

# सृजन और संवाद Srijan Aur Samvad MONTHLY NEWSLETTER

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With great happiness I want to share the inaugural issue of the Monthly Newsletter of the Electronics Engineering Department. As the name of this monthly newsletter suggests, this is about creation and having a positive dialogue. This is a platform where faculty, staff and students can present their views related to Developments in Electronics, share their achievements and to celebrate the milestones which sometimes go unnoticed. The space in this newsletter will also be used to invite opinions and views of experts. I hope this Newsletter achieves its purpose with support from all of you.

Dr. Siva Kumar Tadepalli  
Editor

बहुत खुशी के साथ मैं इलेक्ट्रॉनिक्स इंजीनियरिंग विभाग के मासिक समाचार पत्र के उद्घाटन अंक को साझा करना चाहता हूँ। जैसा कि इस मासिक समाचार पत्र के नाम से पता चलता है, यह सृजन और सकारात्मक संवाद के बारे में है। यह एक ऐसा मंच है जहां संकाय, कर्मचारी और छात्र इलेक्ट्रॉनिक्स में विकास से संबंधित अपने विचार प्रस्तुत कर सकते हैं, अपनी उपलब्धियों को साझा कर सकते हैं और उन मील के पत्थर का जश्न मना सकते हैं जिन पर कभी-कभी ध्यान नहीं दिया जाता है। इस न्यूज़लेटर के स्थान का उपयोग विशेषज्ञों की राय और विचार आमंत्रित करने के लिए भी किया जाएगा। मुझे आशा है कि यह न्यूज़लेटर आप सभी के सहयोग से अपना उद्देश्य प्राप्त कर लेगा।

डॉ. शिवा कुमार ताडेपल्ली  
संपादक



**G. P Singh**  
**CEO at Ambient Scientific Inc**  
**Article is available on LinkedIn**

## DEATH OF CMOS!!!!

Death of CMOS is inevitable ... but not yet ...not just yet ....

CMOS will be replaced by something else, but, for a common person's use that change is 4 to 5 decades away.

The name CMOS is abbreviation for Complementary Metal Oxide Semiconductor. But, the word CMOS has more meaning to most people than the name it represents. CMOS is technology that transforms sand into chips that do magical tasks, and are backbone of all electronics. Electronics, that powers behemoths like supercomputer down to a smart phone (such as iPhone) and even further down to electronics in a sub-dollar toy singing lullaby to a new born baby. Most electronic gadgets, big or small, owe its existence to CMOS. I have tried it many times and experienced that the phrase "Complementary Metal Oxide Semiconductor" is difficult to explain except for the most curious physics enthusiasts.

So let's stick with CMOS.

For past 2 decades, we have witnessed many experts projecting end of life for CMOS within a few years. But, so far powered by human zeal for innovations, CMOS has become only more prevalent.

CMOS will keep scaling down to 10 picometer (0.1 Angstrom) or even smaller in next 4-5 decades before it gets replaced by Quantum device or something else. Machines, materials, procedures and techniques will be invented to make it happen. CMOS has proven to be resilient against many challenges.

We have overcome many challenges such as wavelength limitations (OPC, patterning), gate oxide stress and threshold voltage limitations (metal-oxide gate, doping, implants, Multi-Vt), channel and source-drain conduction limitations (doping and doping gradients, LDD/MDD/HDD, salicide, stressed/strained silicon), interconnect speed limitations (aluminium, copper wires, dielectric improvements) channel leakage problems (3D transistors, Metal gate) etc. New technical challenges will arrive and we'll overcome them.

Of course there are risks.....

One of the biggest risks is the lack of competition fuelled by business consolidation. In past 2 decades we have seen significant slowdown in momentum for semiconductor innovations. Thanks to bold vision of one visionary, the smartphone chips have kept the innovations for process scaling alive. Innovations in high speed and low power has more or less stalled for past 2 decades. I attribute that to lack of competition. But arrival of AI computers will pretty much take care of this problem. In near and distant future, we'll see more innovations in CMOS speed and low power.

Other risk is global non-cooperation among scientists. This can be caused by many factors including political eco-system. However, risks that apply to CMOS also apply to alternative technologies as well. Means, CMOS will remain a dominant force for electronics at any given time. for long time to come..

So what about quantum computing?

## Student Achievements Placements



**Ankit Bisht, 2021-25 Batch** student of Electronics Engineering Department has been placed in Accenture with a Package of Rs. 11 Lakh

## Publications by Students Conference Papers Published/ Presented

**S. Pathak and D.V.S. Reddy** presented a paper titled "Leveraging Renewable Energy Sources by Compact Transparent Rectenna Systems at 2.41GHz and 3.3 GHz (5G) to fulfil Power Requirements in IoT-based Agricultural Applications" at 2<sup>nd</sup> International Conference on Microwave, Antenna and Communication (MAC2024) Co-organized by DRDO, IIT Roorkee, THDC IHET, NIT Uttarakhand and MNNIT Allahabad, authored by S. Pathak, D.V.S. Reddy and T. Goel during 04-06 October, 2024 at Dehradun, India.

**R. Nigam, R. Prakash and S. K. Tadepalli**, "Robust Stability Analysis of 2-D Dynamical Systems for Applications in Automation and Astronomy," 2024 *IEEE Space, Aerospace and Defence Conference (SPACE)*, Bangalore, India, 2024, pp. 944-947, doi: 10.1109/SPACE63117.2024.10668189.

## Journal Papers Published

**Virendra Kumar, S. Pal, V. Singh, B. Goyal, L. K. Awasthi and Y. K. Prajapati**, "On the Feasibility of Thallium Bromide in Long-Range Plasmonic Sensing for Enhancement of Performance," in *IEEE Transactions on Plasma Science*, doi:10.1109/TPS.2024.3468954.

**Virendra Kumar, Rajeev Kumar, Sarika Pal, Yogendra Kumar Prajapati**, Development of surface plasmon resonance sensor utilizing GaSe and WS<sub>2</sub> for ultra-sensitive early detection of dengue virus, *Optik*, Volume 313, 2024

**Virendra Kumar, Sarika Pal, Vivek Singh, Yogendra Kumar Prajapati, J.P. Saini**, Design of a highly sensitive and precise long-range surface plasmon resonance sensor for early detection of malaria, *Physica B: Condensed Matter*, Volume 686, 2024

**Garia, L., Muthusamy, H.** Dual-Tree Complex Wavelet Pooling and Attention-Based Modified U-Net Architecture for Automated Breast Thermogram Segmentation and Classification. *J Digit Imaging. Inform. med.* (2024)

**Juyal, R., Muthusamy, H., Kumar, N. et al.** Resting state EEG assisted imagined vowel phonemes recognition by native and non-native speakers using brain connectivity measures. *Phys Eng Sci Med* 47, 939–954 (2024)

**Ritu Tanwar, Ghanapriya Singh, Pankaj Kumar Pal**, A hybrid transposed attention based deep learning model for wearable and explainable stress recognition, *Computers and Electrical Engineering*, Volume 119, Part B, 2024

**Ritu Tanwar, Orchid Chetia Phukan, Ghanapriya Singh, Pankaj Kumar Pal, Sanju Tiwari**, Attention based hybrid deep learning model for wearable based stress recognition, *Engineering Applications of Artificial Intelligence*, Volume 127, Part B, 2024

## Book Chapter

**Pundir, Yogendra P., Arvind Bisht, and Pankaj K. Pal.** Performance Analysis of Nanosheet Transistors for Analog ICs." *Advanced Nanoscale MOSFET Architectures: Current Trends and Future Perspectives* (2024): 221-253.

## PhD Defence

Ms. Ruchi Juyal, successfully defended her PhD



thesis titled "Deciphering Imagined Speech Using

Electroencephalogram” on August 29, 2024 under the Supervision of Dr. Hariharan Muthusamy.

## Faculty Achievements Conference Organized

Dr. Tushar Goel contributed as Conference Chair in the 2nd IEEE International Conference on Microwave Antenna and Communication held during October 4-6, 2024 at Dehradun.

## Expert Lecture/Invited Talk Delivered

**Dr. Jaiverdhan** delivered an Invited Lecture at



JECREC University Jaipur during 07-09 October 2024.

**Dr. Pankaj Kumar Pal** Delivered an Invited Talk on “Foundation of VLSI Design” at Department of Electronics and Communication Engineering, HNB Garhwal University on 21st Sept. 2024.

**Dr. Pankaj Kumar Pal** Delivered an Invited Talk on “Device-Circuit Co-Design Issues in SRAMs” in Short Term Course (Online Mode) on “Recent Advancements in VLSI Design for IoT Applications (RAVI-2024)” organized by Department of Electronics and Communication Engineering, NIT Kurukshetra (An Institute of National Importance) from 19th – 23rd July, 2024.

**Dr. Pankaj Kumar Pal** Delivered an Invited Talk in SERB & IEEE Sponsored 5-Days Workshop on

“Revolutionizing Tomorrow: Exploring Cutting-Edge Trends in Integrated Circuits” organized at Indian Institute of Information Technology Sri City,



A.P. from 30th Apr., 2024 – 04th May 2024.

**Dr. Pankaj Kumar Pal** Delivered an Invited Talk in IEEE SPS Seasonal School on AMALGAM with MLED on “MOS based Devices” organized in Hybrid (Both Offline & Online), by ECE Department, BTKIT Dwarahat Uttarakhand & IEEE SPS UP Chapter from 27th – 31st March, 2024.

**Dr. Pankaj Kumar Pal** Delivered an Invited Talk in Short Term Training Program (STTP) on “Nano-Scale Devices: Recent Advancement and Future of Semiconductor Industry (NSD-2024)” organized in The School of VLSI Design and Embedded Systems, NIT Kurukshetra (An Institute of National Importance) from 04th – 08th March, 2024.

## Conference Papers Published by Faculty

**Jaiverdhan** "Study and Analysis of Supervised Machine Learning Techniques for Human Activity Recognition and Its Implementation Using Smartphones Sensors." International Conference on Advances in Distributed Computing and Machine Learning. Singapore: Springer Nature Singapore, 2024.

**Jaiverdhan**, et al. "Antenna Design and Optimization Using Machine Learning: A Comprehensive Review." International Conference on Advances in Distributed Computing and Machine Learning. Singapore: Springer Nature Singapore, 2024.

Suryawanshi, A., Singh, A., Ochani, N., Verma, V., & **Jaiverdhan**. (2024, January). IoT Enabled Battery Management System (BMS) with Active Balancing. In International Conference on Advances in Distributed Computing and Machine Learning

(pp. 469-482). Singapore: Springer Nature Singapore.

## Journal Publications By Faculty

Yesudasu,V., Srivastava, R., Pal, S. et al. Performance Enhancement of SPR Sensor for Dengue Virus Detection: Influence of Aluminum Nitride and 2D Materials. *Plasmonics* (2024). <https://doi.org/10.1007/s11468-024-02574-0>

V. Yesudasu, R. Srivastava, S. Pal, M. S. M. Rajan and Y. K. Prajapati, "Surface-Plasmon and Titanate Material-Assisted Sensor Structure for Pseudomonas Bacteria Detection With Increased Sensitivity," in *IEEE Transactions on AgriFood Electronics*, vol. 2, no. 2, pp. 347-354, Sept.-Oct. 2024

R. Srivastava, V. Kumar, S. Tyagi, S. Pal, A. K. Sharma and Y. K. Prajapati, "On the Feasibility of Particle Swarm Optimization Method for Inverse Design of High-Performance SPR Biosensor," in *IEEE Sensors Journal*, vol. 24, no. 10, pp. 16242-16249, 15 May15, 2024

## Sponsored Project

**Dr. Sarita Yadav** has been appointed as Chief Investigator (CI) of the project MIETY Project titled "A novel power on pilot IC for ultra-power wireless IoT devices" under the C2S Category I at NIT Uttarakhand.



Vishwakarma Pooja Celebration

Faculty and students are requested to submit articles both Engineering and General Articles. If any achievement has been missed in this Newsletter you can email to [eceoffice@nituk.ac.in](mailto:eceoffice@nituk.ac.in) or [sktadepalli@nituk.ac.in](mailto:sktadepalli@nituk.ac.in)