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UNIVERSITY

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**et** **elektronika**  
times

VOLUME 01

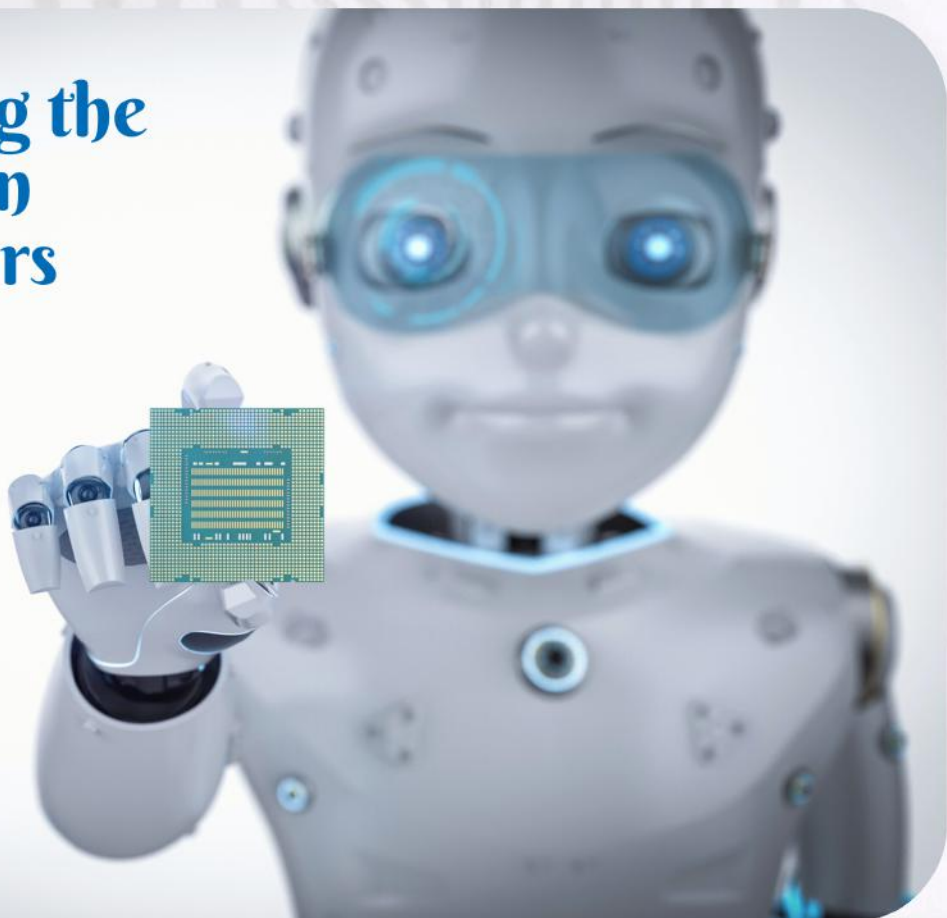
ISSUE 04

APR-JUN 2024

# SCHOOL OF ENGINEERING

Department of Electronics and Communication Engineering

Empowering the  
Next Gen  
Innovators



*Design. Develop. Dominate: The Future of  
Electronic Innovation*

9

INDUSTRY, INNOVATION  
AND INFRASTRUCTURE



  
**Message  
from the  
Head of  
Department**




**PROF. (DR.) SHRUTI VASHIST**

Dear Colleagues,

I am pleased to announce that our department is set to release the fourth issue of Elektronika Times, a publication that continues to capture the remarkable achievements and innovations of our students and faculty. This newsletter has become a testament to the relentless pursuit of excellence that defines our department, from groundbreaking research in communication technologies to pioneering developments in electronic circuit design.

Our commitment to nurturing a dynamic learning environment, enriched by advanced laboratories and strong industry ties, is evident in every page of this newsletter. The dedication of the editorial team and the contributions from all corners of our department have made this issue a true reflection of our collective efforts.

As we look forward to sharing these stories of success and ingenuity, let us remain steadfast in our mission to drive forward technological progress and inspire the next generation of engineers. Congratulations to everyone involved in making this issue a reality. Together, we continue to shape a brighter future for our field.

  
Message from  
the  
Associate Head  
of Department



**DR. MEENAKSHI GUPTA**

Dear Colleagues,

Our faculty members continue to lead in technological advancements, engaging in cutting-edge research from next-generation communication systems to innovative circuit designs. We remain committed to providing our students with hands-on learning experiences through state-of-the-art laboratories and industry collaborations, ensuring they are well-prepared for the evolving technological landscape.

I am delighted to congratulate the editorial team of the ECE Department for successfully releasing the fourth issue of our departmental newsletter. This newsletter not only highlights our students' achievements but also showcases the dedication and hard work of our faculty and staff. Let us continue to push the boundaries of knowledge and innovation as we move forward together.

# Echoes of Compassion: A decade of Difference

## Kaushal

25th April, 2024



Dr. O P Bhalla Foundation has been diligently working on enhancing the skill development of Government School Students through its initiative called Kaushal. We are proud to announce the successful completion of two batches, each comprising 50 students, under this program. Today, on April 25, 2024, marked the commencement of the first session of the third batch in collaboration with the Departments of Electronics and Communication Engineering (ECE) and Mechanical Engineering (ME) at Manav Rachna University (MRU).

The students of this third batch belonged to Grades 9 to 12 and were from GSSS Bhankri. Their enthusiasm was palpable during the inaugural class, where they delved into the basics of Hardware and Software, mastering essential skills such as operating a mouse.

We are excited about the prospects of this new batch and remain committed to empowering these students with valuable IT skills that will undoubtedly shape their futures.

# Glimpses of the Event:



# Teaching Tomorrow: Faculty Growth and Innovation

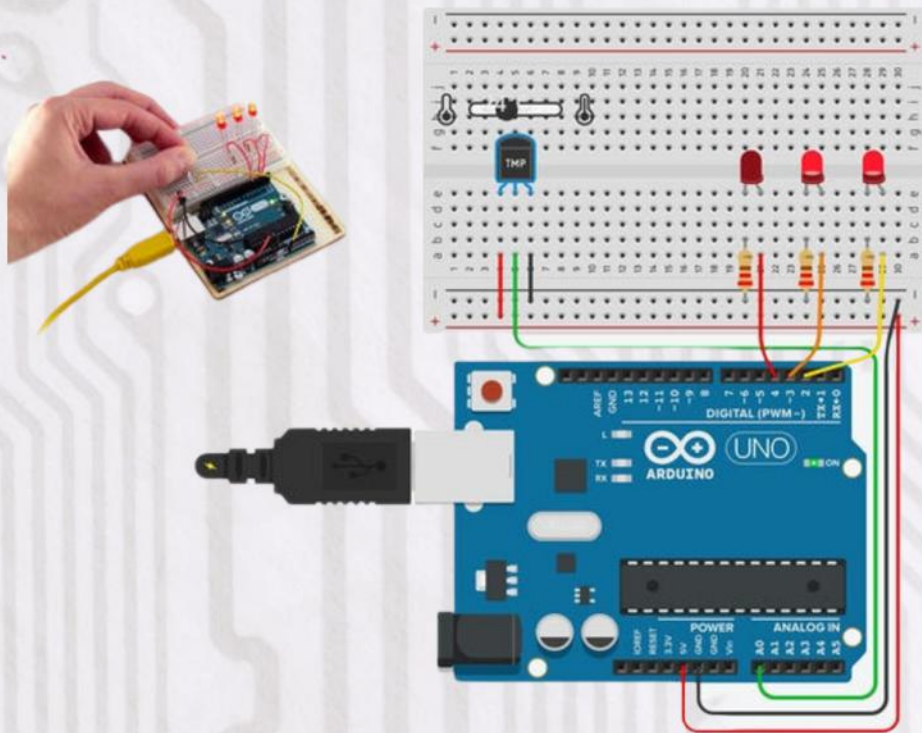
27th- 29th May, 2024

8

DECENT WORK AND  
ECONOMIC GROWTH



## IoT Foundations: Understanding the Basics



The **Department of Electronics and Communication Engineering**, in collaboration with the **Institution's Innovation Council (IC)** at **Manav Rachna University**, successfully organized a three-day Faculty Development Program (FDP) titled "**IoT Foundations: Understanding the Basics**" from 27th to 29th May 2024. This FDP aimed to provide faculty members with foundational skills and insights into IoT technologies and their diverse applications, enhancing their teaching and research capabilities in this rapidly evolving field.

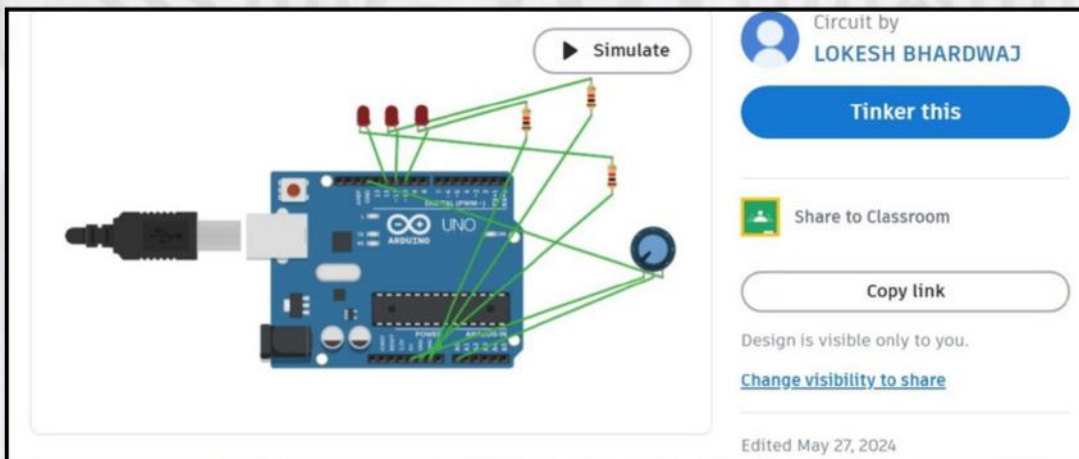
### Topics Covered:

1. Fundamentals of Arduino Uno and Tinkercad for IoT prototyping.
2. Creating LED patterns and basic circuit design.
3. Utilizing MIT App Inventor 2 for mobile application development in IoT projects.
4. Hands-on sessions on hardware projects involving Line Follower and Bluetooth Controlled Vehicle using Arduino Uno.

27 May, 2024

## Day 1: Introduction to Internet of Things and TinkerCad Tools

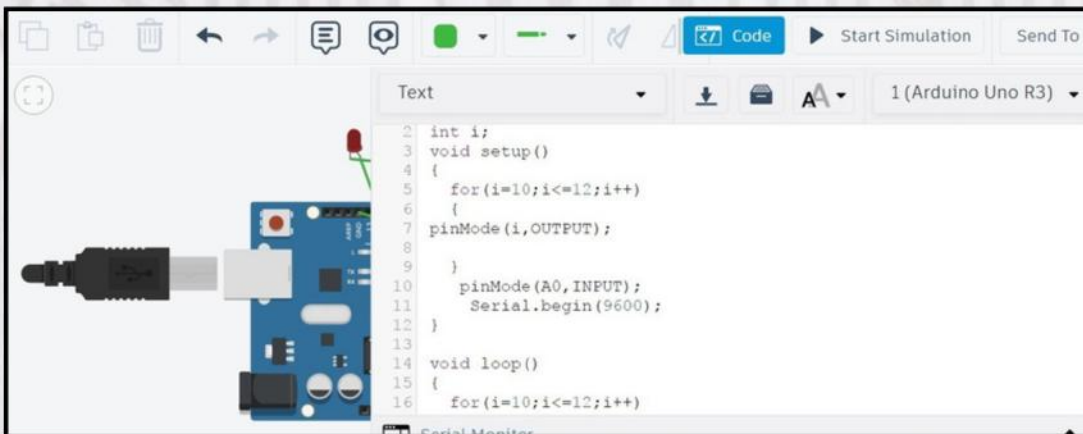
The program commenced with an introduction to the Internet of Things (IoT), highlighting its significance and potential applications across various domains. Faculty participants were introduced to the basics of Arduino Uno and Tinkercad for IoT prototyping. The session included practical demonstrations of LED patterns and basic circuit design using Tinkercad, offering a hands-on approach to understanding IoT fundamentals.



28 May, 2024

## Day 2: Introduction to MIT App and development of mobile applications

The second day of the FDP focused on developing mobile applications using MIT App Inventor 2. Participants learned how to create mobile apps that can control and monitor IoT devices, enhancing their ability to integrate software with hardware. Hands-on sessions enabled faculty to design simple applications to interact with Arduino Uno-based projects, bridging the gap between theoretical knowledge and practical application.



```
Code Start Simulation Send To
1
2 int i;
3 void setup()
4 {
5   for(i=10;i<=12;i++)
6   {
7     pinMode(i,OUTPUT);
8   }
9 }
10 pinMode(A0,INPUT);
11   Serial.begin(9600);
12 }
13
14 void loop()
15 {
16   for(i=10;i<=12;i++)
```



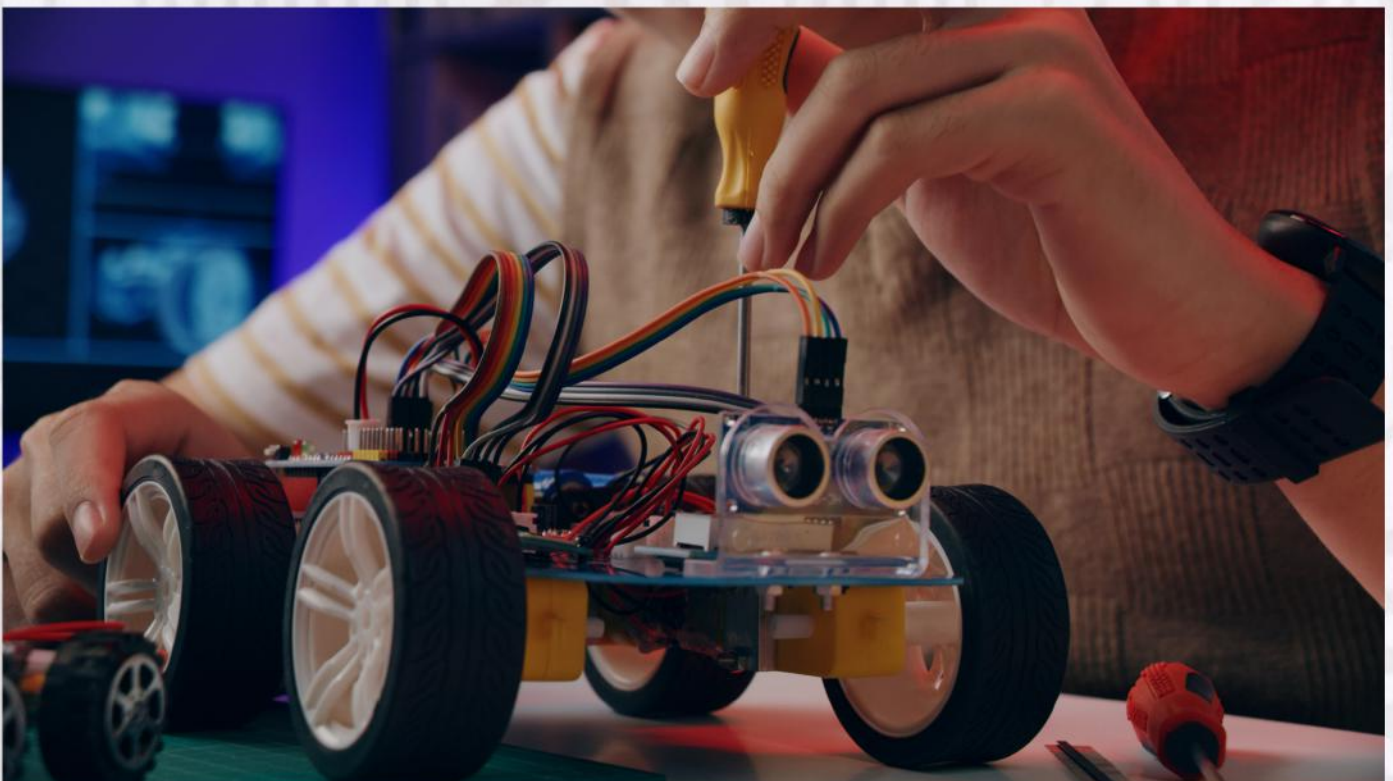


29 May, 2024

## Day 3: Project Submission by participants and Valedictory

The final day concentrated on practical hardware projects, specifically the construction and programming of a Line Follower and a Bluetooth Controlled Vehicle using Arduino Uno. These projects provided faculty with the opportunity to explore real-world applications of IoT technology, from sensor integration to automated control systems.

Through this FDP, faculty members gained confidence in incorporating IoT concepts into their teaching curriculum and research initiatives, fostering an innovative mindset that empowers educators to guide students in exploring technological advancements. Conducted by **Mr. Vijay Kumar Gill** and **Dr. Lokesh Bhardwaj**, the program was a resounding success, offering valuable insights and hands-on experience in IoT technologies, thereby underscoring the department's commitment to creating a dynamic learning environment and promoting technological progress in academia.



**03rd - 15th June 2024**

## *Next-Gen Circuits: Collaborative IC Design Training with 3ST*

The Department of Electronics and Communication Engineering at Manav Rachna University organized a 10-day training program on "Integrated Circuit (IC) Design" in collaboration with 3ST Technologies. The program was targeted at students from the 2nd, 4th, and 6th semesters, aiming to enhance their skills and knowledge in IC design—a vital aspect of modern electronics.



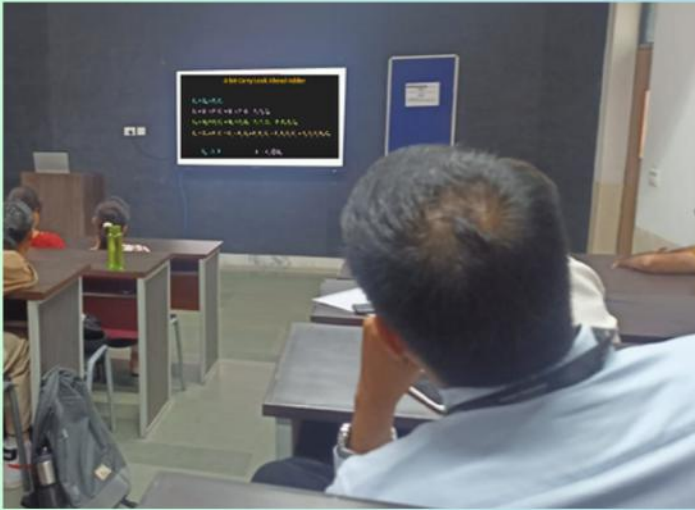
The training covered a comprehensive range of topics, from the fundamentals of digital electronics to hands-on experience with digital design tools. Under the guidance of industry experts from 3ST Technologies, students delved into the core principles of digital electronics, digital logic design, and hardware platforms. The sessions combined theoretical knowledge with practical applications, ensuring a thorough understanding of the subject matter.

Key highlights of the training included:

- Introduction to digital electronics and the significance of ICs in modern electronics.
- Simplifying Boolean expressions and implementing them using logic gates.
- Designing and analyzing combinational circuits like multiplexers, encoders, and decoders.
- Understanding and implementing sequential circuits using flip-flops, counters, and registers.
- Gaining practical exposure to programmable logic devices (PLDs) and field-programmable gate arrays (FPGAs) using Verilog or VHDL.
- Real-time project implementations emphasizing practical applications.

By the end of the program, participants had acquired a strong foundation in IC design, preparing them for advanced applications in the field. The collaborative learning environment and interactive sessions were highly appreciated, fostering both theoretical understanding and practical expertise.

# Glimpses of the Training Event



**Training the students on new technologies for IC designing**

# Innovation Insights: Faculty Spotlight on Emerging Tech Trends

## GREEN HYDROGEN INTEGRATION IN INDIA'S RENEWABLE ENERGY FUTURE

India is positioning itself as a global leader in the green hydrogen revolution, seeing it as a critical piece of its strategy to decarbonize key sectors and meet ambitious climate goals. As the world's third-largest emitter of CO<sub>2</sub>, India's transition to cleaner energy is essential, and green hydrogen presents a promising pathway to achieving this transition.

### Government Initiatives and National Hydrogen Mission

India's government has taken decisive steps to integrate green hydrogen into its energy mix. In 2021, India launched the National Hydrogen Mission, with the aim of becoming a hub for the production and export of green hydrogen. This mission aligns with India's broader goals of reducing its reliance on fossil fuels and cutting its carbon emissions to net zero by 2070.

The mission focuses on boosting domestic production of green hydrogen, with a target to produce 5 million metric tons (MMT) per year by 2030. This push is also aimed at making India a significant player in the global hydrogen market.

### Green Hydrogen's Role in Decarbonizing Industries

India's energy and industry sectors, which are heavily dependent on coal and natural gas, stand to benefit significantly from green hydrogen integration. The government envisions green hydrogen as the solution to decarbonize hard-to-abate sectors like steel, cement, and chemical production. For example, industries that require high-temperature processes can use hydrogen instead of coal or natural gas, significantly reducing carbon emissions. In addition, the transportation sector, particularly long-haul transport and shipping, is expected to adopt hydrogen-based fuels as a sustainable alternative.

### Investment and Infrastructure Development

India is also actively fostering investment in green hydrogen infrastructure. Several large-scale projects have been announced, with companies like Reliance Industries, Indian Oil Corporation (IOC), and Adani Group leading the charge in setting up green hydrogen production plants.

These projects are being bolstered by both domestic and international investments. For instance, the India-US Clean Energy Agenda 2030 Partnership aims to mobilize private sector support to expand green hydrogen production and technology in India. The government is also offering subsidies and incentives, including tax benefits, to spur the development of green hydrogen plants and infrastructure.



## Innovation Insights- contd...

### Renewable Energy Synergy

One of the key advantages India has is its abundant renewable energy resources. India is the world's fourth-largest producer of wind energy and fifth-largest in solar capacity. These renewable resources will play a critical role in producing green hydrogen, as electrolysis—the process used to produce hydrogen—requires a steady supply of renewable electricity.

The integration of green hydrogen with renewable energy is expected to help stabilize the grid, especially during periods when solar and wind power generation exceeds demand. By using excess renewable energy for hydrogen production, India can store energy in the form of hydrogen and use it later for various applications, further enhancing the reliability of renewable energy.

### Challenges Ahead

Despite its potential, the green hydrogen sector in India faces challenges, including the high cost of production and the need for a robust supply chain and infrastructure. Electrolysis technology, while improving, remains expensive, and scaling up green hydrogen production to meet industrial demand will require significant investment in infrastructure, such as hydrogen storage facilities and pipelines. However, with continued government support, technological advancements, and growing private sector involvement, India is on track to become a global leader in green hydrogen. It is concluded that India's green hydrogen journey is poised to transform its energy landscape, reducing dependence on fossil fuels and driving the country toward a greener, more sustainable future. By leveraging its vast renewable resources, India can use green hydrogen not only to decarbonize key sectors but also to position itself as a major player in the global clean energy market.



**-MR. VARUN YADAV**  
**ASSISTANT PROFESSOR**



## Exploring the Latest Trends in VLSI Design: A Front-End vs Back-End Approach

### UNVEILING THE FUTURE OF VLSI: NAVIGATING THE FRONT-END AND BACK-END DESIGN LANDSCAPE

The field of Very Large Scale Integration (VLSI) design has witnessed a surge in interest, driven by the continuous demand for high-performance and energy-efficient electronic devices. VLSI technology allows millions of transistors to be integrated onto a single chip, enabling enhanced functionality within compact electronic systems. The design process is divided into two critical phases: Front-End and Back-End design, each with its distinct role in chip development.

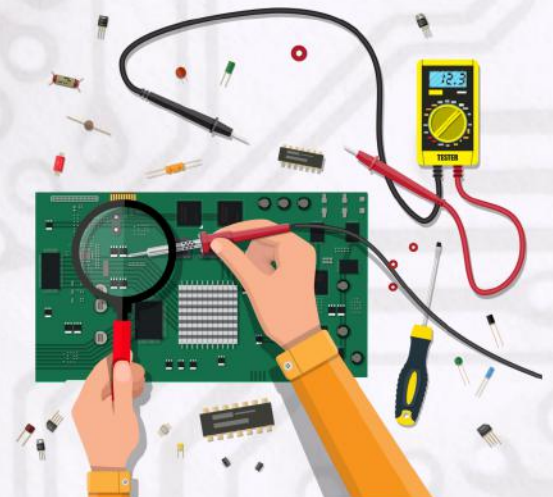
Front-End Design focuses on the architectural and functional aspects of VLSI systems. Engineers in this phase concentrate on conceptualizing the logic, designing circuits, and coding at the Register Transfer Level (RTL) using hardware description languages like Verilog and VHDL. This phase involves essential tasks such as simulation, synthesis, and functional verification to ensure the chip's logic is sound before physical implementation.

In contrast, Back-End Design deals with the physical implementation of the chip. This phase interprets the logic created in the Front-End into a manufacturable layout, involving tasks like floor planning, placement, routing, and timing closure. Engineers here focus on optimizing the chip for performance, power efficiency, and manufacturability while ensuring the design meets the constraints of real-world production.

As VLSI continues to evolve, understanding the nuances of both Front-End and Back-End processes is essential for aspiring engineers. Mastery in these areas opens diverse career opportunities in the semiconductor industry, shaping the future of technology.



**-DR. NITIKA MUNJAL  
ASSOCIATE PROFESSOR**



# Faculty Accolades

Explore the remarkable achievements of  
faculty members

## Prof. (Dr.) Meenakshi Gupta



## Mr. Varun Yadav

**Dr. Meenakshi Gupta** and **Mr. Varun Yadav** have completed the Universal Human Values (UHV-I) module by participating in the 5 Day online FDP on the theme "Inculcating Universal Human Values in Technical Education" organized by the All India Council for Technical Education (AICTE) from 17th June to 21st June 2024.

# Advancing Teleoperation: Breakthrough Publication in Intelligent Service Robotics



**Dr. Niharika Thakur**

The Department of Electronics and Communication Engineering is proud to announce a significant achievement by **Dr. Niharika Thakur**, Associate Professor, whose latest research article has been published in the prestigious SCI-listed journal, Intelligent Service Robotics. The paper, titled "**Time Delay Compensated Disturbance Observer-Based Sliding Mode Slave Controller and Neural Network Model for Bilateral Teleoperation System**," was co-authored with Naveen Kumar and Yogita Gupta and is cited as follows:

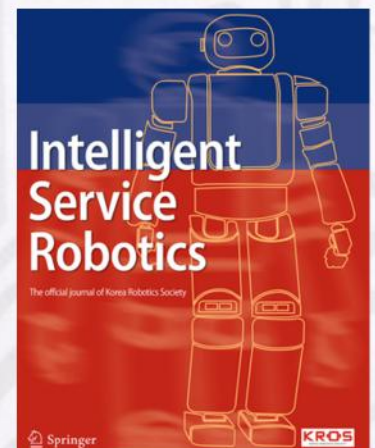
Kumar, N., Thakur, N., & Gupta, Y. (2024). Time delay compensated disturbance observer-based sliding mode slave controller and neural network model for bilateral teleoperation system. Intel Serv Robotics 17, 931–943. [DOI: https://doi.org/10.1007/s11370-024-00546-1](https://doi.org/10.1007/s11370-024-00546-1)



WEB OF SCIENCE  
PUBLICATION

This groundbreaking work underscores Dr. Niharika Thakur's commitment to pushing the boundaries of technology in service robotics and teleoperation systems, bringing her and the department recognition at an international level.

We congratulate Dr. Thakur on this outstanding accomplishment and look forward to further contributions to the field.





# Innovating Solar Technology: Groundbreaking Research published in RSC Advances



**Mr. Vijay Gill**



WEB OF SCIENCE  
PUBLICATION

The Department of Electronics and Communication Engineering proudly announces the publication of Mr. Vijay Kumar Gill, Assistant Professor, in the prestigious journal RSC Advances. His research article, co-authored with Sucheta Juneja, Shiv Kumar Dixit, Shruti Vashist, and Sushil Kumar, is titled "Structural and Optical Properties of Phosphorus Doped Nanocrystalline Silicon Deposited Using a VHF PECVD Process for Silicon Heterojunction Solar Cells and Optimization of a Simple p-n Junction Cell Using SCAP-1D Tool."

Cited as: RSC Adv., 2024, 14, 23873-23885.

**DOI: <https://doi.org/10.1039/D4RA02429J>**

This cutting-edge research investigates the deposition of phosphorus-doped n-type nano/micro crystalline silicon films using a plasma-enhanced chemical vapor deposition (PECVD) technique. The films, prepared at a substrate temperature of 200°C, vary the phosphine gas (PH<sub>3</sub>) flow rate to examine its effect on the optical, electrical, and structural properties of the material. These films are promising candidates for application as emitter layers in silicon heterojunction solar cells, advancing the field of renewable energy.

This remarkable achievement showcases Mr. Gill's contributions to the field of materials science and renewable energy, further elevating the department's research profile on an international platform.

We congratulate Mr. Vijay Kumar Gill and his team on their outstanding work and look forward to more pioneering research from them.

# Faculty Power Unleashed: A Thrilling Showcase of Skill and Sportsmanship!



## **Dr. K. Deepa Shines in Manav Rachna Sports Tournament**

The Department of Electronics and Communication Engineering proudly congratulates **Dr. K. Deepa** for her outstanding performance in the 12th edition of the **Manav Rachna Inter-Faculty and Staff Badminton and Table Tennis Tournament**, organized by the Manav Rachna Directorate of Sports on June 28th and 29th, 2024.

Dr. Deepa emerged as the winner in the singles category and secured the runner-up position in the doubles category. Her success in both events showcases her exceptional athletic abilities and sportsmanship. Competing against faculty and staff from across the university, Dr. Deepa's accomplishments reflect her dedication both on and off the court.

Her victory adds to the department's tradition of excellence, inspiring colleagues and students alike. We congratulate Dr. Deepa on her achievements and look forward to her future successes in both academic and sporting arenas.

# Research and Development

P a t e n t s



## Utility Patent (German)

A German Patent was granted titled, **“A Cloud Computing Based Digital Forensic Investigation System Implemented with Machine Learning Configurations”** in collaboration with

1). Dr. Arijeet Chandra Sen, 2). Dr. Devadutta Indoria, 3). **Dr. Piyush Charan**, 4). Dr. Haewon Byeon, 5). Dr. Ismail Keshta, and 6). Sayali Karmode with German Utility application number 20 2024 102 105 on date 16th May 2024.



In an exciting development, a German patent titled **“A Cloud Computing Based Digital Forensic Investigation System Implemented with Machine Learning Configurations”** was granted on 16th May 2024 under the German Utility application number **20 2024 102 105**. This cutting-edge patent represents a significant leap in the field of digital forensic investigations, combining cloud computing and advanced machine learning technologies to deliver innovative solutions for forensic analysis.

This novel system utilizes cloud computing's scalability and machine learning's precision to enhance the process of digital forensic investigations. By automating the analysis of large data sets and identifying patterns of cybercrime, the system ensures faster and more accurate outcomes. The integration of machine learning algorithms allows the platform to adapt and learn from evolving cyber threats, making it highly effective in real-world applications.

# Research and Development

P a t e n t s



## Design Patent (UK)

A UK design patent was granted titled, “**Smart Brain Monitoring Headset**” in collaboration with

1). Dr.Maddala Vinaya Babu, 2). Sowmya Hari, 3). **Dr. Piyush Charan**, 4). Asheesh Pandey, 5). Vijayalakshmi Renganathan, 6). Dr. Shalin Selvanayagam, 7). Dr. Ranjana Choudhary Ahirwar, and 8). Dr. Amit Chauhan with Design Application No. 6370003 on date 16th May 2024.

<https://www.registered-design.service.gov.uk/find/6370003>

**Intellectual Property Office**

**Certificate of Registration for a UK Design**

Design number: 6370003  
Grant date: 13 June 2024  
Registration date: 04 June 2024

This is to certify that,

in pursuance of and subject to the provision of Registered Designs Act 1949, the design of which a representation or specimen is attached, had been registered as of the date of registration shown above in the name of

Dr.Maddala Vinaya Babu, Sowmya Hari, Dr. Piyush Charan, Asheesh Pandey,  
Vijayalakshmi Renganathan, Dr. Shalin Selvanayagam, Dr. Ranjana Choudhary  
Ahirwar, Dr. Amit Chauhan, Supriya Shrikant Telsang, Dr. Ramanjeet Singh

in respect of the application of such design to:

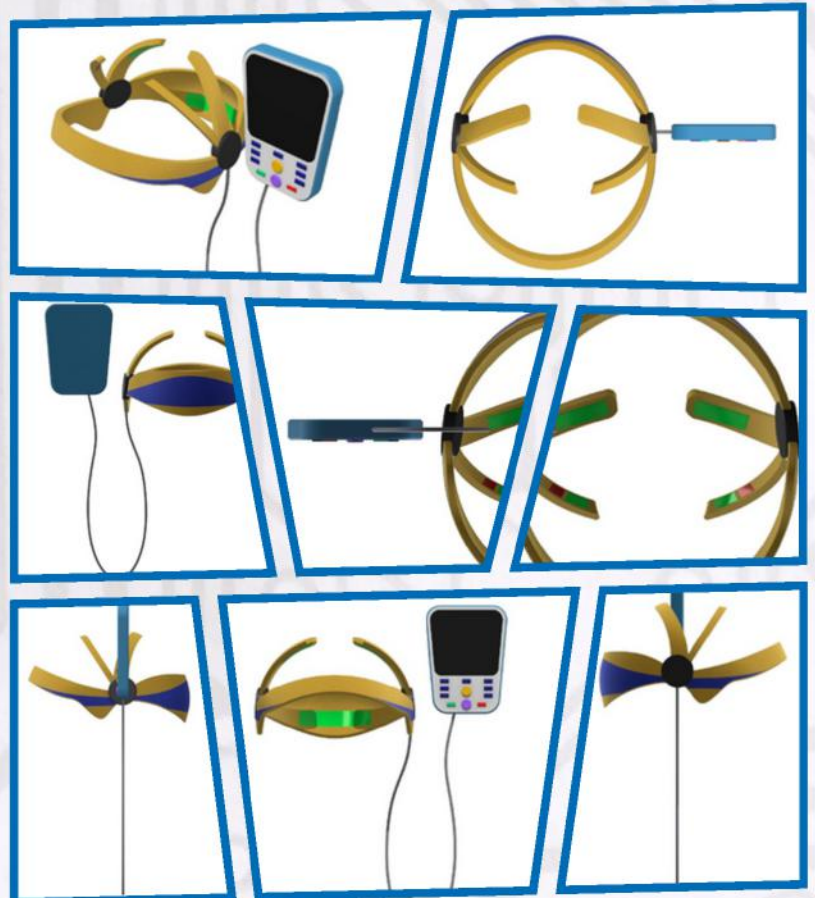
Smart Brain Monitoring Headset

International Design Classification:  
Version: 14-2023  
Class: 14 RECORDING, TELECOMMUNICATION OR DATA PROCESSING EQUIPMENT  
Subclass: 02 DATA PROCESSING EQUIPMENT AS WELL AS PERIPHERAL APPARATUS AND DEVICES

*Adam Williams*

**Adam Williams**  
Comptroller-General of Patents, Designs and Trade Marks  
Intellectual Property Office  
The attention of the Proprietor(s) is drawn to the important notes overleaf.

Intellectual Property Office is an operating name of the Patent Office [www.gov.uk/ip](http://www.gov.uk/ip)



# Research and Development

List of Publications



## Journal Publications

[1]. N. Kumar, **Niharika Thakur**, and Y. Gupta, “**Time delay compensated disturbance observer-based sliding mode slave controller and neural network model for bilateral teleoperation system,**” Intelligent Service Robotics, Jul. 2024, doi: <https://doi.org/10.1007/s11370-024-00546-1>.

[2]. **Vijay Kumar Gill**, S. Juneja, Shiv Kumar Dixit, Shruti Vashist, and S. Kumar, “**Structural and optical properties of phosphorous doped nanocrystalline silicon deposited using a VHF PECVD process for silicon heterojunction solar cells and optimization of a simple p-n junction cell using SCAP-1D tool,**” RSC Advances, vol. 14, no. 33, pp. 23873–23885, Jan. 2024, doi: <https://doi.org/10.1039/d4ra02429j>.

# Thank You



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Ividyanatarishah

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Declared as State Private University vide Haryana Act 26 of 2014

**et** **elektronika**  
times



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