seminar Hall, Department of Electrical and Electronics Engineering, Sri Venkateswara College of Engineering ,under the guidance of Dr.KR Santha , Professor & Head , EEE.





- Ms.Rajeswari.V, full time research scholar, presented a pre confirmation seminar on “Analysis and Design of High gain DC-DC Converter to Electric Vehicles” on 27th, July, 2023 at 10.00 AM in the Seminar Hall, Department of EEE, Sri Venkateswara College of Engineering, Sriperumbudur.



- Dr.C.Kamal, Assistant Professor, conducted the First Doctoral Committee meeting for three research scholars name Mr.G.Gnanave, Mrs.D.Nirmala and Mr.R.Arunraj on 28th July, 2023 (Friday) at 9.30 AM, 12.00 PM and 2 P.M respectively in the Department of Electrical and Engineering, Sri Venkateswara College of Engineering, Sriperumbudur.

Placement and Internship detail

The placement Cell at SVCE organized a Soft skill (Employability) training program for six days for all the final year students to enhance the student's aptitude, verbal and logical reasoning skills in order to improve their chance of clearing the aptitude test during placements. *M/s Springboards* conducted the training program for the batch.

Students from the department of EEE actively participated in the training session. The moments captured during the session are attached below.





Several students from our department underwent industrial training during their summer vacation to enhance their technical knowledge.

Here is a list of students and the companies they got trained.

Name of the Student	Year of Study	Company
Saranya .K	IV	The Head of the Substation, TNEB
Suruthigha S K Swetha A Visalakshi P Ramya R Sanjana Sureshkumar	II	Pneu Tech Industries,

Narendran K Balakrishnan S	III	Chennai Metro Rail Limited (CMRL)
Jaiganesh B Kalanchiyam M Chandirapriyan K Naveenkumar E	II	Tamil Nadu Generation And Distribution Corporation Limited (TANGEDCO)
Pratheep S	II	Hyundai Motor India Limited
Mohana Krishnan K Madhan Raaj P Manush K R	II	Voltech Engineers Private Limited
Kabilan P	II	Engine Factory, Avadi
Akash Prbhagar G R	II	Indira Gandhi Center for Atomic Research (IGCAR),
Deepakraj N R Mugunth Krishna P Barath S N Manoj M	II	North Chennai Thermal Power Station
Srinikesh G Shanmuga Velan M Gokul N Kavibharathi S Sanjana Sureshkumar	II	Integral Coach Factory(ICF)

Dinesh C	II	Siemens Centre of Excellence
Vasanth A Epsiya I Aarthi G	II	National Small Industries Corporation
Kavinaya Sree T Mala Alice Ishwarya S	II	Evolve Robot Lab
Shanmuga Velan.M Srinikesh.G Adhitya.R Viswasree .S Sindhuja.M Sakthiuma.S Divya.R	II	Neyveli Lignite Corporation (NLC)



Alumnus Experience:

"When I first arrived at SVCE, I was frankly overwhelmed by the number of assignments and work, Over the four years, though, I learned to manage my time. On the first day of every semester, I'd add all away games to my calendar. Throughout my education period my undergraduate years were wonderful. The Laboratories at Electrical and Electronics Engineering were excellent. I mastered most of the Electrical and Electronics concepts while doing Practical experiments in these laboratories.

I personally feel the knowledge and Skills (both Technical and Soft Skills) that I acquired motivated me to push myself beyond the limits to pursue higher studies abroad.

My most personally rewarding college experience occurred even before I arrived on campus as a freshman. The college offered an "outward bound" program for first-year students two weeks prior to orientation day. During those two weeks, I overcame fears, made lifelong friends, and gained the self-confidence I needed to start my college journey. So today i am someone working as a Senior Electrical Engineer in a semiconductor industry, It all started from SVCE Since 2014. I take this opportunity to thank all my faculties and friends which I gained as gifts throughout my college days".

Hariharan D

EE Batch 2014-18

Senior Electrical Engineer,

Micron Technology,

Singapore



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

NEWSLETTER

EDITORIAL TEAM

Dr. KR. Santha, Vice Principal & HOD/EEE

Dr. Sudhakar K Bharatan, AHOD/EEE

Dr. R. Karthikeyan, Associate Professor/EEE

Ms. S .Sinthamani, Assistant Professor/EEE

Mr. Sabari S IV year/EEE