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अनुसंधान

SHOWCASING INSTITUTES'S RESEARCH ACTIVITIES

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राष्ट्रीय प्रौद्योगिकी संस्थान दिल्ली

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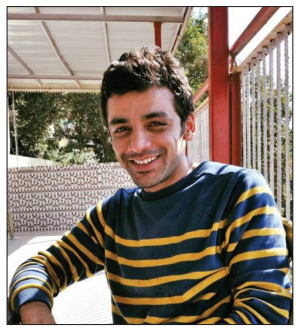

Dr. Nitin S. Singha
(Assistant Professor, ECE)

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LAUNCH OF INAUGURAL EDITION OF "अनुसंधान"

MESSAGE FROM THE PATRON

The year 2022 commemorated the 75 years of India's independence (***Azadi ka Amrit Mahotsav***), which also marked the inauguration of the National Institute of Technology (NIT) Delhi's Research Bulletin **'अनुसंधान'**. NIT Delhi aspires to be the technological research leader and I am confident that **'अनुसंधान'** continues to provide a setting for our faculty and research scholars to showcase their research and innovation accomplishments.

> *Our academic and research output in the coming years is going to decide our contribution in making India a developed nation.*
>
> **– Prof. Ajay K. Sharma**

In 2022, India was awarded the G-20 presidency for 2023. In this context, India has proposed "**Disruptive Science for Innovative and Sustainable Development**" as the subject for **Science 20**. The objective of **Science 20** to leverage scientific, technological, and intellectual interactions among nations, regions, and societies in order to address common problems and form solid international alliances. In line with this, NIT Delhi's research activities have flourished at an ever-increasing pace. Development of new research laboratories in the institute's permanent campus and collaboration with prominent international and national institutions/universities has been the hallmark of the year 2022.

As Director, it is among my top priorities that we continue with developing world-class infrastructure and building resources for our students and scholars, that will lead to cutting-edge research and innovation activities, and entrepreneurship opportunities for the students from all backgrounds. In line with the vision of our Government, our academic and research output in the coming years is going to decide our contribution in making India a developed nation.

It fills me with immense pride to share with you the next edition of our research bulletin **'अनुसंधान'**. I congratulate the editors for their tireless work behind **'अनुसंधान'**.

Prof. (Dr.) Ajay Kumar Sharma
Director, NIT Delhi

FOREWORD

> *The quality of scientific research, its impact, and its fascination among the young minds decide any nation's ambition to become developed with sustainable growth.*
>
> **– Dr. Anuj K. Sharma**

> *Mathematics can unfold the science of imaginations.*
>
> **– Dr. Amit Mahajan**

> *Research on Artificial Intelligence is not limited to Computer Science only but it expands its boundaries into the transdisciplinary applications relevant to technological developments.*
>
> **– Dr. Rishav Singh**

> *Interdisciplinary research leads to the greatest avenue where prodigious ideas are bound to emerge in future.*
>
> **– Dr. Nitin S. Singha**

Research and innovation have never been limited to specific laboratories or discussion forums only. Rather, research has been at the heart of solving problems that concern masses at large. It was Thomas Edison's pioneering research work of inventing the incandescent light bulb in 1879 that has led to bringing instant light to millions of households across the globe. Nearly 100 years ago, Louis de Broglie presented his famous hypothesis that all moving mass particles possess a wave nature. More interestingly, the hypothesis was verified by Davisson-Germer experiment, which almost accidentally became the first ever evidence of wave nature of particles. Modern quantum mechanics, a basis for ground-breaking developments in various streams of science and engineering, became a reality owing to above two phenomena. The year 2022 marks the completion of 75 years of transistor, which was first demonstrated in December 1947 at Bell Laboratory (USA). In these 75 years, the developments in the transistor technology have not only come a long way but also been critical in emergence of advanced semiconductor devices that has led to modern communication systems.

There are numerous examples of such research works which started only with an elementary idea but went on to change the lives of billions across nations and civilizations. It also brings to forefront that a timely dissemination of the research findings is an important aspect. The forums like **'अनुसंधान'** provide added platforms to showcase ongoing research projects and highlight the most significant research outputs from faculty and students of NIT Delhi.

Since the release of the inaugural issue of **'अनुसंधान'** in August 2022, our institute has taken further strides in its research and innovation activities. On October 18, 2022, our institute celebrated its "Research Scholars' Day", which brought together more than 500 researchers from NIT Delhi and from other institutes/colleges in the vicinity. It provided further motivation to our research scholars to focus on solving the societal problems through meaningful research.

The whole team of editors whole-heartedly thank the Hon'ble Director, Prof. Ajay Kumar Sharma, for giving us this opportunity to work on first and the current editions of **'अनुसंधान'**. We are thankful to all the departments, their heads, faculty members, and students for sharing the research information and data for the bulletin.

Let us celebrate our institute's research accomplishments through the second edition of **'अनुसंधान'**.

Editors, 'अनुसंधान'

NIT DELHI – AT A GLANCE

National Institute of Technology Delhi (NITD) is one of the thirty NIT(s) established in the year 2010 by an act of the parliament and has been declared as an Institute of National importance. NIT Delhi is an autonomous Institute, which functions under the aegis of the Ministry of Education, Government of India. It aims to provide education and research facilities in various disciplines of Engineering, Science and Technology, Management, Social Sciences, and Humanities for advanced learning and dissemination of knowledge. The Institute is imparting holistic education, along with inculcating high moral values in its students.

NIT Delhi started its academic session in 2010 and it was operating from its transit campus at Narela, Delhi until recently. The institute has now completely shifted to its permanent campus situated on NH-1 (GT Karnal Road), Narela sub-city, New Delhi. The institute offers B. Tech. programmes in three areas of technology (Computer Science and Engineering, Electronics and Communication Engineering, and Electrical Engineering), M. Tech. programmes in five disciplines, along with Ph.D. programmes in all branches of Science and Engineering. The institute has started its B. Tech. programmes in two new branches (Mechanical Engineering and Civil Engineering) from academic session 2022-23.

The institute makes all attempts to establish strong research collaborations in evolving fields of research in science and engineering. The programmes like joint thesis work, inter-institute collaborative projects, institute assistantship to PG and doctoral students, and administrative support to faculty members for taking up research and consultancy work (sponsored by external agencies). From 2022-23 academic session, the institute has started the Post-Doctoral Fellowship (PDF) programme to further escalate the research activities.

NIT Delhi takes immense pride in conveying that the guidelines of National Education Policy (NEP) 2020 have been implemented for current batches of students. From the academic session 2023-24, the institute aspires to start new UG programmes (*e.g.*, B. Tech. in Aerospace Engineering, B. Tech. in Artificial Intelligence) and PG programmes (*e.g.*, M. Tech. in Smart materials and technology, M. Tech. in Mathematics and Computing), which are being designed in line with the NEP-2020 guidelines.

AREAS OF RESEARCH AT NIT DELHI

Department/Stream	Research Areas
Physics	Nanophotonic Sensors and Devices, Plasmonics, Fiber Optics, Optical Device Modeling, Optical imaging & instrumentation, Biomedical optics, Digital Holography, Microwave imaging and instrumentation, EM Theory in different media, Antennas and wave propagation, MHD waves & Flow
Mathematics	Convection in Fluids, Heat Transfer, Nanofluids, Ferrofluids, Micropolar Fluids, Non-Newtonian Fluids, Porous Media, Computational Applied Mathematics, Climate Modeling,
Chemistry	Design and synthesis of new porous materials with metal skeleton and their application in catalysis, chemical technology, and host-guest chemistry (molecular adsorption and molecular recognition), electrical, optical and magnetic properties.
Civil Engineering	Concrete Structures, Bridges, Earthquake Engineering, Advanced materials like Composites, FGMs, CNTs etc., Environmental Science and Engineering, Environmental Biotechnology, Waste Management, Waste to Energy Conversion
Computer Science and Engineering	Wireless Sensor Networks, Network Theory, Data Analytics, Quantum Computing in Networks, Federated Learning, Machine Learning , Motion analysis, Computer Vision, Cloud Computing, Data Security, 5G, Artificial Intelligence, Databases, Big Data Analytics, Data Science, Health Informatics, Data Mining, Data Warehousing, Databases, Big Data, Software Engineering
Electrical Engineering	Power System Restructuring/Deregulation, Electricity Market, Distributed Generation, Renewable Energy, Security Analysis, Fault Detection, Operation and Control of Power Systems, Smart Energy Network, Electric Vehicle, Power Electronics, Renewable Energy Systems, Electric Drives, Smart Grids (Micro/Nano), Modeling, Design and Digital Control of DC Conversion System, Embedded Systems, Modeling & Design of Converters, FPGA Design, Control Systems, Signal Processing, Control Systems, Biomedical Signal processing, Artificial Intelligence, Renewable Energy, Image Processing, Reliability Engineering, Conventional and Hybrid Power Systems, Power Systems Analysis, and Smart Grid Analysis, RAMS.
Electronics and Communication Engineering	MOSFET and TFET Devices, Standard cell library characterization, Computer Architecture, VLSI Design, Embedded Systems and Digital Image Processing, RF And Microwave Circuits, Networking, Wireless Communication (4G and 5G), Neural Networks, Signal and Image processing, Computer vision, Robotics, Machine Learning and Pattern Recognition, Artificial Intelligence, Optical Communication and Networks, Wireless Communication, Optoelectronics, Digital VLSI, Game theory, Peer-to-Peer Networks, Blockchain, Peer-to-Peer electricity trading, Semiconductor Devices, Nanophotonics, Speech Processing, Communication and Instrumentation, Antennas and wave propagation etc.
Mechanical Engineering	Additive manufacturing, Non-Conventional machining, Metal matrix composites, Metrology, Manufacturing Science, Advanced Machining Processes, Composite Materials

MEMORANDA OF UNDERSTANDING (MOU)

1. NIT Delhi and IIT Ropar AWaDH

On 21st October 2022, NIT Delhi has signed an MoU with the Indian Institute of Technology (IIT) Ropar – Technology and Innovation Foundation for the Agriculture & Water Technology Hub (AWaDH). The MoU was signed by Prof. Ajay K. Sharma (Director, NIT Delhi) and Dr. Pushpendra P. Singh (Project Director, AWaDH, IIT Ropar). The purpose of this MoU is to reap the mutual benefits of institutional collaboration on innovation and entrepreneurship development, and the events to explore the opportunity for various innovation related projects within the domain. It is not limited to sustainable agriculture and water in the framework of National Mission on Interdisciplinary Cyber-Physical Systems between NIT Delhi and IIT Ropar. The event was coordinated by Dr. Anurag Singh (Dean R&C, NIT Delhi) and Sh. Ravinder Kumar (Registrar, NIT Delhi), and was attended by faculty members, scholars, and students across the departments.

2. NIT Delhi and Code Chef

NIT Delhi signed an MoU with CodeChef in October 2022. CodeChef platform offers a Faculty-driven College Program for selected Engineering colleges. Under this partnership, the CodeChef has created a learning program for our institute. They provided our students with 10-Week Customizable Program which is mapped according to our curriculum. This will help in enhancing the programming skills of our students which will further help in elevating the training and placement of NIT students. A total of around 50 students are currently enrolled. Under this, several services will be free and will be community development oriented only. Dr. Shelly Sachdeva (Associate Professor, CSE Department) coordinated the above MoU.

AWARDS AND HONORS

- Dr. Karan Verma received the International Travel Grant from Department of Science and Technology (India) in November 2022.
- Dr. Dharmendra Kumar Jhariya has been elevated to Senior Member of Institution of Electrical and Electronics Engineers (IEEE).
- Dr. Vivek Shrivastava received the IEEE travel grant for participating in IEEE-PES Chapter Chairs meetings held at Singapore in Oct.-Nov. 2022.

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EXPERT TALKS/SEMINARS/FDP/CONFERENCE/OTHER EVENTS ORGANIZED

- *One Week Online Short-Term (STC) Course on "Emerging Trends in Power and Energy Systems (ETPES-2022)" during July 26-31, 2022.*

The aim of this STC was to facilitate the participants about modern technological aspects/ developments in the field of Power and Energy systems, and to provide an insight into how to do research in the above areas along with disciplined focus for various applications. Special emphasis was given for the research challenges and advancement in the field power system monitoring considering cyber-threats, Microgrid and Vehicular Technology, Smart Grid Challenges & Opportunities, Power quality issues, Integration of Multi EV, and Recent Trends in Electricity Markets. The Coordinators of the STC were Dr. Amit Kumar Singh, Dr. Tirupathiraju Kanumuri, and Dr. Sachin Singh.

- *Short-Term Course on LATEST TRENDS IN VLSI DEVICES, CIRCUITS AND TOOLS from 19th-24th, September 2022*

The six days STC on "**Latest Trends in VLSI Devices, Circuits and Tools**" covered both analog and digital circuit design and on how these circuits are implemented in the devices in IC fabrication.

STC on Latest Trends in VLSI Devices, Circuits and Tools

Since most electronic gadgets are battery operated, it is required to design the circuit with low power consumption and high speed. At the same time, the size of the devices is shrinking day by day to accommodate more devices and to increase the performance of other parameters. The designing of new devices is also growing to meet the industry's requirements. Currently, the industry is working on a below 5nm technology node. On the other hand, without the support of the tools, it is not at all feasible to design and fabrication of IC, which consists of millions to billions of Gates/Transistors. This STC covered the areas from devices to circuit design, and also provided exposure to implementing the circuits in FGPA Devices

and Cadence design flow. In this STC program, more than 145 participants from various teaching/research professions participated. Experts were invited from IITs, NITs, and other reputed institutions/industries to deliver lectures during the 6 days program.

- *Faculty Development Program on "Information System Frontiers" sponsored by AICTE ATAL 26 Sep - 7 Oct, 2022.*

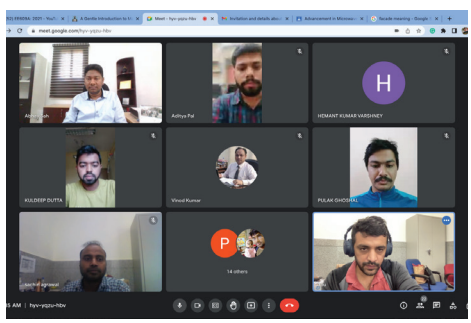
Information System Frontiers (ISF) is the impetus behind the transformation of business processes in every sector of the economy. ISF-2022, a 14-Days AICTE sponsored FDP conducted from 26th September to 17th October 2022 witnessed a participation around 50 professionals/researchers from different parts of the country. The emerging areas covered were big data technologies, object/web technologies, information science, IT integrated manufacturing, medical informatics, mobile computing, and electronic commerce. Advances in Information Systems have broad applications, from design optimization and behavior modeling to vision-based surveillance, assistive robotics, autonomous systems, and advanced manufacturing. This FDP provided a platform to present and discuss the techniques and the latest developments in the area of ISF with their applications.

- *Mechanical Engineering department organized an Expert Talk on ECM Process by Dr. Divyansh Patel, Assistant Professor, BITS Pilani on October 21, 2022.*

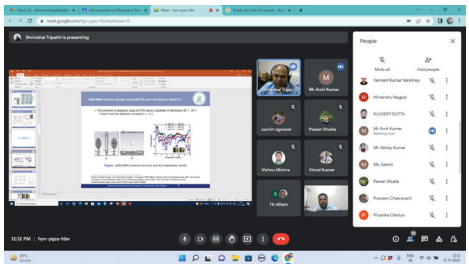
- *One Week Online Short-Term (STC) Course on "Advancement in Microwave Technology for VLSI and Communication System (AMVC-2022)" was organized by ECE Department of NIT Delhi during November 7-12, 2022.*

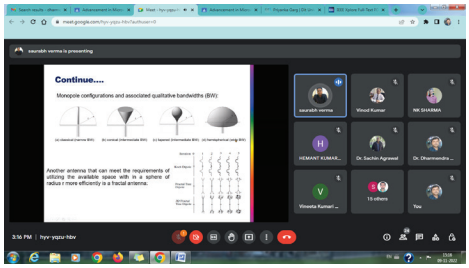
This STC was conducted in hybrid mode, and was organized by Dr. Nitin S. Singha, Dr. Sachin Agrawal, and Dr. D. K. Jhariya. A total of 60 participants registered in this STC. This course provided an overview to the participants about the latest research trend and technologies in the area of microwave technology.

The aim of this STC was to facilitate the participants about modern technological aspects/ developments in the field of Microwave circuits and Devices (Antenna, Filters etc.), 3G, 4G and 5G Communications & VLSI devices and provide an insight into how to do research in the above areas along with disciplined focus for various real-life applications.



Special emphasis was given for the research challenges and advancement in the field of Microwave, Communication, VLSI technologies and their applications. 16 lectures/ cum expert talk



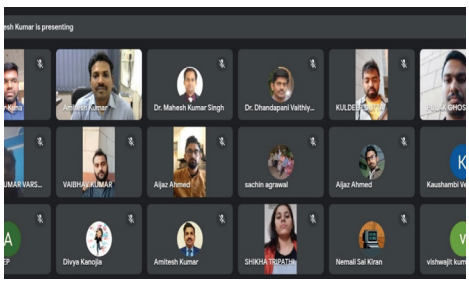


were delivered by the Experts invited from various esteemed institutions like IIT Kanpur, IIT Roorkee, IIIT Naya Raipur, IIIT Kalyani, NIT Hamirpur, NIT Trichy, NIT Calicut, NIT Rourkela, Dr Ravi Dutt Gupta (Sr. Engineer-Antenna Design Comm scope, India) etc. More than 80 participants from various working/ teaching/ research professions participated in this online STC. Apart from outside participants, the department has also made an effort to involve the PhD, PG research scholars of ECE and ECE (VLSI) design, to attend various technical sessions for their enhanced technical and professional skills.

- *1st International Conference on Advancement in Manufacturing Engineering – 2022 (ICAME - 2022) was organized by CAPIER, DTU Delhi and NIT Delhi during November 12-13, 2022 at NIT Delhi, India.*

ICAME-2022, provided a forum to the academia & research institutions, industry experts, designers, management professionals, engineers and executives to collaborate and address the current challenges. The conference also aimed to promote synergetic partnership between academia and industry and also to showcase the growth of cutting edge technology developed in the field of Production and Industrial Engineering in recent past.

- *An expert talk on "**Photonics Generation and Transmission of Microwave Signals**" was organized by ECE Department of NIT Delhi on November 16, 2022.*



Dr. Sandeep Kumar (Assistant Professor, ECE Department) and Dr. Manisha Bharti (Associate Professor, ECE Department) coordinated this expert talk. The aim of this talk was to facilitate the students about modern technological aspects/developments in the field of Photonics and Microwave Communication technology and provided an insight into how to do research in the above areas along with disciplined focus for various real-life applications. Expert talk was delivered by Dr. Amitesh Kumar, Associate Professor, Indian Institute of Technology (ISM) Dhanbad. Approximately 50 UG, PG, PhD students along with faculty members were attended the expert talk.

- **E-gnite'22** was organized by the Startup Centre for Innovation and Entrepreneurship on 30/11/2022 with the aim to foster the innovation and startup culture at NIT Delhi. The expert talk was delivered by the following experts:

  i. Dr. Vivek Kumar Rai, Scientist-F, TDB GoI

  ii. Dr. Pushpendra Singh, IIT Ropar

  iii. Mr. Sandeep Jain, Founder Geeks for Geeks

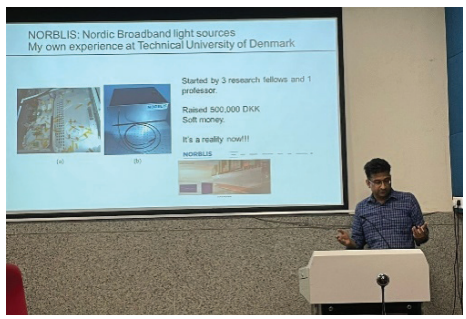
- Expert talk on "IPR Awareness **Programme**" under the N**ational** Intellectual Property Awareness **Mission (NIPAM 2.0)** on November 30, 2022

SCIE@NIT Delhi Organized E-gnite'22 (Fostering Innovation for Societal Needs)

- *International Conference on Big Data Analytics in Astronomy Science and Engineering from 05-Dec-2022 - 07-Dec-2022.*

It was a joint conference conducted by the Department of CSE, NIT Delhi, in collaboration with the University of Aizu, Japan. The conference aimed to provide an international forum for researchers and industry practitioners to share their original research results, practical experiences, and thoughts on big data from different perspectives, including storage models, data access, computing paradigms, analytics, information sharing, and privacy, redesigning mining algorithms, open issues, and future research trends. It attracted research attention to scientific computing systems, data management, and user interfaces. It invited seven international speakers apart from national speakers from various IITs, NITs, CFTIs etc.

- *In celebration of International Light Day 2022, contributing to Azadi Ka Amrit Mahotsav, the 75th Anniversary of Indian Independence, the ECE Department organized expert talks by Dr. Deepak Jain, Assistant Professor, Electrical Engineering Department, IIT Bombay, on:*
  - *How to promote yourself as a young researcher, and*
  - *Novel Optical Fibers for Light Sources and Optical Communication*



- *Events organized by Electrical Engineering Department*

S. N.	Type of event	Title of Event	Duration	Sponsoring Agency
01	FDP	Design, Test and validate, Power Electronics, E-mobility, Renewables, Microgrid using Typhoon HIL	27th June to 2nd July 2022	Self-Sponsored FDP
02	IEEE Expert Talk	PV Technology's current status and future prospects by Prof (Dr.) Saad Mekhilef, IEEE Fellow (USA), Swinburne University of Technology, Melbourne, Australia	22th Sep 2022	IEEE PES-IAS Delhi Chapter & IEEE PELS-IES Delhi Chapter
03	Conference	10th IEEE Power India International Conference 2022	25th -27th November 2022	IEEE PES-IAS Delhi Chapter and IEEE PELS-IES Delhi Chapter
04	Conference	4th International Conference on Communication and Computational Technologies ICCIS 2022	19th – 20th December 2022	Soft Computing Research Society

- *Research Scholars' Day – 2022* **(शोधार्थ)**

Under the supervision of Dean (R&C) Dr. Anurag Singh, the Research Scholars' Day (**"शोधार्थ "**) was organized on October 18, 2022. **शोधार्थ**, an annual event, opens up the platform for the research scholars/faculty research groups to co-act with eminent academicians and researchers augmenting their research scope and expertise. **शोधार्थ** has following objectives:

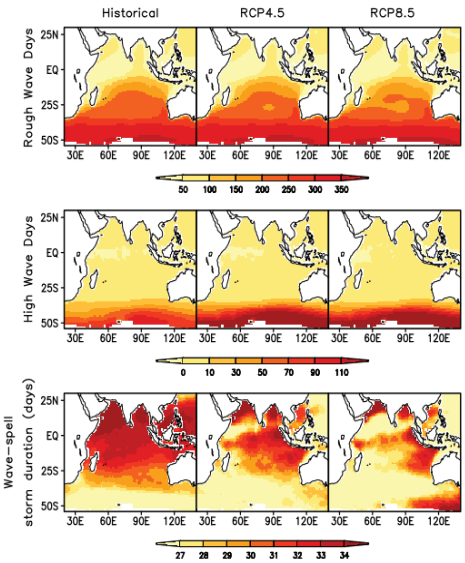
- A platform for the PG and Ph.D. students to exhibit their research through posters, presentations, working model demonstrations etc. which aids in recognition, feedback, partnerships, etc.
- The goal of the research scholar day is to increase the new postgraduate students' understanding of research as well as that of attendees from both inside and outside of NIT Delhi.
- Encourage academics and professionals to exchange ideas across disciplines. Create a space where academics can interact and conceive of new research methods.
- Possibility to improve with eminent speakers to aid scholars in developing their knowledge.
- Find and aware of the opportunity and research facilities available in the respective domain.

  This year's activity witnessed the participation of around 500 researchers from NIT Delhi and other nearby institutes and colleges.

NEWS COVERAGE OF THE INSTITUTE'S RESEARCH ACTIVITIES

➢ **Press Coverages of Dr. Prashant Kumar's collaborative research work**

- *Climate change likely to increase rough wave days in Indian Ocean, northern sector of Arabian Sea, & central Bay of Bengal (Press Information Bureau Delhi, December 9, 2022)*



A team of scientists from the Department of Applied Sciences, NIT Delhi; IIT Kharagpur; and Indian National Centre for Ocean Information Services, Hyderabad, projected the likely future changes in extreme wave height indices over the Indian Ocean. Their research published in the journal '***Climate Dynamics***' (Springer) recently used COWCLIP2.0 datasets to show that the large-scale distribution in future wave climate can vary significantly from the present. The research supported by the Science Research and Engineering Board (SERB), India, can be immensely useful to policymakers and decision-making authorities for both short and long-term planning that can benefit the coastal population. The figure below depicts the climatology of extreme wave indices over the present-day period (1979–2004) and future time period (2081–2100) under RCP4.5 and RCP8.5 scenarios. Dr. Prashant Kumar was the group leader at NIT Delhi.

(Link: https://pib.gov.in/PressReleasePage.aspx?PRID=1882041)

- *Harnessing the power of waves to create power (The Statesman: September 7, 2022)*

A research work by Dr. Prashant Kumar, Ms. Sukhvinder Kaur, and Prof. A. Rosencranz has been highlighted by The Statesman in September 2022. (**Link:** https://tinyurl.com/mrxxmbvp)

Summary: On India's west coast, potential wave power could be developed in the states of Maharashtra, Karnataka, Goa and Kerala. Energy is the most crucial component for the economic growth of a country. The need for energy consumption has significantly risen globally over the last 50 years. Population growth, rising industrialization, economic expansion, modernization of agriculture, and the advancement of the transportation sector are the main components of the energy sector's transformation. In the recent assessment report (AR6) of the Intergovernmental Panel on Climate Change (IPCC), Asia's energy consumption is said to account for 36% of total global consumption. China and India have contributed significantly to the rising global energy demand. Asia consumes 80 per cent of the world's coal, 26 per cent of its natural gas, and 52 per cent of its electricity. Asia's share of the world's primary energy consumption is expected to rise to 48 per cent by 2050.

- *Sea level rise will affect coastal communities (The Statesman:* **July 4, 2022***)*

Another research work by Dr. Prashant Kumar, Ms. Divya Sardana and Prof. A. Rosencranz has been highlighted by The Statesman in July 2022. (**Link:** https://tinyurl.com/2p8huj4k)

Summary: *By the end of 21st century, coastal flood damage in Europe is expected to spike least ten fold with existing adaptation and mitigation measures.* Climate change has stamped its signature on the world's

oceans and atmosphere. A primary contributor to climate change is global warming, which modulates the wind and wave field patterns, sea surface temperature, and sea level pressure anomalies. These changes may result in oceanic warming and hasten the melting of ice caps, ice sheets, and glaciers, leading to accelerated sea level rise (SLR) globally and regionally. Rising sea levels pose a potential threat to the habitat of coastal and offshore communities by intensifying the impacts of coastal hazards such as floods, storm surges, tsunamis, high tides, extreme waves, and erosion in the low-lying areas. The Paris Agreement of 2015 (UNFCCC 2015) proposed to restrict the increases in global warming to well below 2.0°C above the preindustrial level, preferably to 1.5°C. The amount by which sea levels rise as a result of ice sheet melting might be nearly halved if global warming is kept to 1.5°C. However, a recent report from the Intergovernmental Panel on Climate Change (IPCC) portrays a rather gloomy picture of the challenges we confront due to SLR. On a global scale, the sea level is continuously rising and "accelerating" at the rate of 3.6 mm per year. The IPCC's sixth assessment report (AR6, 2022) also notes that human imprints have enhanced greenhouse gas emissions, contributing to fast-rising sea levels.

PHD DEGREE AWARDED

S.N.	Name of PhD Student	Name(s) of Supervisor(s)	Title of PhD thesis	Date
1	Harshvardhan Choudhary	Dr. Dhandapani Vaithiyanathan (ECE) and Dr. Harish Kumar (ME)	*Development and Measurement Uncertainty Estimation of Force Transducers*	23-8-2022
2	Kritika Bansal	Dr. Pankaj Mukhija (EE)	*Aperiodic Sampled-data Control of Networked Systems Under Communication Constraints*	23-08-2022
3	Ghanendra Kumar	Dr. Sandeep Kumar (ECE)	*Performance analysis and simulation of dense wavelength Division multiplexing system in the presence of optical amplifiers*	06-08-2022
4	Neeraj Kumar	Dr. Abhishek Mishra (ME)	*Train Scheduling and Rescheduling for the Indian Railway Network*	23-08-2022
5	Neelam Barak	Dr. Gyanendra Sheoran (AS, Physics)	*Applications of Electrically Tunable Lens in Microscopy*	10-11-2022
6	Vinit Kumar Tripathi	Dr. Amit Mahajan (AS, Mathematics)	*Linear and Nonlinear Stability Analysis of Double Diffusive Convection in a Fluid Layer*	18-11-2022
7	Naveen Chand	Dr. Kapil Kumar (CE)	*Removal of Pollutants from Wastewater using Constructed Wetlands*	30-12-2022

RECENTLY AWARDED EXTERNALLY FUNDED RESEARCH PROJECTS

Research Project Title: Open-source unmanned aerial vehicle simulation
Funding agency: IUSSTF
Name of faculty member: Dr. Karan Verma
Name of the department: Computer Science and Engineering, NIT Delhi

Brief summary of the research work: The project aims to research efficient and sustainable transport systems for cities which are further supported by Unmanned Aerial Vehicles (e.g., delivery drones). For this purpose, an open simulation framework is being developed which models mobility and energy aspects for air

traffic in software. AMSim can be coupled with other frameworks such as Delhi to include road traffic or communication between the road users. With these software models, traffic systems can be evaluated for any scenario.

Research Project Title:	Computational Techniques based investigation for Diabetic Foot Ulcers Complications
Funding agency:	Science and Engineering Research Board (SERB) India
Name of faculty member(s):	Dr. Chandra Prakash
Name of the department(s):	Computer Science and Engineering, NIT Delhi

Brief summary of the research work: The project time to focus on:

- To Model for the Diabetic Foot Ulcers analysis based on the plantar thermogram and pressure profile using advance computational techniques
- Plantar pressure and infrared thermographic imaging can assist the doctors in assessment of the insensate limb of the patients.

CONSULTANCY WORKS UNDERTAKEN

Dr. Ajay Kumar (Associate Professor, Civil Engineering) has undertaken the following consultancy works:

- Vetting of structural design and drawings of 50 bedded hostels (25 boys and 25 girls) at Govt. ITI, Bani and Guest House Katra (Nov.-Dec. 2022)
- Vetting of structural design and drawings of Arwal district Panchayat Sansathan Kendra (DPRC) Bhawan in Bihar (Oct.-Nov. 2022)
- Vetting of Water pumping station Drawings at Nangloi W.T.P. for Kamruddin Nagar Group of Colonies in Mundka Assembly Constituency AC-08, Delhi (Aug. – Sept. 2022)

PATENT APPLICATIONS FILED

S.N.	Title	Name of Inventors	Application no.	Date of filing
1	An enhancement of Indian voice and separation from cocktail party scenario	M. Gupta, R. K. Singh, and Sachin Singh	202211039237	08/07/2022
2	A Solar Assisted Apparatus for Algae Growth	S. Swain, S. S. Sahoo, M. K. Nayak, V. S. Pandey, Ajay K. Sharma, G. Rath, S. Thomas, J. Das, P. Mohanty and S. S. Panda	202231071172	09/12/2022

BOOK CHAPTERS PUBLISHED

1. M. Tiwari, Y. Ismail, Karan Verma, A. K. Garg, "Optical and Wireless Technologies", Springer Nature Singapore (Lecture Notes in Electrical Engineering), vol. 892, 2022, 9789811916472.
2. R. Patel, Pratibha, K. S. Gupta, M. Shebeen T, and R. Chauhan (Eds.), "Futuristic Trends in Management", IIP Proceedings. Volume 2, Book 5, Part 3, 1-November-2022, ISBN: 978-93-95632-91-1.

3. N. Kumar, Pratibha, A. T. Petkoska & M. Singla, "Natural Gums for Fruits and Vegetables Preservation: A Review". In: Murthy, H.N. (eds) Gums, Resins and Latexes of Plant Origin. Reference Series in Phytochemistry. Springer, Cham, 2022. https://doi.org/10.1007/978-3-030-91378-6_4.

4. A. Kumar, R. Singh, R. Sehrawat, N. Kumar, and Pratibha, "Probiotics". In: Chauhan, O.P. (eds) Advances in Food Chemistry. Springer, Singapore, 2022. https://doi.org/10.1007/978-981-19-4796-4_14.

5. N. Kumar, Pratibha, Neeraj and A. T. Petkoska, "Applications of Edible Packaging for Preservation of Mushrooms". In: Wing-Fu Lai (eds) Food Packaging: Safety, Management and Quality. Nova Science Publishers Inc. 2022. ISBN 979-8-88697-249-8. DOI: https://doi.org/10.52305/SEPV4757.

6. S. Kanwar, L. K. Awasthi, and V. Shrivastava, "Cross-Project Defect Prediction by Using Optimized Light Gradient Boosting Machine Algorithm." In Communication and Intelligent Systems. Lecture Notes in Networks and Systems, vol 461. Springer, Singapore, 2022. https://doi.org/10.1007/978-981-19-2130-8_73

7. P. Kumar, P. Priya, and Rajni, "Mathematical Modeling for Non-linear Wave Interaction of Submerged Body Using Hybrid Element Method," Lecture Notes in Mechanical Engineering (LNME), page 15-24, 2022. doi: DOI:10.1007/978-981-19-1929-9_2

8. A. K. Mishra, A. Kumar, D. Vaithiyanathan, Baljit Kaur, "Analysis and Modification of Low Power and High Speed 9T SRAM Cell", Advances in VLSI and Embedded Systems, Lecture Notes in Electrical Engineering, Vol. 962, pp. 45 – 51, 01 December 2022, Springer, Singapore. (Scopus Index, ISBN: 978-981-19-6780-1, DOI: https://doi.org/10.1007/978-981-19-6780-1_4)

EXPERT TALKS DELIVERED AND CONFERENCE PAPERS PRESENTED

Faculty Member(s)	Name and place of Event	Duration	Topic of talk
Dr. Anmol R. Saxena (EE)	Workshop on Microgrid: Issues, Challenges, and its Mitigation organized by Department of Electrical Engineering, NIT Uttrakhand	25-29 Nov. 2022	Power Electronic Interfaces for Green Energy Fed Residential DC Nanogrids.
	IEEE International Conference PIICON'22	25-27 Nov. 2022	Charge Equalization Techniques used for Battery Management System of Residential DC Nano-Grids: A Brief Review
	IEEE International Conference PIICON'22	25-27 Nov. 2022	Active Charge Equalization of an 'm×n' Battery Stack in Electric Vehicles during charging, discharging, or isolated condition
	IEEE International Conference PIICON'22	25-27 Nov. 2022	A Reconfigurable DC-DC Converter with Active Battery Charge Equalization for Power Management of Residential DC Nano-Grids
	IEEE International Conference PIICON'22	25-27 Nov. 2022	Circuit Averaging Approach to Model Two-Switch Battery Integrated DC/DC Converters for Interaction Analysis

	IEEE International Conference PIICON'22	25-27 Nov. 2022	Circuit Averaging Approach for Impedance Modeling of Source and Load Converter with Bidirectional Converter
	IEEE International Conference PIICON'22	25-27 Nov. 2022	Electric Vehicles Scenario and its Charging Infrastructure in India
Dr. Shelly Sachdeva (CSE)	One Week Online FDP, "Blockchain and its Applications", organized by the Department of Computer Science and Engineering and IT, Jaypee Institute of Information Technology, Noida	25th July - 30th July 2022	Blockchain Technology and its Applications (BTA'22)
	21st International Conference on Intelligent Software Methodologies, Tools, and Technique., SOMET 2022, Japan	20 Sep -22 Sep 2022	Database Migration Tools: From RDB to NoSQL Database
Dr. Ajay Kumar (Civil Engg.)	One Week Faculty Development Program on "Technological Advancements in Civil Engineering (TACE-2022)" at Civil Engineering Dept., MMMUT Gorakhpur	5-9 Dec. 2022	Analysis of sandwich laminates
Dr. Anurag Singh (CSE)	11th International Conference on Complex Networks and their Applications, during at Palermo, Italy	Nov. 8-10, 2022	A Biased Random Walk Scale-Free Network Growth Model with Tunable Clustering
	11th International Conference on Complex Networks and their Applications, during at Palermo, Italy	Nov. 8-10, 2022	Mean Hitting Time of Q-subdivision Complex Networks
	11th International Conference on Computational Data and Social Networks	December 2022	A Community Detection Algorithm Using Random Walk
	Lovely University	Nov. 15, 2022	Optimization Techniques
	School of Physical Sciences (SPS), JNU Delhi	Dec. 22, 2022	National Mathematics Day
	GH Raisoni Lecture series, GHRIET Pune	Aug. 12, 2022	Federated Learning,
	G L Bajaj Institute of Technology & Management, Greater Noida Delhi	Sept. 10, 2022	How to write Research Proposal in emerging area of Engineering & Technology
	ECE department lecture series, SRM University, Amravati, AP	September 16, 2022	Federated Learning
	ATAL FDP, CDAC Noida	Dec. 3, 2022	Federated Learning
Dr. Manisha Bharti (ECE)	2nd International Conference on Multidisciplinary in Research and Innovation (ICMRI-2022), Kishori Raman PG College, Mathura, Uttar Pradesh &RSP Conference Hub, Coimbatore, Tamil Nadu, India,	November 26 - 27, 2022.	Comparison of multi-class motor imagery classification methods for EEG signals
	8th International Conference on Signal Processing and Communication (ICSC 2022), organized by JIIT Noida, India	December 01 – 03, 2022	Performance Evaluation of Synthetic Aperture Radar Images

	2nd International Conference on Emerging Electronics and Automation (E2A), Orgnized by NIT Silchar,	December 16 – 18, 2022.	Design of Low Phase Noise PLL with Improved Locking Time
	4th IEEE International Conference on Advances in Computing, Communication Control and Networking, Galgotias College of Engineering & Technology, Greater Noida.	December 16-17, 2022	Circularly Polarized Two Port Flexible Antenna for WLAN And Wi-fi-6G Applications.
Dr. Ashok Dewangan (ME)	International Conference on Nanotechnology: Opportunities & Challenges (ICNOC-2022), organized by Department of Applied Sciences & Humanities, Faculty of Engineering & Technology, Jamia Millia Islamia, New Delhi, India .	November 28-30, 2022	Impact of Hydrogen Enriched-Biogas/Biodiesel on a Diesel Engine: A review
	International Conference on Nanotechnology: Opportunities & Challenges (ICNOC-2022), organized by Department of Applied Sciences & Humanities, Faculty of Engineering & Technology, Jamia Milia Islamia, New Delhi, India.	November 28-30, 2022	A CFD study of combustion analysis of CI engine operated on biodiesel premixed with nonoadditives Process
	1st International conference on Advances in Heat Transfer and Fluid Dynamics (AHTFD-22) at Department of Mechanical Engineering, Z.H. College of Engineering & Technology, AMU, Aligarh.	December 1-3, 2022	A Review on Producing, Storage and Usage of Hydrogen as Fuel in IC Engines
	1st International conference on Advances in Heat Transfer and Fluid Dynamics (AHTFD-22), at Department of Mechanical Engineering, Z.H. College of Engineering & Technology, AMU, Aligarh.	December 1-3, 2022	A Review on Carbon Dioxide Removal Technologies for Biogas Upgrading
Dr. Pratibha (AS-HM)	ATAL FDP on "Information System Frontiers", NIT Delhi	26/09/2022 to 07/10/2022	Teaching Behavior and Well-Being in Students
Dr. Sandeep Kumar (ECE)	8th International Conference on Signal Processing and Communication (ICSC 2022), organized by JIIT Noida, India	01 – 03 Dec, 2022	Classification of cancerous lung images by using transfer learning
	8th International Conference on Signal Processing and Communication (ICSC 2022), organized by JIIT Noida, India	01 – 03 Dec, 2022	Performance Evaluation of Synthetic Aperture Radar Images
	2nd International Conference on Emerging Electronics and Automation (E2A), Orgnized by NIT Silchar,	16th- 18th Dec 2022.	Design of Low Phase Noise PLL with Improved Locking Time
	2nd International Conference on Multidisciplinary in Research and Innovation (ICMRI-2022), Kishori Raman PG College, Mathura, Uttar Pradesh & RSP Conference Hub, Coimbatore, Tamil Nadu, India,	26-27 Nov 2022.	Comparison of multi-class motor imagery classification methods for EEG signals

	IEEE- 7th Students' Conference on Engineering & Systems (SCES-2022), organized by Dept. of Electrical Engineering, MNNIT Allahabad,	July 1-3, 2022.	CubeSat Inter-Satellite Link-based Log Periodic Antenna for C-band Applications
Dr. Leeladhar Nagdeve (ME)	One Day Virtual International Conference on "Plastic & Polymers Technology Conference, Emerging Opportunities of the future" Organised by Matcorr, INDIA	December 16, 2022.	Natural Fiber Reinforced Polymer for Sustainable Bio-Composites: Opportunities, Challenges and Industrial Applications
	International Conference On Precision, Micro, Meso and Nano Engineering (COPEN-12) organized by Indian Institute of Technology, Kanpur, India.	December 08 - 12, 2022	Experimental Investigation into Portable Near Dry EDM
	International Conference On Precision, Micro, Meso and Nano Engineering (COPEN-12) organized by Indian Institute of Technology, Kanpur, India.	December 08 - 12, 2022.	Influence of process variables on surface roughness of 316L stainless steel parts processed through selective laser melting
Dr. Dharmendra Jhariya (ECE)	8th International Conference on Signal Processing and Communication (ICSC 2022), organized by JIIT Noida, India	December 01 – 03, 2022	Dual-Mode Wideband Bandpass Filter Using Single SIW Cavity with Perturbation Slot
	AECE-2022(2nd International Conference AECE-2022 Advancement in Electronics 2022.(CRC Press (Taylor & Francis Online))	July 14th – 15th , 2022	Comparative Analysis of BER performance of M-ary QAM based OFDM Systems in different channel conditions
	International Conference on Intelligent Systems and Smart Infrastructure, organized by Shambhunath Institute of Engineering and Technology (SIET), Prayagraj, IET Lucknow and Manipal University Jaipur in collaboration with Electronics and communication department, at SIET Prayagraj (UP), India.	21st- 22nd May, 2022.	New Framework for Implementation of Decision Tree Classifier
Dr Sachin Agrawal (ECE)	EEE CON 2022 (International Coneference) BITS Pilani	4-5 November	Super Resolution Based Channel Estimation
	MAPCON 2022 (IEEE International Conference) Bangalore	03 (14-16) December 2022	A Conical Shape Monopole THz Super Wideband Antenna For MIMO Application
	CICT 2022 (IEEE International Conference) ABV-IIITM Gwalior	18-20 November 2022	Performance Emulation of Two Vertical Dielectrically Modulated Tunnel Field Effect Transistors
Dr. Manoj Kumawat and Dr. Vivek Shrivastava (EE)	NIT Delhi, PIICON 2022	Nov. 25-27, 2022	Electric Vehicles Scenario in India: Trends, Barriers, and Scope

Dr. Pankaj Mukhija (EE)	PIICON 2022, NIT Delhi	25th-27th November 2022	Event-triggered Speed Synchronization Techniques for Multi Permanent Magnet Synchronous Motors
Dr. Chandra Prakash (CSE)	Distinguished Seminar Series at Manav Rachna University, Faridabad	14 Oct. 2022	Computational Techniques for Gait Profiling in Children with Cerebral Palsy for Rehabilitation
	Two-week online FDP on Medical Image Processing by NIT Patna, NIT Warangal, IIT Roorkee, IIITDM Jabalpur, and MNIT Jaipur	22-Aug-2022 to 2-Sep-2022	Computational Techniques for Classification of Brain Hemorrhage using CT Scans
	Webinar 1.0, RAMAN LAB, MNIT Jaipur	13 August 2022	BCI and Deep Sequence Modeling
Dr. D. Vaithiyanathan (ECE)	Saveetha Institute of Medical and Technical Sciences, School of Engineering, Tamil Nadu, India	29.09.2022	Innovative Ambient Intelligence on Embedded Systems
	St. Xaviers Catholic College of Engineering, Nagercoil, Tamil Nadu, India	18.08.2022	AI for Embedded Systems
	KPR Institute of Engineering and Technology, Coimbatore, India	25.07.2022 to 30.07.2022	Chip Packages

- ***More Papers presented in Conferences:***

- D. Vaithiyanathan, M. Manigandan, I. Manju, "Underwater image enhancement using color constancy via homomorphic filtering and depth estimation", Second International Conference on Signal and information Processing 2022 (IEEE IConSIP-II-2022), College of Engineering Pune (COEP), Maharashtra, India, August 26 - 27, 2022. (**Best Paper Award**)
- D. Vaithiyanathan, A. Mishra, R. Mishra, A. K. Mishra, P. Verma, B. Kaur, "A Modified Dynamic Comparator for Lowering Peak Kink in Differential Amplifier and Latch" Third International Conference on Advances in Physical Science and Materials (ICAPSM 2022), KPR Institute of Engineering and Technology, Coimbatore, Tamil Nadu, India, August 18 – 19, 2022. (**Best Paper Award**)
- D. Vaithiyanathan, M. Manigandan, I. Manju, "Fusion based underwater image enhancement and detail preserving", Second International Conference on Signal and information Processing 2022 (IEEE IConSIP-II-2022), College of Engineering Pune (COEP), Maharashtra, India, August 26 - 27, 2022.
- S. Bhambri; V. Shrivastava; M. Kumawat; "Design Methodology of Single and Multiwinding coupled inductor in Switching Converters", 2022 IEEE 10th Power India International Conference (PIICON)
- R. Jigyasu; V. Shrivastava; S. Singh; "Advance deep convolution neural network for multiple fault diagnosis of induction motor", 2022 IEEE 10th Power India International Conference (PIICON)
- D. S. C. Aditya; V. Shrivastava; "Bidirectional Converter for V2G Application of Reactive Power Compensation", 2022 IEEE 10th Power India International Conference (PIICON)
- R. Jigyasu; V. Shrivastava; S. Singh; "Intelligent multiple fault diagnosis for predictive maintenance of induction motor", 2022 IEEE 10th Power India International Conference (PIICON)
- D. S. Govind; A. Agarwal; V. Shrivastava; "Grid Integrated 10kW Solar Photovoltaic System Using Conventional Controlling Techniques", 2022 IEEE 10th Power India International Conference (PIICON)
- T. Sharma; V. Shrivastava; M. Kumawat; "A Comprehensive Study on Electricity Theft Detection Using Data Analysis", 2022 IEEE 10th Power India International Conference (PIICON).

- A. Mishra, D. Vaithiyanathan, P. Verma, S. Singh, B. Kaur, "Low Power High-Speed Optimized Comparator for Flash ADC", IEEE 2022 Smart Generation Technologies in Computing, Networking & Communication (SMARTGENCON), Ghousia College of Engineering, Bengaluru, Karnataka, India, December 23-25, 2022.
- A. Behera, A. K. Mishra, D. Vaithiyanathan, P. Verma, "Architectural Improvement and Performance Evaluation of 1D-to-2D Array Conversion Priority Encoder", IEEE 2022 Smart Generation Technologies in Computing, Networking & Communication (SMARTGENCON), Ghousia College of Engineering, Bengaluru, Karnataka, India, December 23-25, 2022.
- S. Shukla, A. K. Mishra, P. Verma, D. Vaithiyanathan, B. Kaur, "Design of Low Power N-Bridge Master and P-Bridge Slave Topologically Arranged Flip-Flop", IEEE 2022 Smart Generation Technologies in Computing, Networking & Communication (SMARTGENCON), Ghousia College of Engineering, Bengaluru, Karnataka, India, December 23-25, 2022.
- Ashima, D. Vaithiyanathan, B. Raj, "Temperature Sensitivity Analysis of Graded Channel Si-Nanotube FET based on DC, Analog, and Linearity Parameters", 2022 International Conference on Futuristic Technologies (INCOFT), S. G. Balekundri Institute of Technology (SGBIT), Belagavi, Karnataka, India, 25 - 27 November 2022.
- Ashima, D. Vaithiyanathan, B. Raj, "Effect of Temperature Variations on the Linearity parameters of Graded Channel Nanotube Field Effect Transistor", 2022 Fourth International Conference on Recent Advances in Materials and Manufacturing (ICRAMM 2022), Velalar College of Engineering and Technology, Erode, Tamil Nadu, 08 – 09 December 2022.
- B. Pruthwiraj, A. Mishra, D. Vaithiyanathan, "A Low Power CMOS Analog Multiplier using Regulated Cascode Current Mirror based on Translinear principle", 2022 IEEE 3rd Global Conference for Advancement in Technology (GCAT), Nagarjuna College of Engineering & Technology, Bangalore, India, pp. 1-4, October 07–09, 2022. DOI: 10.1109/GCAT55367.2022.9972163.
- S. Kumari, B. Kaur, A. Mishra, D. Vaithiyanathan, "Analysis and Implementation of a Low Power Sense Amplifier based flip flop with symmetric latch design", 2022 IEEE 3rd Global Conference for Advancement in Technology (GCAT), Nagarjuna College of Engineering & Technology, Bangalore, India, pp. 1-6, October 07 – 09, 2022. DOI: 10.1109/GCAT55367.2022.9972071.
- D. Patidar, A. K. Mishra, D. Vaithiyanathan, B. Kaur, "An Energy-Efficient Conditional-Boosting Flip-Flop with Conditional Pulse for Low Power Application", 2022 IEEE 3rd Global Conference for Advancement in Technology (GCAT), Nagarjuna College of Engineering & Technology, Bangalore, India, pp. 1-7, October 07 – 09, 2022. DOI: 10.1109/GCAT55367.2022.9972127.
- O. Singh, D. Vaithiyanathan, B. Kaur, "Investigation of Temperature variation in Partially Extended Si1-xGex Source Double Gate Tunnel FET", 2022 IEEE 3rd Global Conference for Advancement in Technology (GCAT), Nagarjuna College of Engineering & Technology, Bangalore, India, pp. 1-6, October 07 – 09, 2022. DOI: 10.1109/GCAT55367.2022.9972024.
- V. Verma, A. Mishra, D. Vaithiyanathan, B, Kaur, "Review of Different Flip-Flop Circuits and a Modified Flip-Flop Circuit for Low Voltage Operation", 2022 IEEE 3rd Global Conference for Advancement in Technology (GCAT), Nagarjuna College of Engineering & Technology, Bangalore, India, pp. 1-5, October 07 – 09, 2022. DOI: 10.1109/GCAT55367.2022.9972133.