



Anil Neerukonda Institute of Technology & Sciences (Autonomous)

(Permanent Affiliation by Andhra University & Approved by AICTE
Accredited by NBA (ECE, EEE, CSE, IT, Mech. Civil & Chemical) & NAAC)

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Report on "Inaugural ceremony of IEEE ANITS Electron Devices Society Student Branch Chapter (SBC) & Technical seminar on Trending Power Semiconductor Devices"

Date: 12-04-2023

Resource Persons:

Dr. D. Nirmal,

Vice-Chair, IEEE EDS Region 10(Asia & Pacific),

Professor & Head, Department of ECE,

Karunya Institute of Technology and Sciences, Coimbatore.

Target Audience: Students, and Faculty of ECE Department.

Total no of Participants: 60 Nos.

Objectives:

- ❖ To familiarize IEEE Electron Device Society features and functions.
- ❖ To familiarize trending power semiconductor devices for present and future high power switching applications.

Outcomes:

- ❖ Participants acquired the knowledge about benefits of IEEE membership and IEEE EDS membership.
- ❖ Participants acquired the knowledge about various funding schemes and scholarships under IEEE EDS.
- ❖ Participants acquired the knowledge about recent power semiconductor devices for present and future power switching applications.

Description / Report on Event:

IEEE ANITS Electron Devices Society Student Branch Chapter (SBC03871H) has been approved by IEEE on Feb 14th 2023 and the chapter was inaugurated on 12th April 2023 by the Chief Guest Dr. D. Nirmal, Vice-Chair, IEEE EDS Region 10(Asia & Pacific), Prof. B. Jagadeesh, HOD, ECE, ANITS, Dr. P. Murugapandiyam, Advisor, IEEE EDS Chapter, ANITS, Dr. Usha Bala, IEEE Student branch counsellor, ANITS.

The basic objective of opening this branch under ANITS has been to further open different Society Chapters in various departments of the ANITS thereby involving all Bachelor, Master and Doctoral students and faculty in IEEE activities and awareness through conduction of Technical Seminars, Workshops, Conferences, and other technical & cultural activities leading to promotion of IEEE and advancement of technology in right perspective. At present there are more than 35 IEEE Student Members and more than 12 Professional members under the Electronics and Communication Engineering branch, ANITS.

Executive committee of IEEE EDS Chapter ANITS for AY:2022-2023

S.NO	Name	IEEE MEMBERSHIP ID	Phone Number	Position	Email
1.	Dr. P. Murugapandiyan	95296662	8459633255	Advisor	murugavlsi@gmail.com
2.	SAI TARUN BARATAM	98606825	9560241708	Chair	saitarunbaratam.20.ece@anits.edu.in
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4.	GANDHAVARAPU D S VINAY	98839418	7981600012	Secretary	satyavinay1810@gmail.com
5.	VIJAYA SARADHEE DASARI	98816113	6305517543	Treasurer	vijayasaradhee789@gmail.com
6.	SURYA TEJA MODALAVALASA	99208374	7981032373	Webmaster	msaisuryateja.20.ece@anits.edu.in

Inaugural Session (9:30AM – 10:30AM)

The inaugural ceremony commenced with the **lightning of the lamp (Virtually)** by the dignitaries- **Chief Guest** Dr. D. Nirmal, Vice-Chair, IEEE EDS Region 10(Asia & Pacific), Prof. B. Jagadeesh, HOD, ECE, ANITS, Dr. P. Murugapandiyan, Advisor, IEEE EDS Chapter, ANITS, Dr. Usha Bala, IEEE Student branch counsellor, ANITS, who graced the occasion.

The function began with a welcome speech by Prof. B. Jagadeesh, HOD, ECE, ANITS. He welcomed – **Chief guest** Dr. D. Nirmal, all the IEEE student members, and IEEE professional members. He said that we have opened IEEE EDS chapter under the ECE branch and discussed the benefits of IEEE Membership and facilities of Electron Device Society. He thanked Dr. D. Nirmal on behalf of ANITS for accepting the invitation for the Chief guest of Inaugural Program and a Distinguished speaker. He expressed his special thanks to management of ANITS for extending financial support in organizing various activities. Lastly, he thanked to Dr. Usha Bala and Dr. P. Murugapandiyan for

their cooperation and support from planning to execution of the activities under the student branch.

Dr. P. Murugapandiyar, Advisor, IEEE EDS Chapter, ANITS, briefly introduced the chief guest and gave complete information about IEEE student branch activity plan. He also motivated the students towards IEEE membership and provided the guidance towards how to take the IEEE membership. He said that EDS has many things for its members-- scientific publisher, technical conference sponsor, networking resource-- but at its core EDS is a community of learning. From undergraduate students to PhD candidates and world-renowned researchers, EDS provides device engineers from across the spectrum engaging and enriching educational opportunities. He further said, EDS chapter will conduct technical Poster presentation, technical seminars, project exhibition, National/International workshops, and ethics competitions and many more. He told about student fellowships that each year at least three PhD and Masters Fellowships are awarded with prizes ranging from \$5K (PhD) and \$2K (Masters) per awardee. Lastly, he expressed his best wishes for success of the technical seminar on "**Trending Power Semiconductor Devices**".

Chief guest Dr. D. Nirmal, congratulated to Prof. B. Jagadeesh & his team for their successful attempt to establish an IEEE EDS Student Branch chapter at the ANITS and wished them the best for the further events. He told about some hot topics for research in electronics i.e. electronics in biomedical, green electronics, optical circuits and mobile communication. He encouraged the participants to avail utmost benefit from the technical seminar and explore themselves in the respective research areas.

Chief guest Dr. D. Nirmal delivered the inaugural address. He said that the IEEE Electron Devices Society (EDS) is one of the technical societies & councils that you can join as an IEEE member. He said that the IEEE Electron Devices Society was initially formed as the Institute of Radio Engineers (IRE) Electron Tubes and Solid-State Devices Committee in 1951, and quickly became a professional group: in March 1952 it was called the IRE Professional Group on Electron Devices. After IRE's merger with AIEE in 1963, the group became the IEEE Professional Technical Group on Electron Devices, which merged with the Solid-State Devices Committee in 1963 and with the New Energy Sources Committee in 1964, becoming the IEEE Electron Devices Group. In 1976 the group changed its name to the IEEE Electron Devices Society. He said that EDS now has about 11,000 members and chapters worldwide, sponsors many technical periodicals, provides support for technical meetings, and has its own business office. He also briefed about EDS mission fund. In his speech he talked

about the “William Shockley” who was an American physicist and inventor. Shockley was the manager of a research group at Bell Labs that included John Bardeen and Walter Brattain. The three scientists invented the point-contact transistor in 1947 and were jointly awarded the 1956 Nobel Prize in Physics. Lastly, he wished Electron Device Society chapter of ANITS the very best in all its endeavors.

Technical seminar on “Trending Power Semiconductor Devices” (10.30 AM to 11.30 AM)

Prof. D. Nirmal started the session on Trending Power semiconductor Device in which he discussed about various power semiconductor devices for present and future power electronics applications. He also discussed that the First Junction Transistor was invented by W.B. Shockley in 1951. He gave an insight about some major milestones of semiconductor devices and he also explained the Evolution of VLSI. He also explained that the designers of modern integrated circuitry have continuously attempted to provide more computational speed, with less dissipated electrical power, with less circuit board area, while maintaining a low failure rate, and an aggressive cost. He discussed the Comparison of Semiconductor Properties. He gave some glimpse on Integrated Circuit (IC) types of IC i.e., Monolithic IC and Hybrid IC.

He told some of the important features of GaN-High electron mobility transistors for future RF and power switching applications. He talked about the Various Engineered Device Structures i.e. Lateral Channel Engineered Structures, Work-Function Engineered Structures and Gate- Oxide Engineered Structures. He also talked about how substrate engineering impacts the GaN-HEMTs performance. He concluded diamond substrate is the best choice for GaN HEMTs to achieve better performance and good thermal dissipation. He concluded the session saying that InAlN/GaN HEMTs are providing better RF performance than conventional AlGaN/GaN HEMTs.

Dr. P. Murugapandiyan

Advisor, IEEE EDS Chapter, ANITS.

Dr. B. Jagadeesh

Professor & Head, ECE, ANITS.

Glimpse of "Inaugural ceremony of IEEE ANITS Electron Devices Society Student Branch Chapter (SBC) & Technical seminar on Trending Power Semiconductor Devices"

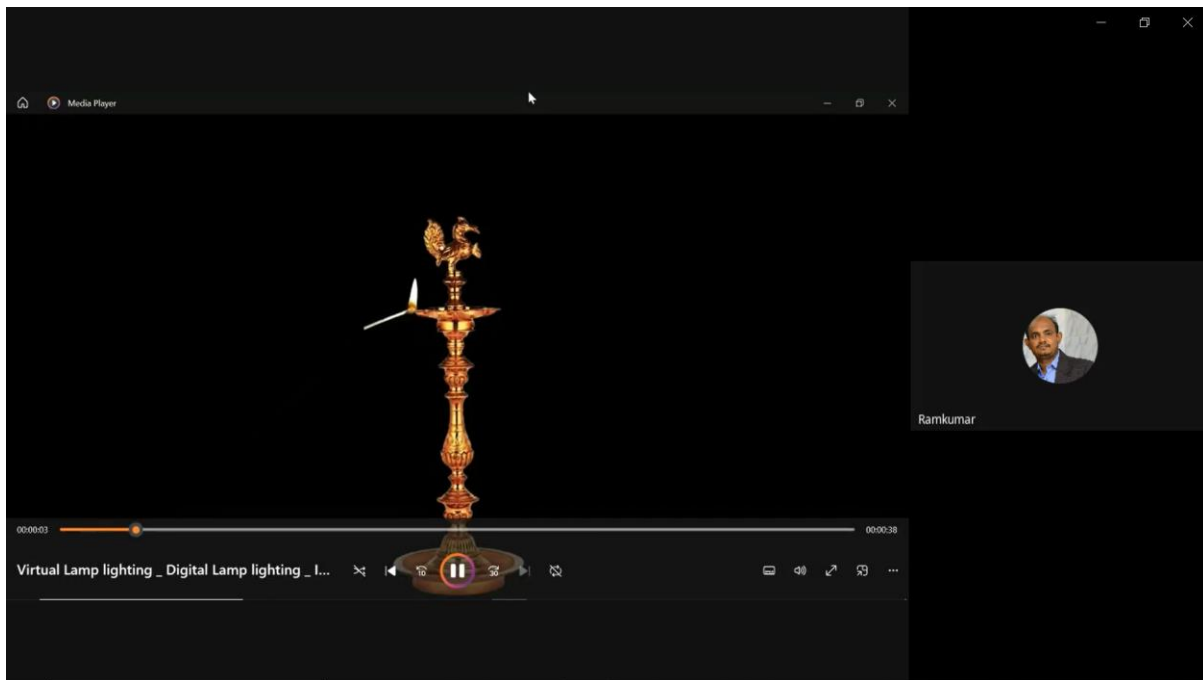


Figure 1. Virtual Lamp lighting



Figure 2. Mr. N. Ramkumar inviting HOD/ECE for welcome address



Figure 3. Prof. B. Jagadeesh, HOD/ECE giving welcome address



Figure 4. Dr. P. Murugapandiyan, Advisor, IEEE EDS ANITS giving Chief guest Introduction

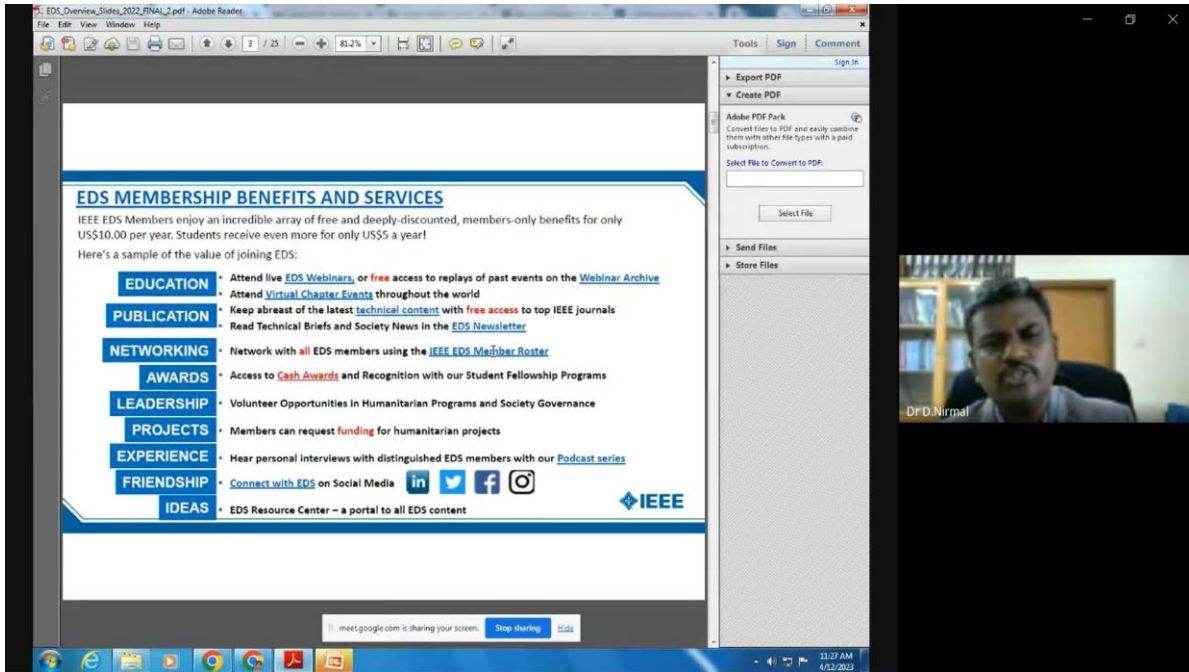


Figure 5. Dr. D. Nirmal, Chief guest, explaining the benefits of IEEE EDS

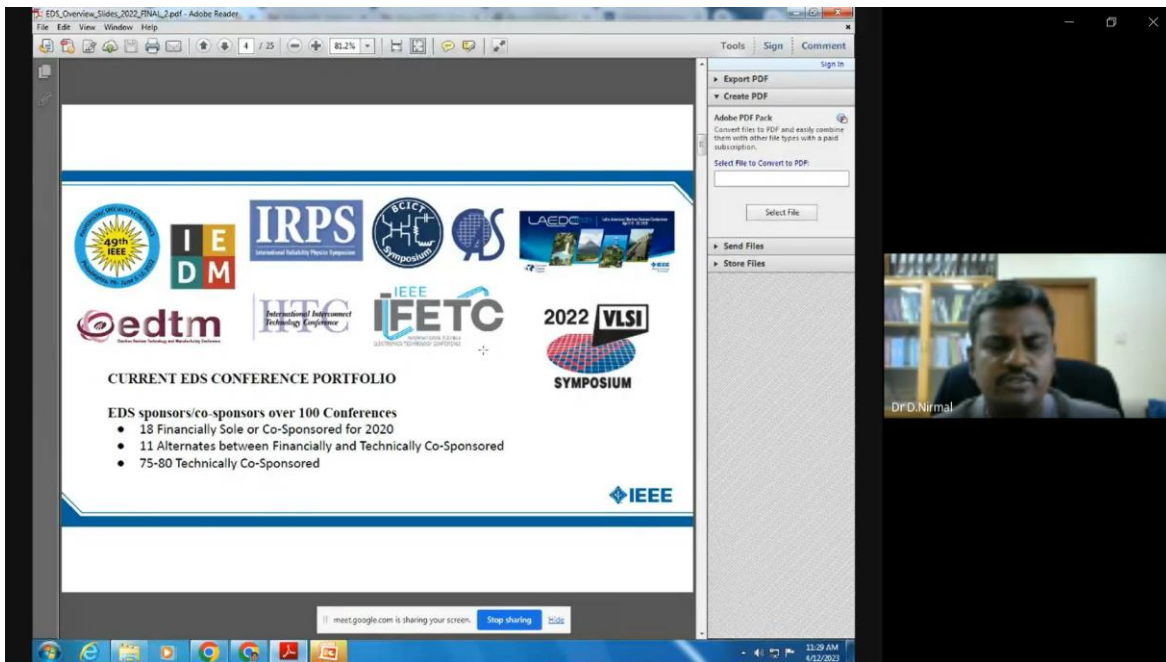


Figure 6. Dr. D. Nirmal, Chief guest, explaining the benefits of IEEE EDS

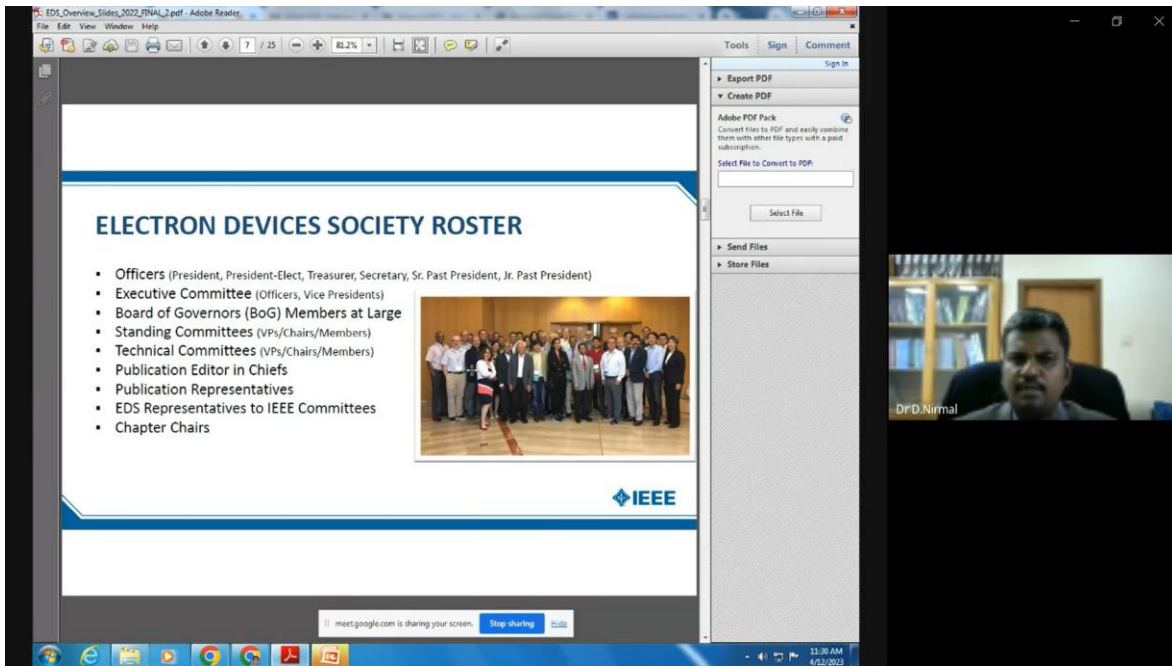


Figure 7. Dr. D. Nirmal, Chief guest, explaining the structure of IEEE EDS Roster

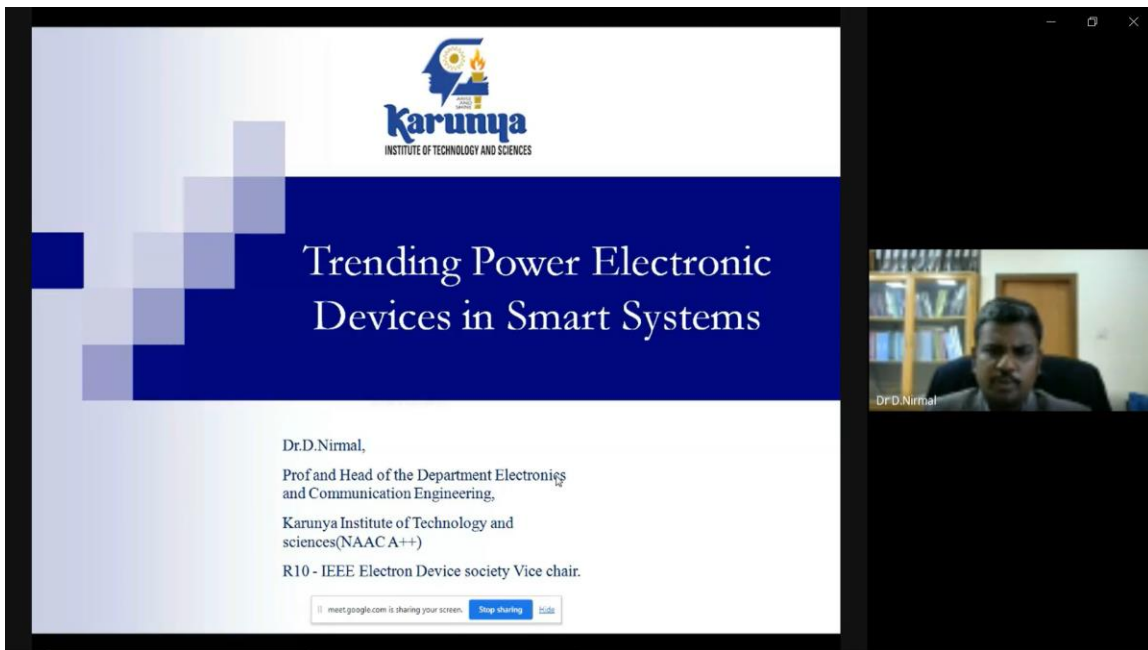


Figure 8. Dr. D. Nirmal, Chief guest, briefing about power semiconductor devices

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PARAMETER COMPARISON WITH OTHER TRANSISTORS

Sr No.	Parameter	Transistor (BJT)	MOSFET	UJT	IGBT	HEMT
1	Input resistance	Low	Infinity	High	Infinity	High
2	Output resistance	Low	Low	Low	Low	High
3	Noise	Low	Low	Low	Low	Low
4	Speed	High	Good	Good	Low	Excellent
5	Power Consumption	High	Low	Low	Low	High
6	Gain	High	Low	Less	Low	High
7	Temperature stability	Low	High	Good	Excellent	Excellent

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Figure 9. Dr. D. Nirmal, Chief guest, explaining the material properties

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SILVACO ATLAS TCAD

- Technology Computer-Aided Design (TCAD) refers to the use of computer simulations to develop and optimize semiconductor processing technologies and devices.

Tools

- Deck build : Tools for creating geometric structures for TCAD simulation.
- Device edit : Tools for simulating semiconductor device performance.
- Tony plot : Visualising and extracting the results.

Models Used

- Mobility model
- Drift-Diffusion model
- Impact ionization model
- Caughey and Thomas model

Important Parameters required:
 Electron affinity, Density of states- CB and VB, Velocity saturation of an electron, Permittivity, Energy band gap, Electron mobility.

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Figure 10. Dr. D. Nirmal, Chief guest, explaining the merits of TCAD for device simulation

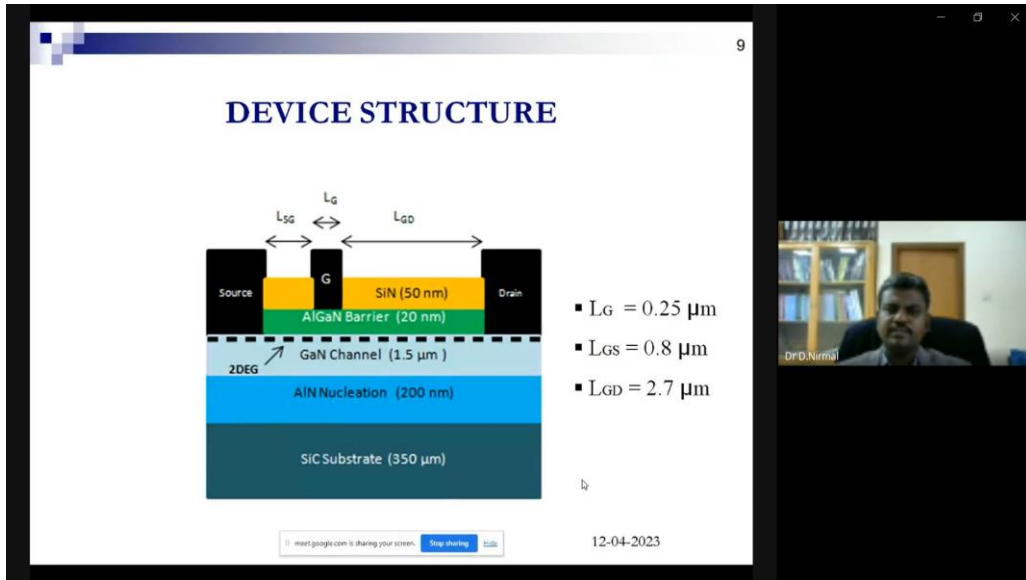


Figure 11. Dr. D. Nirmal, Chief guest, explaining the structure of GaN HEMTs

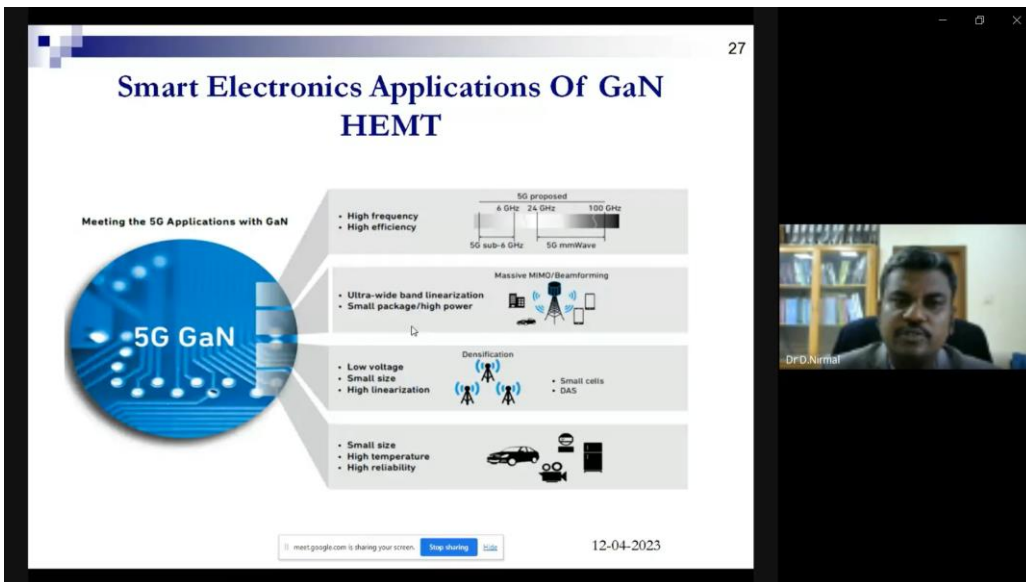


Figure 12. Dr. D. Nirmal, Chief guest, briefing about GaN HEMTs in 5G Technology.

Dr. P. Murugapandiyan

Advisor, IEEE EDS Chapter, ANITS.

Dr. B. Jagadeesh

Professor & Head, ECE, ANITS.