



**DREAM
INSTITUTE OF
TECHNOLOGY**

TECH NOWIZ

**A YEALY COLLEGE
E-MAGAZINE 2K26**

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Chairperson's Message

Dream Institute of Technology aspires to build a strong technical foundation for new age engineering students. We impart skill-based industry driven knowledge over and above university defined curriculum. This will help to develop the broad technical outlook required for students to survive in this competitive market. We always encourage collaboration between students and faculties, reciprocity and cooperation among students, active learning, prompt feedback and experiential learning beyond classroom. Dream Institute of Technology imparts effective learning skills that helps student to accurately remember information learnt, recall them at the right point of time and utilize them effectively in a wide variety of situations. We encourage students to attend their classes in the college regularly, so that they can build up the habit of attending the workplaces punctually. Besides knowledge, discipline is very much essential for every individual to succeed professionally. At Dream Institute of Technology, discipline is maintained on a priority basis within the college campus. Every student in our institute is made to understand that there can be no short-cut to success. I feel privileged to be apart of this institution and hope to fuel the intellectual energies of all our students with the support of dedicated faculty members of our institute.

SUSMITA SARKAR



Principal's Message

India is a fast emerging destination for cutting-edge research & development. In the year 2020 India will be in need of large talent pool not only in information technology but also in other fields like nanotechnology, agricultural science, manufacturing etc. Our students must be equipped to meet these upcoming challenges “Dream Institute of Technology” has become one of the leading engineering institution in West Bengal as well as in India. Within a short span of time the institute has created a niche for itself by providing lucrative career opportunities with esteemed recruiters like TCS, Capgemini, Infosys, Reliance, Accenture, Wipro- spectra mind, Satyam Computers, Cognizant, etc. We have well-equipped computer labs, central computer center and departmental labs to equip students as quality engineers not only in the core sectors but also in the field of software engineering. Dream Institute of Technology, a state-of-the-art engineering institute provides well-equipped workshops and advanced learning resources. From a modest beginning in July 2006, Dream Institute of Technology has made a pledge to create the ideal environment for young, fresh, talents to realize and optimize their potentials. We facilitate students to develop a symbiotic relationship between the community, society, and the institution. We are at work in unison to ensure a tremendous value-addition among our students during their four years’ of stay with us. At the same time, we are also confident to ensure that the alumni of our college always feel proud of their institution of choice in the days ahead of us.

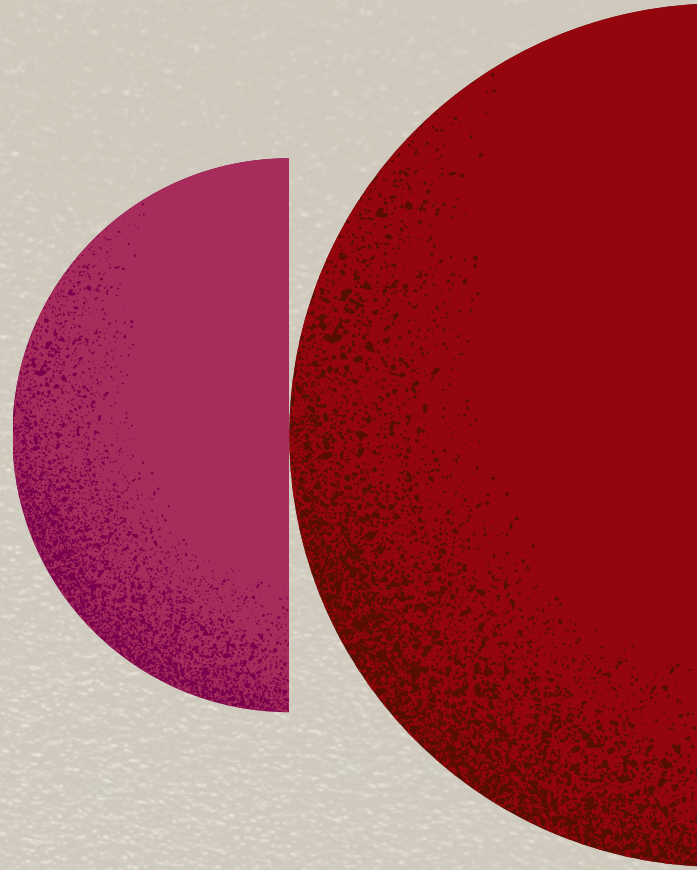
**DR.(PROF.) DIPANKAR
SARKAR**





2026

TABLE OF CONTENTS



1 TEAM
INTRODUCTION

4 POEMS

7 CLASS
REPRESENTATIVES

2 ARTICLES

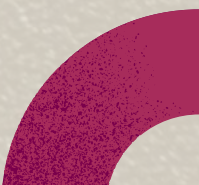
5 PHOTOGRAPHS

8 ACADEMIC
TOPPERS

3 TRAVEL
BLOG

6 ART WORKS

9 EVENTS



OUR TEAM



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i take this opportunity
write you a few lines to inquire
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alth i miss you very much
i hope the time will
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EDUCATION IN INDIA 2026

In 2026, the Indian education landscape is defined by the aggressive implementation of the National Education Policy (NEP) 2020 and a "Youth Shakti" (Youth Power) focus in the national budget. The system is shifting from a rote-learning tradition toward a competency-based, digital-first model. The traditional "10+2" model has been fully replaced by the 5+3+3+4 pedagogical structure, covering ages 3 to 18. Starting in 2026, CBSE Class 10 students have the option to appear for board exams twice in one academic year to reduce stress. Question papers now feature 50% competency-based questions (case studies and application-oriented) to discourage memorization. Class 12 answer sheets are now evaluated via On-Screen Marking (OSM) to improve transparency and speed up results. Higher education is pivoting toward "Industry-Academia" collaboration to fix the long-standing employability gap. There is a heavy push for micro-credentials and apprenticeships, allowing students to earn certifications that are stackable toward a full degree.

2026 marks the year AI moved from "experimentation" to "execution" in Indian classrooms. AI is being used to automate administrative tasks, allowing teachers to focus on personalized student mentorship.

In 2026, the shift toward a more multidisciplinary and digital-heavy education system has created numerous entry points for individuals and organizations to contribute. Whether you are a professional, a student, or a corporate leader, the focus is now on application over theory. The government has streamlined how citizens can help schools through centralized digital portals like Vidyanjali 2.0, MY Bharat Portal, Rashtriya e-Pustakalaya, National Service Scheme (NSS) and Diksha. The NEP 2020 mandates vocational exposure starting from Class 6. This has created a massive demand for industry professionals to act as bridge-builders. Professionals can volunteer through platforms like iVolunteer or Mentor Connect to help students in community colleges with English communication and interview preparation.

For businesses, the 2026 landscape focuses on "Education-to-Employment" pipelines rather than just infrastructure. Companies can partner with the government to upgrade specific schools into PM-SHRI (Schools for Rising India) status by providing smart classrooms, AI labs, and green energy solutions. If you are in academia, the focus is on breaking silos between subjects. Help design "Credit-based projects" for local universities that solve real-world community problems (e.g., waste management, local language translation). If you are an experienced educator, you can contribute by conducting CPD (Continuous Professional Development) sessions for schoolteachers to help them move away from rote teaching toward competency-based methods.

The impact of the educational reforms unfolding in 2026 is transformative, touching everything from individual mental health to India's position in the global economy. By shifting from "what to think" to "how to think," these changes are designed to create a more resilient and adaptable generation. The most immediate impact is the reduction of the "high-stakes" pressure that has historically defined Indian schooling. Since 50% of questions are now competency-based, students who understand concepts are performing better than those who simply memorize. This is fostering a more relaxed classroom environment where "asking why" is valued over "answering what." The gap between having a degree and having a job is finally beginning to shrink due to the integration of vocational and academic streams. The reforms are acting as a catalyst for social mobility and national growth.

~ DR. DIPANKAR SARKAR
PRINCIPAL
DREAM INSTITUTE OF TECHNOLOGY



"BEYOND CLASSROOMS: THE REAL JOURNEY OF A B.TECH. STUDENT"

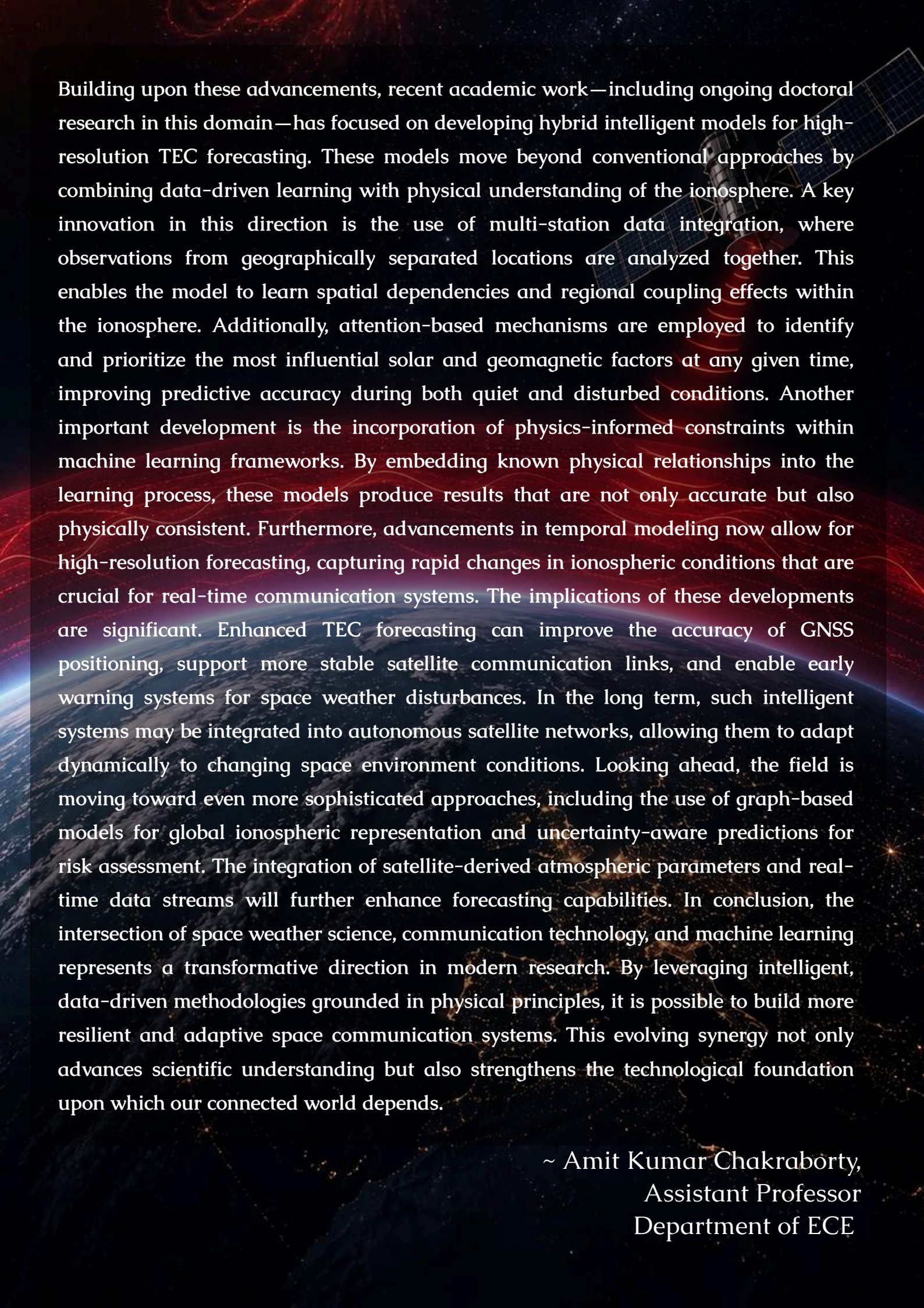
Engineering education is often seen through the lens of classrooms, lectures, and examinations. However, the true essence of a B.Tech. student's life unfolds beyond these formal structures. It is reflected in late-night study sessions, last-minute assignment submissions, and the quiet determination to make things work despite repeated failures. As faculty members, we often witness this journey from the other side of the desk—the sleepy faces in morning lectures, the anxious questions before exams, and the spark of satisfaction when a concept finally clicks. There is a unique rhythm to engineering life. Somewhere between a half-finished assignment at 2 a.m. and a cup of over-boiled hostel chai, a B.Tech. student truly discovers what engineering means. It's not always in the classroom or neatly written notes—it's in the moment when a circuit finally works after ten failed attempts, when a piece of code runs without errors for the first time, or when a simple idea turns into a mini-project worth showcasing. Engineering life is a strange but exciting mix of deadlines, group projects where one person does most of the work, last-minute exam preparations, and endless discussions about "what if we try this differently?" While the curriculum provides the foundation, it is these experiences that shape students into problem-solvers and innovators. Engineering is not merely about mastering theories; it is about developing patience, resilience, curiosity, and the courage to experiment. As educators, recognizing and appreciating this journey allows us to guide students more effectively—not just as learners, but as future engineers ready to face real-world challenges.

~ Dr. Sarbendu Roy
Assistant Professor
Department of ME

INTELLIGENT SPACE COMMUNICATION IN THE ERA OF SPACE WEATHER: A MACHINE LEARNING-DRIVEN PERSPECTIVE



Space communication has evolved into a critical infrastructure supporting navigation, disaster management, aviation, defense, and global connectivity. From satellite-based internet services to Global Navigation Satellite Systems (GNSS), modern society increasingly depends on reliable signal transmission through the near-Earth space environment. However, this environment is far from stable. It is continuously influenced by solar activity, collectively known as space weather, which introduces significant variability into communication channels. Space weather is primarily driven by solar phenomena such as solar flares, coronal mass ejections, and high-speed solar wind streams. When these disturbances interact with the Earth's magnetosphere and ionosphere, they alter the distribution of charged particles. The ionosphere, a region filled with free electrons and ions, plays a decisive role in radio signal propagation. One of the most important parameters used to characterize ionospheric conditions is the Total Electron Content (TEC), which represents the total number of electrons along a signal path between a satellite and a receiver. Fluctuations in TEC can lead to signal delays, phase distortions, and in severe cases, complete signal loss. These effects are particularly pronounced in low-latitude regions like India, where complex electrodynamic processes such as the Equatorial Ionization Anomaly amplify ionospheric irregularities. As a result, ensuring the reliability of space-based communication systems requires accurate monitoring and forecasting of ionospheric conditions. Traditionally, scientists have relied on empirical models and physics-based simulations to understand and predict ionospheric behavior. While these approaches have provided valuable insights, they often face limitations when dealing with highly dynamic and nonlinear conditions, especially during geomagnetic storms. Empirical models may fail to adapt to unusual events, whereas physics-based models can be computationally intensive and dependent on precise input parameters. In recent years, machine learning (ML) has emerged as a powerful tool to address these challenges. By learning patterns directly from observational data, ML models can capture complex relationships between solar activity, geomagnetic conditions, and ionospheric responses. These models are capable of integrating diverse inputs such as solar flux indices, geomagnetic indicators, temporal variations, and geographical information.



Building upon these advancements, recent academic work—including ongoing doctoral research in this domain—has focused on developing hybrid intelligent models for high-resolution TEC forecasting. These models move beyond conventional approaches by combining data-driven learning with physical understanding of the ionosphere. A key innovation in this direction is the use of multi-station data integration, where observations from geographically separated locations are analyzed together. This enables the model to learn spatial dependencies and regional coupling effects within the ionosphere. Additionally, attention-based mechanisms are employed to identify and prioritize the most influential solar and geomagnetic factors at any given time, improving predictive accuracy during both quiet and disturbed conditions. Another important development is the incorporation of physics-informed constraints within machine learning frameworks. By embedding known physical relationships into the learning process, these models produce results that are not only accurate but also physically consistent. Furthermore, advancements in temporal modeling now allow for high-resolution forecasting, capturing rapid changes in ionospheric conditions that are crucial for real-time communication systems. The implications of these developments are significant. Enhanced TEC forecasting can improve the accuracy of GNSS positioning, support more stable satellite communication links, and enable early warning systems for space weather disturbances. In the long term, such intelligent systems may be integrated into autonomous satellite networks, allowing them to adapt dynamically to changing space environment conditions. Looking ahead, the field is moving toward even more sophisticated approaches, including the use of graph-based models for global ionospheric representation and uncertainty-aware predictions for risk assessment. The integration of satellite-derived atmospheric parameters and real-time data streams will further enhance forecasting capabilities. In conclusion, the intersection of space weather science, communication technology, and machine learning represents a transformative direction in modern research. By leveraging intelligent, data-driven methodologies grounded in physical principles, it is possible to build more resilient and adaptive space communication systems. This evolving synergy not only advances scientific understanding but also strengthens the technological foundation upon which our connected world depends.

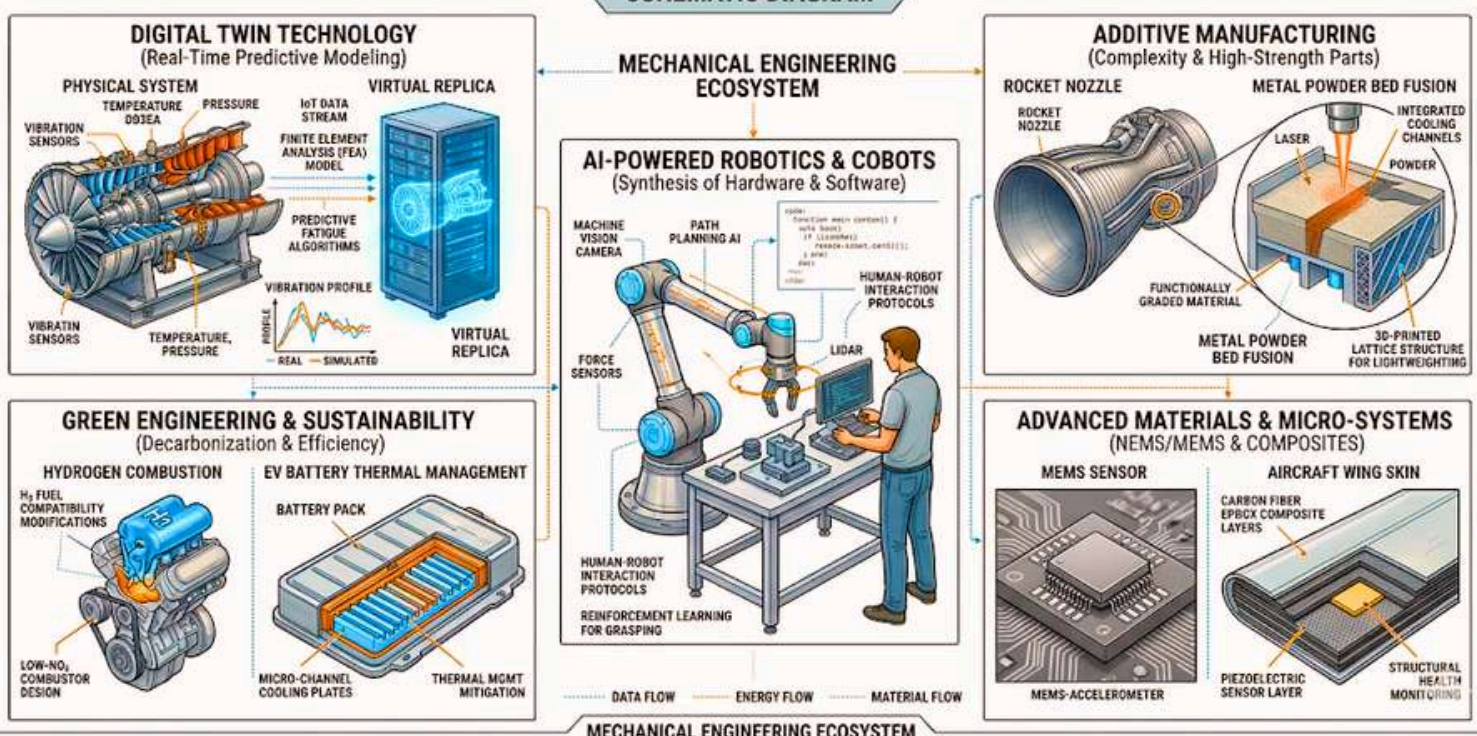
~ Amit Kumar Chakraborty,
Assistant Professor
Department of ECE

The Renaissance of Machines: Navigating Recent Trends in Mechanical Engineering

The landscape of mechanical engineering is currently undergoing a seismic shift, transitioning from traditional heavy machinery toward an integrated, “smart” ecosystem defined by Industry 4.0 and sustainable innovation. At the forefront of this evolution is the digital twin technology, which creates high-fidelity virtual replicas of physical systems, allowing engineers to predict fatigue and performance outcomes in real-time without risking physical assets. This digital transformation is complemented by the mainstream adoption of additive manufacturing, or 3D printing, which has moved beyond simple prototyping to the production of complex, high-strength aerospace and medical components that were previously impossible to forge or mill. Parallel to these digital strides is the urgent pivot toward Green Engineering; as the global community demands decarbonization, mechanical engineers are redesigning thermal systems for hydrogen fuel compatibility and optimizing EV battery thermal management to push the boundaries of energy efficiency. Furthermore, the integration of Artificial Intelligence and robotics is giving rise to autonomous systems and “cobots” that work alongside humans, requiring a new breed of engineers who are as proficient in coding and data science as they are in kinematics and fluid mechanics. Even at the microscopic level, breakthroughs in Micro-Electro-Mechanical Systems (MEMS) and advanced composite materials are enabling the creation of lighter, stronger, and more “aware” structures. As we move forward, the discipline is no longer just about moving parts, but about the seamless synthesis of hardware, software, and environmental stewardship, marking a sophisticated new chapter for the profession.

~ Dr. Abhijit Bhowmik
Head of Department
Department of ME

THE RENAISSANCE OF MACHINES: RECENT TRENDS IN MECHANICAL ENGINEERING SCHEMATIC DIAGS



Homi Bhabha's Legacy: Powering India through Fast Breeder Technology



India's scientific journey has always been driven by visionary minds, and among them, Homi Jehangir Bhabha stands as one of the greatest architects of modern India. His dream was not only to make India scientifically strong but also energy self-reliant. Today, that dream shines brightly through India's first Prototype Fast Breeder Reactor (PFBR) at Kalpakkam.

The 500 MWe PFBR represents a historic milestone in India's nuclear energy programme. Developed by BHAVINI with technological support from Indira Gandhi Centre for Atomic Research, this advanced reactor symbolizes decades of scientific dedication, innovation, and national commitment.

Unlike conventional nuclear reactors, the PFBR is a sodium-cooled fast breeder reactor using mixed oxide (MOX) fuel. Its unique design allows it to produce more nuclear fuel than it consumes. This "breeding" capability makes it highly efficient and strategically important for India, especially considering the nation's limited uranium reserves and vast thorium resources.

The foundation of this achievement lies in Bhabha's visionary Three-Stage Nuclear Power Programme:

Stage I :	Pressurized Heavy Water Reactors using natural uranium
Stage II :	Fast Breeder Reactors such as PFBR, generating additional fissile material
Stage III :	Thorium-based reactors for long-term sustainable energy

This roadmap was designed to ensure India's energy independence for generations to come.

The successful development of the PFBR is not just an engineering accomplishment—it is the realization of a national dream. It reflects India's ability to master complex technologies such as fast reactor engineering, liquid sodium cooling systems, and advanced fuel cycle management.

As India moves toward a cleaner and more sustainable energy future, the PFBR stands as a symbol of innovation, determination, and the enduring vision of Homi Bhabha. It reminds us that great dreams, when supported by science and dedication, can transform a nation.

~ Dr. Abhishek Saha
Assistant Professor
Department of ECE

Radiation Constrained Body Implantable System for Sustained Remote Health Monitoring – An Overview

The convergence of miniaturized electronics, advances in biocompatible materials, and the implementation of low-power wireless protocols has brought in a new era of continuous, remote patient monitoring. At the centre of this transformation sits the implantable medical device — no longer a simple passive object, but an intelligent, energy-aware node in a distributed health network. The primal engineering challenge is no longer merely what to sense, but how to sense it sustainably with minimal radiation exposure, near-zero external power dependence, and data pipelines robust enough to support real clinical diagnosis vis-a-vis the decision-making. This article insights the architecture, energy strategies, communications design, and regulatory landscape of modern low-radiation body implants used in remote health monitoring.

Modern implantable biosensors are not monolithic devices but layered systems integrating sensing interfaces (electrochemical or optical), signal conditioning, ultra-low-power microcontroller firmware, wireless communication, and often embedded energy harvesting. These components must operate within strict thermal and electromagnetic limits, and their tight integration determines clinical viability rather than mere academic utility. Sensing modalities are application-driven: electrochemical sensors enable continuous monitoring of biomarkers such as glucose, lactate, creatinine, and electrolytes; impedance spectroscopy assesses cellular hydration and fluid status; miniaturized pressure sensors track intracranial and intraocular pressures; and embedded photoplethysmographic measures heart rate and oxygen saturation. While this multimodal approach yields rich clinical data, it also imposes significant challenges in data processing, transmission, and system-level management across all layers. In this context, “low radiation” refers to non-ionizing RF emissions from the implant’s wireless subsystem, not ionizing sources such as X-rays or gamma rays. The governing metric is the Specific Absorption Rate (SAR), which measures RF energy absorption in tissue (W/kg). Regulatory bodies such as the FCC and ICNIRP limit SAR to 1.6 W/kg averaged over 1 g of tissue for near-body devices. The key design challenge is to ensure reliable communication and adequate data rates while remaining within these limits. Compliance is achieved through multiple strategies: adaptive transmit power control reduces output when the receiver (typically a body-worn hub) is close; though duty cycling keeps the transceiver in low-power sleep mode, activating only for brief data bursts; and antenna designs are optimized for the tissue dielectric environment to minimize near-field absorption. Additionally, near-field communication (NFC) and inductive coupling at

13.56 MHz confine electromagnetic fields to a few centimeters, significantly lowering SAR and eliminating far-field radiation concerns—well-suited for body-worn hub configurations. Over the past decade, the most significant advancement in implantable devices has been in energy management rather than sensing or communication. The transition from finite-lifetime lithium batteries—limited by capacity, replacement needs, and safety concerns—to on-body energy harvesting is enabling near-perpetual implant operation. Piezoelectric harvesting converts biomechanical motion (e.g., cardiac activity, arterial pulsation, respiration) into electrical energy using deformable materials such as PVDF, yielding $\sim 1\text{--}10\ \mu\text{W}$ —adequate for low-duty-cycle sensing. Biofuel cells provide a metabolically integrated solution by generating power from glucose and oxygen via enzymatic redox reactions, achieving $\sim 0.1\text{--}1\ \text{mW}/\text{cm}^2$, challenges in enzyme stability persist despite advances in encapsulation. Thermoelectric generators exploit small tissue-to-skin temperature gradients ($\sim 1\text{--}3^\circ\text{C}$) using bismuth telluride arrays, producing nanowatt–microwatt levels suitable for always-on ultra-low-power circuits. When harvested energy is insufficient, wireless power transfer via resonant inductive coupling enables efficient ($\sim 60\text{--}80\%$) transcutaneous energy delivery from a wearable unit to recharge internal storage. Collectively, these approaches shift design philosophy from energy budgeting to energy scheduling—aligning sensing, processing, and communication tasks with available power. This requires adaptive firmware capable of dynamically scaling operation based on real-time energy reserves. The communication stack in implantable monitoring devices must optimize trade-offs among data rate, range, power consumption, security, and tissue penetration, with no single protocol suitable for all scenarios. Bluetooth Low Energy (BLE) is widely used for implant-to-wearable communication in body area networks. Operating at 2.4 GHz, it supports data rates of 1–2 Mbps with low power consumption ($<5\ \text{mA}$ during transmission) and benefits from seamless integration with smartphones and consumer hardware. The Medical Implant Communication Service (MICS) band (402–405 MHz) provides better tissue penetration due to lower RF absorption in biological media. It is exclusively allocated for medical implants, minimizing interference, and supports moderate data rates ($\sim 200\ \text{kbps}$), sufficient for most physiological data. Ultra-wideband (UWB) is an emerging option for high-resolution localization and burst data transmission, particularly in neural interfaces. Its short pulses enable precise timing with low spectral power density, ensuring compliance with SAR limits while maintaining efficiency. Continuous transmission of raw sensor data to the cloud is inefficient—wasting energy, consuming bandwidth, and introducing latency that can delay safety-critical responses. A more sustainable approach uses a hierarchical processing architecture. At the implant level, lightweight algorithms perform local feature extraction—detecting key events such as ECG fiducial points, hypoglycemic episodes, or seizure onset—transmitting only compressed features and events rather than raw data. The wearable hub (e.g., patch or smartphone) performs more advanced edge processing using models for tasks like arrhythmia detection, glucose prediction, or sleep-stage classification, typically on low-power neural inference hardware ($\sim 1\text{--}10\ \text{mW}$). It then uploads curated, annotated summaries instead of continuous streams. The cloud backend processes structured clinical data using population-level models, generating insights, alerts, and recommendations for clinicians. A closed-loop system—where cloud insights adapt implant parameters or trigger therapeutic actions (e.g., drug delivery) ultimately delivers the key clinical value of this architecture.



Sustainability in implantable systems extends beyond energy and radiation to include long-term biocompatibility and material lifecycle. Protective packaging materials such as parylene-C, liquid crystal polymer, and titanium shield electronics from the body's corrosive environment while minimizing immune response. Biodegradable devices that safely dissolve after use eliminate the need for surgical retrieval and enable temporary, non-permanent implants. From an environmental perspective, reducing reliance on batteries lowers demand for materials like lithium, cobalt, and cadmium. Although more complex, energy-harvesting designs offer a more sustainable alternative to conventional replace-and-dispose battery systems. Commercializing an implantable monitoring system requires navigating complex regulatory pathways. In the United States, such devices are classified as Class III and must undergo the FDA's Premarket Approval (PMA) process, which demands robust clinical evidence of safety and efficacy. In the European Union, the Medical Device Regulation (MDR 2017/745) enforces similarly stringent requirements, including ongoing post-market clinical evaluation for implantable devices. The incorporation of AI in edge and cloud layers adds further complexity. Continuously learning algorithms that evolve with patient data pose regulatory challenges, as their real-world behaviour may diverge from their initially approved state. Consequently, regulators are developing frameworks for software-as-a-medical-device (SaMD), making early regulatory engagement essential for compliance.

The evolution of sustainable implantable monitoring systems is moving toward greater autonomy, intelligence, and seamless integration. Self-powered devices, adaptive low-RF communication, and on-device clinical inference are already demonstrated in research prototypes. The next major challenge lies in system-level integration—translating these advances into scalable, reliable, and regulatory-compliant products that perform across diverse patients and clinical conditions. Looking ahead, clinicians may monitor large populations through unified platforms aggregating continuous cardiac, metabolic, and neurological data from ultra-miniaturized implants. These devices, powered by the body's own processes and operating within safe RF limits, are no longer conceptual—the engineering groundwork for this future is already in place.

~ Debajyoti Chatterjee
Assistant Professor
Department of ECE

FUTURISTIC APPROACH TO ELECTRIC VEHICLES



The Electric Future Begins

The world is entering a transformative era where electric vehicles (EVs) are no longer just eco-friendly alternatives—they are the foundation of future mobility. What once seemed futuristic is now becoming reality, as EVs integrate cutting-edge technologies, reshape urban living, and redefine how

energy is consumed and shared. Driven by environmental concerns and rapid innovation, EVs are evolving into intelligent, connected, and sustainable systems that go far beyond transportation.

Intelligent & Autonomous Driving

One of the most exciting futuristic aspects of EVs is the rise of **artificial intelligence (AI)** in driving systems. These vehicles can:

- Detect obstacles and prevent collisions
- Optimize routes using real-time data
- Learn and adapt to driver behaviour

AI-powered EVs use sensors, cameras, and deep learning to mimic human decision-making, making driving safer and more efficient.

Advanced Battery Revolution

Battery technology is the backbone of EV innovation. Future advancements include:

- Solid-state batteries with higher energy density
- Faster charging (minutes instead of hours)
- Longer lifespan and improved safety

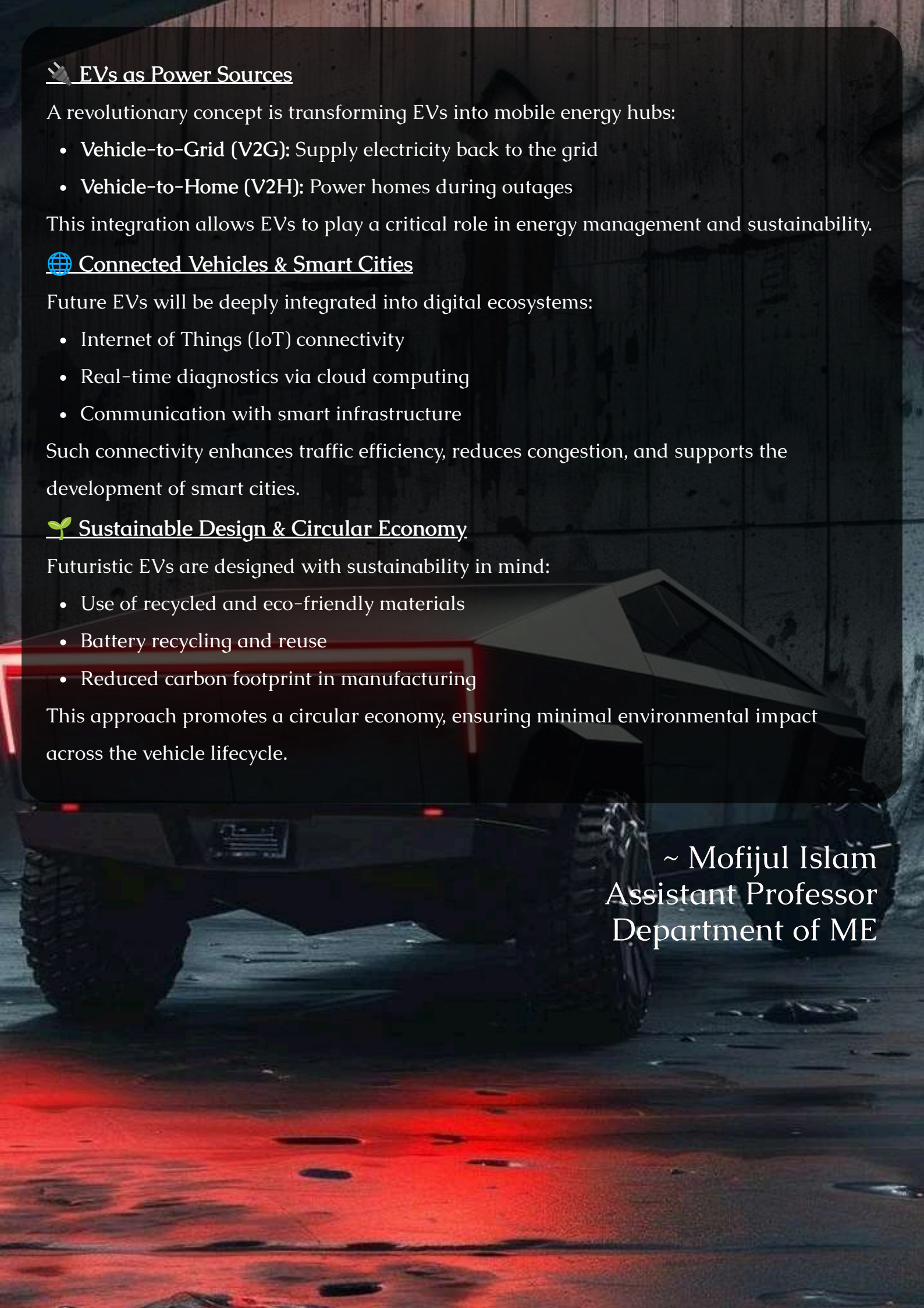
Research and investment are heavily focused on reducing battery costs while increasing performance, making EVs more accessible to the masses.

Smart & Wireless Charging

Charging systems are evolving to match the pace of innovation:

- Ultra-fast charging stations
- Wireless charging roads under development
- Smart charging that balances grid demand

These technologies aim to eliminate “range anxiety” and make EV charging seamless and convenient.



EVs as Power Sources

A revolutionary concept is transforming EVs into mobile energy hubs:

- **Vehicle-to-Grid (V2G):** Supply electricity back to the grid
- **Vehicle-to-Home (V2H):** Power homes during outages

This integration allows EVs to play a critical role in energy management and sustainability.

Connected Vehicles & Smart Cities

Future EVs will be deeply integrated into digital ecosystems:

- Internet of Things (IoT) connectivity
- Real-time diagnostics via cloud computing
- Communication with smart infrastructure

Such connectivity enhances traffic efficiency, reduces congestion, and supports the development of smart cities.

Sustainable Design & Circular Economy.

Futuristic EVs are designed with sustainability in mind:

- Use of recycled and eco-friendly materials
- Battery recycling and reuse
- Reduced carbon footprint in manufacturing

This approach promotes a circular economy, ensuring minimal environmental impact across the vehicle lifecycle.

~ Mofijul Islam
Assistant Professor
Department of ME

Solve for x.:

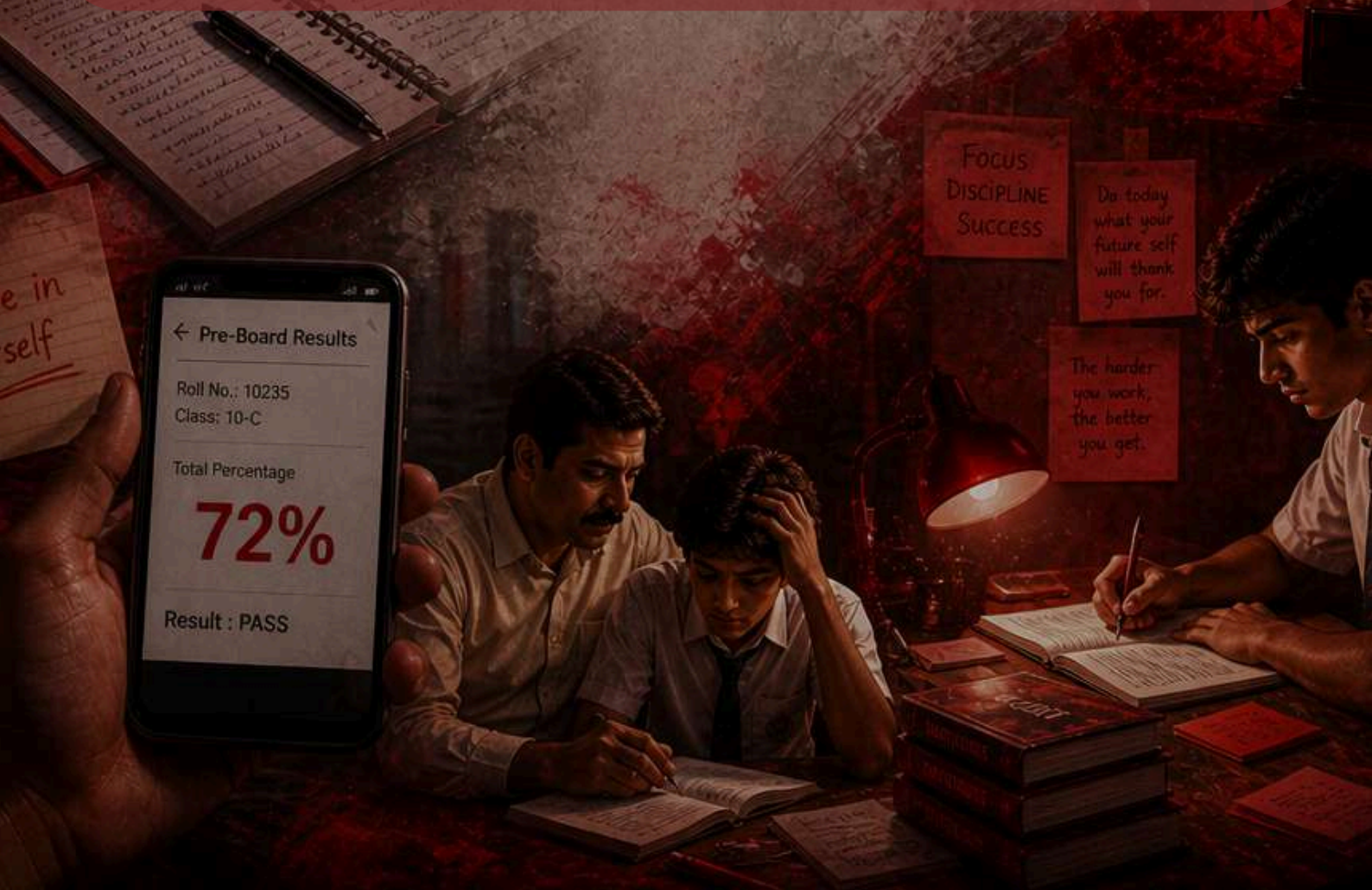
$$2x^2 - 5x + 3 = 0$$

THE LAST BENCH PROMISE

The bell rang through the corridors of LEO XIIIth Higher Secondary School. For all other students it was an ordinary day.. But for the students of Class 10-C every day felt important. It was their final year in school. A year filled with pressure, expectations and dreams. Amal sat on the bench near the window. From there he could see the playground where he and his friends once spent hours playing cricket. But now instead of cricket bats and laughter, their days were filled with textbooks, homework and preparation for the board exams. "Amal solve this equation " said Teacher Latha during the mathematics class. Amal stood up nervously. He looked at the board. The numbers seemed confusing. His mind was filled with thoughts about the exams and his parents expectations. After class his friend Anandhu noticed his silence. "You seem worried " Anandhu said. Amal sighed. "Everyone expects me to score above 90%. What if I fail them?" Anandhu smiled. He replied, "Marks are important.. They don't decide who you are. Just try your best, Amal." As the months passed, life became a cycle of school, tuition and endless revision. Even lunch breaks were spent discussing chapters and sample papers. The pressure of board exams was something every student in Class 10-C felt. One day Amal received his pre-board results. His hands trembled as he opened the online site. He scored 72%. Disappointed and afraid he showed the result to his father. His father looked at him calmly. He said, "Is this your effort, Amal?" Amal lowered his head. He replied softly "I tried." His father placed a hand on his shoulder. He said, "Then keep trying Amal. Success comes to those who do not give up." Those words gave Amal a determination. He began studying. Not out of fear. With confidence. Something wonderful happened in Class 10-C. of competing with each other students began helping each other. Anandhu explained mathematics problems.

Noel shared history notes. Amal helped friends understand science diagrams. They realized they were stronger together. The board exams arrived. They slowly came to an end. On the day as the final bell rang the students walked out of the classroom. They had emotions. Relief, happiness and a little sadness. Anandhu looked around. He said, "Can you believe it? No more classes together." Amal glanced at the bench. He looked at the classroom. So many memories lived there. Laughter, stress, friendships and dreams. Years later Amal realized that the important lessons of 10th standard were not found in textbooks or exam papers. They were found in friendship, hard work and the courage to keep going. When things seemed difficult. Because 10th standard was never about exams. It was about growing up....

~ Bristo Leksin
3rd Year, ECE Dept.



Not Planned, But Destined: My Kedarnath Yatra with my Mother

There is a Phase called "Don't choose when to visit Kedarnath; the "Call" chooses you." For me, that call came unexpectedly on a quiet holiday afternoon while watching a random YouTube travel vlog of Kedarnath. What started as a fleeting thought quickly turned into an unwavering decision: *I had to go, and I had to take my mother with me.* Convincing her wasn't easy. Like any mother, she was concerned about the terrain, the uncertainty, and the risks, especially since it was monsoon season. Since it was our first visit and no one in our family had travelled to Kedarnath in recent years, we had no one to guide us through the journey. But somewhere between my insistence and her silent faith, she agreed. The YouTube vlogs proved to be incredibly helpful, providing me with valuable ideas, guidance, and practical do's and don'ts for the Kedarnath Yatra. Within a week, all the logistics were arranged, train tickets on the Upasana Express from Howrah to Haridwar up and down, bus bookings to Sonprayag, government registration, medical fitness certificates and lodge reservations at Gaurikund, Kedarnath and Sitapur. Fortunately, I got my semester break from my Institute during this period, which perfectly complemented my plans and gave me the freedom to continue the Kedarnath Yatra without any worries. Going in July is traditionally considered "off-season" due to the monsoons. However, the timing turned out to be a blessing. The sacred Kedarnath Temple follows a divine tradition. It opens every year on the auspicious day of Akshaya Tritiya and closes on the night of Diwali. During the harsh winter months, when Kedarnath becomes inaccessible due to heavy snowfall, the idol of Lord Kedarnath is ceremonially moved and worshipped at the sacred Omkareshwar Temple near Rudraprayag.

Our journey began at Howrah Station on July 9th, 2024. By the 10th, we were in Haridwar, standing on the banks of the Har-Ki-Pauri Ghat, watching the Ganga Aarti. As the evening bells echoed and the Ganga flowed at our feet, we sought the blessings of Maa Ganga to begin our yatra. I knew this journey was more than just travel, it was a calling. The next morning at dawn, we boarded a bus toward Sonprayag. Looking out the window, we saw the majestic confluence at Devprayag Sangam, the emerald confluence of the Alaknanda and Bhagirathi and the sacred Dhari Devi Temple. Nature seemed to whisper blessings at every turn. By 2:30 PM, we reached Sitapur Bus Terminus, walked to Sonprayag, and took a shared jeep to Gaurikund. That evening, we visited the Holy Gauri Devi Temple, a ritualistic must before ascending to Kedarnath. The Mandakini River flowed beside our lodge with powerful, rhythmic roar and white-foamed waves. Local legend says this river shows the path to the temple, like a guide calling pilgrims toward Kedarnath.



Framing the beauty of the mountains
as I climbed toward the clouds

On July 12th, at 4:00 AM sharp, the real test began. The trek from Gaurikund to Kedarnath is nearly 18 kilometers. To ensure my mother's comfort, I arranged a Pitthu (basket porter) to carry her, while I chose to walk the entire distance. These porters carry pilgrims on their backs in a specially designed basket, from Gaurikund to the Kedarnath temple. Armed with only the essentials like raincoats, warm clothes, medicines, dry foods, water bottle and a wooden walking stick bought in Sonprayag, I stepped into one of the most challenging yet rewarding journeys of my life. We left our heavy luggages in the cloakroom at Gaurikund. The trail passed through Jungle Chatti, Bheembali, Rambara Bridge, Linchauli, and finally the Kedarnath Base Camp. I would suggest to take "baby steps" on the steep sections and stay on the main road, never take shortcuts.



My First View of
Kedarnath Temple

The organization is beautiful; every 500 meters, there are water stations for the horses and medical centres, food & water stalls and resting areas for pilgrims. Along the way, I met many strangers who, in that shared journey of devotion and struggle, felt like an extended family. We encouraged each other, shared moments of rest, and unknowingly became companions in faith. The people trekking with me kept chanting "Har Har Mahadev," which brought a positive vibe to the journey.

By the final 4 kilometers, I was physically shattered. My legs felt like lead, and I truly believed I couldn't go on. Then, a miracle happened. A stranger, an elderly man appeared. He didn't just encourage me; he held my hand and guided me the rest of the way to the temple where my mother was waiting for me. Before I could even process what had happened, he disappeared into the crowd. To this day, I believe he was more than just a stranger. Entering the Kedarnath Temple at 4:00 PM is a moment I cannot fully put into words. The evening Mangal Aarti offered a sense of divine peace that washed away the exhaustion of the 18km climb. Standing before Lord Shiva, words failed me. Seeing the temple draped in the evening mist, surrounded by the echoes of bells, was a "lifetime experience" that words fail to capture. The sacred Shivalingam at Kedarnath rises in a unique, triangular form, resembling the hump of a bull. It stands as a silent, stony testament to the ancient legends of the Mahabharata and the divine presence of Lord Shiva. In Hindu mythology, it is believed that after the Kurukshetra war, the Pandavas sought Shiva for atonement. Shiva took the form of a bull to hide from them, and when Bhima tried to catch him, he dived into the ground, leaving his hump behind at Kedarnath.



Me with my mother
after Kedarnath
Darshan

Because of the monsoon timing, the usual crushing crowds were absent, allowing us a peaceful moment of connection. The most transformative moment, however, happened the next morning. The next morning at 6:30 AM, I went back to the temple alone for a final darshan. It was crowded, and I felt I might miss my chance. Suddenly, a priest, a fellow Bengali approached me. In my mother tongue, he asked if I wanted to offer Puja. He took me straight inside, seated me in front of the sacred Shiva Lingam, and guided me through the puja. I touched the Shivling. In that moment, I broke down. I simply sat there and cried. It wasn't sadness; it was a profound sense of arrival and gratitude. I also followed the tradition of collecting water from the Amrit-Kund behind the temple, a sacred souvenir that remains preserved in my home today. I also stood before the Vim-Sheela, the massive boulder that miraculously diverted the 2013 floods and saved the temple. Seeing it in person makes you realize how thin the line is between nature and the divine.

With a heart full of peace, we began our return journey. This time, I took a horse to nurse my swollen legs, while my mother continued with the pitthu. We reached Gaurikund by 2:30 PM, collected our bags, and headed to Sitapur for our morning bus back to Haridwar. If you want to experience the trek on foot, I suggest taking a pony on the way up to save your energy for the spiritual experience at the top, and then walking the way down.

Just when I thought my Kedarnath Yatra had come to an end, destiny had something more in store for me. While collecting our belongings from the Gaurikund cloakroom before our final descent, I unknowingly left behind my jacket that I had been carrying in my hand. It wasn't until we had reached Sitapur that I realized my mistake. A wave of disappointment rushed over me, not because it was just a jacket, but because it held memories of the journey. With a hopeful heart, I called the lodge manager in Gaurikund and requested his help in sending



The Holy Bhim Sheela



it to Sitapur. Initially, he refused due to the lack of anyone available to carry it. I felt helpless and quietly accepted that perhaps it was gone forever. But sometimes, when faith guides you, things change. After a while, the manager called back. He had found a tourist family returning to Sitapur advised me to get in touch with them. With folded hands over a phone call, I requested their help and without hesitation, they agreed. When they reached Sitapur, they shared their hotel location, and I went there to collect my jacket. That moment was filled with gratitude, not just for retrieving something I had lost, but for experiencing yet again the kindness of unknown people. As I began walking back to our guest house to rejoin my mother, I passed a line of shared jeeps. The drivers were calling out a name that instantly caught my attention: “Triyugi Narayan!”

I stood frozen for a moment. This was the legendary site where Lord Shiva and Devi Parvati were wed in the presence of the Gods. I hadn't planned for this; it wasn't on our itinerary. But standing there with my recovered jacket in hand, it felt like a direct invitation. I realized then how much grace was being showered upon me, first the recovery of my belongings, and now this unplanned opportunity. I hopped into a shared jeep and made the winding climb to the temple. Inside, I saw the holy fire, the eternal flame that has been burning since the celestial wedding of Lord Shiva and Goddess Parvati. The ritual of darshan here is deeply symbolic, devotees offer a pinch of dust into the Holy Wedding fire, which has been burning since ancient times, as a way to help keep this sacred flame alive forever. I performed the ritual. There were also three holy kunds, Shiv Kund, Vishnu Kund, and Brahma Kund. I collected water from each of them, preserving it carefully, knowing these were not just drops of water but symbols of divine connection that I would carry home. It felt as if the blessings of Kedarnath Temple had extended beyond expectation.

On the morning of 14th July, we boarded our bus from Sitapur at 6 AM, heading back toward Haridwar. By about 2 PM, we settled into a lodge near the railway station, and in the evening, we made our way to the holy Har Ki Pauri. Standing once again by the holy Ganga, I folded my hands, not to ask for anything this time, but simply to say thank you. Thank you for protecting us, for guiding us, and for allowing us to complete the Kedarnath Yatra safely. We stayed an extra day in Haridwar to let my mother rest after the physically demanding journey. On 16th July, we boarded our return train from Haridwar to Howrah. And on the evening of 17th, we finally reached home.

Returning home, I realized that I didn't just bring back holy water or a walking stick. I brought back a strengthened bond with my mother and a heart full of Himalayan silence. From convincing her to seeing her smile in the lap of the Himalayas, every moment was priceless. Kedarnath isn't just a destination; it is an emotion that stays with you long after the trek ends. And somewhere between the mountains, the flowing Mandakini, and the chants of “Har Har Mahadev,” I found Kedarnath, but more importantly, I found a deeper connection to life itself.

~ Saurav Ghosh
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Electrical Engineering in the Age of Sustainability & Startups – A Global Perspective

Abstract

The discipline of Electrical Engineering is undergoing a transformative evolution driven by sustainability imperatives, rapid digitalization, and a vibrant global startup ecosystem. With increasing concerns over climate change and energy security, engineers today are expected not only to design efficient systems but also to innovate solutions that are environmentally responsible and economically viable. This article explores how electrical engineering is shaping the future through renewable energy integration, smart technologies, and entrepreneurial ventures. By highlighting global and Indian examples, it aims to inspire students to align their technical knowledge with innovation and societal impact.

I. Introduction

Electrical engineering, often regarded as the backbone of modern civilization, has continuously evolved alongside human progress. From powering industries and homes to enabling communication and automation, it has played a crucial role in shaping economies and daily life. Today, however, the discipline stands at a defining crossroads where technological advancement must align with environmental responsibility and global sustainability goals. The 21st century is driven by two interconnected forces – the urgent need for sustainable development and the rapid rise of innovation-led entrepreneurship. Climate change, energy crises, and rising carbon emissions have compelled nations to rethink energy strategies, guided by global commitments such as the Paris Agreement. Electrical engineers are now not just system designers but key contributors to building sustainable and efficient energy systems.

Simultaneously, traditional career paths are evolving. The emergence of startups and innovation ecosystems has transformed engineers into innovators and entrepreneurs. The integration of technologies such as Artificial Intelligence, Internet of Things, and data analytics is enabling smarter and more efficient solutions across industries. India reflects this global transition, with ambitious renewable energy targets and initiatives like Startup India fostering innovation. For students, especially at institutions like Dream Institute of Technology, this is an era of immense opportunity. Learning now extends beyond classrooms to innovation labs and digital platforms, encouraging students to solve real-world problems.

In essence, electrical engineering today is not just about circuits—it is about shaping a sustainable, innovative, and technology-driven future. In the context, the role of young engineers becomes more critical than ever. They are the driving force behind innovation, the bridge between technology and society, and the architects of a cleaner, smarter, and more sustainable world.

II. Sustainability and the New Energy Paradigm

The transition from fossil fuels to renewable energy sources is one of the most significant global shifts of our time. Solar, wind, and hybrid systems are rapidly replacing conventional power generation methods as nations strive to achieve carbon neutrality and energy security. In this transformation, electrical engineers play a crucial role in designing efficient systems, integrating renewable sources, and maintaining grid stability.

India has made remarkable progress in this direction. The Bhadla Solar Park stands as one of the largest solar power installations in the world, symbolizing the nation's commitment to clean energy. Such large-scale projects highlight the importance of power electronics, control systems, and grid integration—core domains of electrical engineering. Another emerging frontier is green hydrogen, which produces zero emissions except water vapor, with organizations like Indian Oil Corporation investing in pilot projects that open new avenues in clean fuel and energy storage technologies. Although hydrogen production requires high energy input, this challenge can be effectively addressed by utilizing surplus daytime solar power through grid integration, making it a truly green and sustainable alternative.

An equally significant example is the green transformation of Indian Railways, one of the largest railway networks globally. With nearly complete electrification of its broad-gauge network, the shift from diesel to electric traction has substantially reduced carbon emissions. The organization is steadily integrating renewable energy into its operations, with solar and wind power contributing to its energy mix, and has set an ambitious target of becoming a net-zero carbon emitter by 2030. A notable innovation is the development of hydrogen-powered trains representing a major step toward clean transportation. Additionally, the use of regenerative braking in modern electric locomotives enhances energy efficiency by feeding power back into the system.

These developments clearly illustrate that sustainability today extends beyond power generation into transportation and infrastructure. For students, this evolving paradigm sends a strong message— the future of electrical engineering lies in sustainability-driven innovation. Whether it is renewable energy integration, smart transportation systems, or advanced energy storage, the opportunities to contribute meaningfully to society are vast and ever-expanding.

III. Digitalization and Smart Technologies

The integration of digital technologies with electrical systems has ushered in a new era of intelligent, efficient, and responsive infrastructure. Concepts such as smart grids, Internet of Things (IoT), and Artificial Intelligence (AI) are transforming conventional power systems into dynamic networks capable of real-time monitoring, adaptive control, and predictive decision-making. Globally, companies like Siemens AG are deploying AI-driven solutions for predictive maintenance and automated grid management, while General Electric is advancing smart manufacturing aligned with Industry 4.0.

In India, digitalization is rapidly reshaping the power sector. Smart metering initiatives led by Energy Efficiency Services Limited enable real-time energy tracking and demand-side management. Cities like Delhi and Mumbai are adopting smart grids to improve reliability and reduce losses, while Power Grid Corporation of India Limited uses Wide Area Monitoring Systems (WAMS) and phasor measurement units (PMUs) for real-time grid stability monitoring. IoT-enabled smart homes, prepaid meters, and intelligent EV charging systems further enhance energy efficiency and consumer control.

These advancements highlight that electrical engineering is no longer limited to hardware; it is increasingly driven by data, software, and connectivity. For students, this underscores the importance of interdisciplinary skills in programming, analytics, and communication, opening new avenues for innovation and entrepreneurship in a rapidly evolving digital landscape.

IV. The Rise of Startups in Electrical Engineering

The rapid emergence of startups in electrical and energy sectors is transforming the future of technology. With growing demand for sustainable energy, smart mobility, and automation, electrical engineers are moving beyond traditional roles to become innovators and entrepreneurs. Supported by initiatives like Startup India and Make in India, India's startup ecosystem is witnessing strong growth.

Globally, companies such as Tesla Inc., BYD Company, and Enphase Energy have revolutionized clean energy and mobility. In India, Ather Energy, Mahindra & Mahindra, TVS and Tata Motors are accelerating EV adoption. Battery innovation is being driven by Exide Industries, Amara Raja Energy & Mobility, and SUN Mobility. India is also witnessing a surge of innovative startups such as Statiq and ChargeZone in EV charging infrastructure, Enlitso Energy in advanced battery solutions, and Euler Motors in electric mobility. In renewable energy, ReNew Power, Adani Green Energy, and Loom Solar are expanding clean energy access, while startups like Oorjan Cleantech are promoting rooftop solar solutions. On the other side, rural electrification and microgrid innovation are gaining momentum through startups such as Husk Power Systems, Mera Gao Power, Gram Power, and ONergy Solar, which are delivering decentralized solar microgrids, smart metering, and affordable energy solutions to underserved communities.

These developments show that electrical engineering now drives innovation across energy, mobility, and digital infrastructure. For students, even small projects like solar microgrids or smart energy systems can evolve into impactful startups, making this an exciting era of opportunity.

V. Bridging Academia and Entrepreneurship: The Role of Institutions

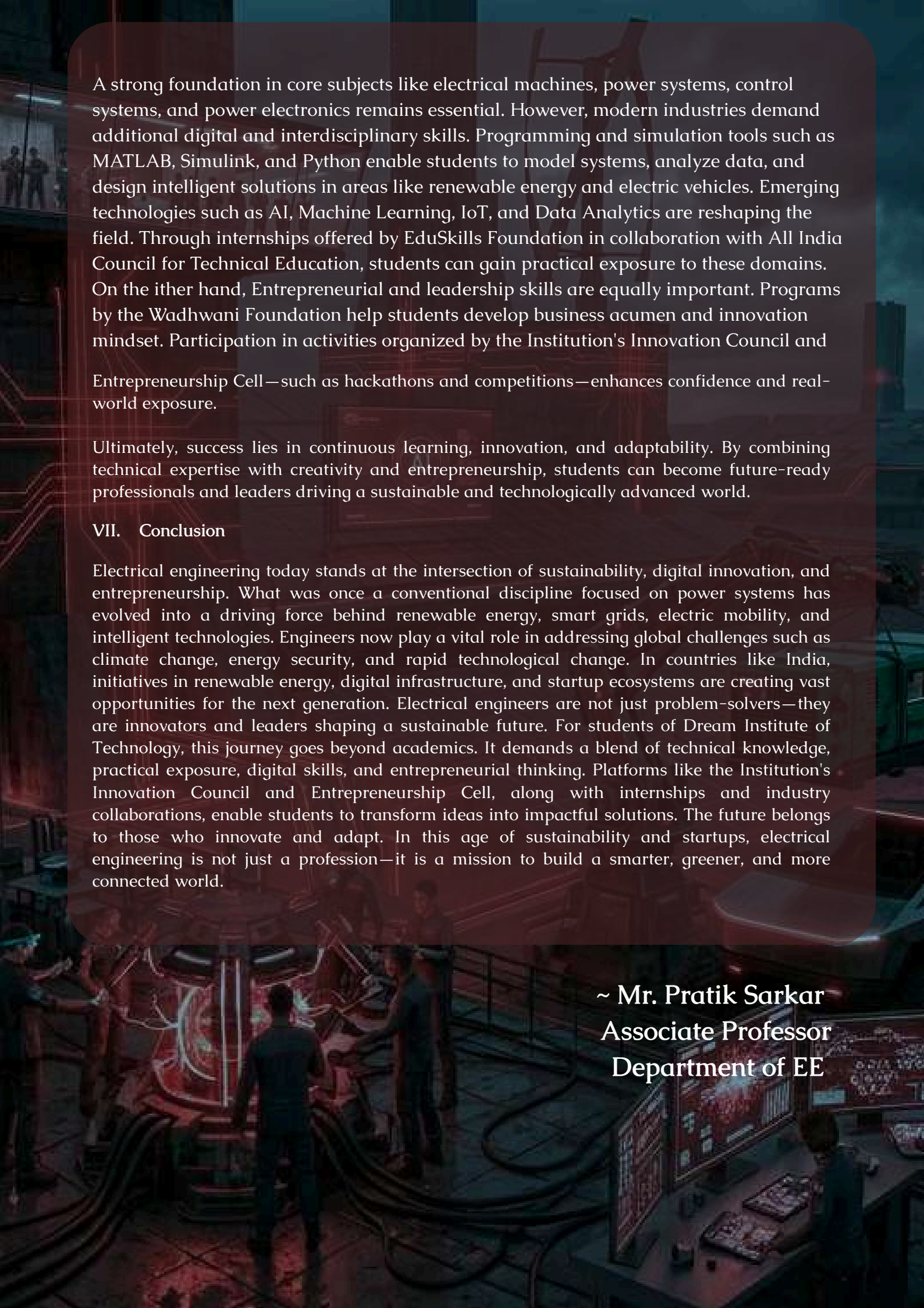
In today's rapidly evolving technological landscape, academic institutions are no longer limited to theoretical learning; they are emerging as innovation hubs where ideas are transformed into real-world solutions. As industries shift toward automation, sustainability, and digitalization, institutions must prepare students not only as skilled engineers but also as entrepreneurs. While core subjects like electrical machines and power systems remain essential, modern education must emphasize practical problem-solving, interdisciplinary learning, and innovation. Govt. Initiatives such as Atal Innovation Mission and Startup India have encouraged institutions to build incubation and startup ecosystems. The Institution's Innovation Council further promotes entrepreneurship and innovation among students.

Leading institutions like Indian Institute of Technology Madras and Indian Institute of Technology Bombay demonstrate how academic support can nurture successful startups such as Ather Energy. At Dream Institute of Technology, the Institution's Innovation Council and Entrepreneurship Cell actively organize workshops, competitions, and mentorship programs. Students benefit from virtual internships through EduSkills Foundation in collaboration with All India Council for Technical Education, gaining exposure to emerging technologies. Entrepreneurship courses by the Wadhwani Foundation, technical training through MATLAB online certificate courses further enhance industry readiness.

By fostering innovation, industry collaboration, and entrepreneurial thinking, institutions can empower students to become job creators, shaping a sustainable and technology-driven future.

VI. Student Connect: Skills for the Future at Dream Institute of Technology

In this era of sustainability, digital transformation, and startup-driven innovation, the role of students is evolving rapidly. The future electrical engineer will be defined not just by academic knowledge, but by adaptability, creativity, and problem-solving ability. For students of Dream Institute of Technology, this presents immense opportunities to build skills for a competitive, technology-driven world.



A strong foundation in core subjects like electrical machines, power systems, control systems, and power electronics remains essential. However, modern industries demand additional digital and interdisciplinary skills. Programming and simulation tools such as MATLAB, Simulink, and Python enable students to model systems, analyze data, and design intelligent solutions in areas like renewable energy and electric vehicles. Emerging technologies such as AI, Machine Learning, IoT, and Data Analytics are reshaping the field. Through internships offered by EduSkills Foundation in collaboration with All India Council for Technical Education, students can gain practical exposure to these domains. On the other hand, Entrepreneurial and leadership skills are equally important. Programs by the Wadhvani Foundation help students develop business acumen and innovation mindset. Participation in activities organized by the Institution's Innovation Council and Entrepreneurship Cell—such as hackathons and competitions—enhances confidence and real-world exposure.

Ultimately, success lies in continuous learning, innovation, and adaptability. By combining technical expertise with creativity and entrepreneurship, students can become future-ready professionals and leaders driving a sustainable and technologically advanced world.

VII. Conclusion

Electrical engineering today stands at the intersection of sustainability, digital innovation, and entrepreneurship. What was once a conventional discipline focused on power systems has evolved into a driving force behind renewable energy, smart grids, electric mobility, and intelligent technologies. Engineers now play a vital role in addressing global challenges such as climate change, energy security, and rapid technological change. In countries like India, initiatives in renewable energy, digital infrastructure, and startup ecosystems are creating vast opportunities for the next generation. Electrical engineers are not just problem-solvers—they are innovators and leaders shaping a sustainable future. For students of Dream Institute of Technology, this journey goes beyond academics. It demands a blend of technical knowledge, practical exposure, digital skills, and entrepreneurial thinking. Platforms like the Institution's Innovation Council and Entrepreneurship Cell, along with internships and industry collaborations, enable students to transform ideas into impactful solutions. The future belongs to those who innovate and adapt. In this age of sustainability and startups, electrical engineering is not just a profession—it is a mission to build a smarter, greener, and more connected world.

~ Mr. Pratik Sarkar
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Role of magnetism and magnetic domains in data storage technology: a basic introduction for Engineering students

The discovery of the "attractive" or "magnetic" ore, Lodestone, which was later used for navigation in a compass, marked the advent of a fascinating subject called magnetism. Since then, magnetism and magnetic phenomena have played an important role in the development of human civilization and modern technology.

The Physical Foundation

Today, our understanding of magnetism is closely related to the concept of **electron spin**, which emerges from the relativistic description of an electron in an electromagnetic field and is described by the **Dirac equation**. In many materials, especially **ferromagnetic materials**, magnetism originates from the intrinsic magnetic moments associated with electron spin. In simple terms, electrons behave like tiny bar magnets that we use in the laboratories.

Magnetism is closely related to applications throughout the industrial era. Many of today's useful devices would be unthinkable without forefront research in magnetism. Nowadays, magnetic materials are widely used in **hard disk read heads**, **computer memory**, **racetrack memory**, **identity cards**, **speakers**, **refrigerator door seals**, **automobiles**, and **toys**, among many other applications. The list is endless.

Scientific development

The scientific understanding of magnetism developed through several landmark discoveries. In 1600, **William Gilbert** proposed that the Earth behaves like a giant magnet. Later, scientists such as **Hans Christian Ørsted**, **André-Marie Ampère**, **Carl Friedrich Gauss**, **Jean-Baptiste Biot**, and **Félix Savart** established the relationship between electricity and magnetism. In 1831, **Michael Faraday** discovered electromagnetic induction, and **James Clerk Maxwell** unified these ideas through Maxwell's equations, laying the foundation of classical electrodynamics. Contributions by **Nikola Tesla** further demonstrated that electric currents can produce magnetic fields that generate motion and electrical power, laying the foundation for modern electric motors.

Why do we study magnetism, and how does it govern materials science and engineering?

Magnetic data storage

Magnetism is essential in materials science and engineering because it enables the generation, transmission, conversion, and storage of electrical energy. From electric motors and generators to transformers, data storage systems, and medical imaging, magnetic principles form the backbone of modern electrical and electronic technologies. There are way too many applications, so a discussion in one article would be overwhelming. Among these applications, remains one of the most widely used technologies for storing large volumes of information, so let's think together. Did you think about how the computer you use stores all the data?

Computer data storage

also called digital data storage, involves preserving digital information using technological systems that include computer hardware and recording media. Generally, storage components that operate at very high speeds but lose data when power is off are called memory. In contrast, slower devices that keep data even without power are known as storage. Modern computers mainly use hard disk drives (HDDs) or solid-state drives (SSDs) for long-term data storage. In this article, let's explore the key requirements for making hard drives from a material scientist's perspective.

Magnetic storage medium

One of the most widely used magnetic storage devices is an HDD, which is a widely used device for storing digital data in computers. It stores and retrieves information using the principle of magnetism. Data is recorded on rotating disks called platters, usually made up of Aluminium alloy or ceramics, which are coated with a thin layer of magnetic material (mainly cobalt-based alloys). By changing the direction of magnetization on the disk surface,

digital information can be stored permanently. The basic parts of an HDD are shown in Figure 1 (left). If you were to look at higher magnification at the surface of the platter of a typical hard disk, you would see images similar to those on the right. The image we see is of magnetic grains, which are responsible for storing information.

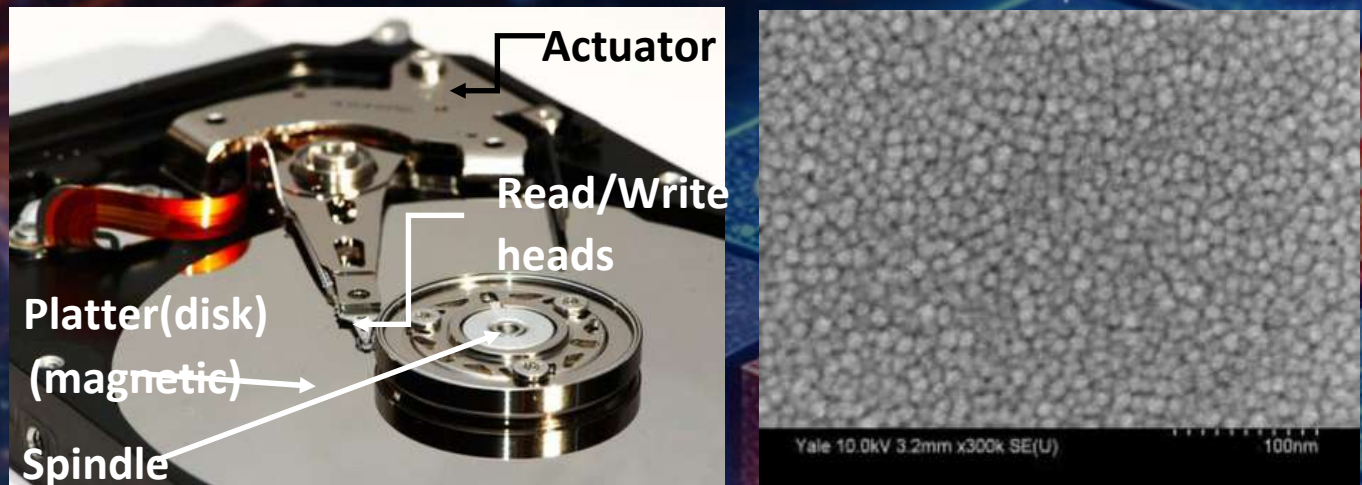


Figure 1. Photo courtesy: [Magnus Hagdorn Flickr \(CC BY-SA 2.0\)](#) (left) [Yale Institute for Nanoscience and Quantum Engineering](#) (Right).

Magnetic domains: importance and experimental visualization

Magnetic data storage works based on the **magnetization of magnetic domains**. Let's now delve deeper into the topic and relate its practicality to what you read in Physics. We know magnets aren't attracted to everything; if we put a magnet on a wooden wall, it will fall right down. Generally, magnets are attracted to objects that are made of the metals **iron, nickel, or cobalt**. These materials are called **ferromagnetic materials**. The reason magnets stick to these metals is because of a special characteristic of the atoms inside these metals. In most other materials that are non-magnetic, the **magnetic moments** of the atoms inside are all oriented in random directions that cancel each other out, resulting in no net magnetization. Magnetic domains are small regions within **ferromagnetic materials** where the magnetic moments of atoms are aligned in the same direction. They form spontaneously to minimize the total energy of the system, and their behaviour under external magnetic fields and temperature changes determines the macroscopic magnetic behaviour of a material. There can be numerous domains within an object. From hard drives, sensors, to emerging spintronic devices, controlling domain behaviour lies at the heart of magnetic technology.

The process of magnetizing a material using an external magnetic field is called **magnetic induction**. Once a magnet has been induced, it produces its own magnetic field as long as its domains are aligned. Once we have induced a magnet, we can observe an interesting effect when the external magnetic field is removed. Depending on the material, the domains will stay lined up together in the same direction even after the external field is gone. The domains do not instantly return to normal. This tendency to stay aligned is called **hysteresis**, which we read in our Physics courses. Hysteresis is what allows us to make **permanent magnets**.

Magnetic storage in hard drives stores binary data (1s and 0s) by altering the magnetization of these tiny regions (domains) on spinning platters coated with magnetic material. A read/write head, controlled by an actuator, 'flips these regions' polarity to write data and detects the changes to read it. Modern hard drives contain **trillions of magnetic domains**, allowing storage capacities of terabytes at relatively low cost. Though slower than SSDs, magnetic drives remain crucial for archiving large datasets in both consumer and enterprise applications, leveraging reliable magnetic recording principles. Another important term that plays a key role in material designing is the **"domain walls"**. **Domain Walls and Advanced Magnetic Materials:** Domain walls are the boundaries where magnetization rotates from one domain orientation to another. Magnetic domain walls are controlled by manipulating their motion and position using external magnetic fields, spin-polarized electric currents (spin-transfer torque), and electric fields in multiferroic materials to tune energy barriers. Research on domain walls and their manipulation using different techniques is a hot topic of research in national and international laboratories focussing on advanced designing of materials in materials science and engineering.

Experimental Observation of Magnetic Domains

Magnetic domains can be experimentally detected by several techniques, such as Magneto Optical Kerr effect (MOKE), Magnetic Force Microscopy (MFM), Lorentz Transmission Electron Microscope (LTEM), etc.

Figure 2 shows magnetic domain patterns observed using (a) Magneto-Optical Kerr Effect (MOKE) microscopy and (b) Magnetic Force Microscopy (MFM). These techniques enable visualization of domain structures and domain wall motion in ferromagnetic materials. Researchers can determine important parameters such as magnetic exchange interactions, anisotropy, and magnetization dynamics relevant to magnetic data storage technologies.

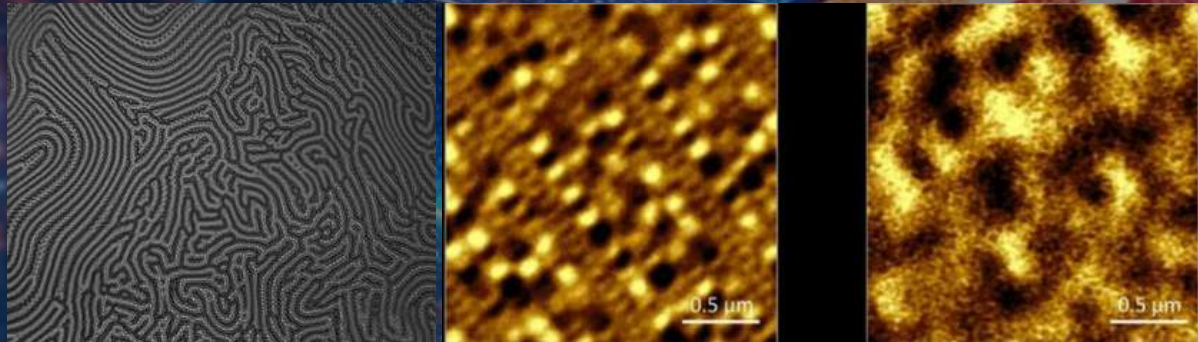


Figure 2. Photo courtesy: [MOKE imaging on \$\text{Fe}_3\text{GeTe}_2\$ single crystal taken at RIEC, Tohoku University. We observe a stripe-like magnetic domain pattern with alternating contrast \(black and white\), signifying parallel and antiparallel spin orientations, *Scientific Reports* 11, 14121 \(2021\).](#) (Left)

MFM image of magnetic material in HDD, Beilstein J. Nanotechnol. 8, 28 (2017). (Right)

This highlights that the concepts of magnetism and magnetic domains, often introduced in basic Physics courses, are not merely theoretical ideas but form the foundation of modern technological applications. Understanding domain behavior is essential for designing advanced magnetic materials and for developing magnetic memory and data storage technologies. Consequently, these principles play a crucial role across fundamental physics, materials science, and engineering, driving innovations in modern information storage systems.

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শক্তির উৎস ও তার বিভিন্ন ব্যবহার

~ বিপ্লব ব্যানার্জী

বর্তমান যন্ত্রদানবের যুগে শক্তির চাহিদা এমনভাবে বেড়ে গেছে যে আমরা প্রতিনিয়ত কাজ করে যাচ্ছি স্বল্প খরচ ভিত্তিক সহজসাধ্য উৎসের সন্ধানে। এখন দেখা যাক মোটামুটি কি কি ধরনের শক্তির উৎস আছে এবং কিভাবে তার ব্যবহার করি। দু-একটি ছাড়া বেশীর ভাগ ক্ষেত্রেই তড়িচ্চুম্বকীয় আবেশে বিদ্যুৎ শক্তি তৈরি করা হয়। আর আমাদের বিভিন্ন ধরনের প্রয়োজন অনুসারে আমরা এই বিদ্যুৎ শক্তিকে কয়েকটি বিশেষ প্রক্রিয়ায় অন্যান্য ব্যবহারিক শক্তিতে রূপান্তরিত করি। পৃথিবীর সৃষ্টিতে যে পরিমাণ শক্তি গচ্ছিত ছিল, এখনও সেই পরিমাণ শক্তিই বর্তমান। শক্তির বিনাশ নেই কেবল পরিবর্তন ঘটে মাত্র। বেশীর ভাগ ক্ষেত্রেই বিদ্যুৎ শক্তিকে কাজে লাগিয়ে আমরা অন্যান্য প্রয়োজনীয় শক্তির তৈরি করে থাকি। আমাদের চাহিদার বেশীর ভাগ বিদ্যুৎ শক্তিই উৎপন্ন হয় কয়লা পুড়িয়ে। এরপরে আছে ডিজেল, পেট্রল, কেরোসিন, ইউরেনিয়াম নামক তেজস্ক্রিয় পদার্থ ইত্যাদি। সব জ্বালানীর ক্ষেত্রেই শেষ পর্যন্ত দেখা যায় একটা অল্টারনেটর এর অক্ষদণ্ড (Shaft) অর্থাৎ আর্মেচার কুণ্ডলীকে ভৌম-কুণ্ডলীর (Field coil) এর মাঝে আবর্তিত হওয়ার সুযোগ দিয়ে বিদ্যুৎশক্তি তৈরি করা হচ্ছে। তাপ-বিদ্যুৎ, নিউক্লীয় বিদ্যুৎ প্রভৃতির ক্ষেত্রে কোন না কোন একটা জ্বালানীকে পুড়িয়ে বিশাল তাপ শক্তি তৈরি করা হয় এবং শেষ ধাপে এই উদ্ভূত তাপ শক্তিকে কাজে লাগিয়ে খুব উচ্চ চাপের জলীয় বাষ্প উৎপাদিত করে সেই চাপকে বিভিন্ন যান্ত্রিক কলাকৌশলের মাধ্যমে অল্টারনেটরতে এর অক্ষদণ্ডকে প্রায় 3000 R.P.M (Revolution Per Minute)-এ ঘোরানো হয় এবং সেই সুবাদে স্থিত-ভৌমকুণ্ডলী (Stator Field Coil) থেকে বিদ্যুৎ শক্তি পাওয়া যায়। এখন তড়িৎ শক্তি উৎপাদনে ইউরেনিয়াম নামক তেজস্ক্রিয় পদার্থ কয়লা অপেক্ষা কেন অনেক গুণ বেশী

কার্যকরী তা আগেভাগে একটু বলে নেওয়া ভাল। সর্বকালের জগৎ বিখ্যাত বিজ্ঞানী আইনস্টাইনের বিখ্যাত সূত্র $E=mc^2$ অনুযায়ী [যেখানে E-শক্তি, m=ভর এবং, C = আলোর গতিবেগ = 3×10^{10} সে.মি/সেকেন্ড] 1 গ্রাম পদার্থকে সম্পূর্ণরূপে শক্তিতে রূপান্তরিত করলে 9×10^{20} ergs পরিমাণ যান্ত্রিক শক্তি পাওয়া যায় যা 21.5×10^{12} ক্যালরি পরিমাণ তাপীয় শক্তি বা 25×10^6 KWH পরিমাণ তড়িৎ শক্তির সমান। এভাবে দেখা যায় যে 1 পাউন্ড ইউরেনিয়ামকে সম্পূর্ণরূপে তাপ শক্তিতে রূপান্তরিত করলে 10×10^{12} ক্যালরি পরিমাণ তাপশক্তি পাওয়া সম্ভব অন্য দিকে 1 পাউন্ড কয়লাকে (যদি ধরে নেওয়া যায় তাতে শতকরা 100 ভাগই কার্বন মৌল আছে।) সম্পূর্ণরূপে তাপশক্তিতে রূপান্তরিত করলে তা থেকে 4×10^6 ক্যালরি পরিমাণ তাপশক্তি পাওয়া সম্ভব হবে। কাজে কাজেই শক্তি উৎপাদক হিসাবে ইউরেনিয়াম নামক তেজস্ক্রিয় পদার্থ কয়লা অপেক্ষা 25 লক্ষ গুণ বেশী কার্যকরী। নিউক্লীয় বিদ্যুৎশক্তিস্তর ক্ষেত্রে এই তাপ শক্তি পাওয়া যায় অত্যন্ত উৎকৃষ্ট শ্রেণীর ইউরেনিয়াম নামক তেজস্ক্রিয় মৌলের কেন্দ্রের অবিরত স্বতঃস্ফূর্ত বিভাজনকে স্থায়ীভাবে সুনিয়ন্ত্রিত করে। এরপর এই বিশাল মাপের তাপশক্তিকে কাজে লাগিয়ে ধাপে ধাপে উচ্চচাপের জলীয় বাষ্প তৈরি করা হয় যা অল্টারনেটর অক্ষদণ্ডকে ঘূর্ণায়মান করে বিদ্যুৎশক্তি তৈরি করতে সাহায্য করে। কিন্তু নিউক্লীয় বিদ্যুতের ক্ষেত্রে আরও একটি বস্তুর খুব প্রয়োজন যার নাম হল ডয়টেরিয়াম অক্সাইড (D_2O) বা ভারী জল যা পরমাণুর কেন্দ্রীয় বিভাজন ঘটান সময় উদ্ভূত বিশাল পরিমাণ তাপকে প্রশমিত হতে সাহায্য করে অর্থাৎ এককথায় যা পরমাণু চুল্লী প্রকল্পে মডারেটর হিসাবে কাজ করে। উপরোক্ত দুটো ক্ষেত্রেই কয়লা বা তেজস্ক্রিয় পদার্থ থেকে তাপ শক্তি, তাপ শক্তি থেকে যান্ত্রিক শক্তি এবং শেষ

ধাপে এই যান্ত্রিক শক্তি বিদ্যুৎ শক্তিতে রূপান্তরিত হচ্ছে। কিন্তু নিউক্লীয় বিদ্যুৎ প্রকল্পে দুটো বড় সমস্যা হল তেজস্ক্রিয় পদার্থের বিকিরণজনিত সমস্যা এবং বিক্রিয়া শেষে তেজস্ক্রিয় ভস্ম ফেলে দেওয়ার সঠিক স্থান নির্ণয় করা। বহু দেশে খুব পুরু দেওয়ালগুলো কংক্রিটের বড় বড় কুঠরীর মধ্যে তেজস্ক্রিয় পদার্থ ভরে সমুদ্রের বহুনিচে ঐ কুঠরীগুলো দীর্ঘদিন ধরে নিমজ্জিত অবস্থায় রেখে দেওয়া হয় এবং বিকিরণজনিত সমস্যার হাত থেকে বহুলাংশে রেহাই পাওয়া যায়। জলবিদ্যুৎ প্রকল্পে বিশাল জলাধারের জলকে যান্ত্রিক কলাকৌশলের মাধ্যমে উচ্চ প্রবাহে পরিণত করা হয় এবং তা বড় বড় ড্রাম বা Fin type Cut Pot-এ ফেলা হয়। এই ড্রাম বা Pot অল্টারনেটের অক্ষদণ্ডের সাথে সংযুক্ত থাকে এবং অক্ষদণ্ড ঘূর্ণীয়মান হয়ে বিদ্যুৎ শক্তি উৎপন্ন করে। সারাবছর এই জলাধারে একটি নির্দিষ্ট পরিমাপের জল ধরে রাখাটাই জলবিদ্যুৎ প্রকল্পের প্রধান কাজ। অনেক দেশেই সমুদ্রের ঢেউকে কাজে লাগিয়ে যথেষ্ট পরিমাণ বিদ্যুৎ শক্তি তৈরি করা সম্ভবপর কিনা তা নিয়ে এখন থেকেই অনেক রকম চিন্তা ভাবনা করছে। অস্ট্রেলিয়া মহাদেশে এমন কতগুলি স্থান আছে যেখানে সারাবছর উচ্চগতির বায়ুপ্রবাহ পাওয়া যায় এবং বায়ুপ্রবাহের এই বিরাট গতিশক্তিকে কাজে লাগিয়ে অল্টারনেটের Rotor-কে ঘূর্ণীয়মান করা হয় এবং বিদ্যুৎ শক্তি তৈরি হয়। মেরু অঞ্চল, গ্রীনল্যান্ড এবং সাইবেরি প্রভৃতি বরফের দেশে বছরের একটি নির্দিষ্ট সময়ে যখন বরফ গলতে শুরু করে তখন বরফ গলার মুহূর্তটিকে (due to Piezoelectric effect) কাজে লাগিয়ে প্রচুর পরিমাণ বিদ্যুৎ শক্তি উৎপাদন করা সম্ভব হচ্ছে। জৈব গ্যাস প্রকল্পে পশু আর মানুষের ত্যাগ করা মল-মূত্র অর্থাৎ Night Soil এবং বিভিন্ন ধরনের পচনশীল আবর্জনার (debris) কিছু অংশকে রাসায়নিক বিক্রিয়ার সাহায্যনিয়ে প্রচুর পরিমাণ জৈবগ্যাসে পরিণত করা ক্রমশই সহজসাধ্য হয়ে উঠছে। প্রায় সব জৈব গ্যাসেই প্রচুর পরিমাণ দাহ্য মিথেন, হাইড্রোজেন ও কার্বন মনোক্সাইড গ্যাস থাকে যা সরাসরি জ্বালানীর কাজে ব্যবহার করে প্রচুর তাপ-শক্তি ও আলোকশক্তি পাওয়া সম্ভবপর হয়। আবার এই তাপ শক্তিকে

অনায়াসেই বিদ্যুৎ শক্তিতে পরিণত করা যায়। অনেক ক্ষেত্রে জৈব গ্যাস প্রকল্পে কুঠুরীর বন্ধ উচ্চ চাপের গ্যাসকে যান্ত্রিক প্রক্রিয়ায় অলটারনেটের অক্ষদণ্ডকে ঘূর্ণীয়মান করে বিদ্যুৎ শক্তিতে রূপান্তরিত করা হয়। বায়ুমণ্ডলের একটি নির্দিষ্ট উচ্চতায় স্বতঃস্ফূর্ত তড়িৎ মোক্ষণ সংঘটিত হয়। অদূর ভবিষ্যতে তা কাজে লাগিয়ে প্রচুর পরিমাণ বিদ্যুৎশক্তি তৈরি করা সম্ভব। আফ্রিকা, অস্ট্রেলিয়া প্রভৃতি যে সব দেশে বহু জলপ্রপাত আছে সেসব দেশে খুব সহজেই বড় বড় জলবিদ্যুৎ প্রকল্প গড়ে ওঠার সম্ভাবনা, কারণ ঐসব জলপ্রপাতে সারাবছরই একটা ভাল মাপের জলের প্রবাহ পাওয়া সম্ভব। MHD বা Magneto Hydro Dynamics প্রক্রিয়ায় একটি উচ্চ শক্তিশালী চুম্বকের দুই মেরুর মাঝে স্থায়ী নিয়ন্ত্রিত জলের প্রবাহ ঘটিয়ে প্রচুর বিদ্যুৎশক্তি তৈরি করা সম্ভব। রাশিয়া এবং আমাদের দেশে এর উপর অনেক গবেষণার কাজ চলছে। মাটির তলায় যে বিশাল তাপশক্তি এবং খুব উচ্চ চাপের গ্যাসের রাজ্য আছে তাকে কাজে লাগিয়ে অদূর ভবিষ্যতে প্রচুর বিদ্যুৎশক্তি তৈরি করা সম্ভব হবে। বর্তমান যন্ত্রবিদ্যার চরম উৎকর্ষতাকে কাজে লাগিয়ে সারা বছরই তাজা থাকে এমন সব আণ্বেয়গিরিকে সুনিয়ন্ত্রিত করে বিদ্যুৎশক্তি তৈরি করা সম্ভব কিনা মানুষ এখন থেকেই তা চিন্তা করছে। পৃথিবীর প্রায় তিনভাগই জল। এই বিশাল জলরাশির 1000 কোটি ভাগের এক ভগ্নাংশকেও আমরা যদি বিশেষ ধরনের রাসায়নিক বিক্রিয়ার সাহায্যে আনতে পারি তাহলে পৃথিবীতে খুব সম্ভাব্য দরের কোটি কোটি মেগাওয়াট বিদ্যুৎ শক্তি তৈরি করা সম্ভব হবে। কয়লা, পেট্রোলিয়ামজাত জ্বালানী ক্রমশই শেষ হয়ে আসছে। আবার তেজস্ক্রিয় পদার্থকে ব্যাপকভাবে ব্যবহার করে প্রচুর পরিমাণ শক্তি পাওয়া সম্ভব হলেও তেজস্ক্রিয় পদার্থের বিকিরণ জনিত পরিবেশ দূষণের যথেষ্ট সম্ভাবনা আছে এবং পরিবেশে Ecological Imbalance ঘটবে অর্থাৎ কিয়দংশ পরিবেশ তার স্বাভাবিক ভারসাম্য হারাবে। কাজেই সেই দিক থেকে সৌর শক্তিকে কাজে লাগিয়ে একরকম নিরাপদে প্রচুর পরিমাণ শক্তি উৎপাদন করা বেশ যুক্তিযুক্ত ব্যাপার। সূর্য হল আমাদের এই ছায়াপথে 1011 সংখ্যক তারার একটি 8,64,000 মাইল ব্যাসের বিশাল তারা যা

পৃথিবী থেকে 9 কোটি 30 লক্ষ মাইল দূরে অবস্থিত। সূর্যের ভর মোটামুটিভাবে 2×10^{27} টন এবং গড় ঘনত্ব 1.4 গ্রাম প্রতি সি. সি. (i.e. 1.4 gms/C.C.)। সূর্যের পৃষ্ঠদেশের যে অংশ আমাদের দৃশ্যমান তাকে বলা হয় ফটোস্ফিয়ার (Photosphere) এবং তার তাপমাত্রা 6000°C (সেন্টিগ্রেড) আর সূর্যের ভিতরের কেন্দ্রদেশের তাপমাত্রা 1 কোটি 30 লক্ষ ডিগ্রী সেন্টিগ্রেড। অনেক বিজ্ঞানীর মতে সূর্যের কেন্দ্রের তাপমাত্রা 2 কোটি ডিগ্রী সেন্টিগ্রেডের কাছাকাছি। সূর্য গঠিত হয়েছে শতকরা 88 ভাগ হাইড্রোজেন গ্যাস, 9 ভাগ Helium গ্যাস এবং 3 ভাগ অন্যান্য ভারী মৌল দিয়ে। বিখ্যাত জার্মান বিজ্ঞানী বেথের মতে সূর্যের এই বিরাট শক্তির জন্য মূলত দায়ী সূর্যের কেন্দ্রে সংঘটিত অত্যন্ত জটিল ধরণের পর্যায়ক্রমিক তাপ-নিউক্লীয় বিক্রিয়া যার ফলে চারটি হাইড্রোজেন পরমাণু সংযুক্ত হয়ে একটি হিলিয়াম পরমাণু উৎপন্ন হয় আর সেই সঙ্গে অবিষ্টান্ত ভাবে নির্গত হতে থাকে বিপুল পরিমাণ শক্তি। এই বিক্রিয়ার ফলে সূর্য তার পৃষ্ঠদেশ থেকে প্রতি সেকেন্ডে 3.8×10^{32} ergs পরিমাণ শক্তি বিকিরণ করে যা 42 লক্ষ টন ভরের (mass) সমান, অর্থাৎ এককথায় সূর্য প্রতি সেকেন্ডেও 42 লক্ষ টন ভর হারিয়ে ফেলছে। সূর্য এভাবে ভর হারাতে থাকলেও 10 লক্ষ বছরে নিজ ভরের 10 লক্ষ ভাগের মাত্র 10 ভাগ ভর হারাবে। মোট ভরের তুলনায় যা সত্যিই খুবই নগণ্য বলা চলে। কাজেই সূর্য থেকে বিকীর্ণ শক্তির হাজার হাজার কোটি ভাগের এক ভাগকেও যদি আমরা সঠিকভাবে কাজে লাগাতে পারি তবে পৃথিবীর বুকে প্রতি সেকেন্ডে প্রচুর কলকারখানা তৈরি করা সম্ভব হবে। সূর্যরশ্মিকে কাজে লাগিয়ে এক ধরণের তড়িৎ কোষ তৈরি হচ্ছে যার নাম সৌর কোষ। এ হল এক ধরণের বিদ্যুৎ উৎপাদক বস্তু যার উপরি তলে সূর্য রশ্মি পড়লে তা থেকে একমুখী বিদ্যুৎপ্রবাহ তৈরি হয়। অন্যভাবে বলতে পারি সৌর কোষ হল এক ধরণের P-N Junction Diode যা সরাসরি সূর্যরশ্মিকে বিদ্যুৎ শক্তিতে রূপান্তরিত করে। সূর্য থেকে বিকীর্ণ রশ্মি যখন কোন সেমিকন্ডাকটর ক্রিস্টাল দ্বারা শোষিত হয় তখন যে পরমাণু দ্বারা ঐ ক্রিস্টাল তৈরী তার একেবারে বাইরের কক্ষ থেকে কয়েকটি ইলেকট্রন খসে

পড়ে এবং অন্য দিকে বেশ কয়েকটি হোলের সৃষ্টি হয় এবং তৎক্ষণাৎ Diode-এর Junction এ স্থির তড়িৎ ভারসাম্যে বিঘ্ন ঘটে। ফল হল তড়িতের প্রবাহ। এই পদ্ধতিকে কাজে লাগিয়ে Bell Telephone Company Silicon Junction Diode Solar Cell তৈরি করতে সমর্থ হয়। এই Junction Diodeগুলির উপরিতলে সূর্যরশ্মি পড়লে উপরিতলের প্রতি বর্গ সেন্টিমিটারে প্রায় 100 mw বিদ্যুৎ শক্তি উৎপন্ন হয়। এই রকম অনেকগুলি সৌর কোষ পরস্পর Series এবং Parallel Connection করে তৈরি হয় Solar Panel। মানুষের সৃষ্ট কৃত্রিম উপগ্রহ অর্থাৎ স্যাটেলাইটের যাবতীয় ইলেকট্রনিকের যন্ত্রপাতির বিদ্যুৎ এই Solar Panel-ই সরবরাহ করে। স্যাটেলাইটে যে Solar Panel থাকে তা কমপক্ষে 75 watt বিদ্যুৎশক্তি দিতে সক্ষম। এখন পর্যন্ত Solar Panel যথেষ্ট ব্যয়সাধ্য হওয়াতে সাধারণ মানুষ তেমনভাবে এর ব্যবহার করতে পারছে না কারণ সূর্যরশ্মি থেকে সৌরকোষ দিয়ে 1 watt বিদ্যুৎ শক্তি পেতে গেলে সাধারণ বাজার থেকে কিনে আনা Solar Panel এর মূল্য পড়ে আনুমানিক কমপক্ষে 600 টাকা। 6 ভোল্ট দিয়ে একটি সাধারণ Transistor Radio চালাতে গেলে প্রায় 600 mw বিদ্যুৎ শক্তির প্রয়োজন। কাজেই খরচটা সহজেই অনুমেয়। আবার অন্যদিকে রাত্রিবেলা সূর্যের অনুপস্থিতিতে সৌরকোষ এক রকম অচল বলা চলে। সৌরকোষ আলোক রশ্মির সমানুপাতিক। সৌরকোষ ততক্ষণই কার্যকর যতক্ষণ পর্যন্ত সেখানে আলো থাকে তা সূর্য থেকে হোক বা অন্য যে কোন ভাবে হোক। যে কোন ব্যাটারি ছাড়াই অল্প মিলিওয়াট শক্তিসম্পন্ন Transistor Radio চালাবার জন্য প্রয়োজনীয় বিদ্যুৎশক্তি বায়ুমণ্ডলের Electromagnetic wave থেকেও অনায়াসেই পাওয়া সম্ভব যার জন্য প্রয়োজন হয় একটি Tank Circuit Proper Detection and Filtering এবং সবচেয়ে বড় কথা হল এই কুণ্ডলীকে কার্যকরী করতে কোন তড়িৎ কোষ বা ব্যাটারীর প্রয়োজন হয় না। কাজেই যান্ত্রিক শক্তি রাসায়নিক শক্তি, বিদ্যুৎ শক্তি, চৌম্বক শক্তি, আলোক শক্তি এবং সৌর শক্তি ইত্যাদি সব শক্তিই মূলতঃ এক, কেবল চেহারাটা ভিন্ন ভিন্ন। একটা আরেকটার রূপান্তর মাত্র।

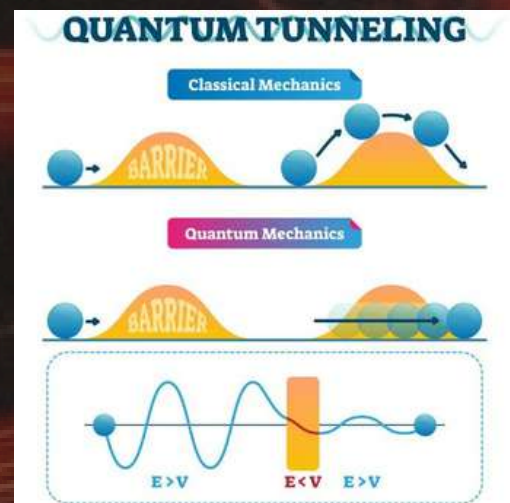
Quantum Tunneling- *Living Fiction in Reality*

If you are a science fiction fan or love exploring fantasy realms attaching scientific logic or tag to it, it may have been an unfulfilled desire for you to pass through concrete objects or barriers as if they stand there helplessly watching us penetrate them. Well, till now, it is actually possible, at least at the Quantum level. In fact, it is the fundamental reason behind the Sun exists as it allows protons to overcome the Coulomb barrier (electric repulsion) to trigger nuclear fusion, even though they don't have enough thermal energy to do it classically, thus the earth exists as it is today and above all, we exist! It makes the things possible that are supposed to be impossible! While Quantum physics with the advancement of technologies leaps in the quantum level observation, it becomes evident that light, being an electromagnetic wave in its own authority, has been exhibiting this weird behavior since the genesis of creation. In 2025, the three scientists John Clarke, Michel H. Devoret and John M. Martinis were conferred with the honorable Nobel Prize for "the discovery of macroscopic quantum mechanical tunneling and energy quantization in an electric circuit" that is directly related to the operation of the superconducting qubits that form superposition states and interact through Josephson junctions that make the faster-than-classical-calculations possible in IBM Quantum Processors. While tunneling was known for subatomic particles, Clarke, Devoret, and Martinis proved it happens in large-scale circuits (Josephson junctions) that contain billions of electrons acting in unison. This is the bridge between the "tiny" world and the "real" world. But what exactly is Quantum Tunneling? Let's take a deep dive into it.

□ **Concept:** According to the Quantum Physicists,

"Quantum tunneling is a quantum mechanical phenomenon where particles overcome potential barriers that, according to classical mechanics, should be insurmountable. This effect is a direct consequence of the principles of quantum mechanics and has profound implications for both theoretical and applied physics."

In layman's word, suppose, you want to pass a ball you have to the other side of the barrier wall you standing right in front of, implying the only condition of the ball making use of kinetic energy E that surpasses the barrier height Potential Energy V ($E > V$) at ease according to the **Law of Conservation of Energy** backed by the classical physics. But **Quantum Tunneling**, a.k.a.



Tunneling Effect: Classical Mechanics vs Quantum Mechanics

Tunneling Effect enables us to fuse the ball through the barrier itself at the subatomic and atomic level despite the kinetic energy E being less than the barrier potential energy V itself ($E < V$)

- ❑ **Violating the Classical Mechanics:** Microscopic particles, i.e., protons or electrons exhibit the property of wave-particle duality. Consider a particle with energy E confined in a box with height V . Following the laws of Classical Mechanics, the particles have no escape from the box due to the kinetic energy of these particles falling short to cross the barrier height of the box. But when the thickness of the barrier is thin enough, the **Tunneling Effect** comes in play when the particles have some probability of penetrating through the barrier without sufficient energy to appear on the other side of the box.
- ❑ **Mathematical Realization:** Why does the particle's wave-like identity propose it to behave like so? Well, at quantum level, when such particles reach a barrier that they can't overcome, their wave function changes from sinusoidal to exponentially diminishing in form. The solution for the Schrödinger equation in such a medium is :

$$\psi = N e^{-\beta x}$$

Where, N is the Normalization constant and $\beta = \frac{\sqrt{2m(V-E)}}{\hbar}$

For a quantum particle to appreciably tunnel through a barrier three conditions must be met :

- I. The height of the barrier must be **finite** and the thickness of the barrier should be **thin**.
 - II. The potential energy of the barrier exceeds the kinetic energy of the particle ($E < V$).
 - III. The particle has wave properties because the wavefunction is able to penetrate through the barrier. This suggests that quantum tunneling only applies to microscopic objects such as, protons or electrons but not for macroscopic objects.
- ✓ *When these conditions are met, there should be some probability of finding the particles on the other side of the barrier. Beginning as a sinusoidal wave, a particle begins tunneling through the barrier and goes into exponential decay until it exits the barrier and gets transmitted out to the other side as a final sinusoidal wave with a smaller amplitude. The act of tunneling decreases the wave amplitude due to the reflection of the incident wave when it comes into the contact with the barrier but does not affect the wave equation.*
- ❑ The probability, P , of a particle tunneling through the potential barrier is derived from the Schrödinger Equation and is described as ,

$$P = \exp\left(\frac{-4a\pi\sqrt{2m(V-E)}}{\hbar}\right), \text{ where } E < V$$

Where ,

- V is the potential barrier,

- E is the kinetic energy possessed by the particle, and a
- is the thickness of the barrier,
- m is the mass of the particle
- h is Planck's Constant = $6.6260 \times 10^{-34} \text{ m}^2 \text{ kg/s}$

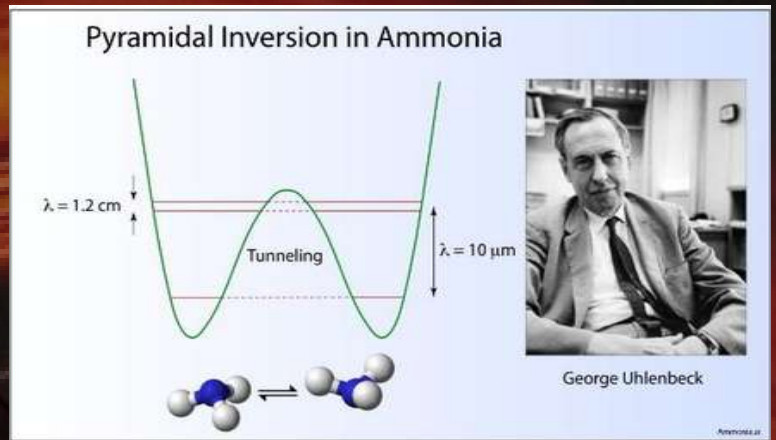
Thus, when an object's mass increases, the probability of an object tunnelling through a barrier decreases, specially when the gap between object's energy and the barrier energy increases. Following the equation, the probability of tunnelling decreases exponentially with the square root of the particle mass and the thickness of the barrier.

❑ **A few prominent Quantum Tunneling discourses :** In 1932, George Uhlenbeck observed atom

tunnelling in NH_3 or Ammonia molecule. The molecule has a pyramidal structure with the Nitrogen hovering over the plane defined by three Hydrogen atoms.

But an equivalent configuration has been observed where the Nitrogen atom was hanging below the hydrogen plane, marking the evidence of Nitrogen tunnelling through the hydrogen plane to move to other side of the barrier. The lightweight hydrogen atoms make very small barrier of infrared energies to pass the Nitrogen atom.

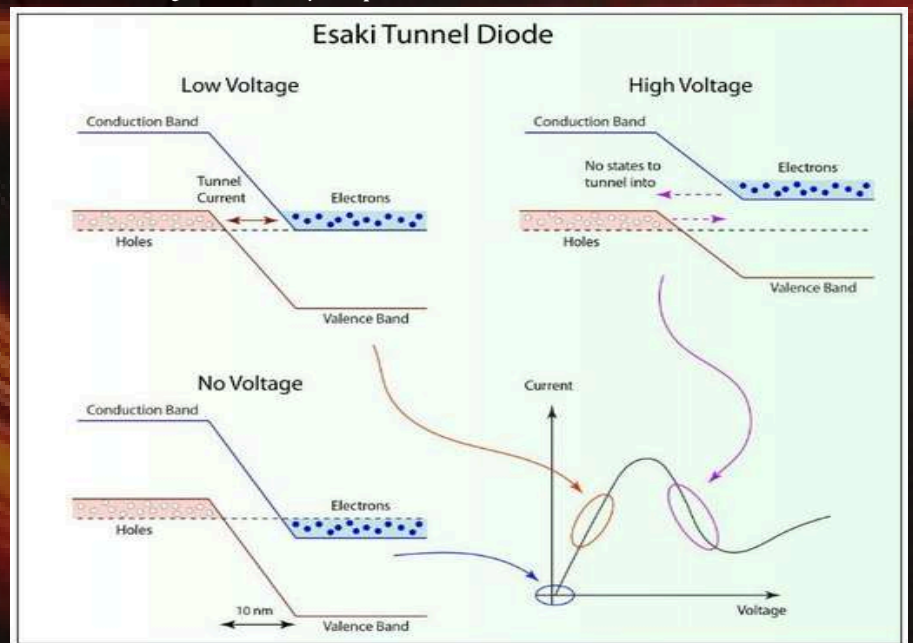
When the ammonia is excited into its first vibrational excited state, the molecular wavefunction travels through barrier splitting the excited level by 1.2 cm wavelength microwave signal.



Pyramidal Inversion in Ammonia

In 1957, Leo Esaki observed electrons tunnelling in heavily doped Germanium and Silicon semiconductors. While

working with heavily doped p-n junction diodes, he discovered a phenomenon known as negative differential resistance where the current through an electronic device decreases with increase in voltage. The junction thickness being about 10 nm, he concluded that the electron current was tunnelling quantum mechanically through the junction. Esaki tunnel diodes being the fastest semiconductors of that time, the negative differential resistance produced high frequency oscillations, hence were used in early communication satellites.



Esaki Tunnel Diode

❑ Frustrated Total Internal Reflection (FTIR) – A visual analogous story to Quantum Tunneling mechanics

- **Concept:** When light is incident on the interface of two medias, it is partly transmitted into the second medium and partly reflected back into the first. If the index of the refraction of medium 1 (n_1) is greater than the index of refraction of medium 2 (n_2) and the angle of incidence exceeds the critical angle [$\phi_c =$

$$\sin^{-1}\left(\frac{n_2}{n_1}\right)], \text{ total internal reflection occurs. The}$$

incident light is completely reflected back to medium 1. Surprisingly, evanescent wave or the disturbance wave penetrates into the second medium when the total reflection occurs.

- **Mathematical Realization:** The way a plane electromagnetic wave (i.e, laser ray) propagates through a thin homogeneous film surrounded by two semi- infinite dielectric media of different refractive indices has been explained by Fresnel relations long ago. They determine how much light would be reflected as well as transmitted , for example,

$$\text{Reflection Coefficient} = r = \frac{(n_1 \cos \phi_1 - n_2 \cos \phi_2)}{(n_1 \cos \phi_1 + n_2 \cos \phi_2)}$$

$$\text{Transmission Coefficient} = t = \frac{2n_1 \cos \phi_1}{n_1 \cos \phi_1 + n_2 \cos \phi_2}$$

Where $n_1 > n_2$ [n_1 = refractive index of medium 1, n_2 = refractive index of medium 2] When

the TIR(Total Internal Reflection) happens, though 100% light gets reflected , light

acrossthe boundary doesn't vanish out completely, a weak wave is formed called Evanescent wave. Whenwe bring another medium , i.e, glass close to the boundary, the evanescent wave energy gets

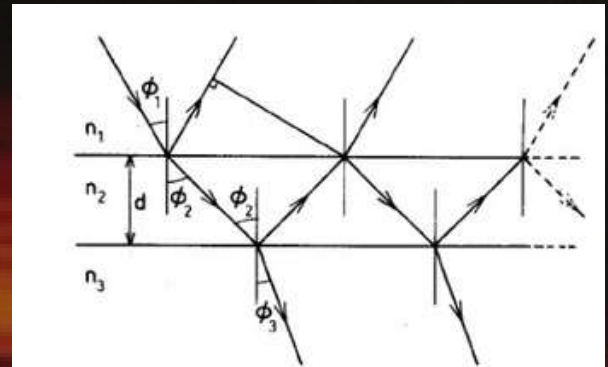
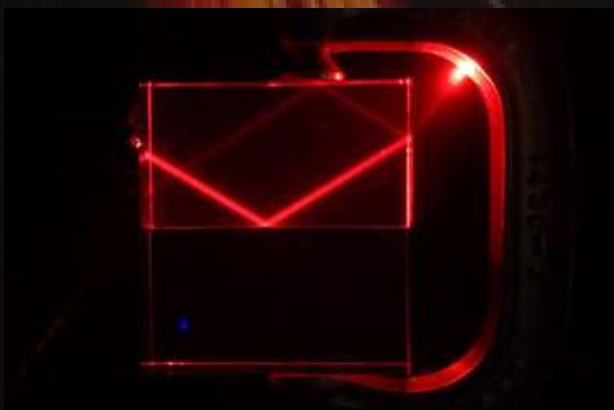


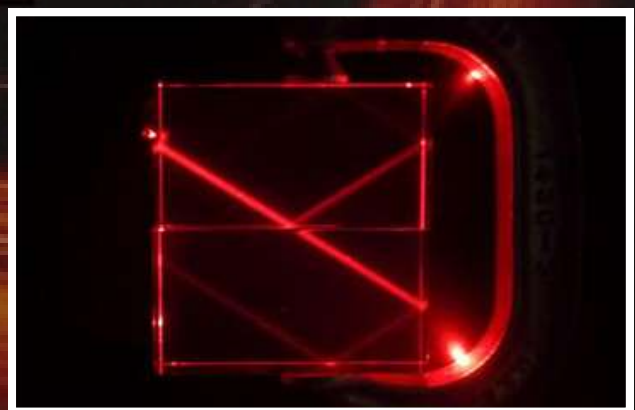
Fig. 1. Reflection and transmission at a thin, homogeneous film.

© 1986 American Association of Physics Teachers

Image Credit: Research Gate



Two refraction blocks are mounted in a vise. The laser is aimed for the light to be totally internally reflected to the first block.



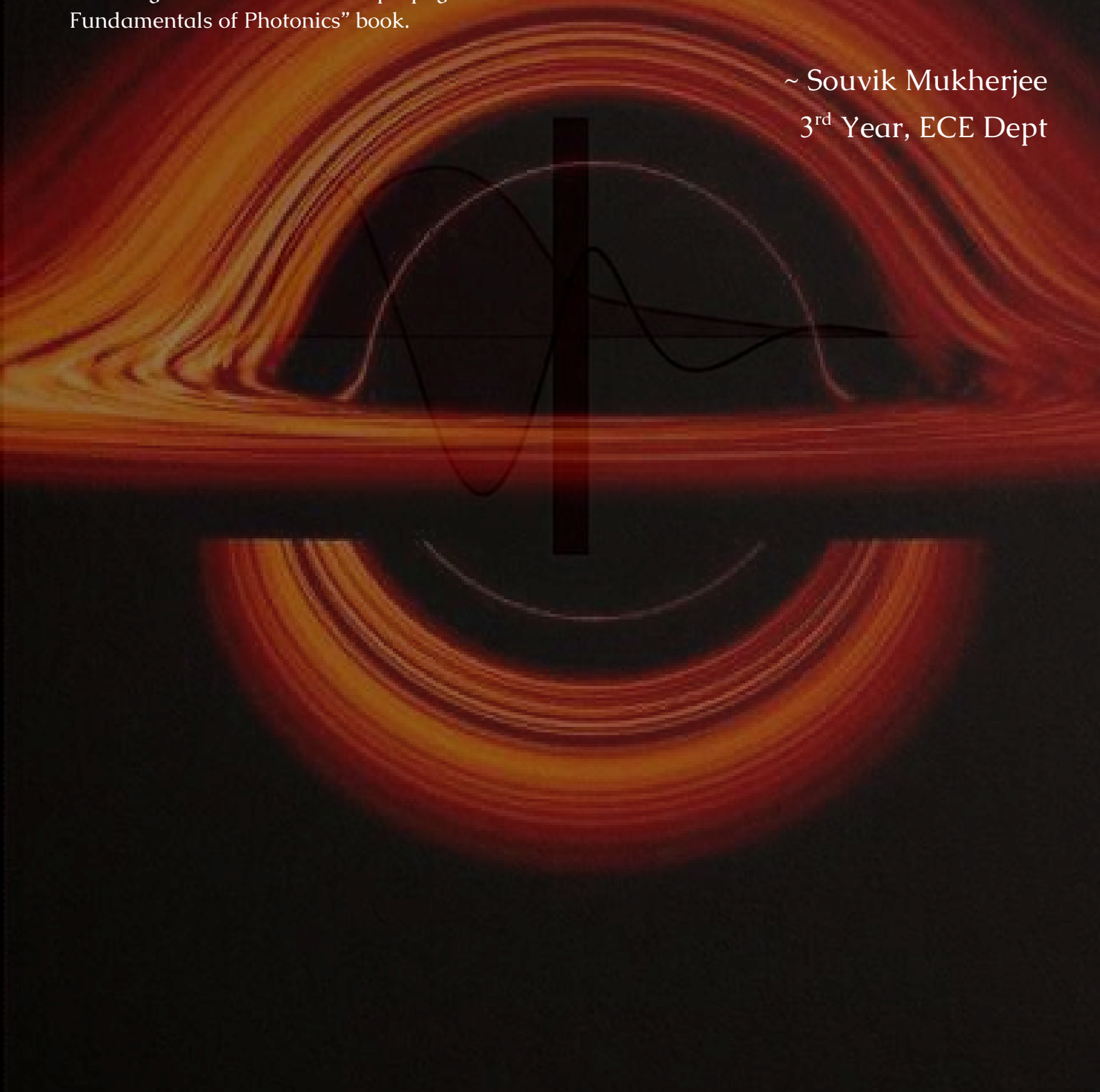
The vise is tightened to reduce the gap between the blocks until a transmitted beam (evanescent wave) from the laser can be seen passing through the second block demonstrating Frustrated Total Internal Reflection

transferred , causing the FTIR(Frustrated Total Internal Reflection) being optically analogous to the Quantum Tunnelling . To quote from the classic book on Optics, “The Fundamentals of Photonics”, it says –

“Evanescent fields, such as those produced at a surface where total internal reflection occurs, also exhibit such confinement. Evanescent fields are present in the immediate vicinity of sub wave length size apertures, such as the open tip of a tapered optical fiber. Their use allows imaging with resolution beyond the diffraction limit and forms the basis of near-field optics.”

Evanescent waves are neither forward nor backward propagating; rather, they propagate in the transverse plane where they are generated. Interestingly, numerous optical experiments have been operated using the Negative Index Metamaterial (NIM) slabs exhibiting a negative Refractive Index involving the evanescent wave propagation observation that are documented in the classic “The Fundamentals of Photonics” book.

~ Souvik Mukherjee
3rd Year, ECE Dept



The Eye Beyond The Tear

There is something deeply unsettling—and equally fascinating—about an eye staring through a tear in a surface. It feels as though we are being watched from the other side of reality, as if a hidden world is peeking through a fragile boundary. This image captures more than just a human eye; it captures curiosity, mystery, and the idea of perception itself.

The torn surface acts like a barrier between two dimensions. On one side, there is the ordinary world—textured, muted, almost lifeless. On the other side, there is life, awareness, and emotion, represented by the vivid detail of the eye. The contrast suggests that what we see on the surface is not always the full truth. There may be depth, secrets, or even entirely different realities hidden just beneath.

The eye itself is striking. Its sharp focus and intricate patterns draw attention immediately, symbolizing awareness and observation. Eyes are often called the “windows to the soul,” and here, that idea feels even more literal. The eye isn’t just looking—it’s searching, questioning, and perhaps even judging. It creates a sense of connection between the viewer and the unseen observer behind the tear.

This image can also represent human curiosity. Just as the tear reveals a glimpse of what lies beyond, people are always trying to break through limitations—seeking knowledge, truth, or understanding. It reflects the desire to look beyond appearances and uncover what is hidden.

At the same time, there is a hint of vulnerability. The torn opening suggests something fragile, as if the boundary could break further at any moment. It reminds us that perception is delicate—what we believe to be solid and real can easily be disrupted.

~ Sudeshna Halder
3rd Year, CSE Dept.

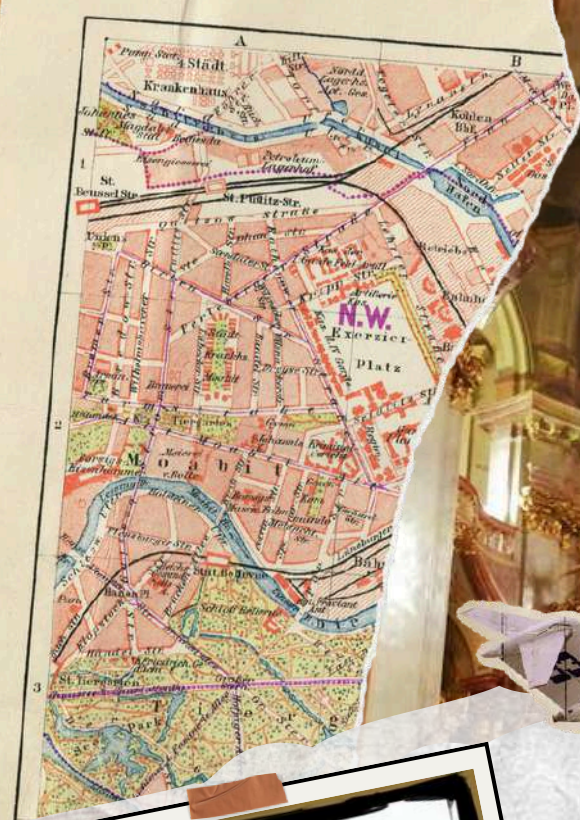
The Power of Youth in Shaping the Future)

Youth is the most powerful and dynamic section of any nation. It represents energy, creativity, and the ability to bring change. In today's fast-changing world, the role of youth has become more important than ever before. With the right mindset and determination, young people can shape not only their own future but also the future of society. As a student of Electrical Engineering, I strongly believe that technology plays a key role in shaping modern society. From electricity generation to smart systems, innovation in this field is transforming the way we live. Today's youth, especially engineering students, have the opportunity to develop sustainable and efficient solutions for real-world problems such as energy conservation, renewable energy, and smart infrastructure. One of the biggest strengths of youth is adaptability. Growing up in a digital era, we are quick to learn new technologies and ideas. This ability helps us stay ahead and contribute to innovation. However, along with knowledge, responsibility is equally important. We must use our skills not only for personal success but also for the betterment of society. Education is not just about textbooks and exams; it is about developing character, discipline, and critical thinking. A responsible and aware student can make meaningful contributions to society. Along with academics, maintaining mental and physical health is also essential. A balanced lifestyle helps in achieving long-term success. In conclusion, youth is the backbone of any nation. With dedication, hard work, and the right direction, we can build a brighter and more sustainable future. It is our responsibility to use our knowledge and energy wisely to bring positive change in the world.

Radiation Constrained Body Implantable System for Sustained Remote Health Monitoring – An Overview

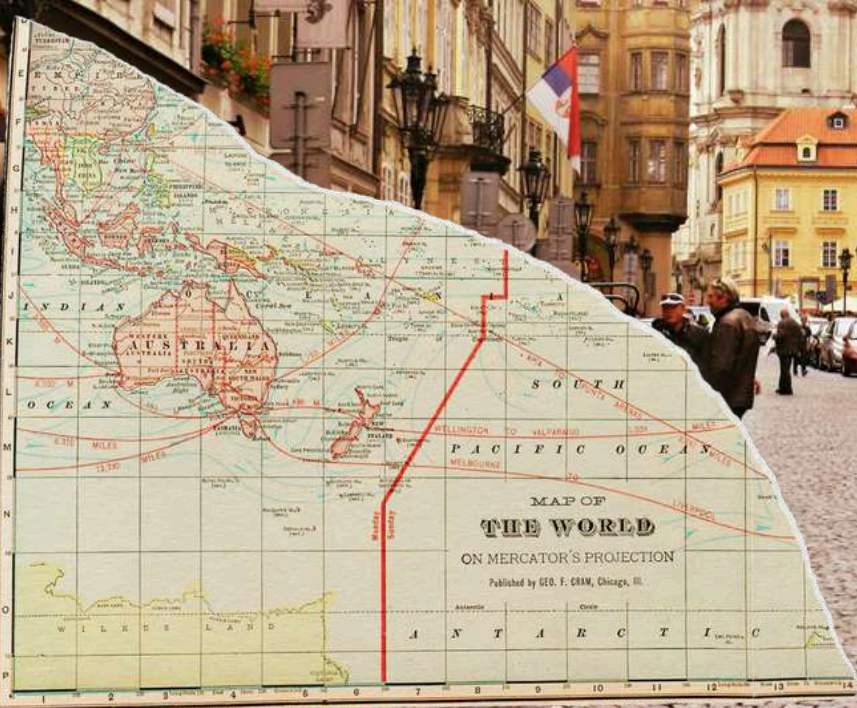
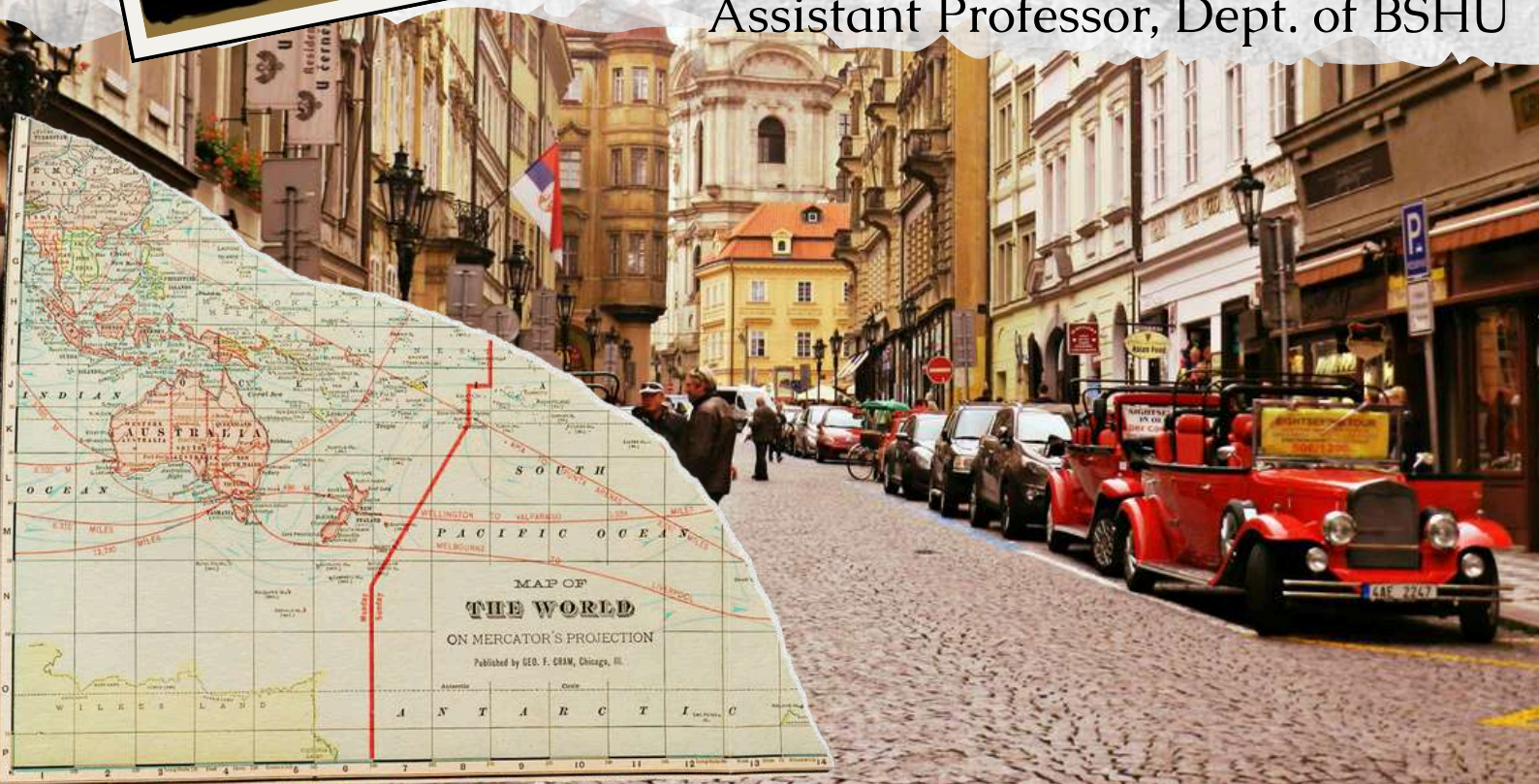
The convergence of miniaturized electronics, advances in biocompatible materials, and the implementation of low-power wireless protocols has brought in a new era of continuous, remote patient monitoring. At the centre of this transformation sits the implantable medical device — no longer a simple passive object, but an intelligent, energy-aware node in a distributed health network. The primal engineering challenge is no longer merely what to sense, but how to sense it sustainably with minimal radiation exposure, near-zero external power dependence, and data pipelines robust enough to support real clinical diagnosis vis-a-vis the decision-making. This article insights the architecture, energy strategies, communications design, and regulatory landscape of modern low-radiation body implants used in remote health monitoring.

~ Rahul Kumar Sah
2nd Year, ECE Dept.



New girl in the old city!!

A Travel Blog By
Rajeswari Roy Chowdhury
Assistant Professor, Dept. of BSHU



A travel memoir as a solo traveler.

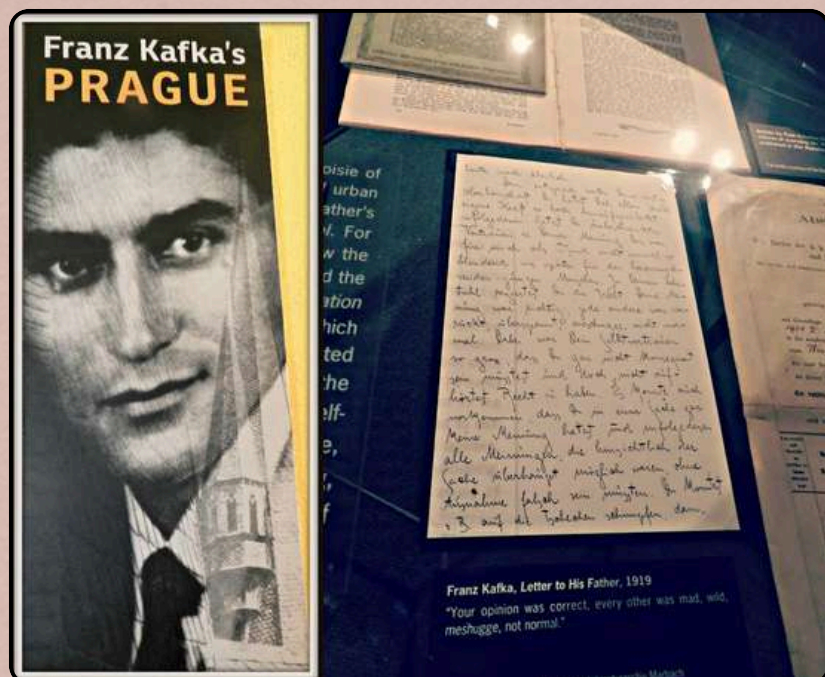
When I landed in this city alone during my PhD days, I was an absolute novice, with a little fear in my heart about how this place would welcome me. But within just a week, this place embraced me with such warmth, turning the journey into one of the most unforgettable experiences of my life, transforming me as a person.

Prague!! Known as the City of a Hundred Spires, Prague rises like a page from a medieval manuscript with its glorious historic past and enchanting aura. I had some sleepless nights and foodless noons; the wanderlust inside me drove me crazy.



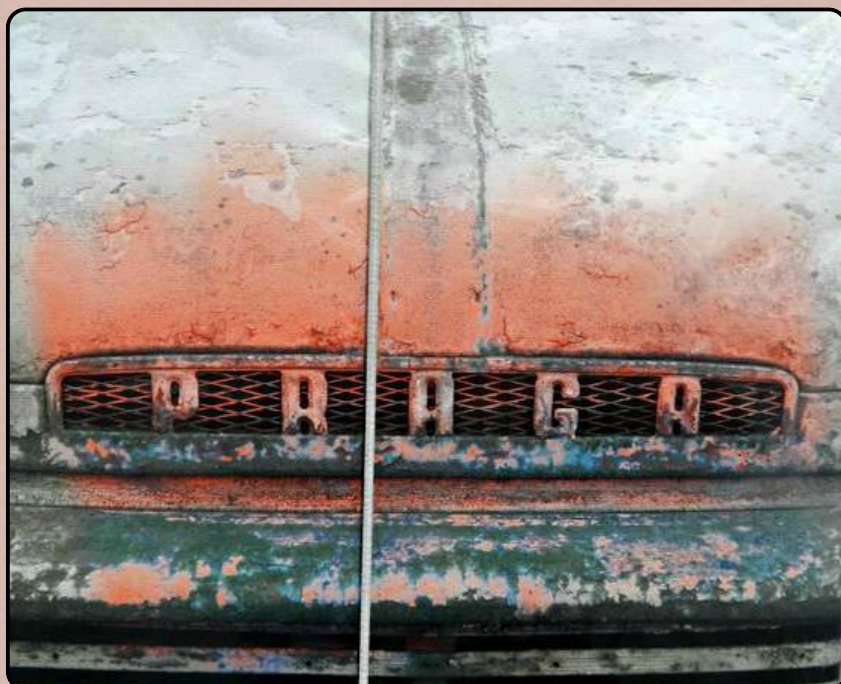
It felt quite surreal that I had walked for more than sixty hours in just one week, wandering endlessly through its historic, hard-cobbled lanes. I could smell every bit of its history. I was struck by Prague's dramatic skyline, its baroque spires piercing the night sky. And when I passed through the Gothic towers of the ancient city gate, I felt as though I had entered another world. It is an amalgamation of different historic periods. As I moved through New Town Square and entered Old Town Square to witness the unique medieval Astronomical Clock—an attraction for people from all around the world—I felt time itself slow down. What is mesmerizing about Prague is its effortless meshing of cultures; Gothic, Bohemian, German, Habsburg, and Communist vestiges exist side by side, leaving the traveler with a constant sense of intrigue at every street corner.

Visited all those places, heard and unheard, visited almost every corner of the city on foot. Praha still stands among all the glorious moments it has celebrated and all the tragedies it has endured. The Franz Kafka Museum provided me with a glimpse of his original manuscripts. The museum is also a beacon of the city's history, for in many ways the story of the German-Jewish-Czech Kafka is also the story of Prague itself – a city of struggling identities and artistic vision, constantly caught between empires. I walked through the golden lanes of the castle, paused at the John Lennon Wall layered in messages of despair and hope, and traced the quiet, flowing Vltava river, wandered through the tragic lanes of the Jewish town and the synagogues which still carry



spine-chilling signs of the holocaust, and into the bustling New Town buzzing with tourists. It is a city with a rich historical past and a bubbly, chirpy vibrance. step, I felt less like an outsider and more like a participant in Prague's ongoing story, As a traveler, I learned that travel is not merely about visiting landmarks; it's about absorbing the culture, the people, and the food.

Prague is famous for its street music. The melancholy in the tunes of musicians – from the land of operas, theatres, and of course, Mozart – playing on the roads and bridges will always draw me back to the city, like the Pied Piper of Hamelin. This city gave me a “dream come true” opportunity to watch a live ballet at the Estates Theatre. As a lover of dance, it was indeed a dream that everybody would cherish.



The stroll across the Charles Bridge on a rainy night, listening to the musicians pouring their treasures, and the view of the golden castle – these memories remain vivid. All the tourists gathered in the Old Town Square, enjoying together Mozart's symphonies played by a young musician shivering in the heavy downpour—all these little glimpses will remain in my heart forever. I always knew there was a traveler inside me since childhood, but this place ignited a deeper passion for exploring the world.



It was just the beginning! I loved, laughed, and lived every moment in this city. It was a brief stay, yet deeply satisfying.

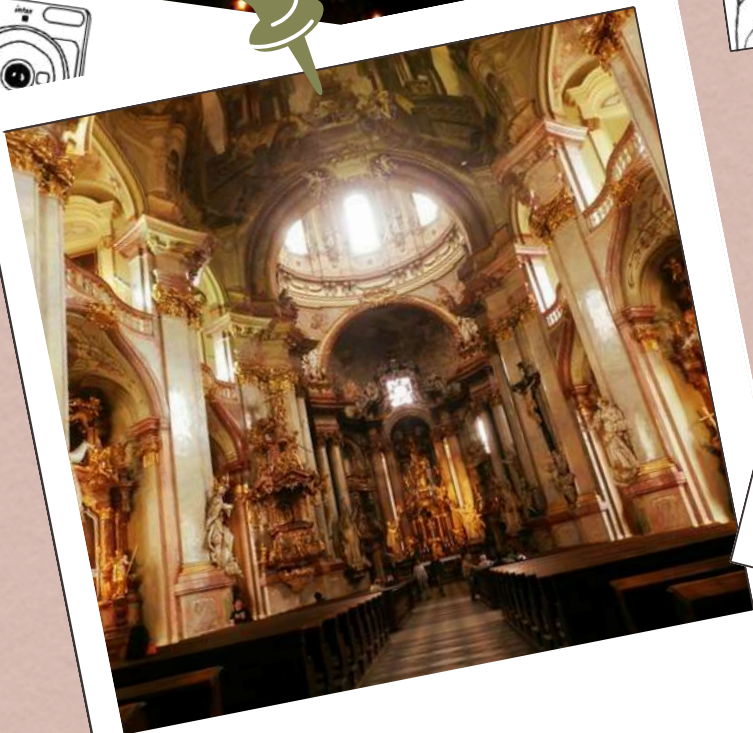
Amid the glitz of Western commerce and dreary shards of Communism, Prague remains a fairytale city, a cultural cuvée of almost endless variety that can surely catch any visitor by surprise, or invite them to delve deeper into already cherished discoveries.

Bidding adieu to the land of Bohemia was hard, but I knew that my departure from Prague was never final. The city has a way of calling you back—through memory, through music, through the echo of footsteps on ancient stone.

Musicians pouring their treasures, and the view of the golden castle – these memories remain vivid. All the tourists gathered in the Old Town Square, enjoying together Mozart's symphonies played by a young musician shivering in the heavy downpour—all these little glimpses will remain in my heart forever.

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POETRY



Walter Scott & Co. Ltd.
London, 1900.



A SELFISH DREAM

A Beautiful girl standing on the roof in the open sky.
The open sky are very glittering,
Moon and stars give heaven light.
The girl try to hug the little stars
She prayers to God, "I do it my lard.
They are talking with my parents"
She gazed and gazed in the open sky.
And to find her parents.
Suddenly broke her dream.
She has gone to the roof and saw the open sky.
There is no heaven light.

*~Abdul Majid Shaikh
Assisstant Professor
CSE Department*



THE CONSISTENT

The transient hour remains silent.
An idol of metal has rampaged,
by Gong...
Some silver silhouette wrinkles...
The howling wings bears the
woolf hair.

From north to south and to north,
the hour and minute hand
has encompassed the course.
Only tick tick...
and the smell of copper.

Under the mask appears some unnamed
long-haired..
Their hands were empty with harshness of
brutalic metal.
Their tampon reflection flashes the teeth of
metal.

The sequences are worn in the
swirling flow...
like a vast garland of numberless numbed
heads.
from the numbed harshness the spark
generates the premordial figure,
uncircled by the boundation of time. The
grassroute figures skeleton
and the earth binds the fleshs.
The poles balances the limbs like the
Albion man.
The mind winds the strangeness of violin. The
spark ups and ups
ups and ups until it becomes the huge
fire. The mass of a long hair,
ossed by its sacred wiredness
to circuit the rotation.

~ Tanmay Mahato
Assistant Professor
BSHU Department

“আসল রূপ”

এই সময়টা কেমন যেন অদ্ভুদ
মানুষের কাছে থেকে ও থাকে বহুদূরে ,
হাতে হাতে ফোনের আলো জ্বলে
কিন্তু মনগুলো অন্ধকারে ডুবে চলে...॥

হাসির ছবি ভাসে পর্দার ছবিতে
ভেতরের কান্না থাকে গোপন করতে,
সত্য আজকাল মুখ ঢাকে ভয়ে
মিথ্যে বড় সাহসী সবার সামনে...॥

বন্ধুত্ব এখন লাইক কमेंটে বাঁধা
ভালোবাসা যেন মিথ্যে শর্তে বাঁধা,
মানুষ মানুষ কে চেনে আর
আর স্বার্থের চশমায় দেখে সংসার...॥

তবুও কোথাও আছে আলোর জ্বালা
কেউ চুপি চুপি বদলায় সময়ের পালা,
যদি আমরা হই একটু মানবিক
তবেই বদলাবে সমাজের দিক...॥

এই সময়ে আয়নায় দেখো নিজেকে
প্রশ্ন করো - "আমি কেমন মানুষ এখন",
কারণ পরিবর্তন শুরু হয়
নিজের ভেতর থেকে চির গোপন...॥

~Sougata Jana
2nd Year, ME Dept.

Dream

*I carry dreams in quiet eyes,
Not loud, but deep like endless skies.
Of roads unknown, of distant lands.*

*I dream of mountains, tall and wise,
Touching secrets in the skies,
Where every wandering heart belongs.*

*For journeys teach what books may miss,
They shape the soul, they clear the view,
And show the world in shades so true.*

*But dreams are not just meant to stay,
They ask for courage, bold and free,
To become the person you're meant to be.*

Ankita Karmakar
3rd Year, CSE Dept.



Zindagi

Kya hai woh cheez,
Jiska naam hai zindagi?
Satya ko dikhane wali,
Wahi hai zindagi.

Khoya hua waqt kabhi wapas nahi aata,
Dekh chuke hain har koi apna nahi hota.
Phir bhi sapna dekha toh pal mein kho gaya,
Shayad mujhme hi koi kami reh gaya.
Chaand ko bula kar sab kuch bol diye,
Woh bhi sunkar mujhpe hi hans diye.
Tabhi kismat ne samjha diya wahi,
Usi ka naam hai zindagi.

~ Sumana Manna
2nd year, CSE

"স্মৃতির ক্লাসরুম"

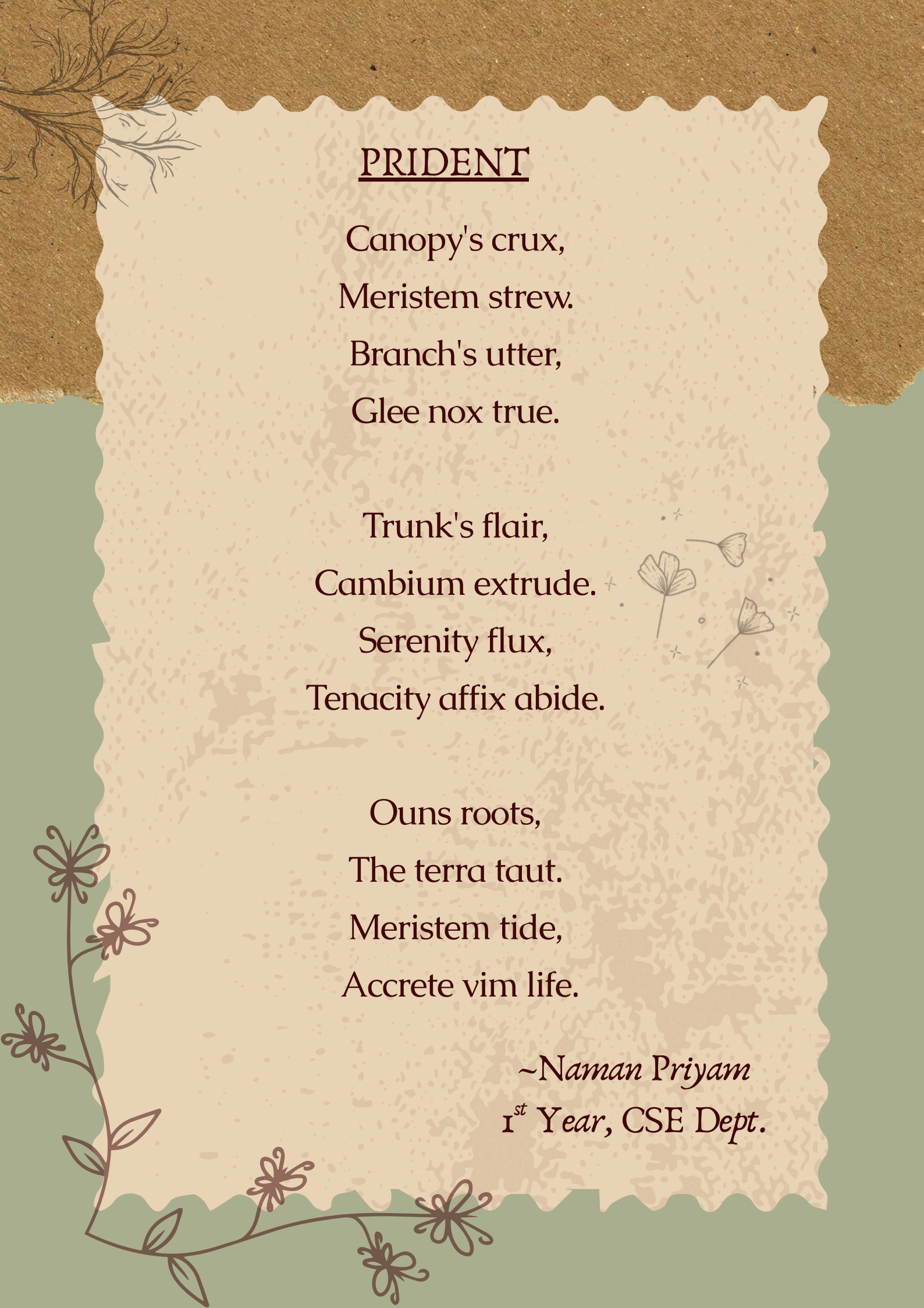
আজকে আমরা খুব *mature*,
পড়তে যাই *college...*
আড্ডা চাই, ঠাট্টা ও চাই,
মীমস্ ও চাই *savege...*

আর হয় না স্কুলের দেখা,
ক্লাসরুম গুলো বড্ড একা।
ক্লাসরুম এর ওই নোংরা ছবি,
Monitor এর ব্যর্থ দাবি...॥

হেডস্যারের ওই গরম চোখ
পড়ত ডান্ডা বাড়লে নখ।
মনে পড়ে সেই *tiffin hour*, সরস্বতী পূজোর ধুম,
নিরালা দুপুরে মন ভারী করে, কাঁদে আমার
ক্লাসরুম...॥

তুমি আমার আড়াই পৃষ্ঠা অংকের প্রথম
লাইনের ভুল, যেটাকে সঠিক মনে করে
আমি পুরো অঙ্কটাই করে এসেছিলাম...॥

~Sougata Jana
2nd Year, ME Dept.



PRIDENT

Canopy's crux,
Meristem strew.
Branch's utter,
Glee nox true.

Trunk's flair,
Cambium extrude.
Serenity flux,
Tenacity affix abide.

Ouns roots,
The terra taut.
Meristem tide,
Accrete vim life.

~Naman Priyam
1st Year, CSE Dept.



When Light Holds Its Breath

The world is held in a purple hush,
Where day and night begin to brush.

A golden eye, a burning sphere,
Tells the sky that sleep is near.

Below, the water holds its breath,
A mirror deep as life and death,
Tracing the silhouette of the pine,
And the sun's soft, shimmering line.

The reeds stand tall like silver spears,
Guarding the pond through passing years,
While shadows stretch in quiet grace,
Upon this still and hallowed space.

No ripple breaks the velvet floor,
As light retreats from the distant shore;
A moment caught in amber light,
Before the world belongs to night.

~Arindam Bera

2nd year, CSE Dept.

আমাদের DIT, আমাদের গল্প

Dream Institute of Technology-র গেটে পা রাখা সেই প্রথম দিন,
ECE-র ক্লাসরুমে ঢুকেই বুঝি, জীবনটা হবে এক নতুন রুটিন।

Ohm's Law, KVL, KCL-এ মাথা যখন হ্যাং,
ক্যান্টিনের চায়ে তখনই জমে আমাদের গ্যাং।

Lab-এর ব্রেডবোর্ডে তার জুড়ি, স্যার বলেন “এটা নয়,”
Viva-র টেবিলে বুক ধুকপুক, তবু মুখে ফুল কনফিডেন্স রয়।

অ্যাটেন্ডেন্স শর্ট, অ্যাসাইনমেন্ট লেট, প্রজেক্টে সারারাত,
তবু DIT-র ECE আমরা, হার মানতে জানি না তো, ভাই।

Fourier-এর ডেউয়ে ভেসেছি, Laplace-এ খুঁজেছি কুল,
সেমিকন্ডাক্টরের মতো doped আমরা, ট্যালেন্টে ফুল।

ফেস্টের রাতে আলো জ্বেলেছি, সার্কিটের মতোই ব্রাইট,
বন্ধুত্বগুলো সোল্ডার করা, কখনো হবে না কাইট।

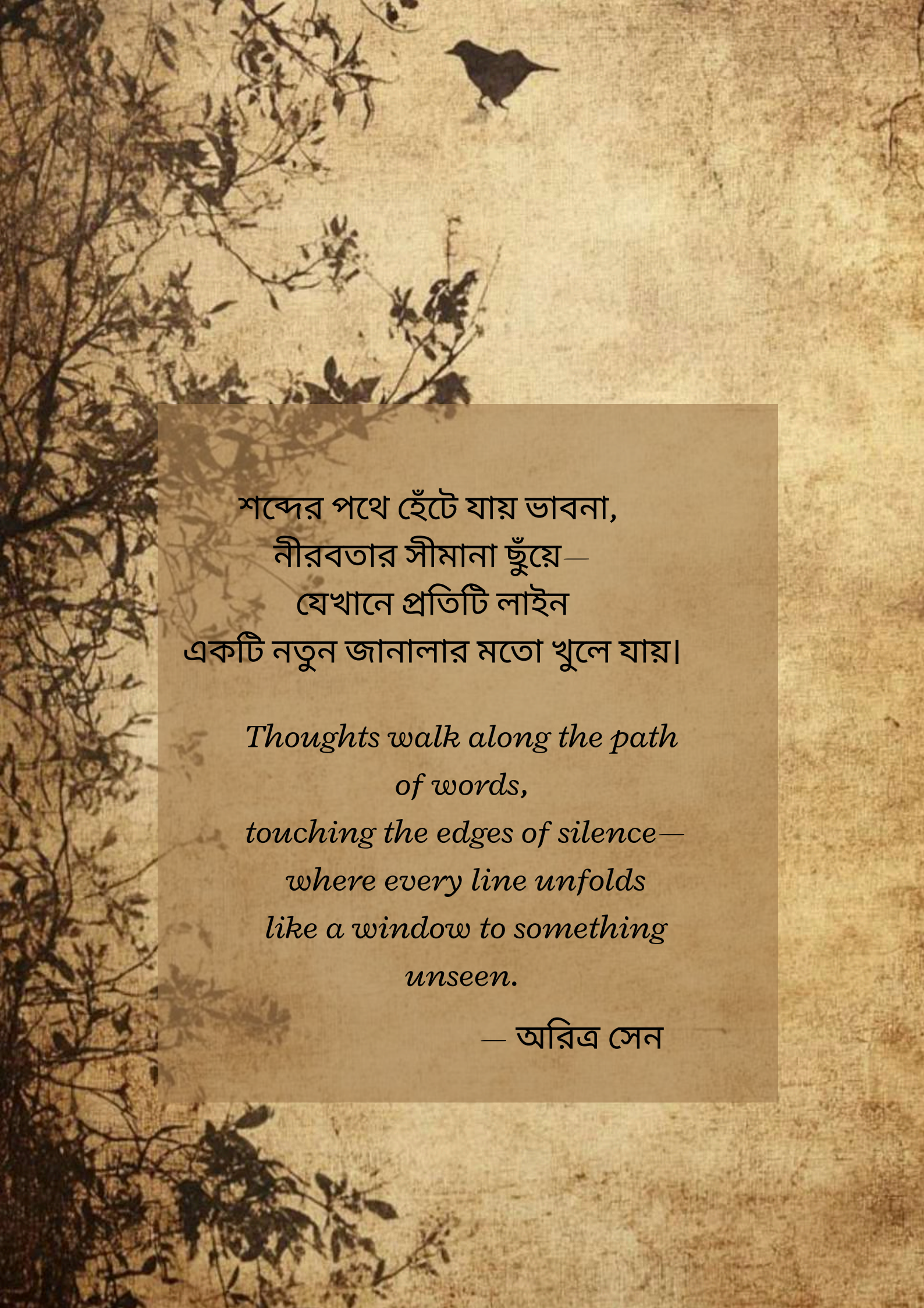
চার বছর পর আজ যখন বিদায়ের ঘণ্টা বাজে,
সার্টিফিকেটের চেয়ে দামি স্মৃতিগুলো বুকে সাজে।

Signal ছিল নিয়েজে ভরা, তবু Filter করেছি ভয়,
DIT শুধু কলেজ না রে, এটা আমাদের দ্বিতীয় পরিচয়।

চিপ বানাব, দেশ গড়ব, যাব সারা দুনিয়ায়,
কিন্তু বুকের ভেতর ECE-র DIT লেখা থাকবে চিরকালটাই।

সার্কিট ছিঁড়ে গেলেও কানেকশনটা রয়ে যাবে ঠিক,
কারণ আমরা DIT-র ECE, আমরা টেকের বস পাবলিক।

~Satyajit Mondal
3rd year, ECE. Dept.



শব্দের পথে হেঁটে যায় ভাবনা,
নীরবতার সীমানা ছুঁয়ে—
যেখানে প্রতিটি লাইন
একটি নতুন জানালার মতো খুলে যায়।

*Thoughts walk along the path
of words,
touching the edges of silence—
where every line unfolds
like a window to something
unseen.*

— অরিত্র সেন

দেয়াল পত্রিকা প্রকাশ

কলেজতে নোটিশ এল,
প্রকাশ হবে দেয়াল পত্রিকা,
জ্বালাতে হবে জ্ঞানের দ্বীপ,
হবে আলোক বর্তিকা।
লিখতে বসে সারাক্ষণ,
ভাবছি আমি মনে,
একটা কিছু লিখবো আমি,
হোক না যা তার মানে।
প্রথম প্রথম ভেবেছিলাম
কাজটা খুবই সোজা,
লিখতে বসে ভেবে দেখি
এ যে ভীষণ বোঝা।
গদ্য ভেবে পদ্য লিখি,
এখন কি যে করি,
কিছুই যে আসেনা মনে,
শুধু ভেবেই মরি।
চোখের জলে নাকের জলে,
লিখি অনেক খেটেখুটে,
শেষ পর্যন্ত ভালোই হলো,
উঠলো সে যে ফুটে।
আমার লেখা সবাই দেখে,
হাসাহাসি করে,
তাইতো আমি তাদের বলি
B-tech কমপ্লিট কর।

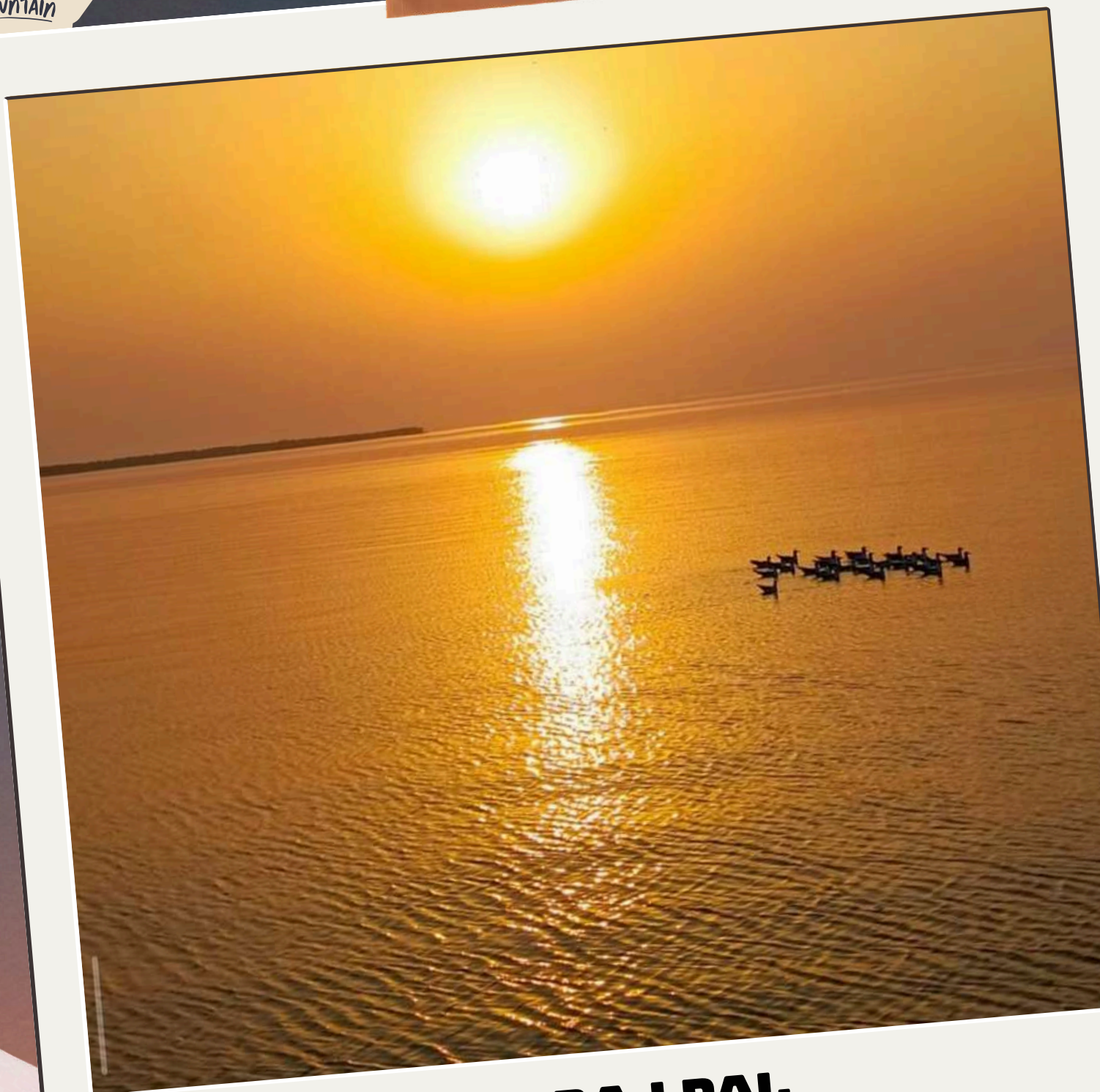
~Abhijit Mahapatra
4th Year, EE Dept.



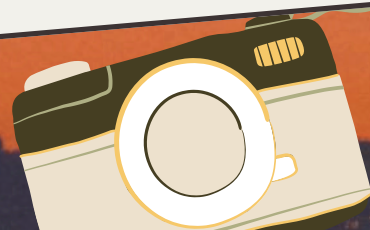
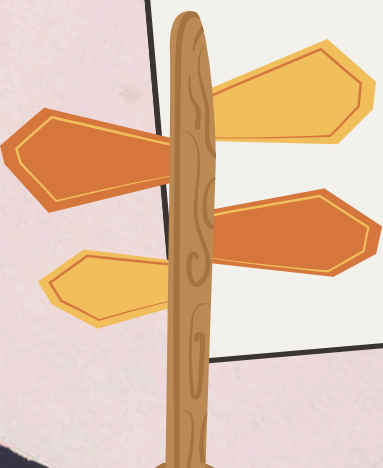
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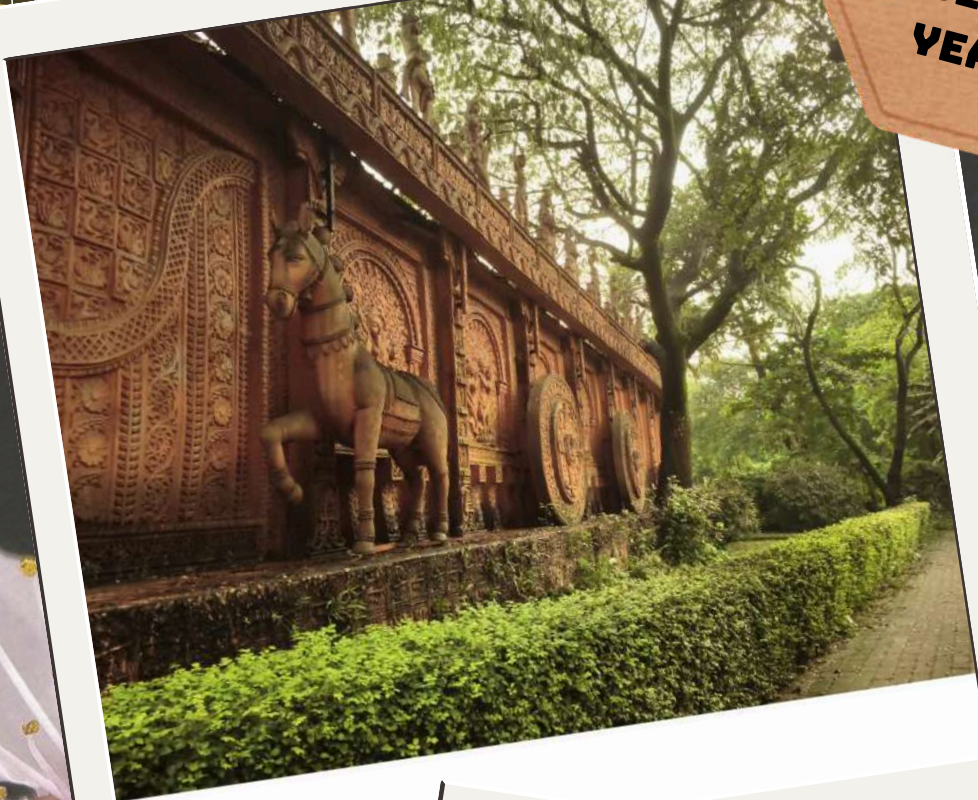


SWARAJ PAL
2ND YEAR, CSE DEPT.

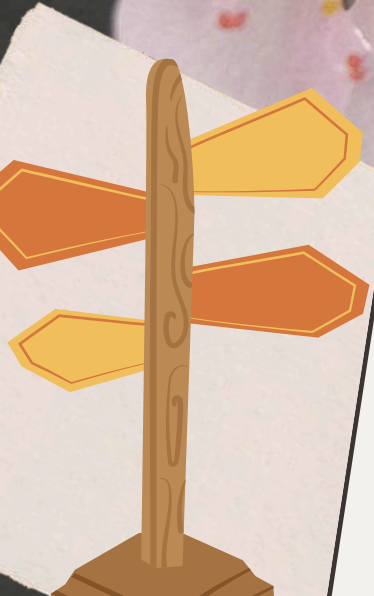




MOUPRIYA MAJI
DEPARTMENT: CSE
YEAR: 3RD

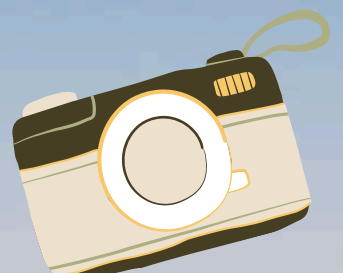


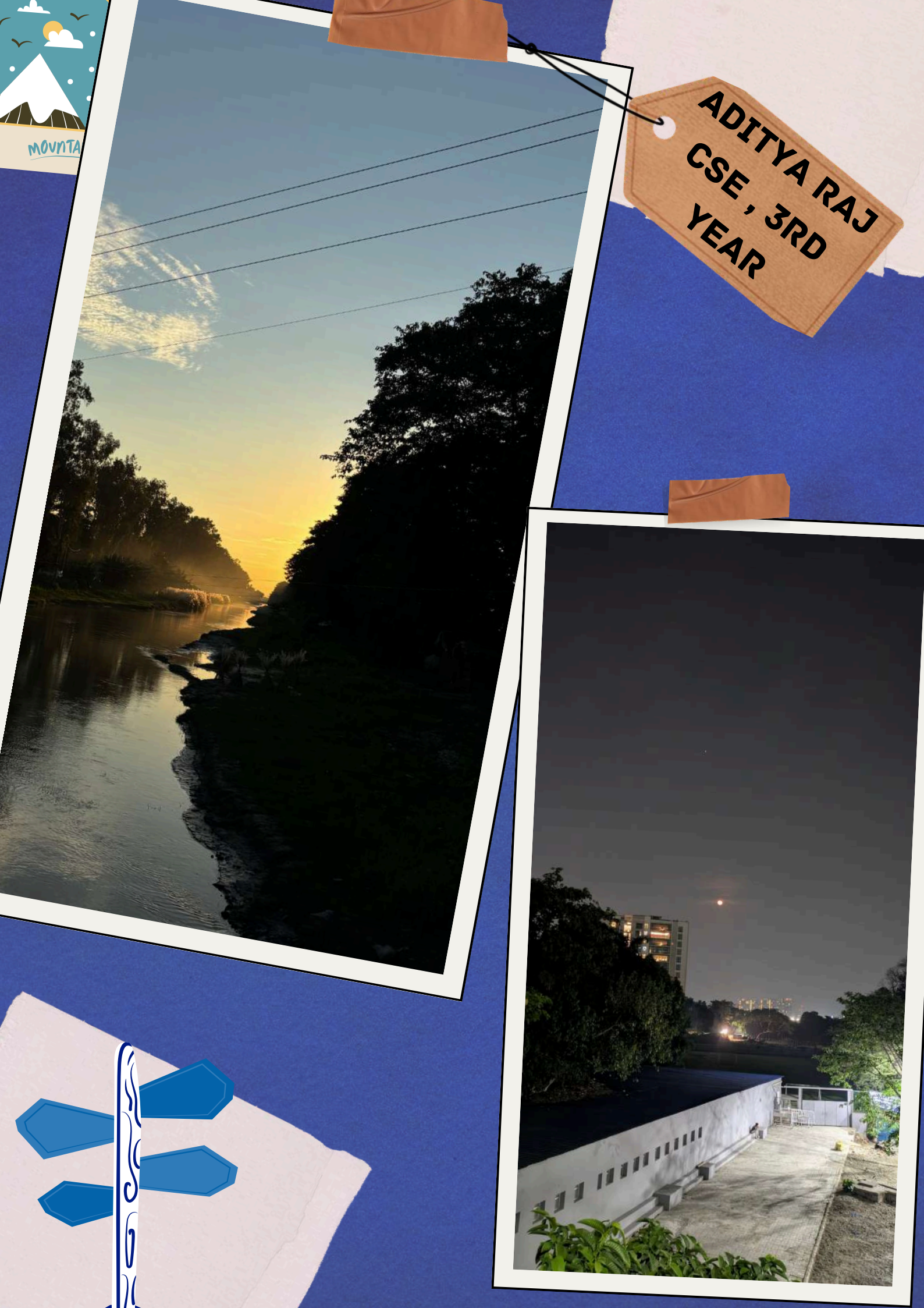
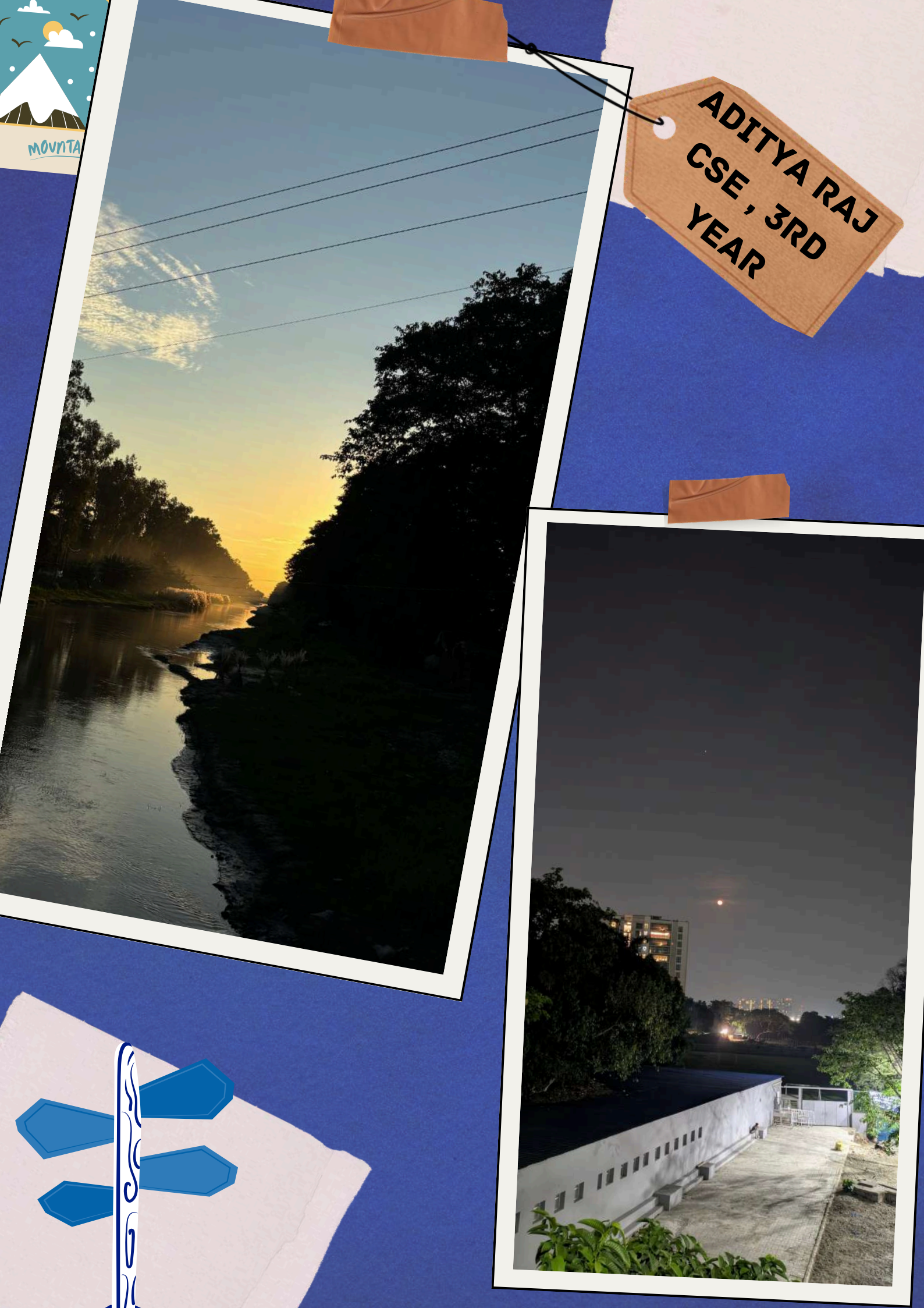
vivo V50e





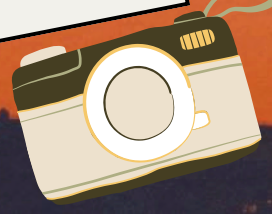
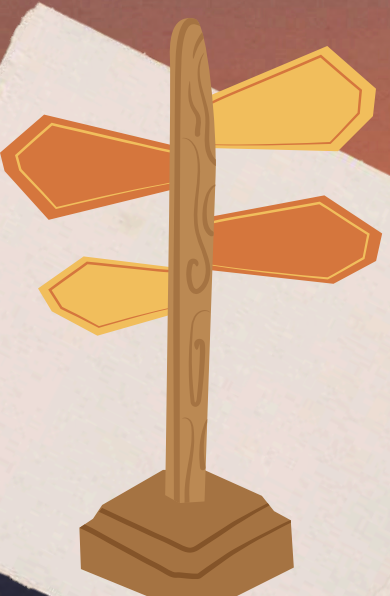
SAYAN JANA
1ST YEAR, ECE DEPT.

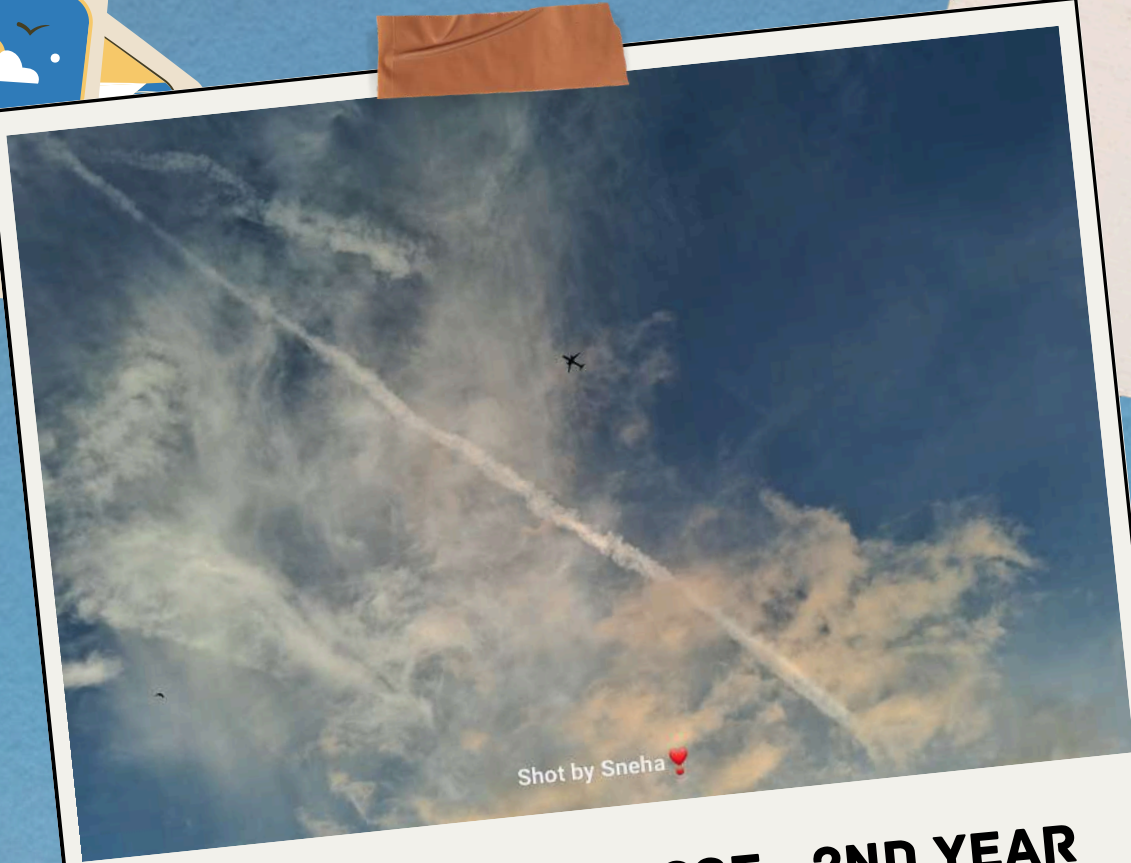
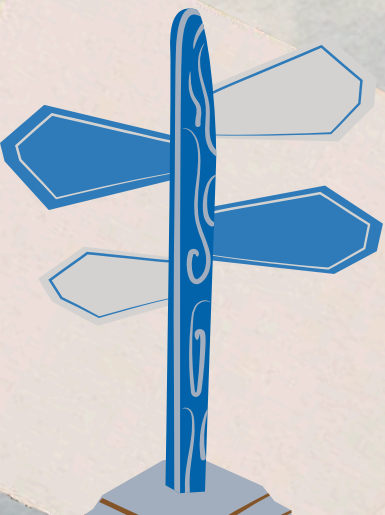
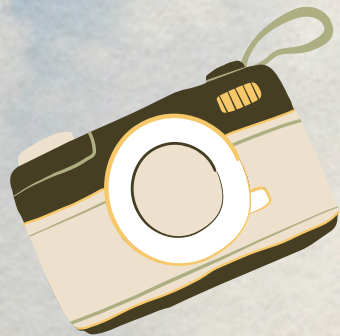






DEBABRATA MANDAL, 2ND YEAR, ECE



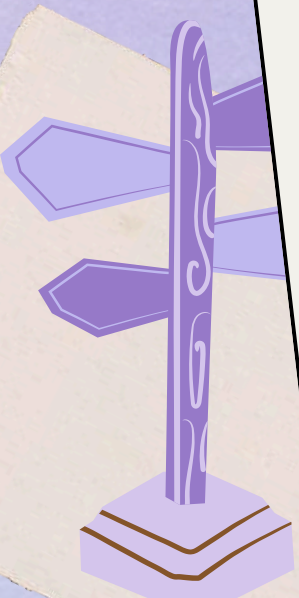
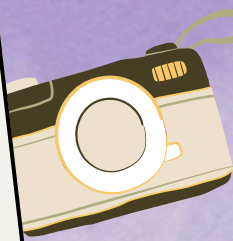


Shot by Sneha ❤️

SNEHA MONDAL , CSE , 2ND YEAR



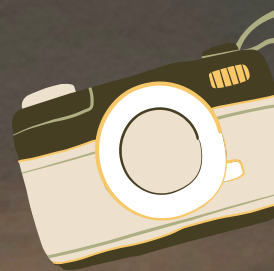
JINIYA SAHA
2ND YEAR, CSE

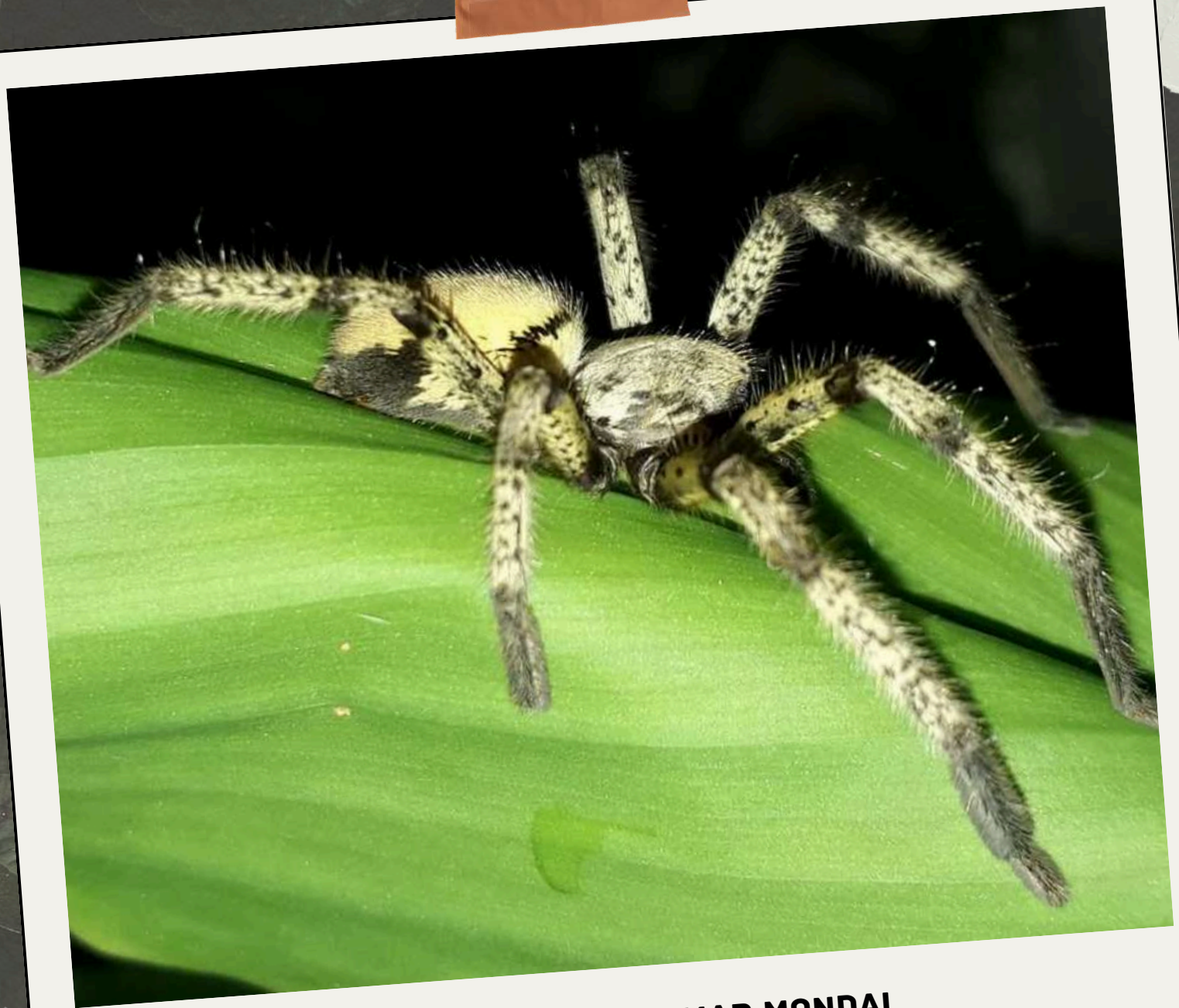




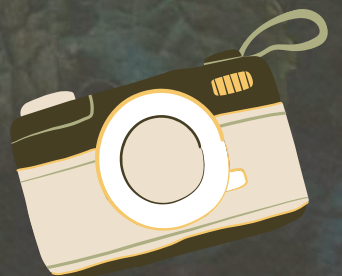
MOUNTAIN

BIKRAM SARDAR
1ST YEAR, CSE





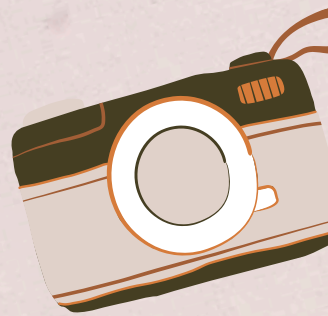
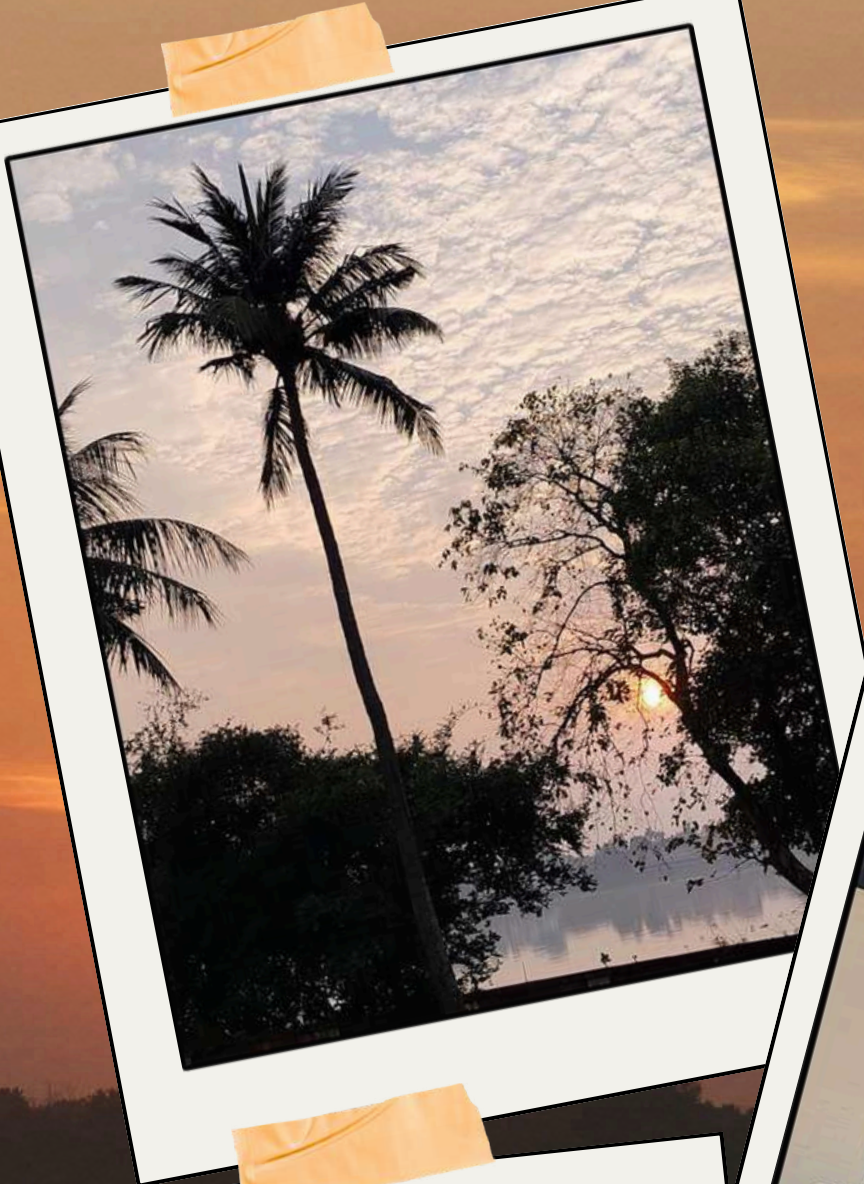
NAME- KAUSTAV KUMAR MONDAL
2ND YEAR, ECE





NAME- SUMANA MANNA
2ND YEAR, CSE



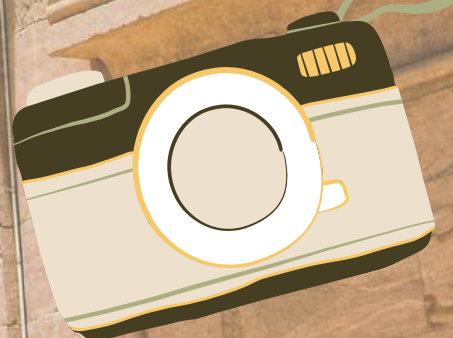
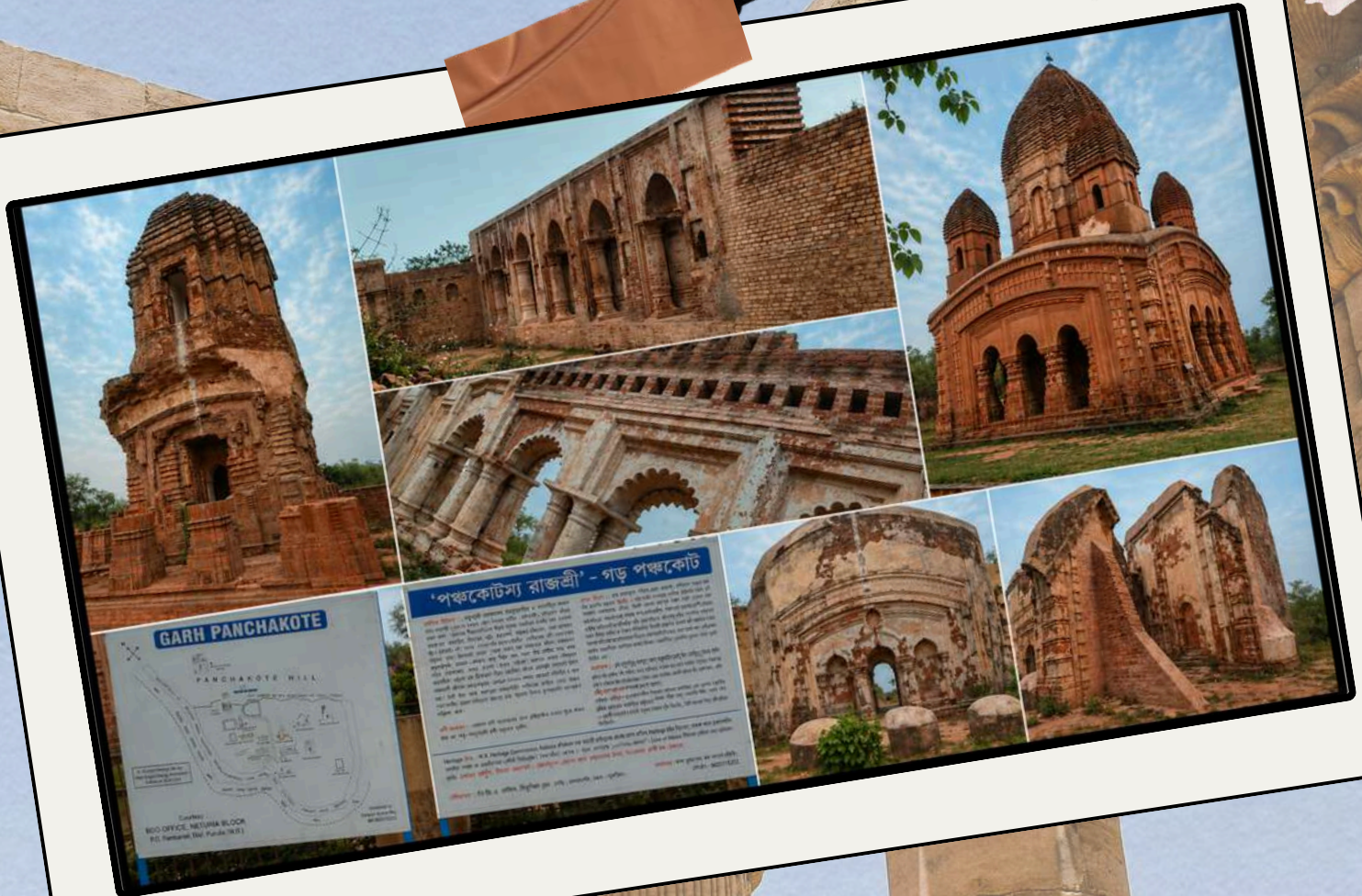


PRABIR BANERJEE
2ND YEAR, ECE





DR. ABHISHEK
BAGCHI.
ASSISTANT
PROFESSOR,
EE DEPARTMENT



ARTEVA



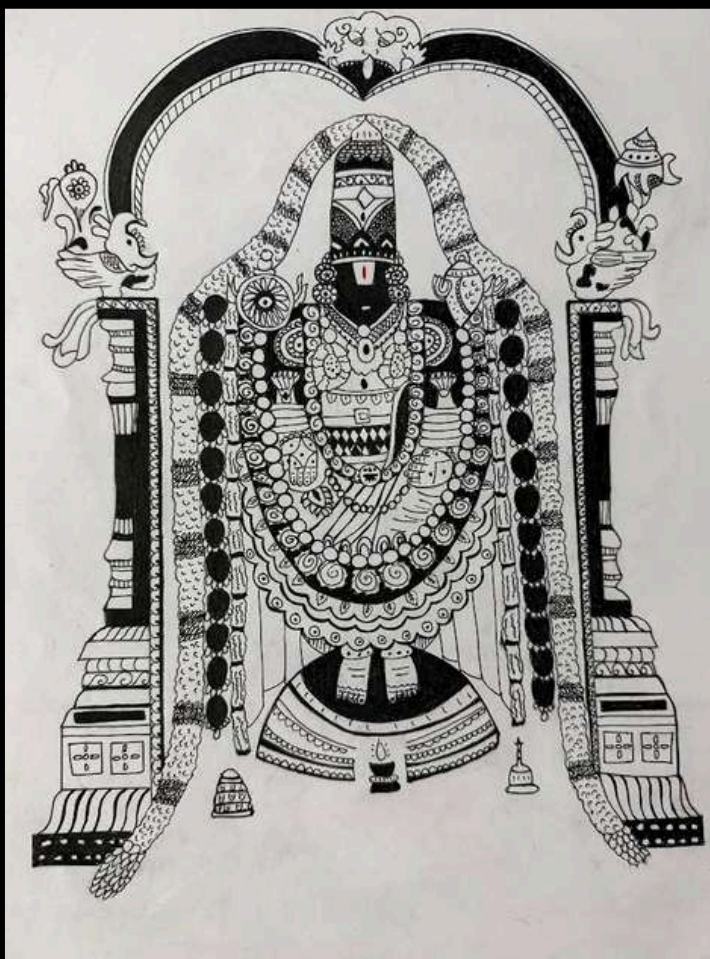
SANTOSHI SINGH
ASST. PROFESSOR(BSHU)

**“LORD GANESHA
PORTRAYED WITH
ELEGANCE, DETAIL, AND
SPIRITUAL CHARM.”**



**“A DIVINE UNION OF
SHIVA AND SHAKTI
EXPRESSED THROUGH
ARTISTIC HARMONY.”**





**“INTRICATE DEVOTION
CAPTURED IN DIVINE
SYMMETRY.”**

**SANTOSHI SINGH
ASST. PROFESSOR
(BSHU)**

**“GRACE AND
STRENGTH
REFLECTED IN A
TIMELESS FEMININE
PORTRAIT.”**



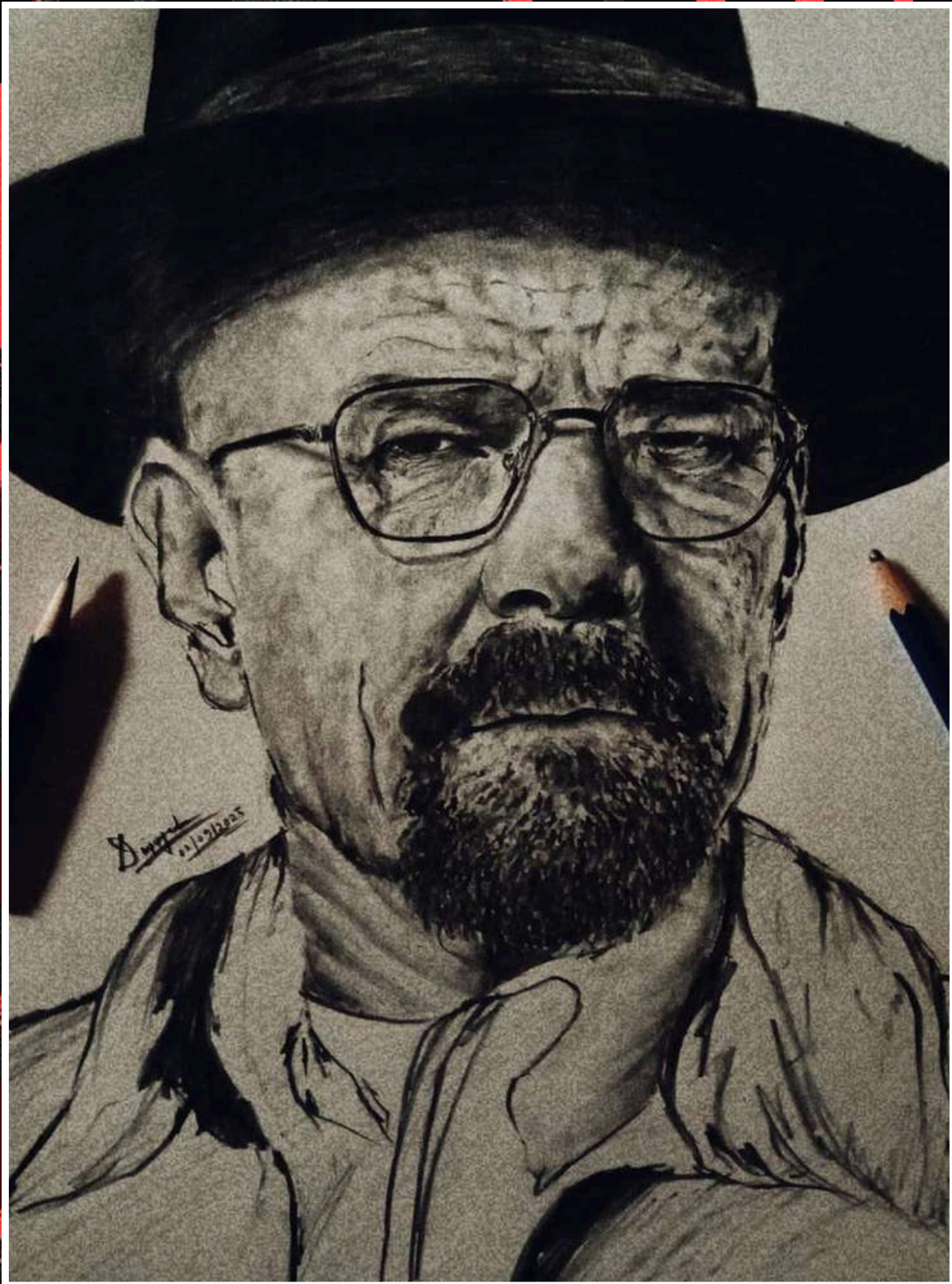
KRISNA



RUPAM DAS

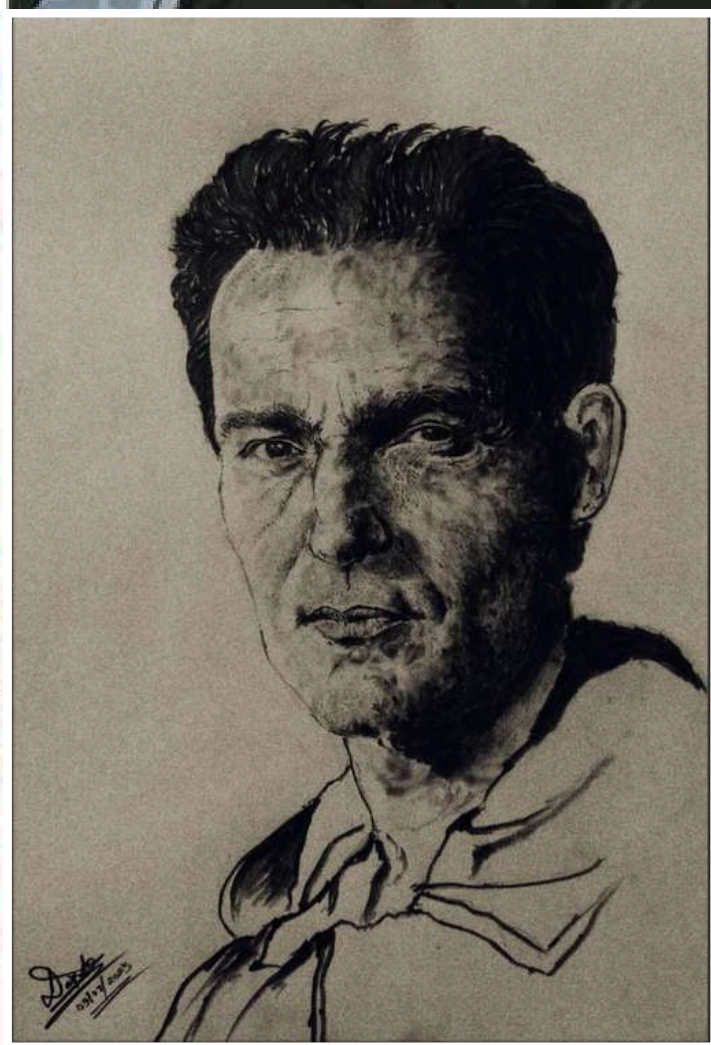
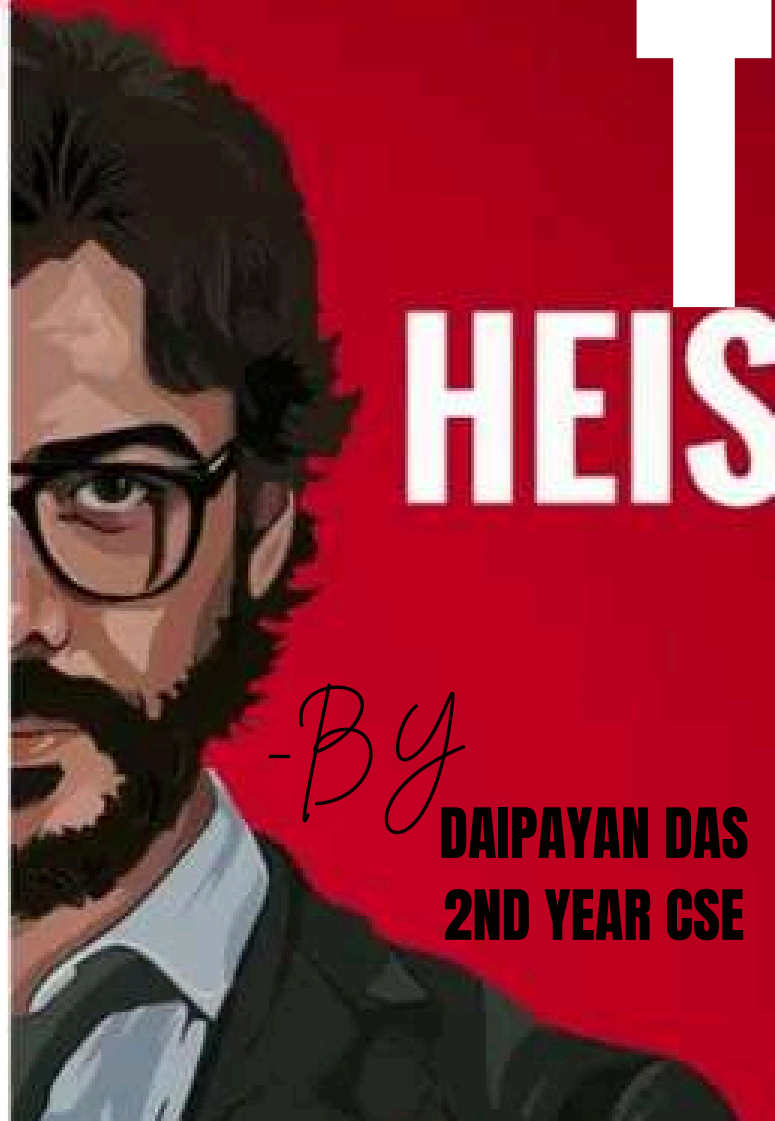
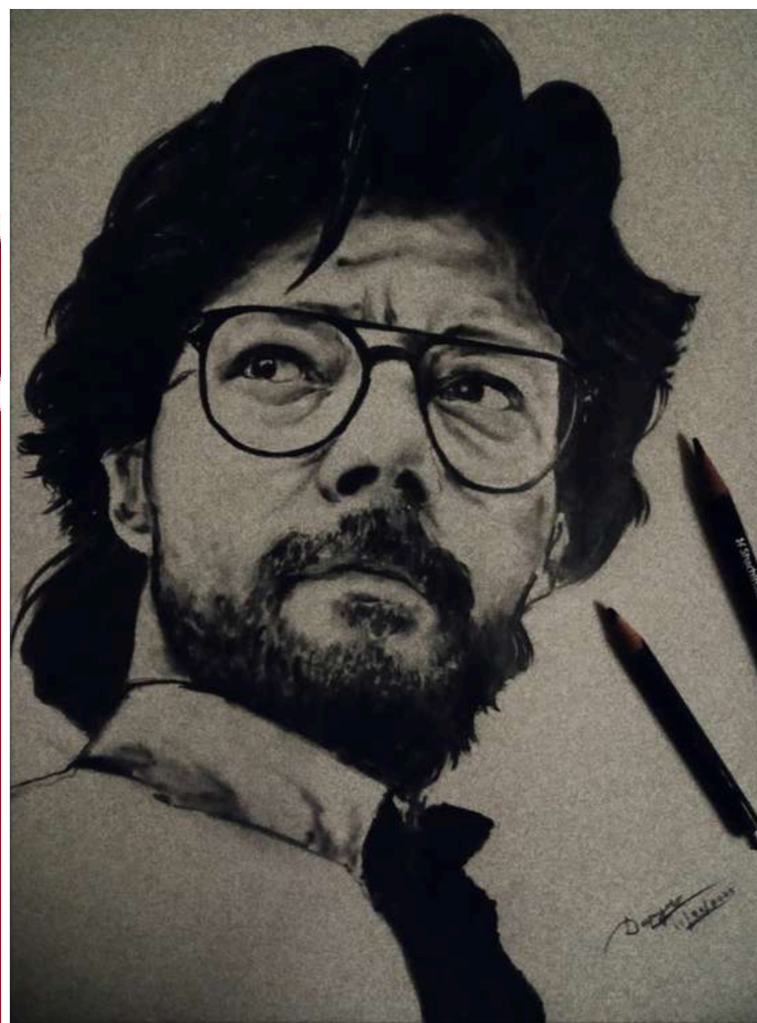
1st YEAR, CSE

BREAKING



-By

DAIPAYAN DAS
2ND YEAR CSE



PIRATES



STRANGER



SAYANIKA BANERJEE
3RD YEAR, CSE

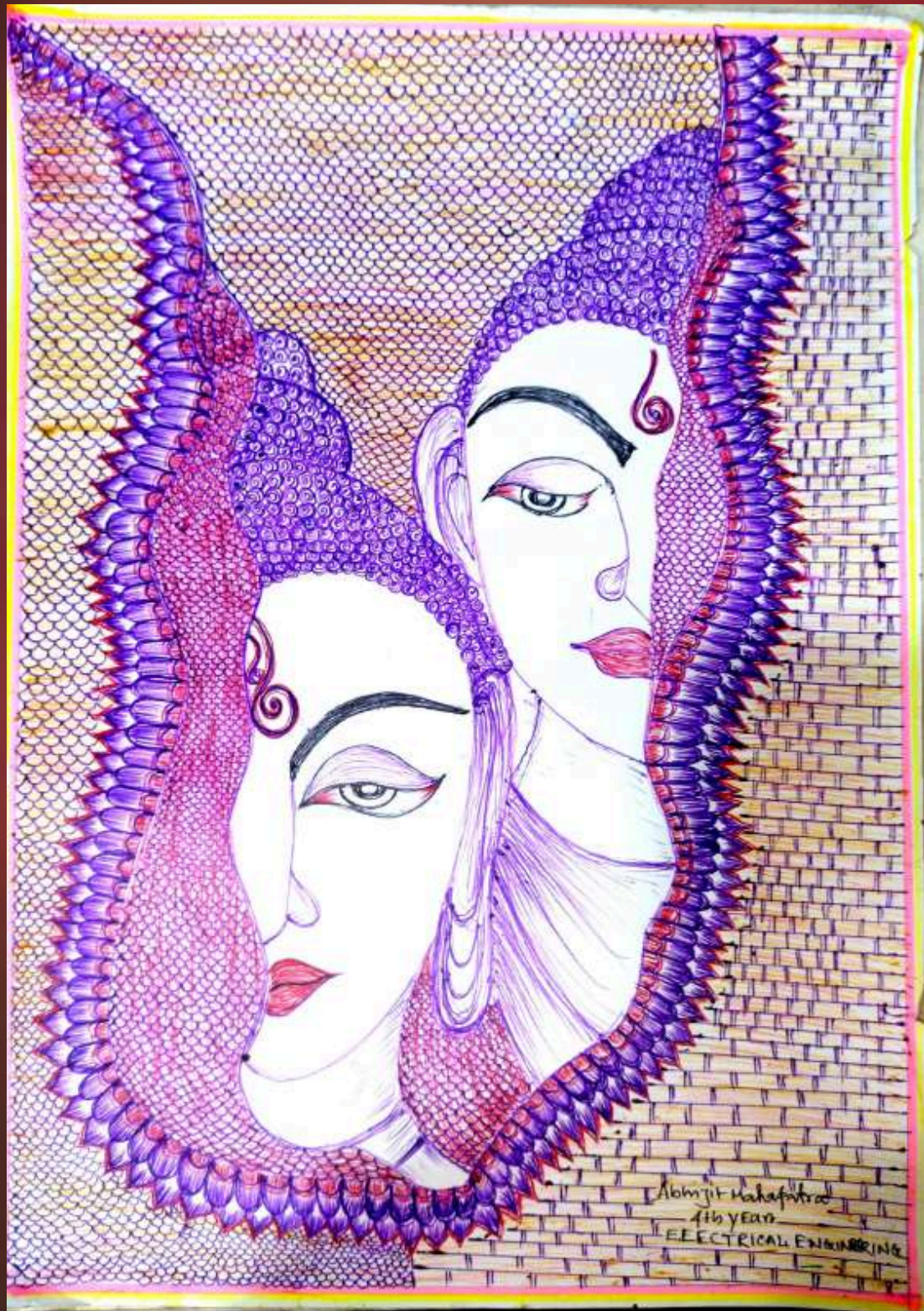
THINGS



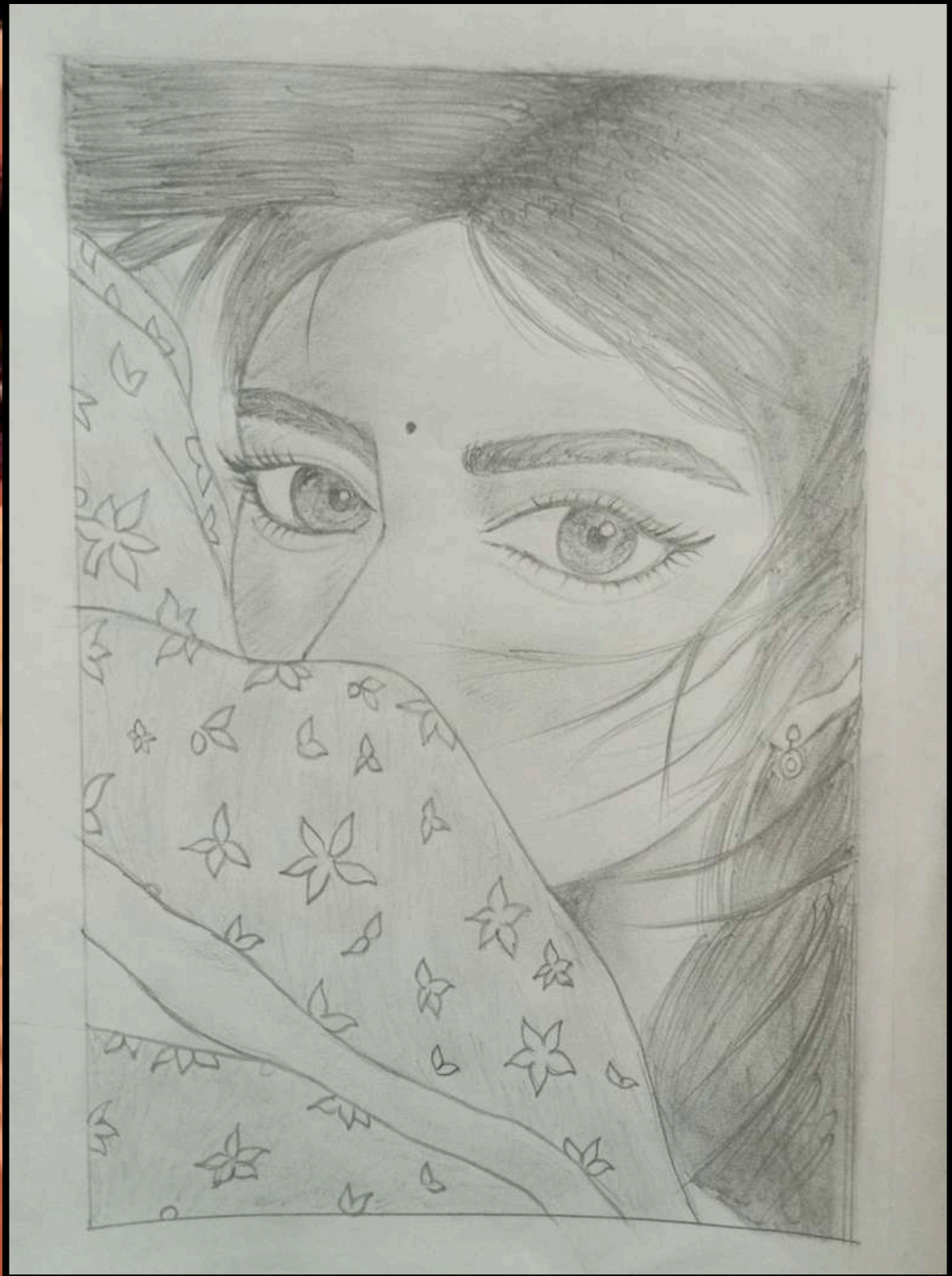
TANUSHREE SARKAR
3RD YEAR, ECE



SOUMOJIT MONDAL
2ND YEAR, CE

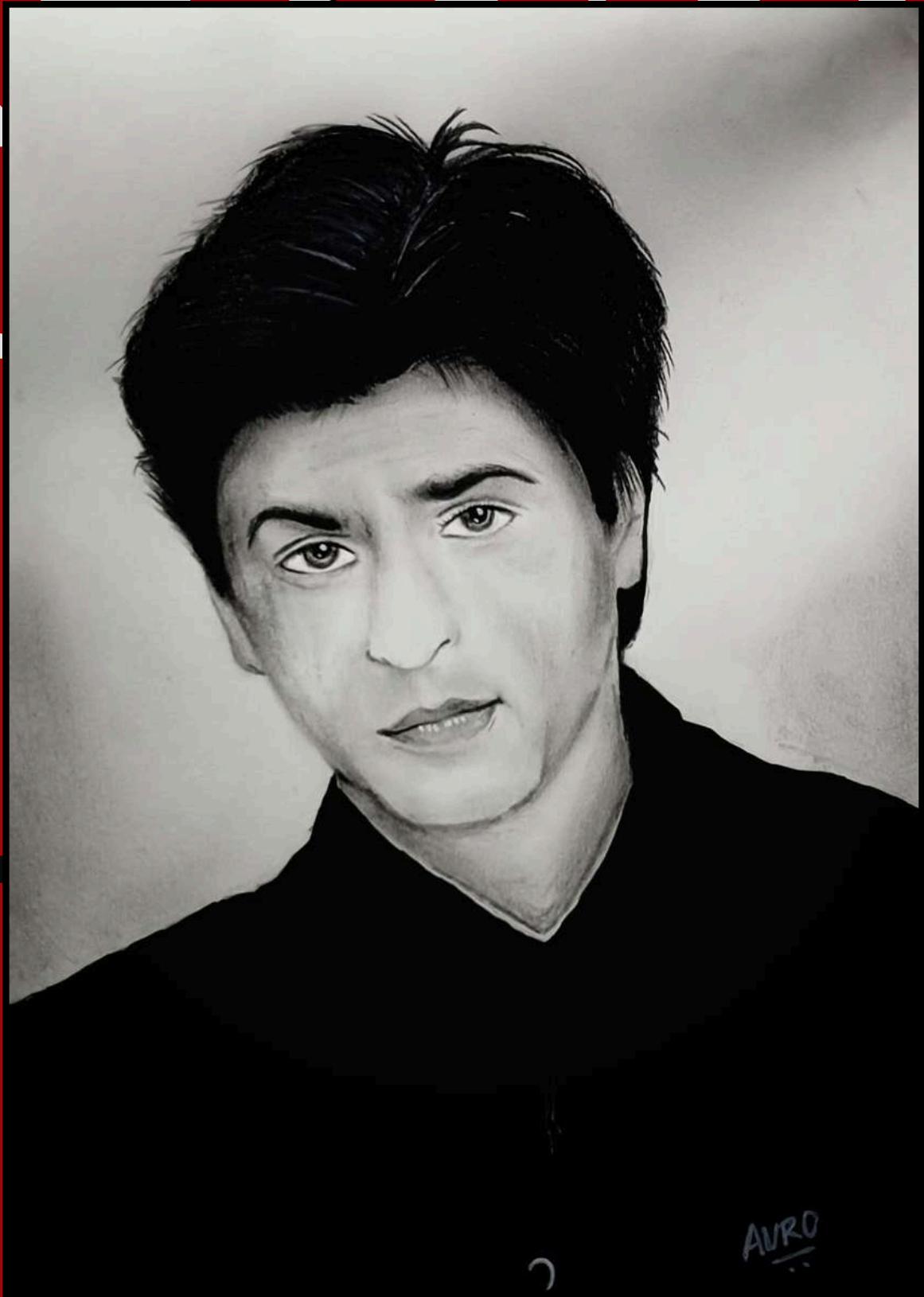


ABHIJIT MAHAPATRA
4TH YEAR , EE



SHWETA KARMAHAPATRA

1ST YEAR, CSE



Abhranil Maji

3rd YEAR CSE

CLASS REPRESENTATIVES



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EVENTS

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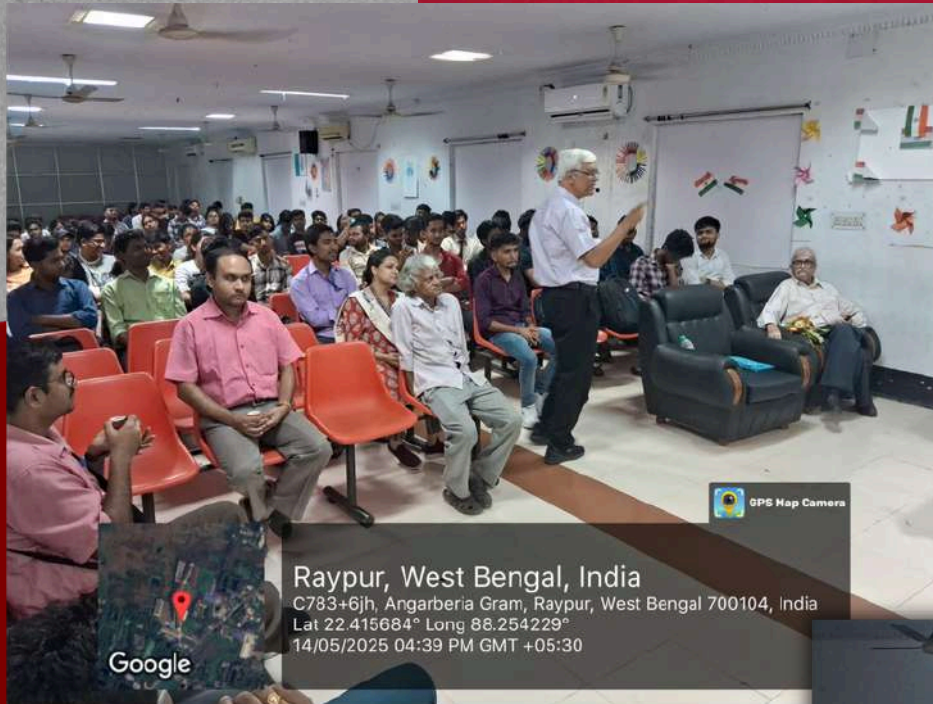
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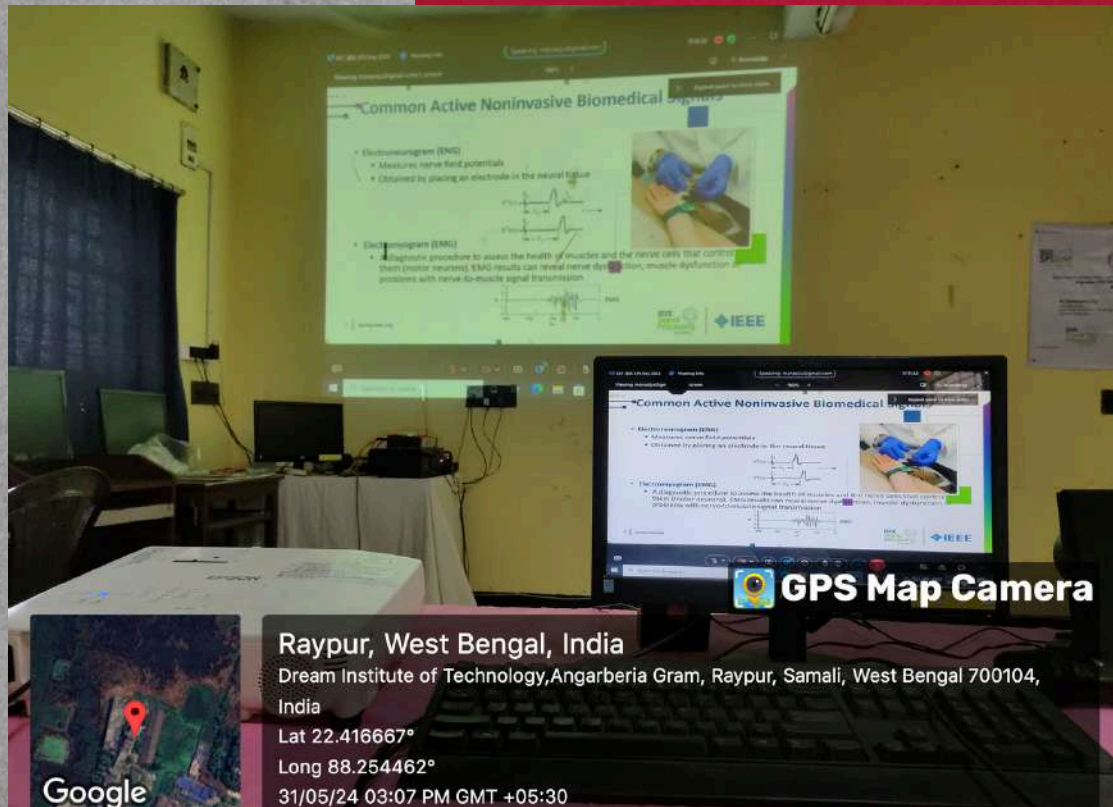
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PROFESSOR OF ELECTRICAL
ENGINEERING, JADAVPUR
UNIVERSITY**



**PROF. SUGATA MUNSHI,
FORMER PROFESSOR OF
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DATE: 31.05.2024

DR. DEBANGSHU DEY

DEPARTMENT OF ELECTRICAL ENGINEERING

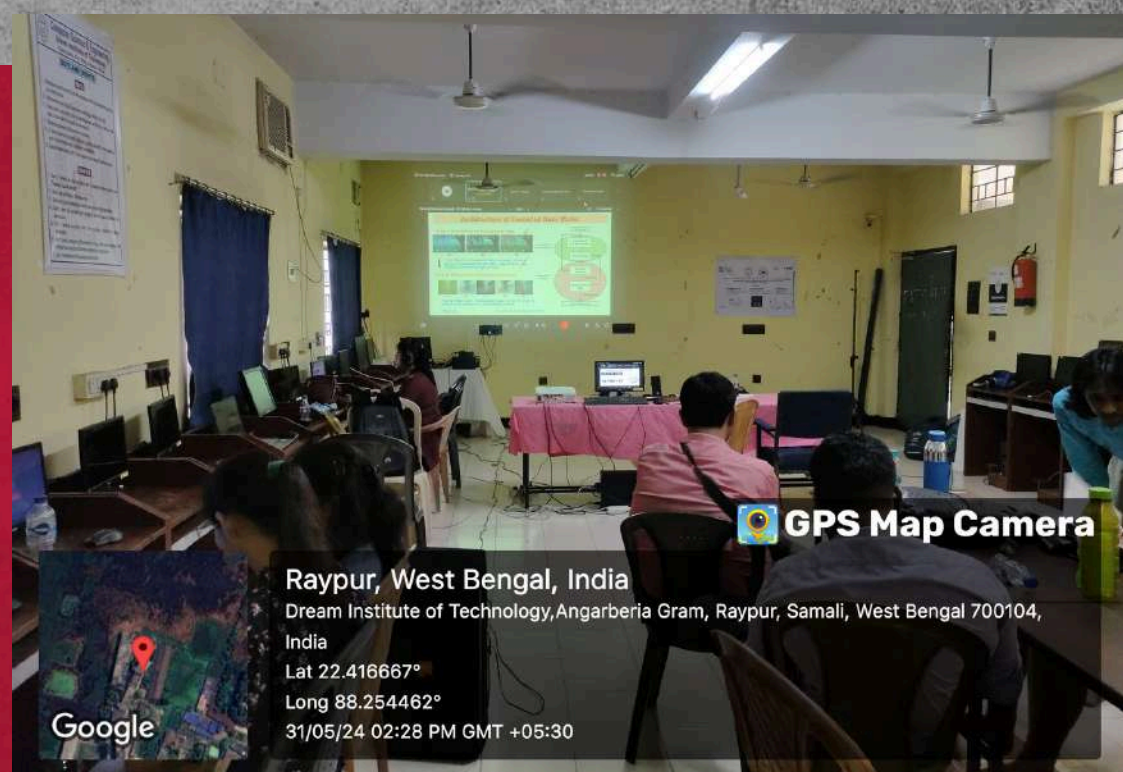
JADAVPUR UNIVERSITY

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